

The Research Question And Hypothesis

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What is a Research Question?

- **Research** is “diligent and systematic inquiry or investigation into a subject in order to discover or revise facts, theories, applications, etc.” (Dictionary.com)
- **Curiosity** is “the desire to learn or know about anything; inquisitiveness” (Dictionary.com)
- Considered together, curiosity is the source of our questions
 - We ask because we want to know
 - Research is the means by which we find an answer



A Research Question is...

- Something you want to know about your discipline, or about a specific area within your discipline.
- Not a topic, fragment, phrase, or sentence. It ends with a question mark.
- Clear and precisely stated. It is not too broad, nor is it too narrow.
- Open-ended, as opposed to closed. It cannot be answered in a sentence or phrase.



Research Question can be of Different Levels

- **Descriptive RQ** : seeks description of a phenomenon. (usually covers only one variable).
 - What is the prevalence of STDs in college students in south Florida?
 - What is the socioeconomic status of college students presenting with an STD at a university clinic in south Florida?



Research Question can be of Different Levels

- **Inferential RQ:** aims at drawing inference from a sample of population. Involves a minimum of one independent variable and one dependent variable.
 - What is the relationship between socioeconomic status and occurrence of STDs among college students in south Florida?
 - What is the influence of an online STD training program on the desire to practice safe sex in a sample of college students?



Essential Elements of a Research Question

Acronym	Definition	Description
P	Participant or population	Can be only one participant, a group of participants
I	Intervention	Intervention of interest (Intervention A). Can be therapeutic (therapy), preventive (vaccination, education), diagnostic (BMI,), administrative or related to economic issues
C	Control or comparison	Comparator (Control, Intervention B)
O	Outcome	Expected result

** The Intervention and Comparator = Independent Variable
The Outcome = Dependent Variable



PICO Example 1

- In ventilated patients (P), what is the influence of head-of-bed elevation of 45 degrees (I) compared to 20 degrees (C) in reducing incidence of ventilated associated pneumonia (O)?



PICO Example 2

- In hospitalized children, (P) how does the Wong-Baker Pain FACES Rating Scale (I) compare to the Child Medical Fear Scale (C) in evaluating the child's level of pain (O)?



PICO Example 3

- In non-ambulatory patients, (P) how does turning the patient (I) compare to pressure mattresses (C) in reducing the risk of pressure ulcers (O) ?



PICO Practice 1

- P = Account Executives
 - I = Bonus (\$)
 - C = Recognition
 - O = Employee satisfaction
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- In a sample of account executives (P), how does monthly bonus (I) compare to recognition (C) in increasing employee satisfaction (O)?



PICO Practice 2

- P = Technical Support Representatives
 - I = Daily huddles
 - C = Control
 - O = Customer satisfaction
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- In a sample of Technical Support Representatives (P), how do Daily huddles(I) compare to Standard Practice (C) in increasing customer satisfaction (O)?



PICO Practice 3

- P = Home Buyers
 - I = Weekly conversation with agent
 - C = Random conversations
 - O = Home purchase
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- In a sample of Home Buyers (P), how would Weekly conversation with agent(I) compare to Random conversations (C) in increasing Home purchase rate (O)?



Framing a Research Question

Choose an interesting broad topic

Preliminary literature review

Narrow the topic (based on your interest and community interest)

Frame RQ (Consider PICO elements)

Test for goodness: novelty, relevance, clear, ethical, interesting, feasible, appropriately complex



FINER Criteria of a Good RQ

- **Feasible**

- Adequate number of subjects
- Adequate technical expertise
- Affordable in time and money
- Manageable in scope

- **Interesting**

- Interesting enough to engage student, supervisor & research community

- **Novel**

- Addresses a defined gap in knowledge



FINER Criteria of a Good RQ

- **Ethical**

- Acceptable to study population, no potential harm to them

- **Relevant**

- To scientific knowledge
- To field
- To future research

- *Don't forget*

- **Clear**
 - Well defined, focused
- **Appropriately complex**
 - Neither very ambitious nor very simple
 - well suited to caliber of student & supervisor



What is a Hypothesis?

- A statement that makes a prediction about the result of an experiment.
- A supposition or proposed explanation made on the basis of limited evidence as a starting point for further investigation.
- A hypothesis is very specific and it is based on previous empirical research. Hypothesis is used in quantitative research.



Forms of Hypothesis

Null Hypothesis

- Predicts that no relationship or significance difference exists between two or more variables.

Alternative Hypothesis

- There exist a significant difference between two or more variables.
- Non- directional hypothesis or Directional hypothesis.
 - One-tailed or two-tailed



Forms of Hypothesis

- Null hypothesis is a hypothesis to be disproved.
- When the null hypothesis is rejected, alternate hypothesis accepted (at least for the time being)
 - Remember, we do not prove anything. We find evidence for a phenomena.
- Accept the null hypothesis – There is no evidence for a difference
- Reject the null and accept the alternative hypothesis – There is a statistically significant difference



Practice 1

- RQ: In a sample of patients diagnosed with COVID-19, taking Drug X compared to standard treatment, see a reduction in severity of COVID-19 symptoms?
- H_0 :
- H_1 :



Practice 2

- RQ: In a sample of company employees, who received a recognition award compared to a gift certificate, show higher employee satisfaction on the Employee Satisfaction Survey?
- H_0 :
- H_1 :



Practice 3

- RQ: In a sample of potential home buyers, who received a pre-survey compared to no survey, result in a higher rate of sales?
- H_0 :
- H_1 :



Review 1

- When writing a research question, always remember PICO
 - Population
 - Intervention
 - Comparator
 - Outcome



Review 2

- **Null Hypothesis (H_0):** Predicts that no relationship or significance difference exists between two or more variables.
- **Alternative Hypothesis (H_1):** There exist a significant difference between two or more variables.
 - Non- directional hypothesis or Directional hypothesis
 - One -tailed or two-tailed
- *We never prove but only provide evidence!*



One Final Note

- **Beyond your research question and hypothesis**
 - **A Retrospective Study: You want to think about the format of the required data. This includes details as to the columns and rows of a requested dataset. See example below**

Patient #	Age	Sex	Weight	BP Systolic	BP Diastolic
67154	32	M	165	121	81
74514	28	F	125	118	72
82357	45	M	180	126	78



End of Presentation

