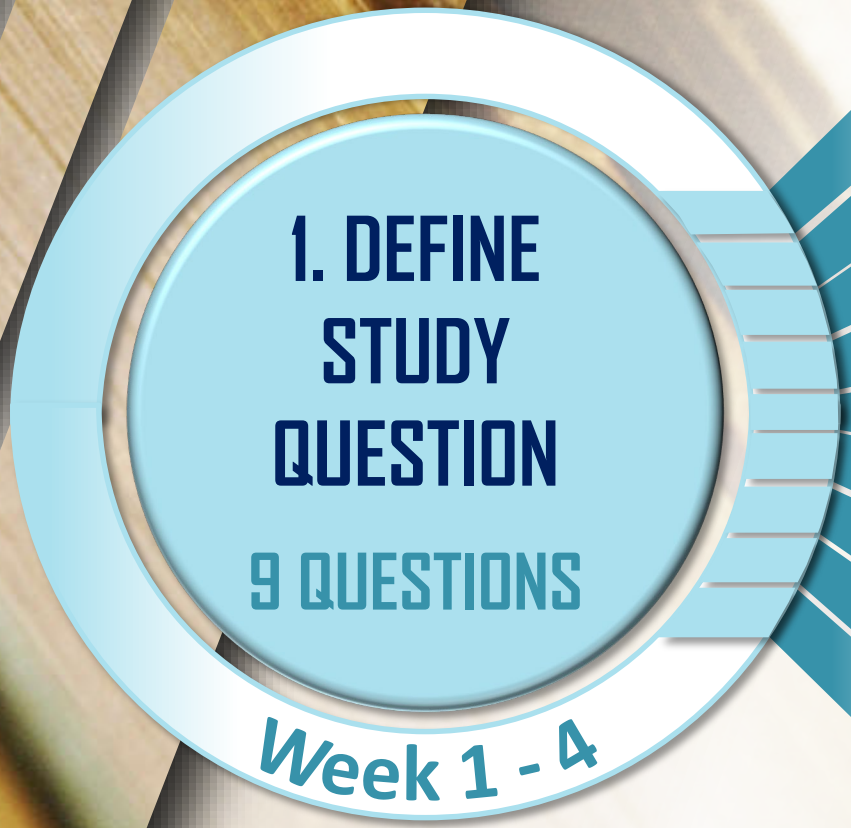
EDUCATIONAL RESEARCH

6 Steps 21 Questions



1. What is the topic of study?
2. What has been done before?
3. What is the specific research question?
4. What is the major outcome?
5. What is the treatment?
6. Looking for difference or relationship?
7. What is the expected answer?
8. What population to apply results?
9. Why do this study?

From: Designing Studies and Writing Scientific Paper
G. Bordage, MD, Ph.D & B. Dawson, Ph.D

By NemMD

1. DEFINE STUDY QUESTION

9 QUESTIONS

Week 1 - 4

1. What is the topic of study?

- Not too broad, not to vague
- Your interests or preoccupations
- An existing project
- The literature
- Discussion of colleagues
- New ideas (step forward) or rectifying past weaknesses
- Must be important
- Is a reflection of the researcher's interest

By NemMD

1. DEFINE STUDY QUESTION

9 QUESTIONS

Week 1 - 4

1. What is the topic of study?

Latulippe & Routhier

Maintenance of clinical competence

Maintenance of clinical skills: in particular, reading EKGs

Maintenance of clinical skills among residents in family medicine concerning the importance of EKGs

By NemMD

1. DEFINE STUDY QUESTION

9 QUESTIONS

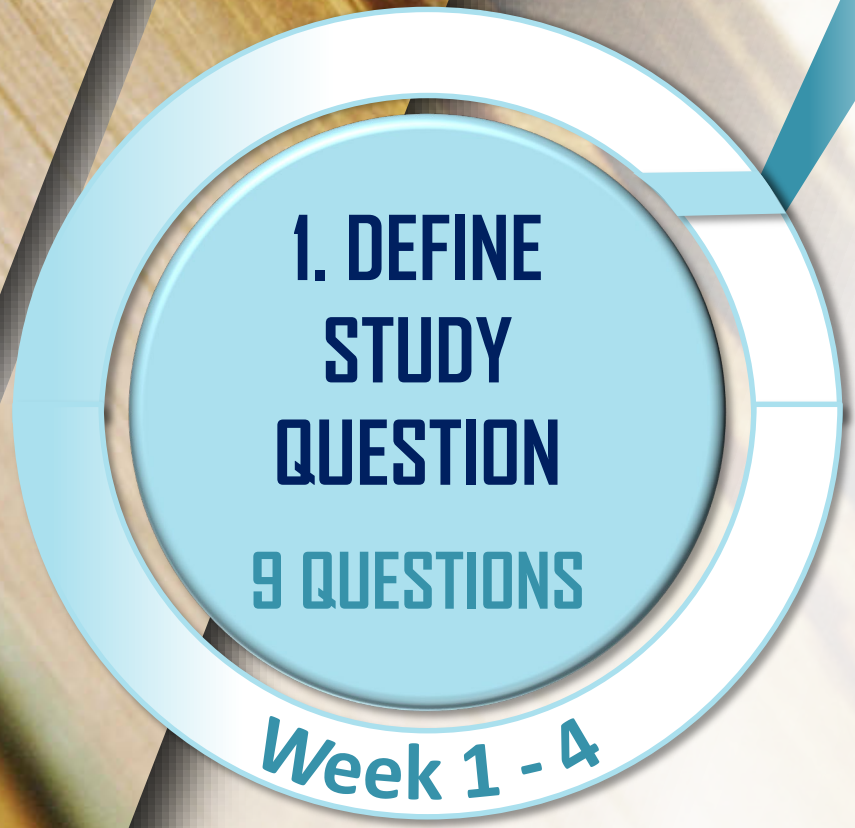
Week 1 - 4

1. What is the topic of study?

Latulippe & Routhier

Determining the maintenance of clinical competence to interpret cardiac arrhythmias among junior and senior residents in family medicine

By NemMD



2. What has been done before?

- In abstract, introduction and references
- What has been done before:
  - Demonstrates the theoretical framework
  - Avoids repeating previous studies when it's not necessary
  - Shows a step forward for the field of study

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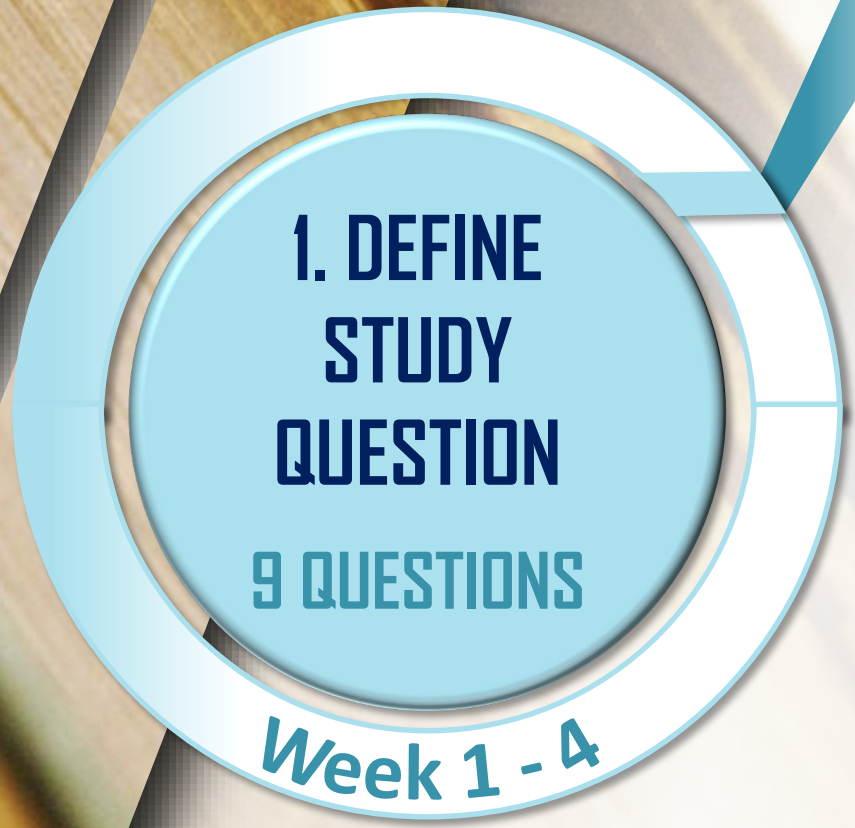
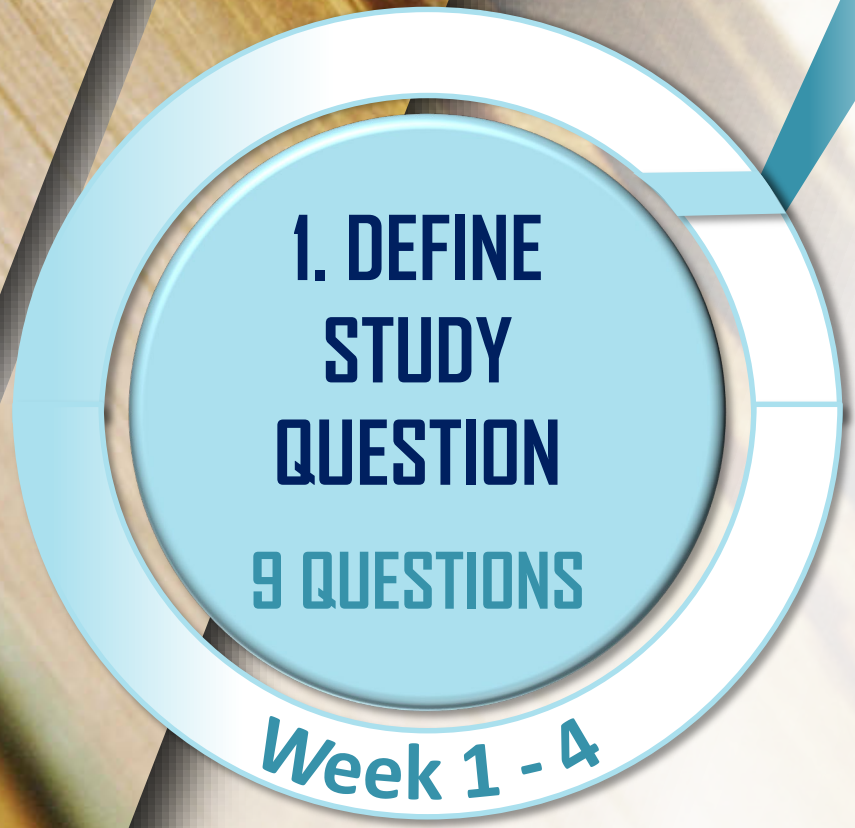


3. What is the specific research question?

- Demanding but crucial
- In abstract and last intro paragraph before methods
- Must be:
  - Focused, specific, clear
  - Operationally defined variable
  - Relationship between two variables
  - Formulated within theory (organized body of literature)
  - Population of interest

By NemMD



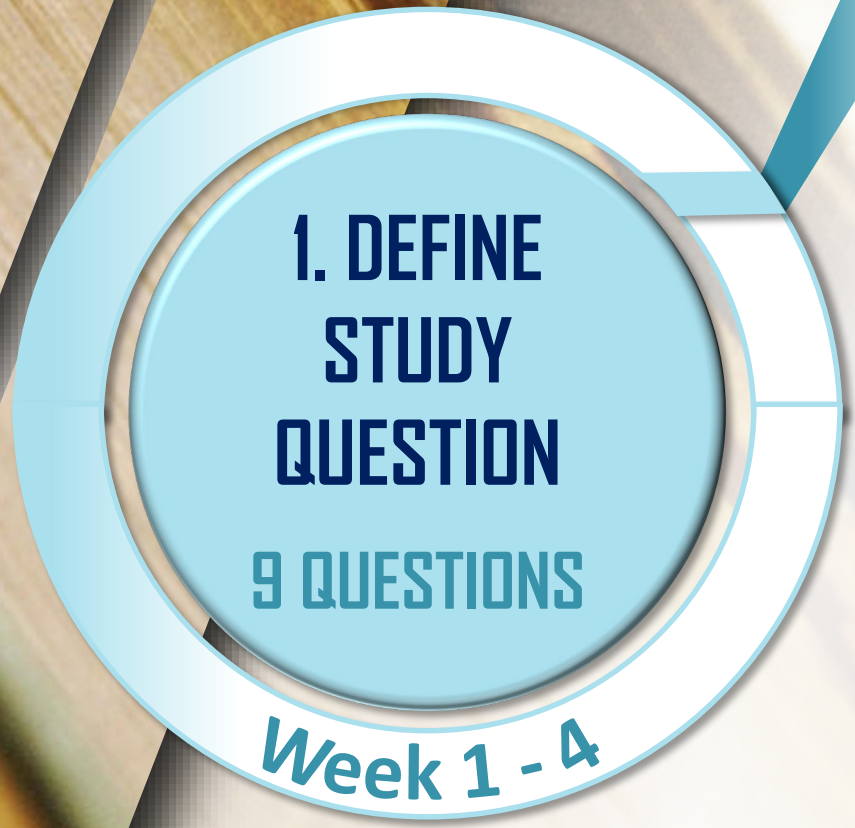
3. What is the specific research question?

There are three basic types of questions that research projects can address:

1. Descriptive

When a study is designed primarily to describe what is going on or what exists. Public opinion polls that seek only to describe the proportion of people who hold various opinions are primarily descriptive in nature. For instance, if we want to know what percent of the population would vote for a Democratic or a Republican in the next presidential election, we are simply interested in describing something.

By NemMD



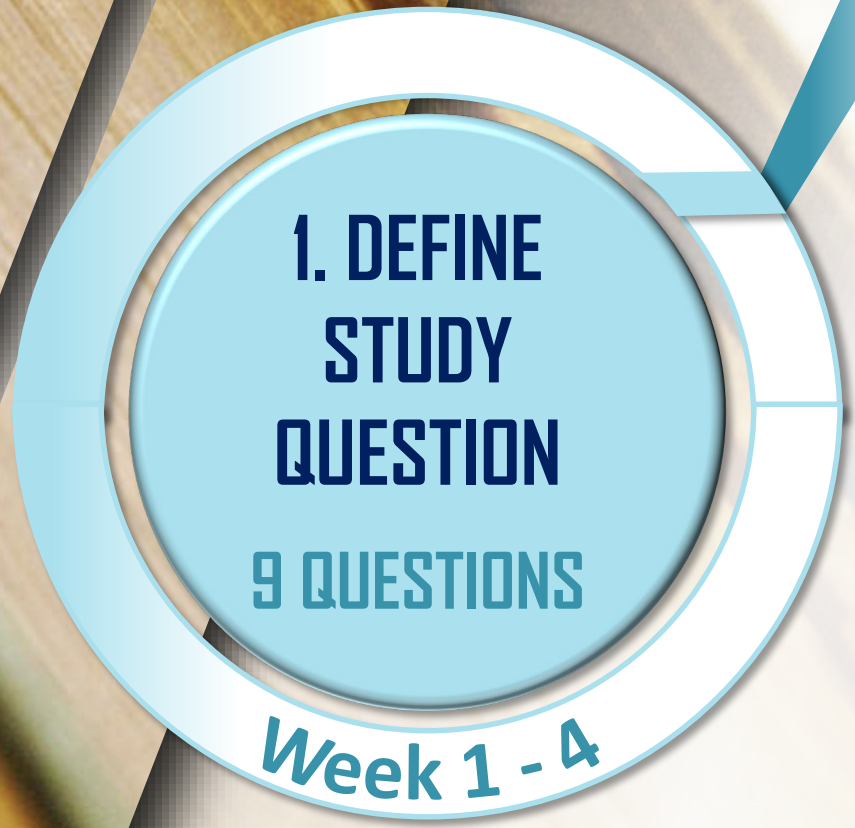
3. What is the specific research question?

There are three basic types of questions that research projects can address:

2. Relational

When a study is designed to look at the relationships between two or more variables. A public opinion poll that compares what proportion of males and females say they would vote for a Democratic or a Republican candidate in the next presidential election is essentially studying the relationship between gender and voting preference.

By NemMD



3. What is the specific research question?

There are three basic types of questions that research projects can address:

Causal

When a study is designed to determine whether one or more variables (e.g., a program or treatment variable) causes or affects one or more outcome variables. If we did a public opinion poll to try to determine whether a recent political advertising campaign changed voter preferences, we would essentially be studying whether the campaign (cause) changed the proportion of voters who would vote Democratic or Republican (effect).

By NemMD

1. DEFINE STUDY QUESTION

9 QUESTIONS

Week 1 - 4

3. What is the specific research question?

Latulippe & Routhier

Determining the maintenance of clinical competence to interpret cardiac arrhythmias among junior and senior residents in family medicine

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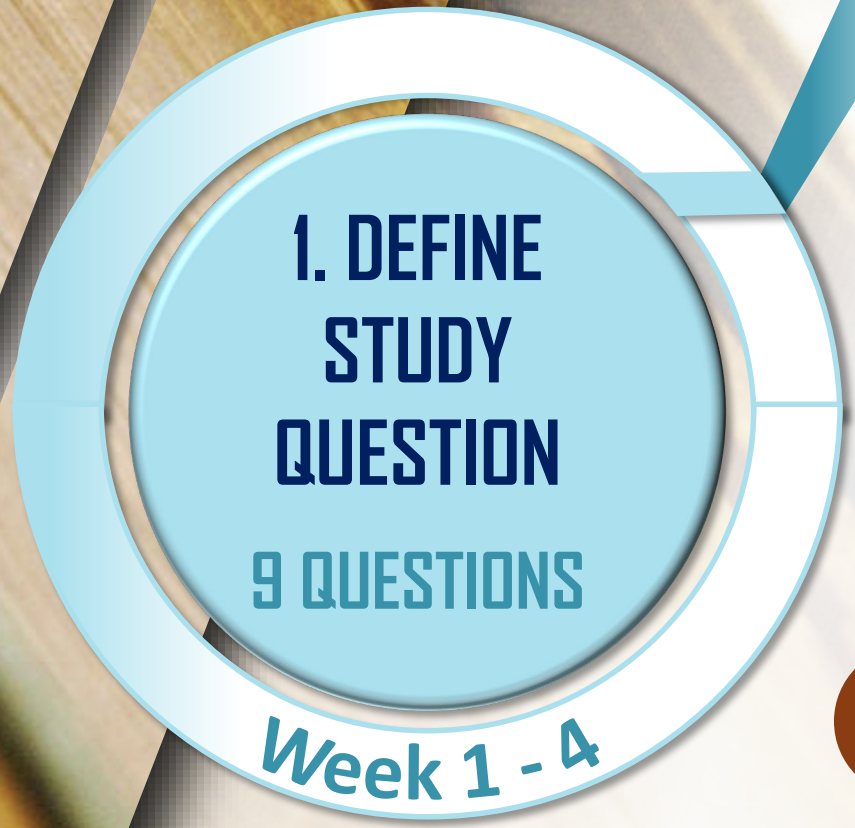

3. What is the specific research question?

Latulippe & Routhier

Determining the maintenance of clinical competence to interpret cardiac arrhythmias among junior and senior residents in family medicine

What period of time must elapse before junior and senior residents in family medicine lose their ability to correctly interpret five types of supraventricular arrhythmias on an EKG?

By NemMD

1. DEFINE STUDY QUESTION

9 QUESTIONS

Week 1 - 4

3. What is the specific research question?

Operational variables

- Observable
- Measurable
- Beyond concepts

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OPERATIONALIZATION

CONCEPT

CONSTRUCT

Define by using other words

Define a word by telling what actions or behaviors it expresses or implies

Constitutive

Define a construct with other construct

Operational

Assigning meaning to a construct or variable by specifying the activities or "operations" necessary to measure it.

Measured

Describes how a variable will be measured

Experimental

Spells out the detail (operations) of the intervention's manipulation of a variable

1. DEFINE STUDY QUESTION

9 QUESTIONS

Week 1 - 4

3. What is the specific research question?

Latulippe & Routhier

- Period of time: 1 -18 months
- Junior and senior residents
- Lose their ability: min. level
- Interpret
- Five supraventricular arrhythmias on an EKG

By NemMD

1. DEFINE STUDY QUESTION

9 QUESTIONS

Week 1 - 4

Question 4: What is the major outcome (dep. Var)? How will we measure it?

- Outcome, criterion, dependent variable
- In abstract and methods
- Why important?
  - Precise and limited in number
  - Valid (measures what we intend to measure)
  - Reliable / reproducible (same value occurs when measured again)
  - Determines the way data is summarized and analyzed

By NemMD

1. DEFINE STUDY QUESTION

9 QUESTIONS

Week 1 - 4

Question 4: What is the major outcome (dep. Var)? How will we measure it?

Kinds of variables

- Counted variables
  - Proportions and percentages
  - Eg. % visiting library
- Measured variables
  - Means
    - Mean number of books read

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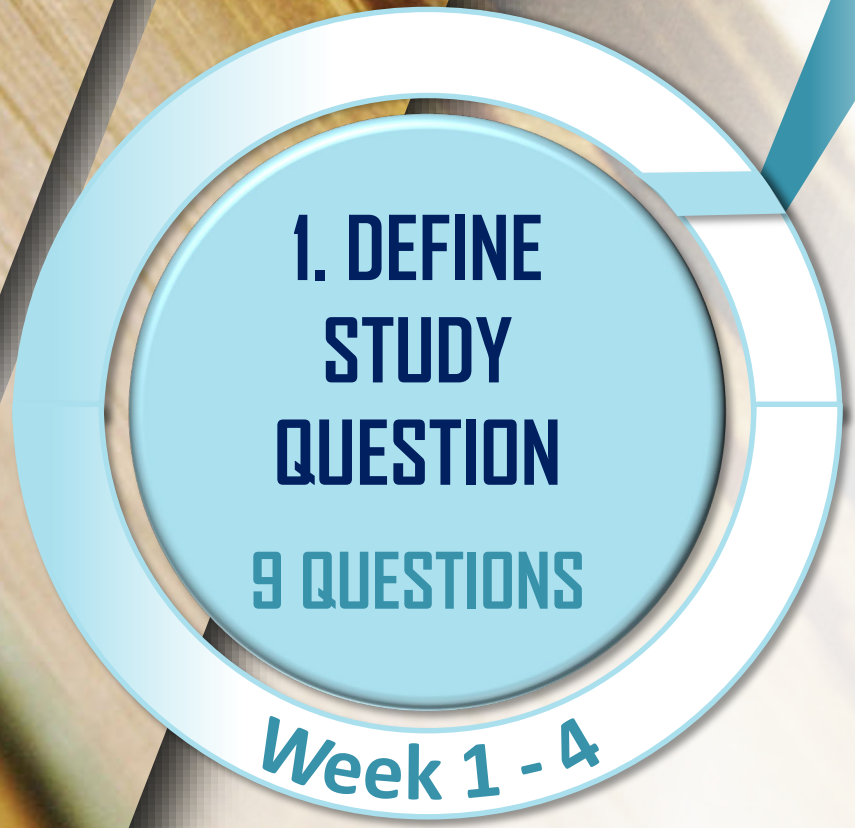


Question 5: What is the treatment/ precursor (ind. Var)?

- Intervention, precedes
- In abstract and methods
- The treatment, explanatory, or independent variable:
  - Formulated in context of the theory
  - Reflects relationship between independent and dependent variables

By NemMD

1. DEFINE STUDY QUESTION

9 QUESTIONS

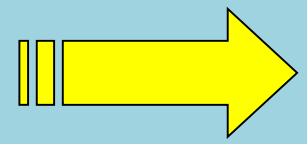
Week 1 - 4

Question 5: What is the treatment/ precursor (ind. Var)?

Variables

Independent

- Circumstance
- Cause
- What precedes
- Manipulated
- controlled



Confounding
(to be controlled)

Dependent

- Behavior
- Effect
- What follows
- Measure phenomena

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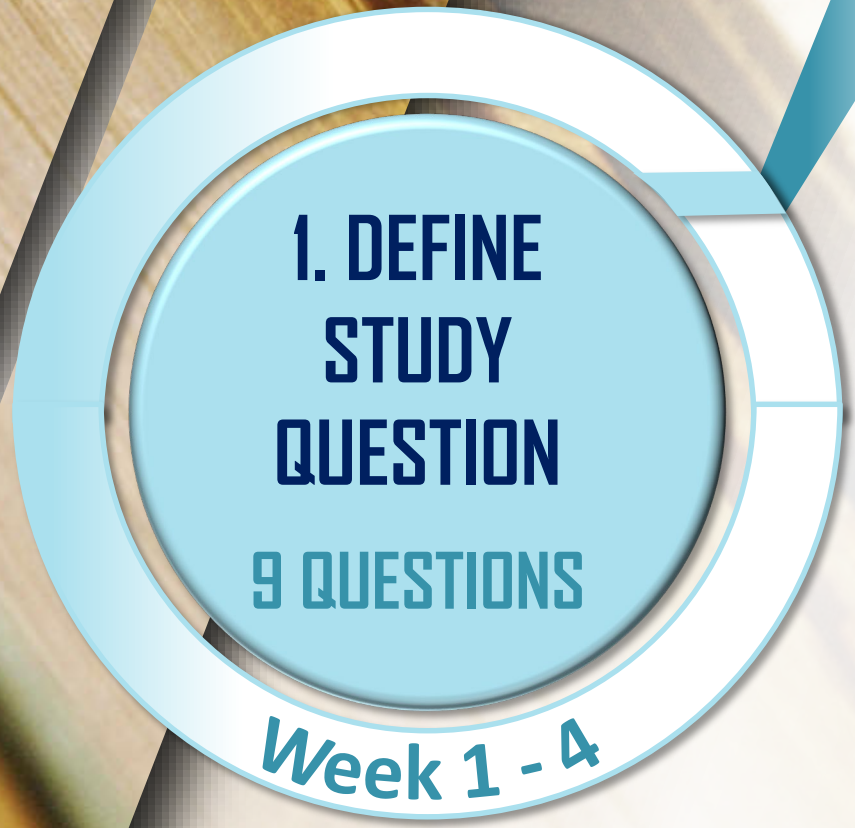

Question 6: Are we looking for a difference or relationship (association)?

- In title and statistical methods
- Why important?
  - Looking for a difference?
  - A relationship (association)?
    - Determines the statistical methods
    - Required in order to draw correct conclusion

By NemMD

1. DEFINE STUDY QUESTION

9 QUESTIONS

Week 1 - 4

Question 6: Are we looking for a difference or relationship (association)?

Differences

- Examined by:
  - T-tests and analysis of variance for difference in means
  - Chi-square for difference in proportion

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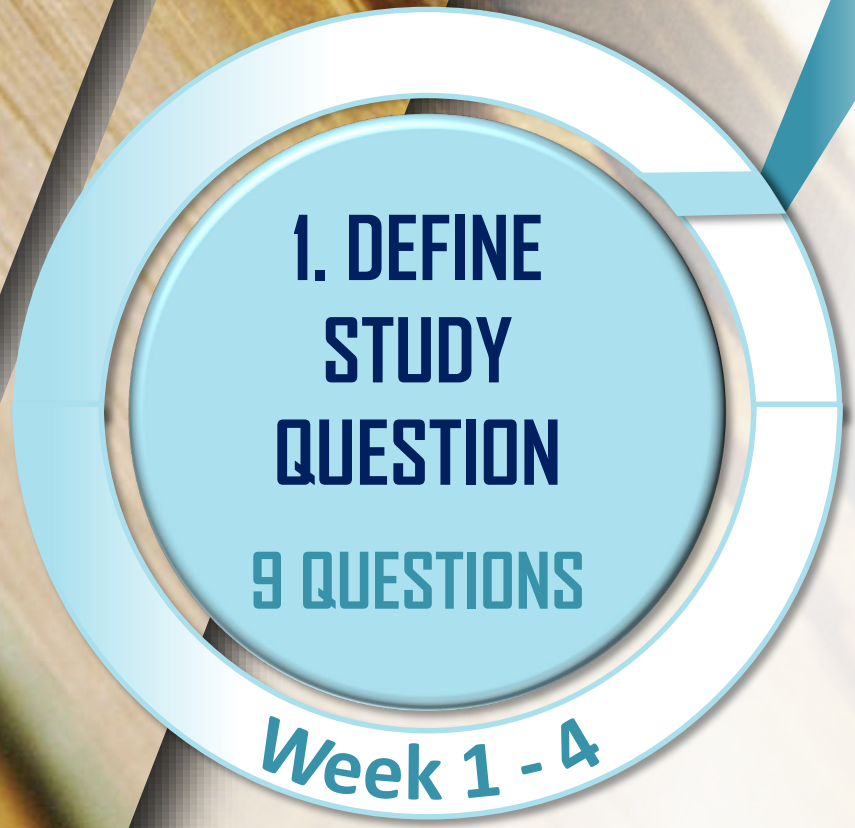

Question 6: Are we looking for a difference or relationship (association)?

Relationships

- Examined by:
  - Correlation and regression for measured variables
  - Chi-square or Fisher's exact test for counted variables

By NemMD

1. DEFINE STUDY QUESTION

9 QUESTIONS

Week 1 - 4

Question 7: What answers do we expect to find?

Research hypothesis

- In title and introduction
- Why important?
  - Focuses the study
  - Indicates the outcome of interest
  - Defines the approach to statistical inference

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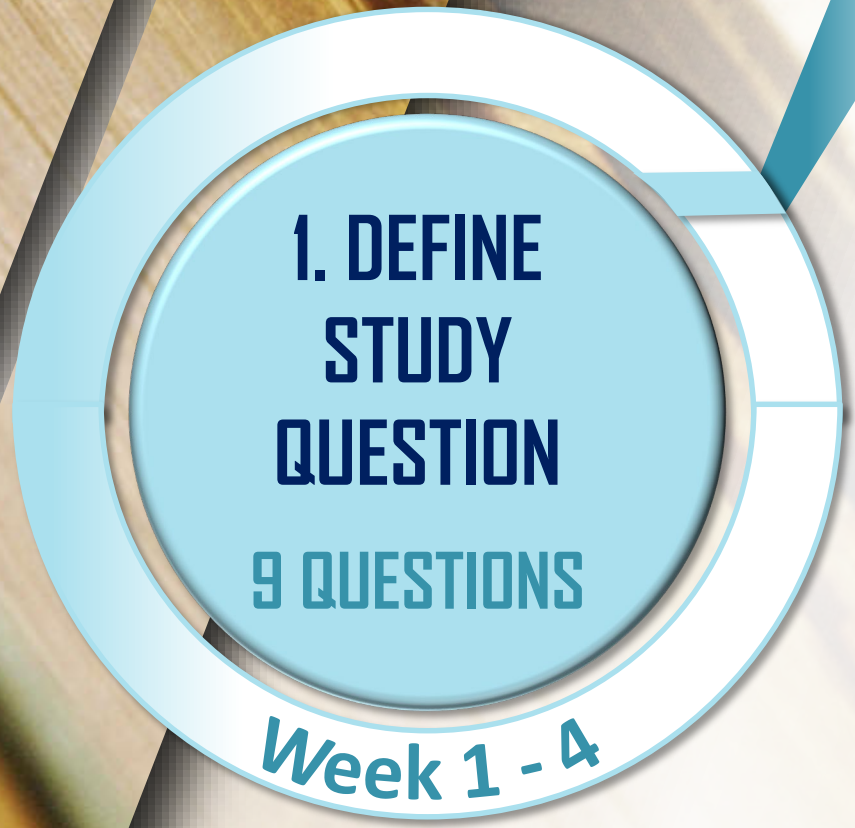

Question 7: What answers do we expect to find?

Research hypothesis

… anticipated response to the research question

- Expected answer?
  - Statistically test the prediction
  - Study the probability of the occurrence or non-occurrence of an event

By NemMD

1. DEFINE STUDY QUESTION

9 QUESTIONS

Week 1 - 4

Question 7: What answers do we expect to find?

Research Hypotheses

- Ho: Null / stat. hypothesis
  - No difference
- H1: Alternative hypothesis
  - A difference
- Hd: Descriptive hypothesis
  - Favored response

By NemMD

1. DEFINE STUDY QUESTION

9 QUESTIONS

Week 1 - 4

Question 7: What answers do we expect to find?

Research Hypothesis

… a prediction to be verified scientifically

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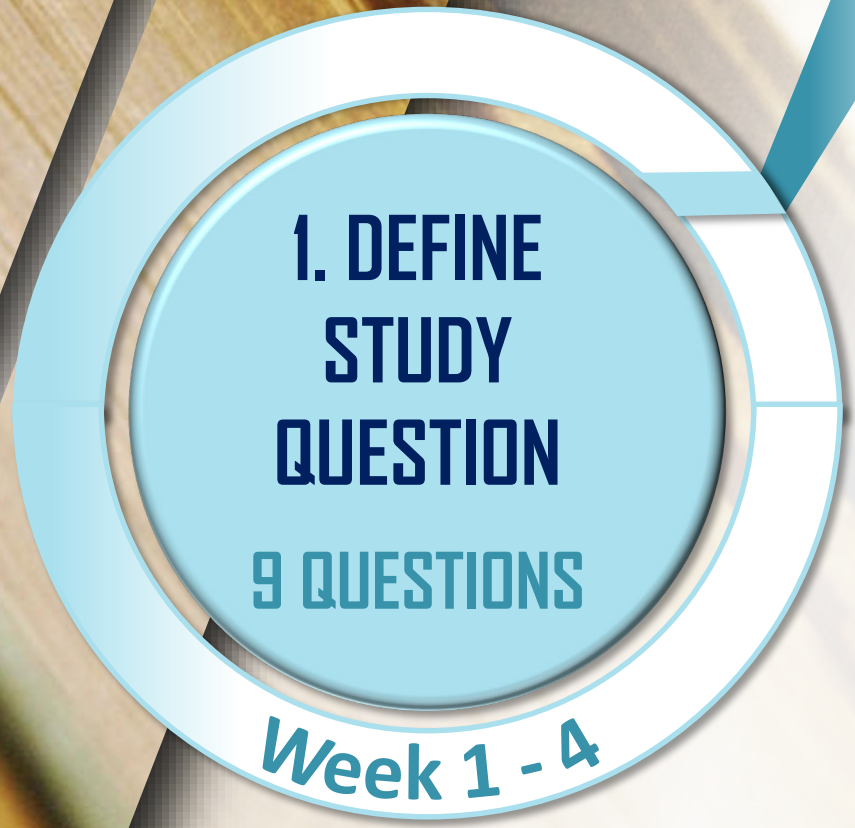

Question 7: What answers do we expect to find?

- Research hypothesis

… clear and precise description of the relationship between independent and dependent variables

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1. DEFINE STUDY QUESTION

9 QUESTIONS

Week 1 - 4

Question 7: What answers do we expect to find?

Expected answer?

Ho: Null hypothesis

- States that there is no relationship between the two variables and
- That the difference observed can be attributed to sampling error or random fluctuations

By NemMD

1. DEFINE STUDY QUESTION

9 QUESTIONS

Week 1 - 4

Question 7: What answers do we expect to find?

Expected answers:

Ho: Null hypothesis

- Ho: $\mu_a = \mu_b$
- μ: dependent variable (Greek letters)
- A, b: dependent variable

  If the difference observed is greater than simple random fluctuations, then Ho is rejected… the results are statistically significant

By NemMD

1. DEFINE STUDY QUESTION

9 QUESTIONS

Week 1 - 4

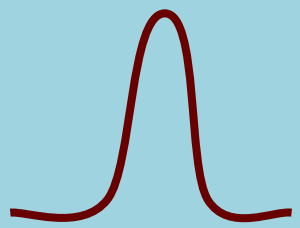
Question 7: What answers do we expect to find?

Expected answer?

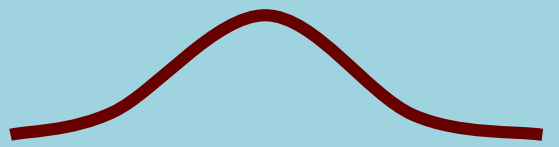
Ho: Null hypothesis

Re: Variations

- Ho: □1 = □2



- H1: □1 □ □2



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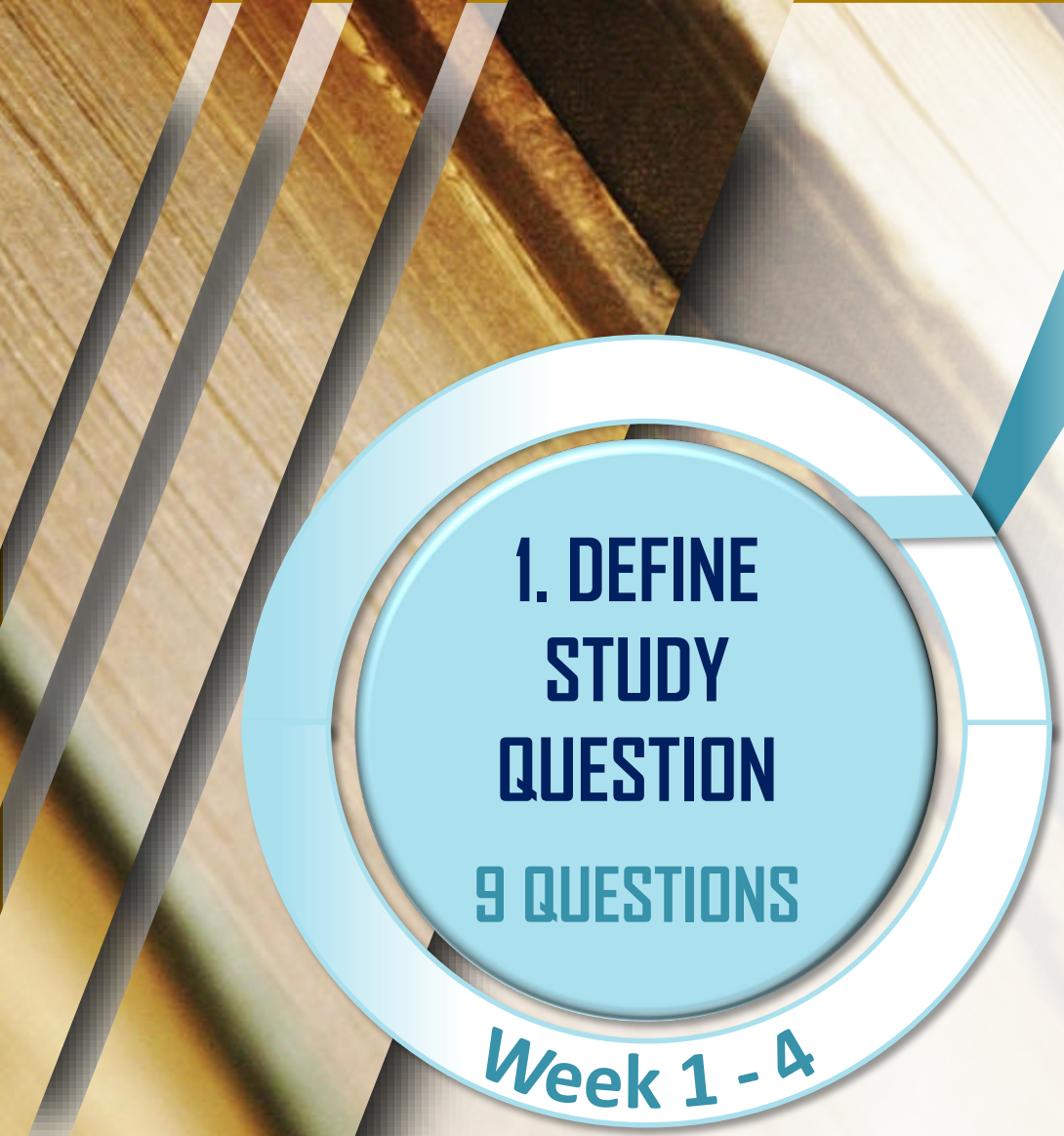


Question 7: What answers do we expect to find?

Ho: Null hypothesis

Re: Variations

Looking for Differences

… never show Ho

By NemMD

1. DEFINE STUDY QUESTION

9 QUESTIONS

Week 1 - 4

Question 7: What answers do we expect to find?

Expected answer?

Ho: Null hypothesis

Re: means

$$Ho: \mu_a = \mu_b$$

$$H1: \mu_a \ ? \ \mu_b$$

$$Hd: \mu_a > \mu_b$$

By NemMD

1. DEFINE STUDY QUESTION

9 QUESTIONS

Week 1 - 4

Question 7: What answers do we expect to find?

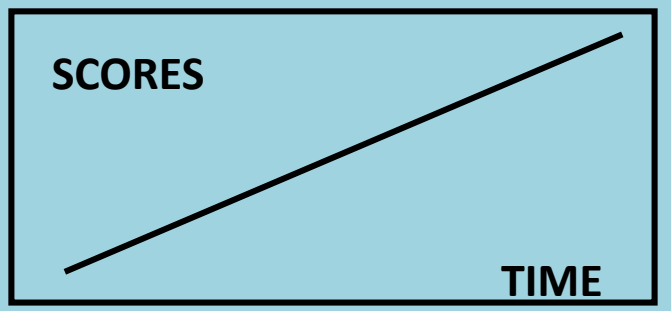
Expected answer?

Ho: Null hypothesis

Re: relationships

$$Ho: \rho = O$$

$$H1: \rho \neq O$$



By NemMD

1. DEFINE STUDY QUESTION

9 QUESTIONS

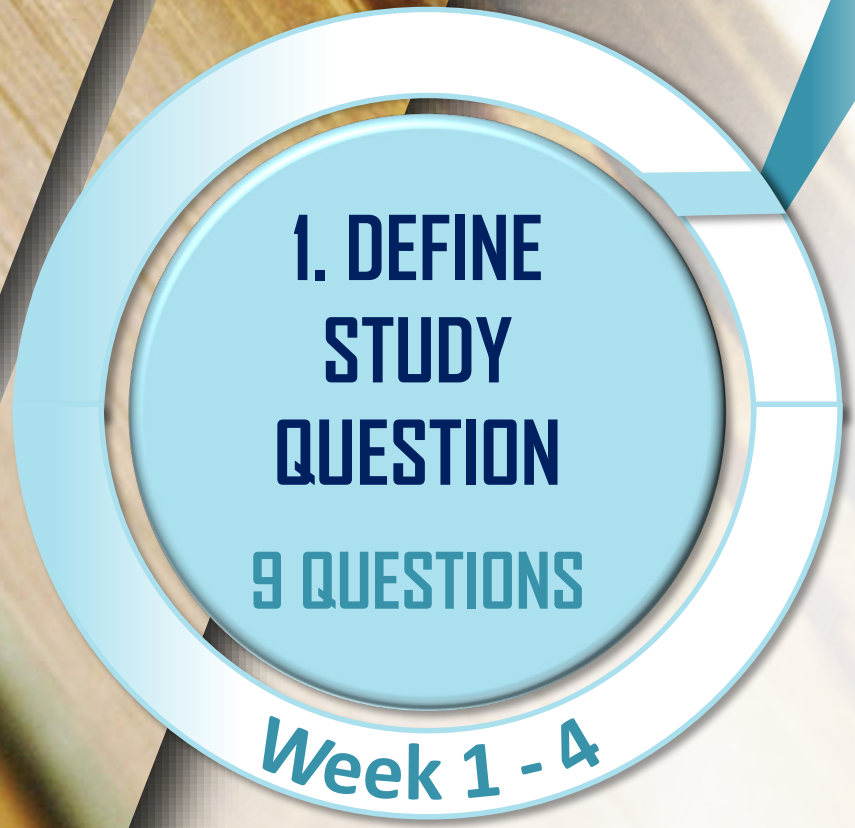
Week 1 - 4

Question 7: What answers do we expect to find?

Is difference or relationship statistically significant?

- P-values tell
  - If outcome is due to chance variation
  - The probability the observed outcome occurs by chance
  - Traditional values are .05, .01. .001. For reporting, give the actual value

By NemMD



Question 8: To what group or population do we want to apply our results?

- In abstract and description of study population in methods
- Why important?
  - Determines the applicability (generalizability) of findings
  - Must be representative if findings are to generalize

By NemMD

1. DEFINE STUDY QUESTION

9 QUESTIONS

Week 1 - 4

Question 9: Why do this study? Significance

- Relevance re:
  - Literature / theory
  - Funding agency
  - institution

By NemMD

EDUCATIONAL RESEARCH

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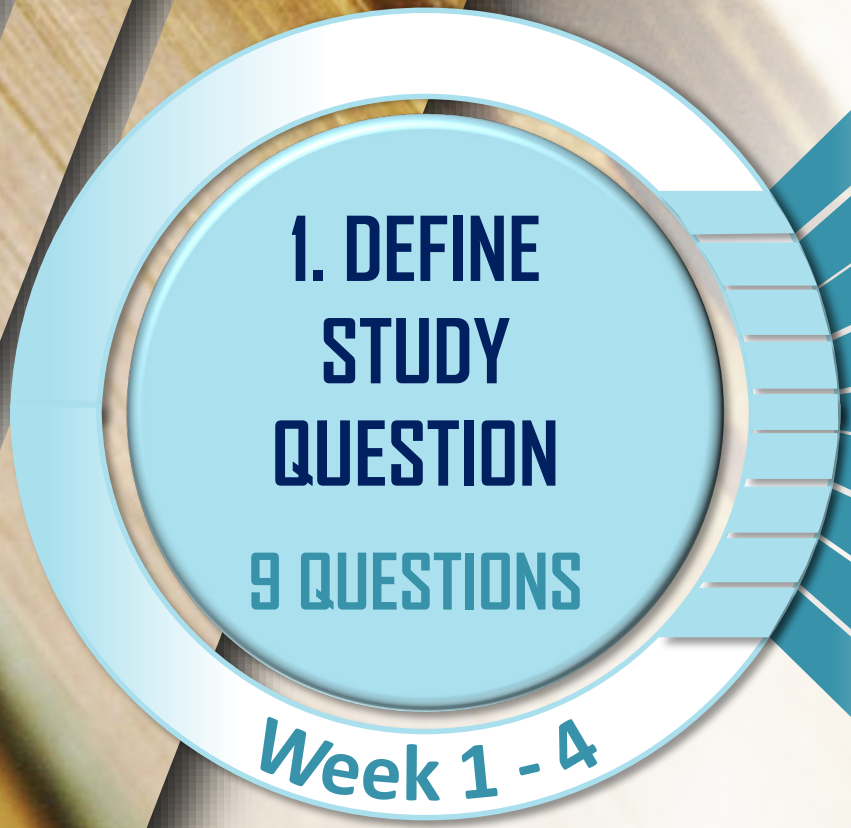

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