Research Methodology

Ogunba Beatrice Olubukola

bogunba@oauife.edu.ng

Department of Human Nutrition and Dietetics,

Faculty of Basic Medical Sciences

College of Health Sciences

Obafemi Awolowo University, Ile Ife

- **Research** is searching for and gathering information, usually to answer a particular question or problem

- Research is the careful consideration of study regarding a particular concern or research problem using scientific methods.

- A **research design** is a strategy for answering your research question using empirical data
- Creating a research design means making decisions about:
  - Your overall research objectives and approach
  - Whether you'll rely on primary research or secondary research
  - Your sampling methods or criteria for selecting subjects
  - Your data collection methods
  - The procedures you'll follow to collect data
  - Your data analysis methods

Step in research planning and design

- **Step 1: Consider your aims and approach**
- Before you can start designing your research, you should already have a clear idea of the research question you want to investigate
- The first choice you need to make is whether you'll take a **qualitative or quantitative** approach

Qualitative approach	Quantitative approach
• Understand subjective experiences, beliefs, and concepts • Gain in-depth knowledge of a specific context or culture • Explore under-researched problems and generate new ideas	• Measure different types of variables and describe frequencies, averages, and correlations • Test hypotheses about relationships between variables • Test the effectiveness of a new treatment, program or product

Step 2: Choose a type of research design

- Within both qualitative and quantitative approaches, there are several types of research design to choose from.
- Each type provides a framework for the overall shape of your research.

Types of quantitative research designs

- Quantitative designs can be split into four main types.
- **Experimental** and **quasi-experimental** designs allow you to test cause-and-effect relationships
- **Descriptive** and **correlational** designs allow you to measure variables and describe relationships between them.

Type of design	Purpose and characteristics
Experimental	• Used to test causal relationships • Involves manipulating an independent variable and measuring its effect on a dependent variable • Subjects are randomly assigned to groups • Usually conducted in a controlled environment (e.g., a lab)
Quasi-experimental	• Used to test causal relationships • Similar to experimental design, but without random assignment • Often involves comparing the outcomes of pre-existing groups • Often conducted in a natural environment (higher ecological validity)
Correlational	• Used to test whether (and how strongly) variables are related • Variables are measured without influencing them
Descriptive	• Used to describe characteristics, averages, trends, etc • Variables are measured without influencing them

Types of qualitative research designs

- Qualitative designs are less strictly defined
- This approach is about gaining a rich, detailed understanding of a specific context or phenomenon, and
- you can often be more creative and flexible in designing your research
- They often have similar approaches in terms of data collection,
- but focus on different aspects when analyzing the data

Type of design	Purpose and characteristics
Case study	• Detailed study of a specific subject (e.g., a place, event, organization, etc). • Data can be collected using a variety of sources and methods. • Focuses on gaining a holistic understanding of the case.
Ethnography	• Detailed study of the culture of a specific community or group. • Data is collected by extended immersion and close observation. • Focuses on describing and interpreting beliefs, conventions, social dynamics, etc.
Grounded theory	• Aims to develop a theory inductively by systematically analyzing qualitative data.
Phenomenology	• Aims to understand a phenomenon or event by describing participants' lived experiences.

Step 3: Identify your population and sampling method

- Your research design should clearly define who or what your research will focus on, and how you'll go about choosing your participants or subjects
- In research, a **population** is the entire group that you want to draw conclusions about
- while a **sample** is the smaller group of individuals you'll actually collect data from

Defining the population

- A population can be made up of anything you want to study—plants, animals, organizations, texts, countries, etc
- For example, will you focus on people from a specific demographic, region or background? Are you interested in people with a certain job or medical condition, or users of a particular product?
- The more precisely you define your population, the easier it will be to gather a representative sample

Step 4: Choose your data collection methods

- Data collection methods are ways of directly measuring variables and gathering information.
- They allow you to gain first-hand knowledge and original insights into your research problem.
- You can choose just one data collection method, or use several methods in the same study

Step 5: Plan your data collection procedures

- As well as deciding on your methods, you need to plan exactly how you'll use these methods to collect data that's consistent, accurate, and unbiased
- Planning systematic procedures is especially important in quantitative research,
- where you need to precisely define your variables and ensure your measurements are high in reliability and validity.

Operationalization

- Some variables, like height or age, are easily measured.
- But often you'll be dealing with more abstract concepts, like satisfaction, anxiety, or competence
- Operationalization means turning these fuzzy ideas into measurable indicators.
- If you're using **observations**, which events or actions will you count?
- **Reliability and validity**
- Reliability means your results can be consistently reproduced, while validity means that you're actually measuring the concept you're interested in

Step 6: Decide on your data analysis strategies

- On its own, raw data can't answer your research question.
- The last step of designing your research is planning how you'll analyze the data.
- Your choice of statistical test depends on various aspects of your research design, including the types of variables you're dealing with and the distribution of your data

Decide on your data analysis strategies cont.

- It is essential to ensure that your data is:
- **Valid** – founded, logical, rigorous, and impartial.
- **Accurate** – free of errors and including required details.
- **Reliable** – other people who investigate in the same way can produce similar results.
- **Timely** – current and collected within an appropriate time frame.
- **Complete** – includes all the data you need to support your business decisions.

- Research methodology is the **formula for conducting a study**, from data collection to analysis.
- Research methodology is a **way of explaining how a researcher intends to carry out their research**.
- It's a logical, systematic plan to resolve a research problem.
- A methodology details a researcher's approach to the research to ensure reliable, valid results that address their aims and objectives

Why is a research methodology important?

- A research methodology gives research legitimacy and provides scientifically sound findings.
- It also provides a detailed plan that helps to keep researchers on track, making the process smooth, effective and manageable.
- A researcher's methodology allows the reader to understand the approach and methods used to reach conclusions

Benefits:

1. Other researchers who want to replicate the research have enough information to do so
2. Researchers who receive criticism can refer to the methodology and explain their approach
3. It can help provide researchers with a specific plan to follow throughout their research
4. The methodology design process helps researchers select the correct methods for the objectives
5. It allows researchers to document what they intend to achieve with the research from the outset

Planning your methods

- When planning your methods, there are two key decisions you will make
- First, decide how you will **collect data**
- Your methods depend on what type of data you need to answer your research question
- **Qualitative vs. quantitative**:
- Will your data take the form of words or numbers?
- **Primary vs. secondary**:
- Will you collect original data yourself, or will you use data that has already been collected by someone else?

Planning your methods

- **Descriptive vs. experimental:**
- Will you take measurements of something as it is, or will you perform an experiment?
- Second, decide how you will **analyze the data**
- For quantitative data, you can use statistical analysis methods to test relationships between variables
- For qualitative data, you can use methods such as thematic analysis to interpret patterns and meanings in the data

Qualitative

- Qualitative research involves collecting and analyzing written or spoken words and textual data
- It may also focus on body language or visual elements and help to create a detailed description of a researcher's observations
- Researchers usually gather qualitative data through interviews, observation and focus groups using a few carefully chosen participants

Qualitative cont.

- This research methodology is subjective and more time-consuming than using quantitative data
- Researchers often use a qualitative methodology when the aims and objectives of the research are exploratory
- For example, when they perform research to understand human perceptions regarding an event, person or product

Quantitative

- Researchers usually use a quantitative methodology when the objective of the research is to confirm something. It focuses on collecting, testing and measuring numerical data, usually from a large sample of participants.
- They then analyze the data using statistical analysis and comparisons.
- Popular methods used to gather quantitative data are:
- Surveys
- Questionnaires
- Test
- Databases
- Organizational records

Quantitative cont.

- This research methodology is objective and is often quicker as researchers use software programs when analyzing the data
- An example of how researchers could use a quantitative methodology is to measure the relationship between two variables or test a set of hypotheses

Mixed-method

- This contemporary research methodology combines quantitative and qualitative approaches
- to provide additional perspectives, create a richer picture and present multiple findings
- The quantitative methodology provides definitive facts and figures
- while the qualitative provides a human aspect
- This methodology can produce interesting results as it presents exact data while also being exploratory

Factors to consider when choosing a research methodology

The research objective:

- Consider the research project objective.
- When researchers know what information they require at the end of the project to meet their objectives, it helps them select the correct methodology and research method

Significance of statistics:

- Another factor to consider is whether you require concise, data-driven research results and statistical answers.
- Or whether the research questions require an understanding of reasons, perceptions, opinions and motivations

Factors to consider when choosing a research methodology

Nature of the research:

- If the aims and objectives are exploratory, the research will probably require qualitative data collection methods.
- However, if the aims and objectives are to measure or test something, the research will require quantitative data collection methods

Sample size:

- How big does the sample need to be to answer the research questions and meet the objectives?
- The sample size can determine your data-gathering methods, such as whether to use in-person interviews or smaller samples or online surveys for larger ones

Factors to consider when choosing a research methodology

Time available:

- If there are time constraints, consider techniques like random or convenience sampling and tools that allow for data collection in a few days.
- If there's more time available for data collection, in-person interviews and observations are possible

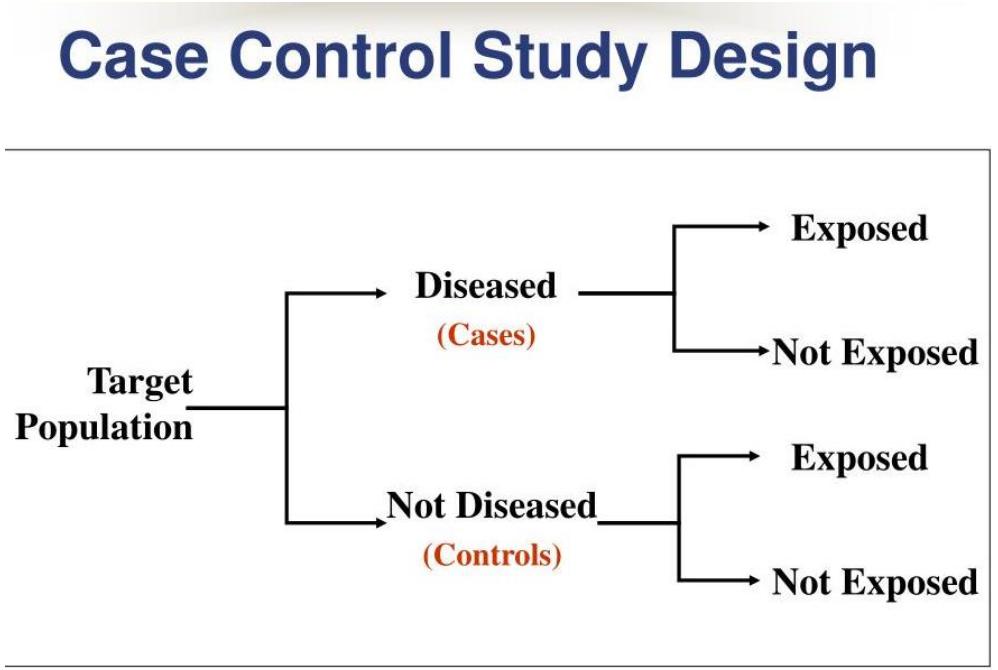
- There are many different types of research studies, and each has distinct strengths and weaknesses
- In general, randomized trials and cohort studies provide the best information when looking at the link between a certain factor (like diet) and a health outcome (like heart disease)

Laboratory and Animal Studies

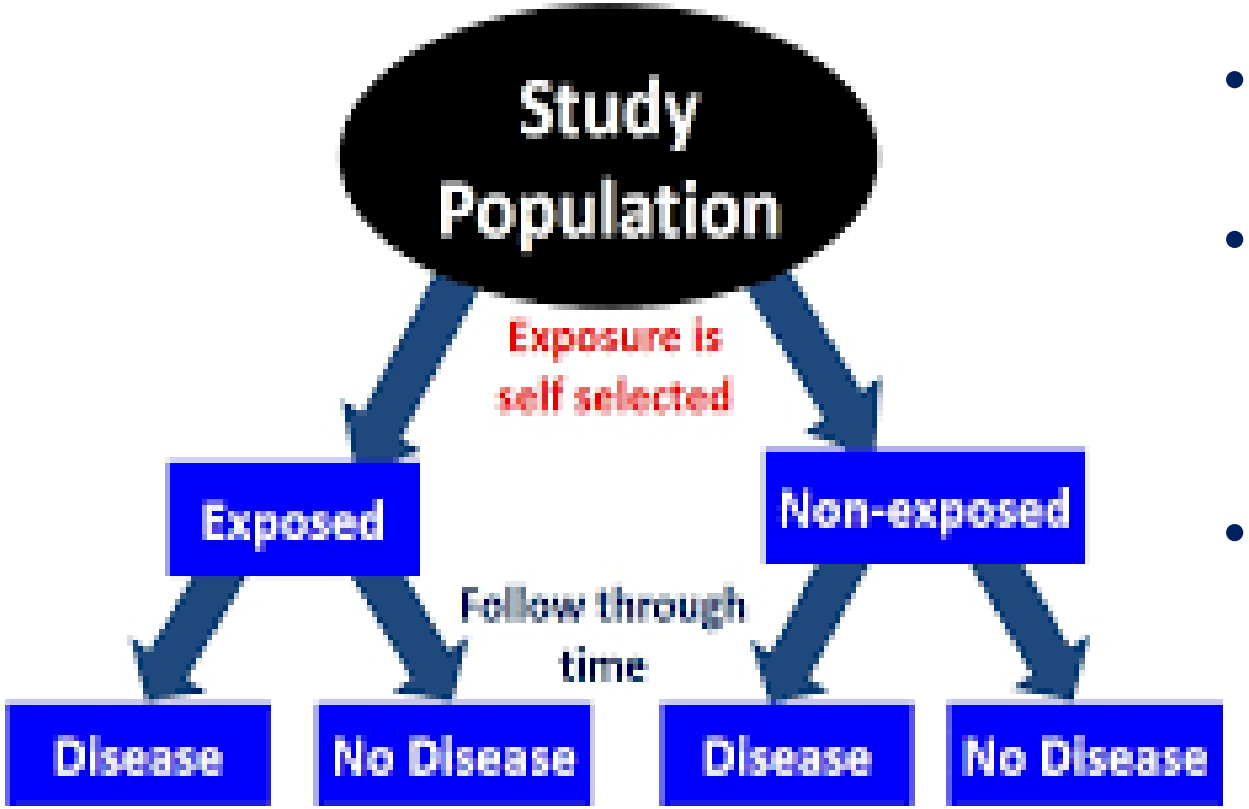
- These are studies done in laboratories on cells, tissue, or animals
- Laboratories provide strictly controlled conditions and are often the genesis of scientific ideas that go on to have a broad impact on human health.
- However, laboratory studies are only a starting point
- Animals or cells are no substitute for humans

Case-Control Studies

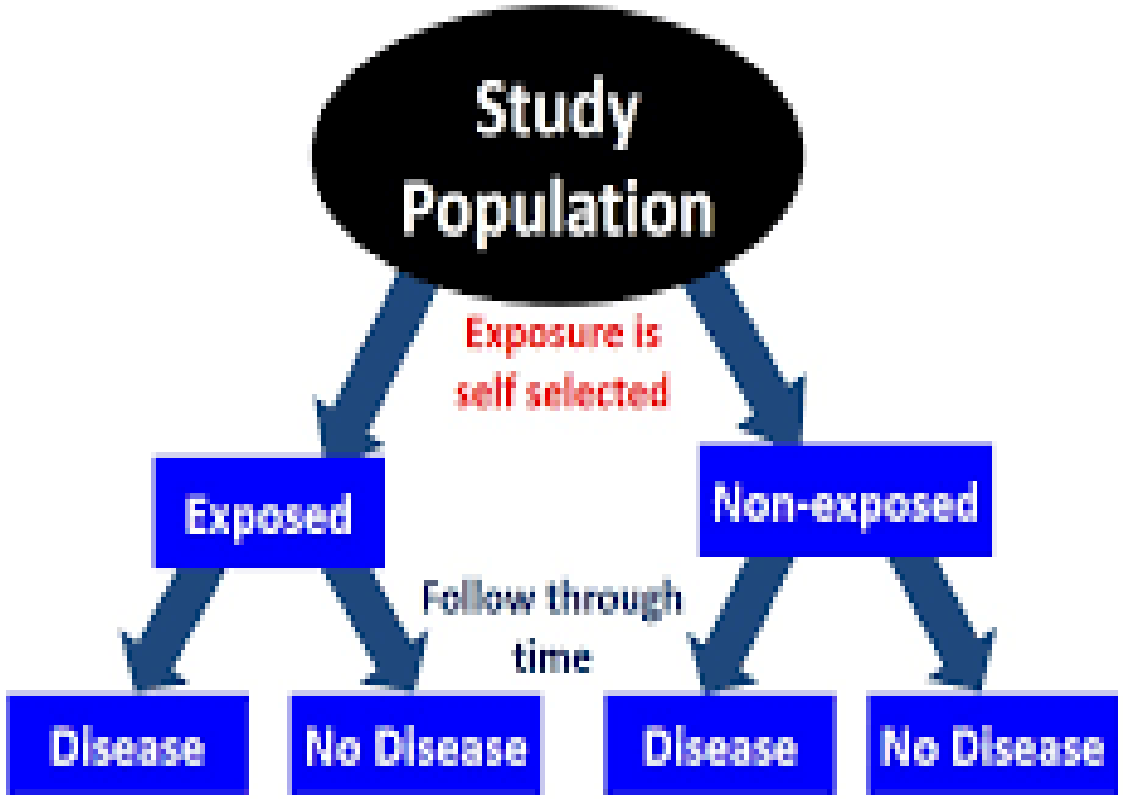
- These studies look at the characteristics of one group of people who already have a certain health outcome (the cases) and
- compare them to a similar group of people who do not have the outcome (the controls)
- While case-control studies can be done quickly and relatively cheaply, they aren't ideal for studying diet because they gather information from the past
- People with illnesses often recall past behaviours differently from those without illness
- This opens such studies to potential inaccuracy and bias in the information they gather



Cohort Studies



- These studies follow large groups of people over a long period of time
- Researchers regularly gather information from the people in the study on a wide variety of variables (like meat intake, physical activity level, and weight)
- Once a specified amount of time has elapsed, the characteristics of people in the group are compared to test specific hypotheses
- (like the link between carotenoids and glaucoma, or meat intake and prostate cancer)

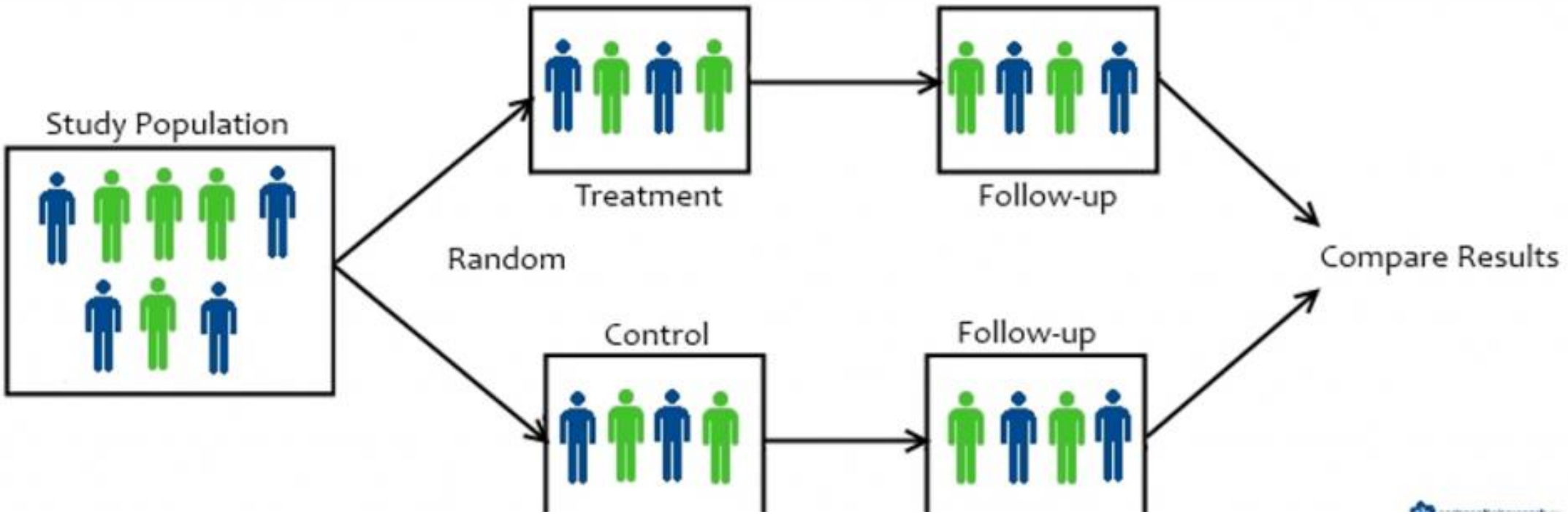


Cohort Studies cont.

- Though time-consuming and expensive
- cohort studies generally provide more reliable information than case-control studies because they don't rely on information from the past
- Cohort studies gather the information all along and before anyone develops the disease being studied
- As a group, these types of studies have provided valuable information about the link between lifestyle factors and disease

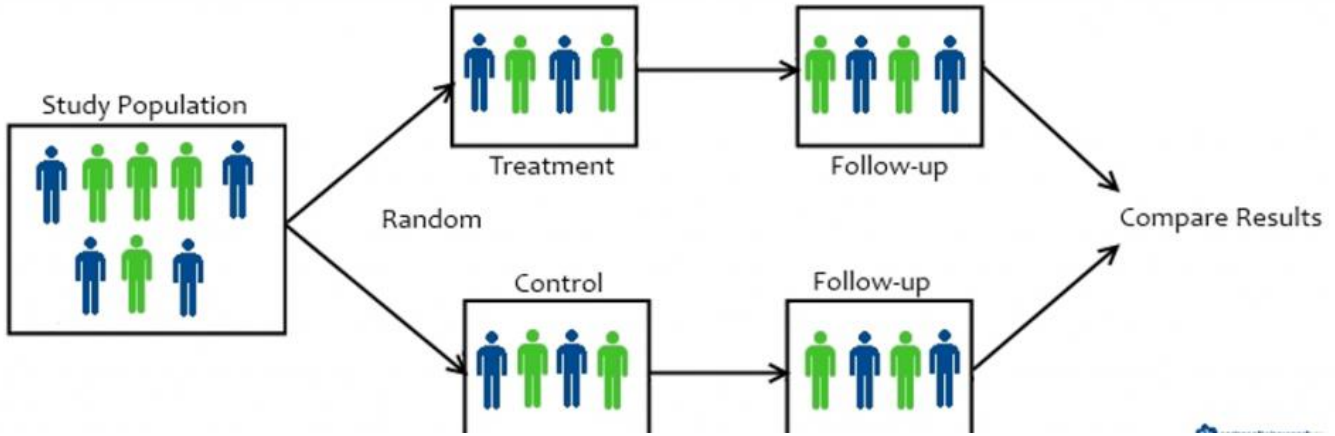
Randomized Trials

- Like cohort studies, these studies follow a group of people over time
- However, with randomized trials, the researchers intervene to see how a specific behavior change or treatment, for example, affects a health outcome



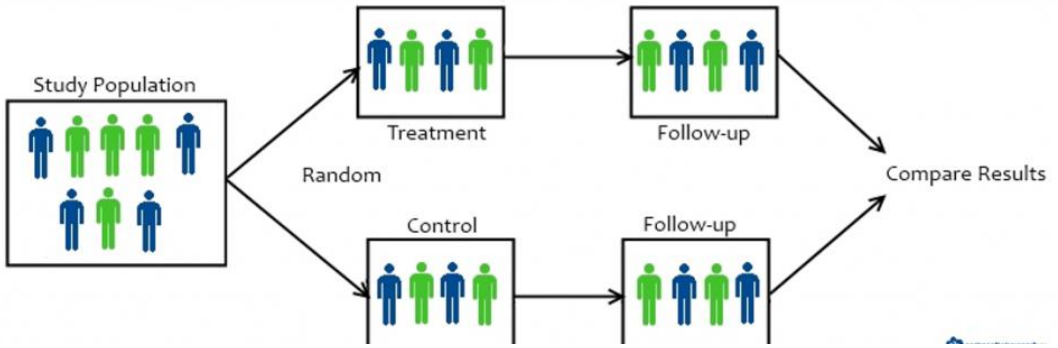
Randomized Trials cont.

- They are called "randomized trials" because people in the study are randomly assigned either to receive or not receive the intervention
- This randomization helps researchers hone in on the true effect the intervention has on the health outcome



Randomized Trials cont.

- However, randomized trials also have drawbacks, especially when it comes to diet
- While they are good at looking at topics like vitamin supplements and cancer
- when the change in diet is more involved than say taking a vitamin pill
- participants begin to have trouble keeping to their prescribed diets.
- Such involved interventions can also become very expensive



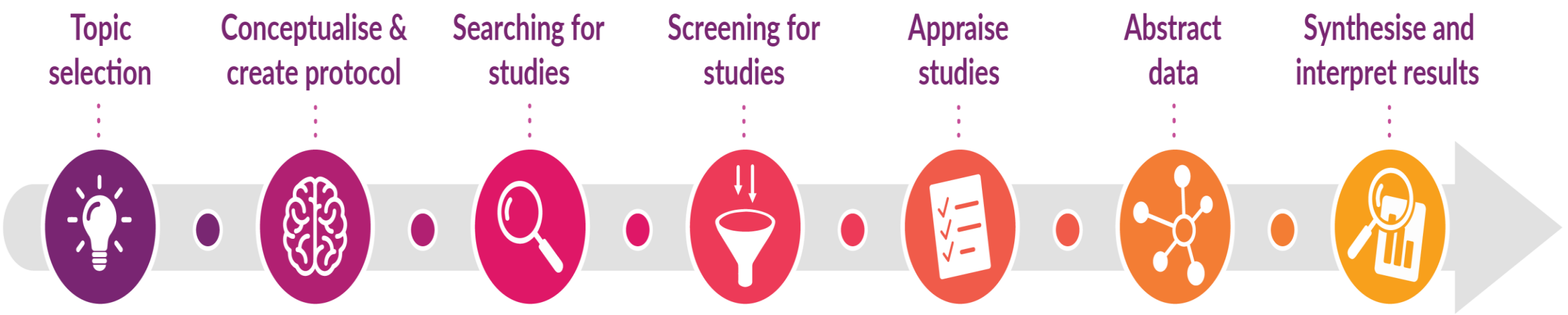
Systematic Review Methodology contd.

- Systematic review is a rigorous and transparent method to synthesize scientific evidence in which bias is minimized
- A systematic review is a scholarly synthesis of the evidence on a clearly presented topic using critical methods to identify, define and assess research on the topic
- A systematic review extracts and interprets data from published studies on the topic, then analyzes, describes, and summarizes interpretations into a refined conclusion

Systematic Review Methodology contd.

- The purpose of a systematic review is to deliver a meticulous summary of all the available primary research in response to a research question
- A systematic review uses all the existing research and is sometime called ‘secondary research’ (research on research)
- They are often required by research funders to establish the state of existing knowledge and are frequently used in guideline development

Steps in a systematic review




THANK YOU!