Quantitative Research

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What is quantitative research?

- Patterns, trends, or relationships
- Objective measures, statistical analysis



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How to change the design

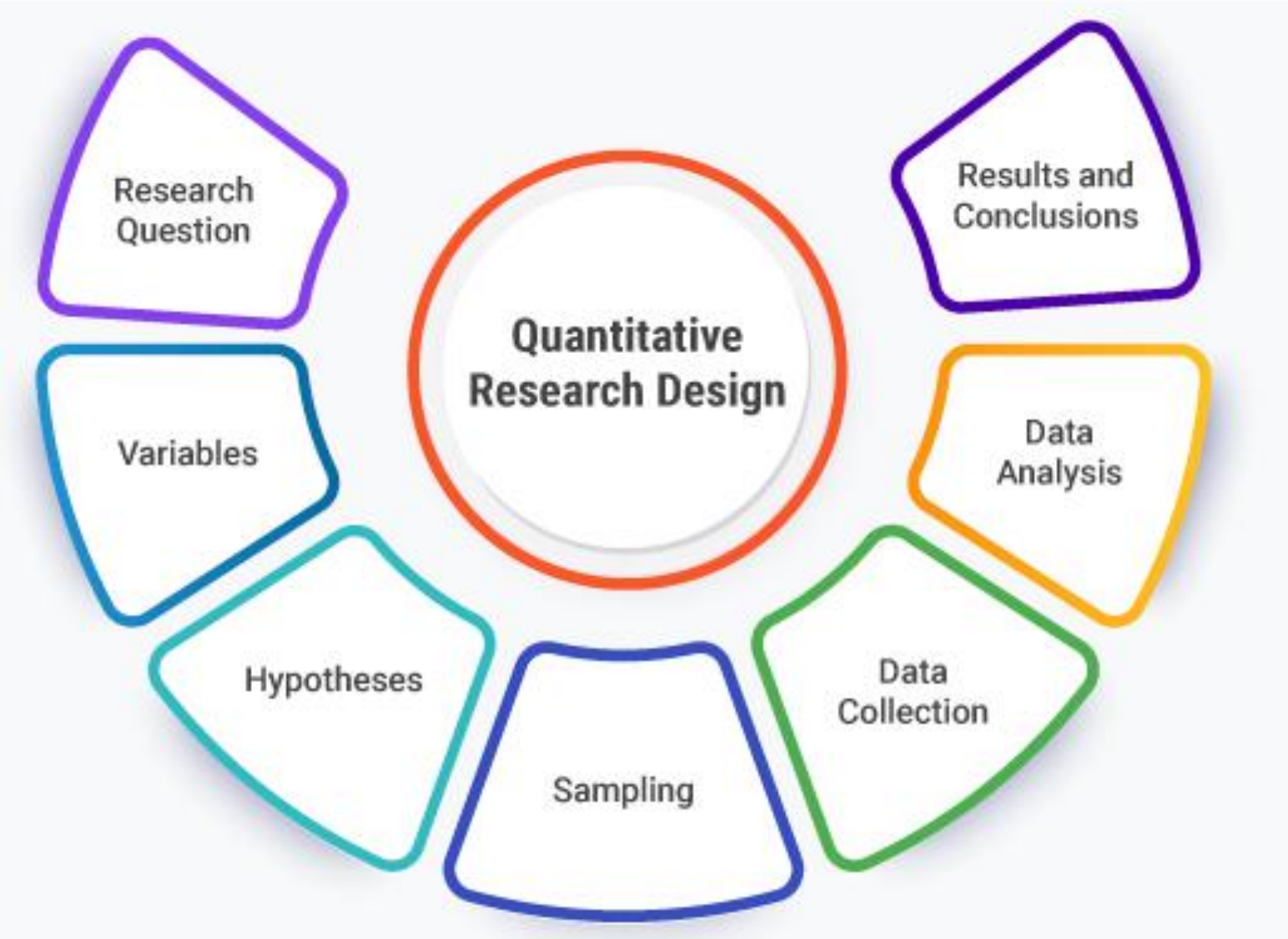


Which research term sounds most confusing?

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Key components



Start with your research question!

Q: Can haemodiafiltration (HDF) improve sleep apnoea in people receiving haemodialysis?

Common study designs

Choosing the right design starts with your research question



1. Experimental designs

- RCT
- Quasi-experimental

Test the effect of an intervention (cause) on an outcome.

2. Observational designs

- Cohort study
- Case-Control study
- Cross-sectional study

Observe without intervention to explore associations or risks.

3. Descriptive Designs

- Survey Study
- Descriptive cross-sectional

Describe characteristics or outcomes in a population.

4. Longitudinal vs cross-sectional

- Longitudinal = multiple points
- Cross-sectional = 1 point in time

Consider timing of data collection.

Choosing the right study design

Match your design to your question, aims and what is feasible



1. Base on your research question/aim

Cause and effect

→ Experimental design

You want to test whether an intervention causes a change in outcome.

Description or association

→ Observational design

You want to describe a situation or explore relationships/associations.

2. Feasibility / practicality

Prospective	Plan ahead and collect data going forward in time.
Retrospective	Use existing data/records to answer your question.
Pre–post	Measure before and after an intervention in the same group.

Back to our research question!

Q: Can haemodiafiltration (HDF) improve sleep apnoea in people receiving haemodialysis?

Do not edit
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Which study design would you chose?

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If we change the research question...

A different question leads us to a different study design.



2 What is the prevalence of sleep apnoea in people receiving haemodialysis?

We want to **estimate how common** it is in this population.

Focus: Estimating the frequency or prevalence in a defined population.

Purpose: To describe how common the condition is.

Think about it!

What study design(s) would be most appropriate to answer this question?

Different question.
Different purpose.
Different design.

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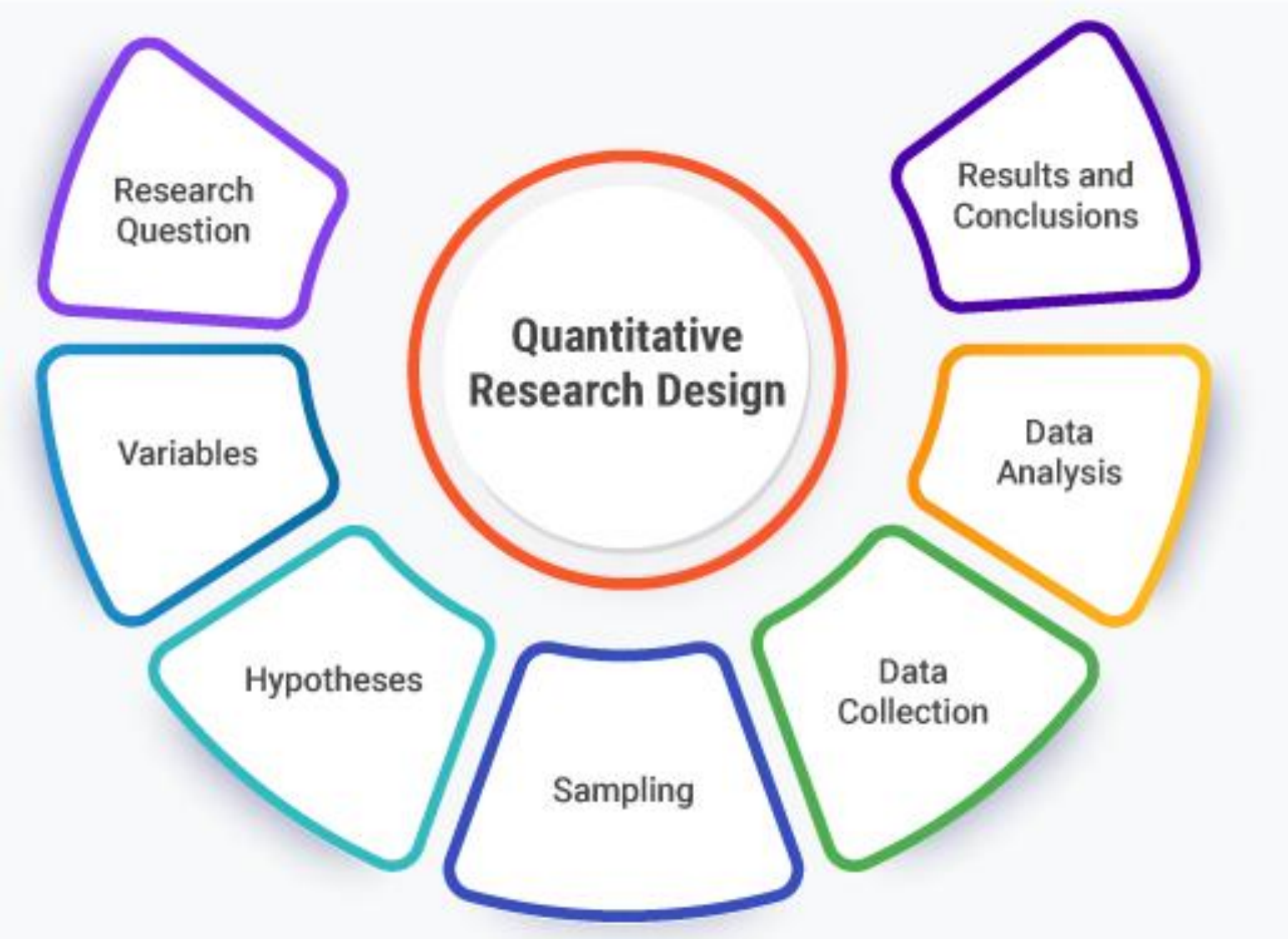


Which study design would you chose?

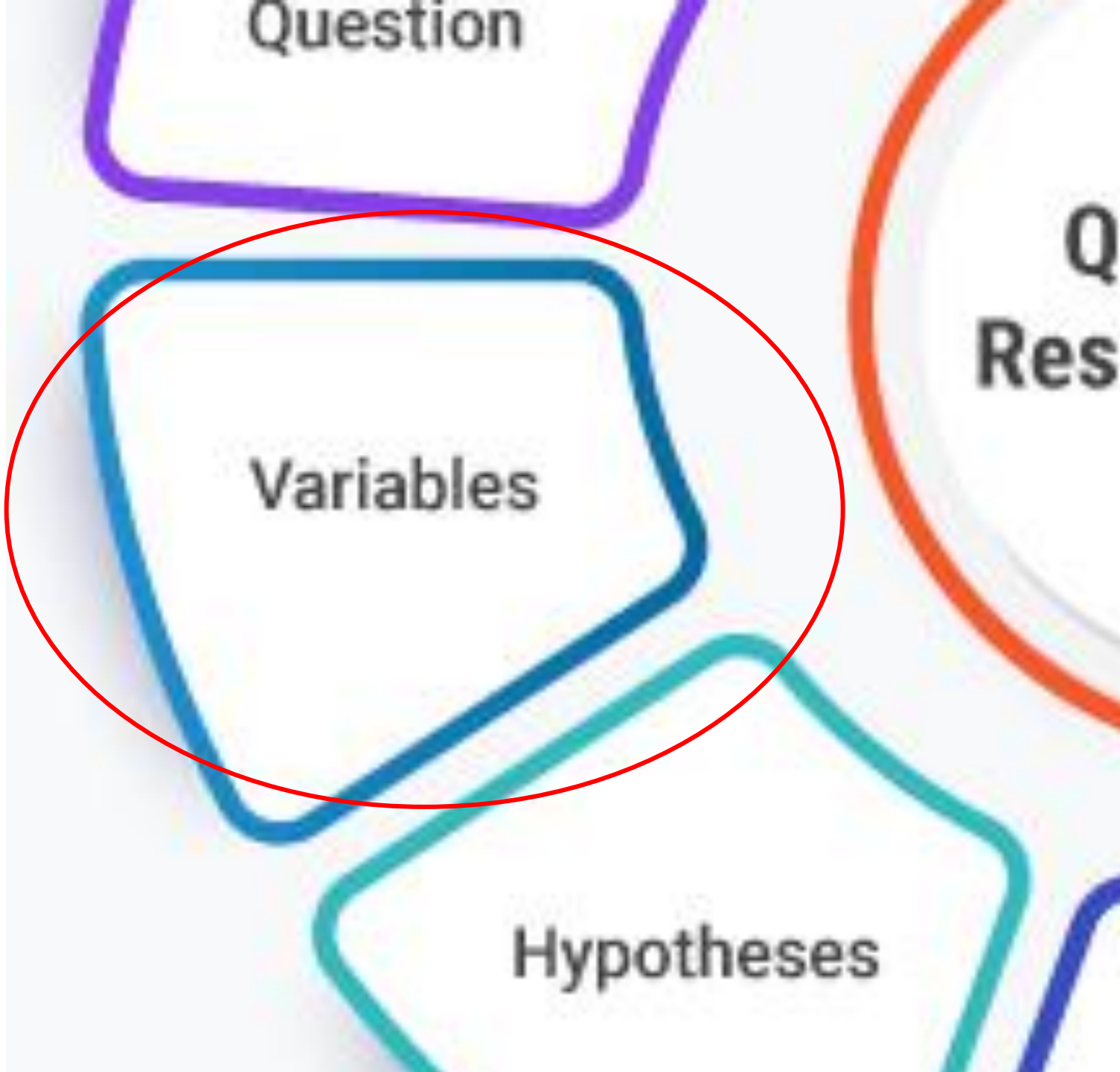
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Key components



Key components



Variables

(characteristics or quantity that can be measured and assigned a numerical values)

Table 1. Baseline patient characteristics by treatment order

Characteristic	HF-HD first (n = 8)	OL-HDF first (n = 7)	Total (n = 15)
Age, years	76±7	62±19	70±15
Gender			
Male	6 (75)	6 (86)	12 (80)
Female	2 (25)	1 (14)	3 (20)
Dialysis vintage, m	43.9±23.7	43.4±33.1	43.7±27.4
AHI, h	38.3±15.3	47.0±37.6	42.4±27.3
Neck size, cm	45.1±5.5	45.7±3.8	45.4±4.6
Body mass index, kg/m^2	30.4±5.3	30.5±5.6	30.4±5.3
Lifestyle			
Smoking status			
Current	2 (25)	2 (29)	4 (27)
Past	6 (75)	5 (71)	11 (73)
Sleep aids			
Medication	0 (0)	1 (14)	1 (6.7)
Remedies	0 (0)	1 (14)	1 (6.7)
Unemployed/retired	8 (100)	7 (100)	15 (100)
Snore loudly	6 (75)	6 (86)	12 (80)
Comorbidities			
Diabetes mellitus	4 (50)	4 (57)	8 (53)
Hypertension	5 (63)	4 (57)	9 (60)
Heart failure[a]	4 (50)	4 (57)	8 (53)
Stroke	5 (63)	1 (14)	6 (40)
Malignancy	3 (38)	0 (0)	3 (20)
Mental illness	2 (25)	3 (43)	5 (33)

Data reported as mean ± SD or n (%).
[a] History of one or more of following diagnosis: congestive heart failure.
HF-HD, high flux haemodialysis; OL-HDF, online haemodiafiltration; AHI, apnea-hypopnea index.

Variables

In quantitative research, we look at the relationship between variables.

haemodialysis?

INDEPENDENT VARIABLE (Cause)

Researcher can control or manipulate



IV: HDF

DEPENDENT VARIABLE (Effect)

Depends on the changes made to the independent variable



DV: sleep apnoea symptoms

Remember: We examine how the **independent variable** (what we change) affects the **dependent variable** (what we measure).

DEPENDENT VARIABLES = OUTCOMES

Independent Variable (Cause)
HDF (haemodiafiltration)

Dependent Variable (Effect)
Sleep apnoea symptoms

Outcomes are the results we measure to determine the effect of the independent variable.

TYPES OF OUTCOMES

PRIMARY OUTCOMES

Main result the study is designed to evaluate.
It directly answers the central research question.

e.g., **Severity of sleep apnoea**
(measured by Apnoea–hypopnea index, AHI)

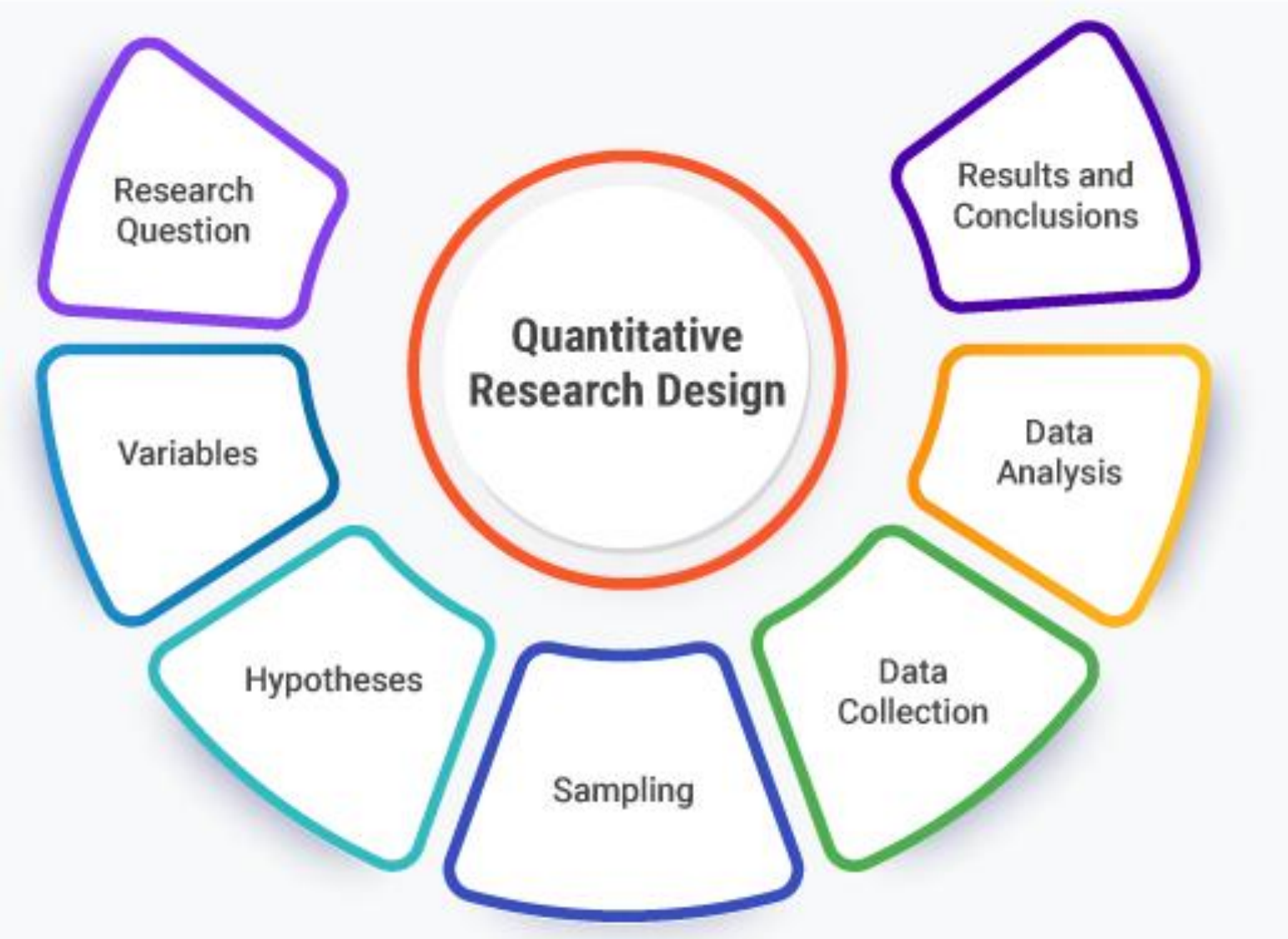
SECONDARY OUTCOMES

Additional results that provide more information about the intervention or phenomenon but are **not the main focus** of the study.

e.g., **Serum inflammatory cytokines**
(beta-2-macroglobulin, CRP, TNF–α, IL-6, IK-8)
& **PROM** (daytime sleepiness, QoL and sleep quality)

Clear outcomes = Clear answers. Choose outcomes that are **relevant, measurable and meaningful!**

Key components



Key components

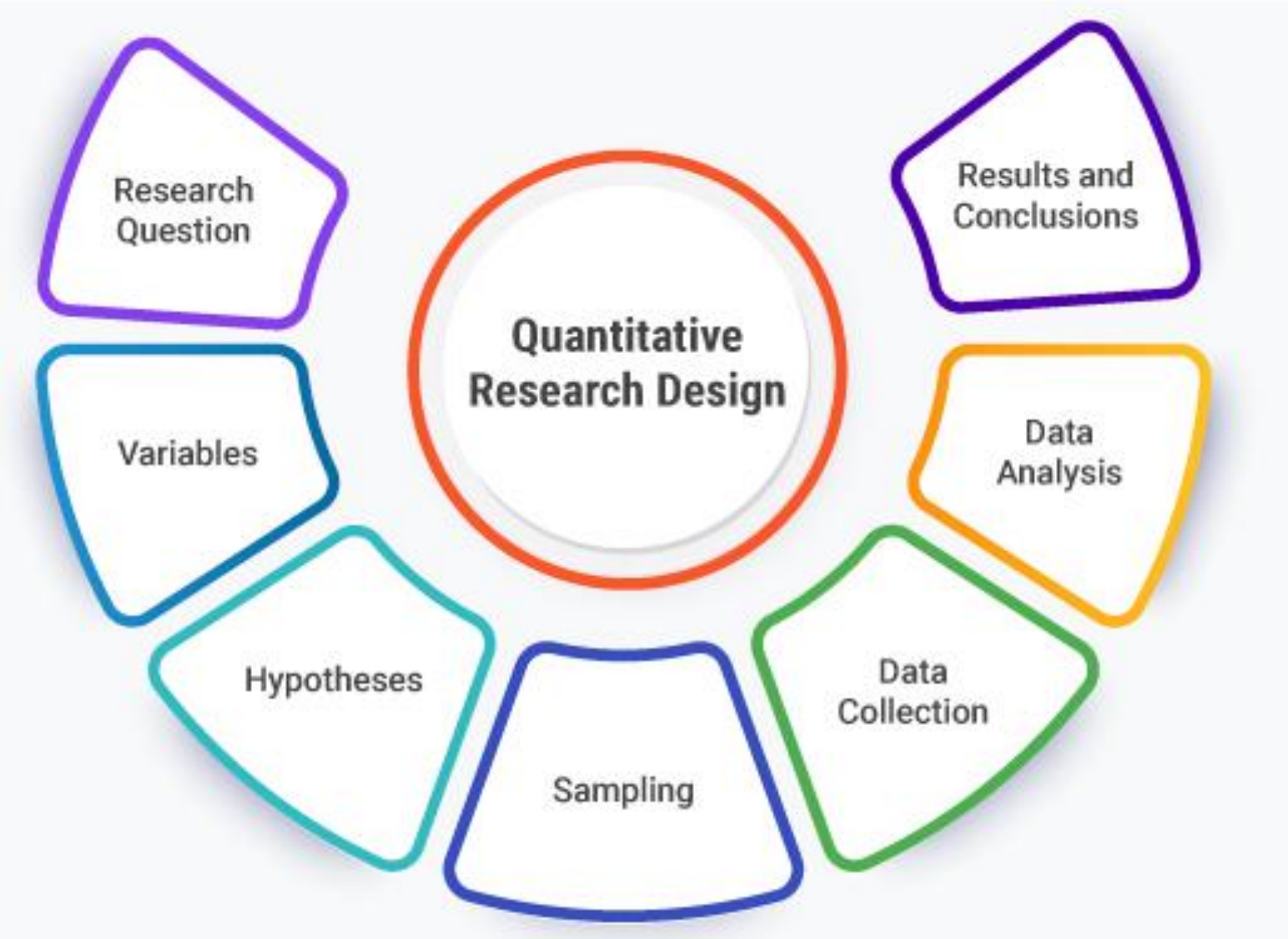


Hypothesis

- A hypothesis is a proposed explanation for a phenomenon
- H0: HDF will not improve sleep apnoea (measured by Apnoea-hypopnea index) compared to standard HD



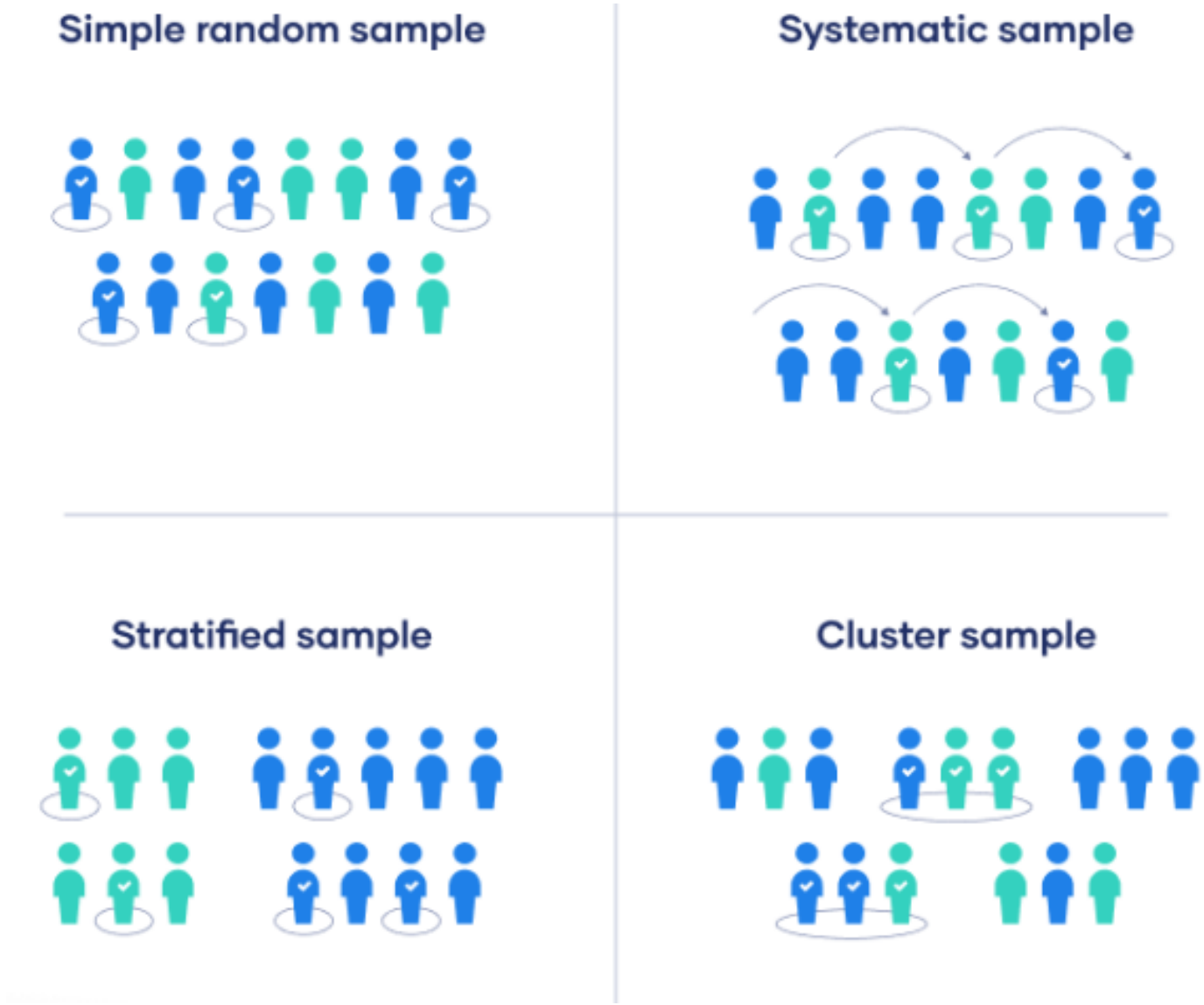
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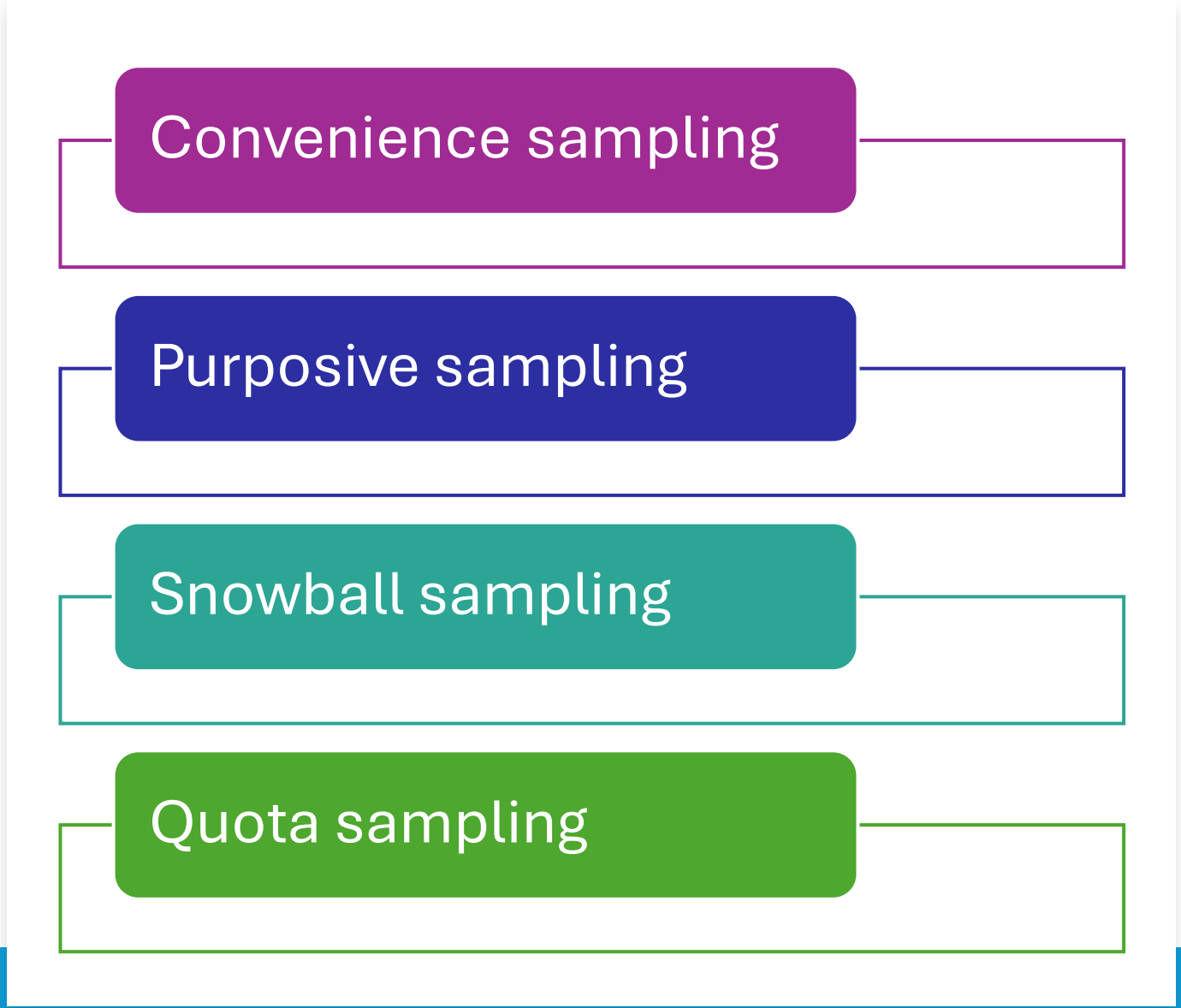

Hypotheses
Sampling
Data
Collection

Sampling

- **Probability sampling :** random selection. strong statistical inferences
- **Non-probability sampling:** non-random selection based on convenience or other criteria. Easily collect data.



Non-probability sampling methods



Sampling key considerations

- Representativeness
- Random selection
- Sampling methods
- Sample size
- Sampling bias



Data Collection

- Measurable
- Instruments (objective or self-reported?)
- Methods (online? internal data?)
- Ethical considerations (consent? Implied consent? Opt- out consent)
- Data quality and reliability
- Practical issues- less is more…



SAMPLE SIZE

Sample size should be large enough to detect meaningful effects for the primary outcome while remaining ethical, feasible, and statistically sound.

1

Large enough

to answer the primary outcome of the study.

2

Factors influencing sample size

Level of confidence, margin of error, population variability, effect size, research design.

3

Effect size

- Small effect → larger sample needed
- Large effect → smaller sample

4

Usually based on

- Previous studies
- Pilot data
- Clinical relevance

Example

The sample size was calculated based on the difference in AHI.
A sample size of 20 was required to detect a clinically significant AHI difference of 15 from a sleep study in a crossover study, with 80% power.

n = 20

TAKE HOME MESSAGES

Simple ideas. Strong impact. Better patient care.

Good research makes a difference in real lives.



Good research starts with a clear clinical question

Everything begins with asking the right question.



Different questions need different study designs

The research question determines the method.



Outcomes and sample size matter

Good studies need meaningful outcomes and enough participants.



Research should improve patient care

The goal is better evidence, better decisions, and better outcomes for people receiving dialysis.

Now is the game time!!

- https://uonline.h5p.com/content/1292904149251865919

