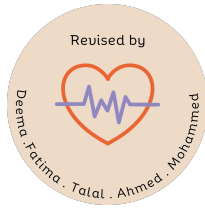


Research
442



Selecting Study Variables

Lecture No. 13

Objectives:

1. Understand variables and their role in health research
2. Understand the types of variables that can be used
3. Know how to select appropriate study variables

~ This lecture was presented by **Dr. Kholood Altassan**

~ It is included in the **Midterm Exam**

~ We highly recommended reading the **Ayah** in the first page

Slides

Color code

Original text

Dr. Notes

Important

Golden note



Extra



Editing file

What is a Variable?

What is a Variable?

Definition: A variable is a **characteristic or quality** that can be observed or **measured** and that can take on different values.

Variables are the building blocks of research studies, and they are used to understand **relationships** between different **phenomena**.
The relationship between exposure and outcome.

A variable can be an answer to a survey question, a biomarker **CBC**, a vital sign **Temperature**, a diagnosis, we often use scores for things that need multiple factors to come to a conclusion, e.g, mental health and SLE, etc.

E.g., Sex, age, BP, depression score, levels of PM10 ¹

The choice of variables depends on your research question and objectives.

سُورَةُ الْأَنْعَامِ

وَلَوْ أَنَّ أَهْلَ الْقُرَىٰ ءَامَنُوا وَاتَّقَوْا لَفَتَحْنَا عَلَيْهِم بَرَكَاتٍ
مِّنَ السَّمَاءِ وَالْأَرْضِ وَلَٰكِن كَذَّبُوا فَأَخَذْنَاهُم بِمَا كَانُوا
يَكْسِبُونَ ﴿٦١﴾

المختصر في التفسير

ولو أن أهل هذه القرى التي أرسلنا إليها رسلنا صدقوا ما جاءتهم به رسلهم، واتقوا ربهم بترك الكفر والمعاصي، وامتنثال أوامره لفتحنا عليهم أبواب الخير من كل جهة، ولكنهم لم يصدقوا ولم يتقوا، بل كذبوا بما جاءت به رسلهم، فأخذناهم بالعذاب فجأة بسبب ما كانوا يكسبونه من الآثام والذنوب.

1. PM10 (particles with a diameter of 10 micrometres or less): these particles are small enough to pass through the throat and nose and enter the lungs. It's for air pollution.

Dependent variables measure the response to independent variables at least based on my hypothesis.

The variable measures the risk factors or exposure called independent variable.

Understanding the different types of variables and their characteristics is essential for conducting research, selecting appropriate statistical tests, and drawing meaningful conclusions from your data.

Variable can reflect the exposure or reflect the outcome.

What are the Types of Variables?

1. Type of data

1. **Independent Variable (exposure variable; متغير مستقل):** is the variable that is the **presumed cause** or predictor of a particular outcome.

E.g., in a drug study, the type of **medication** administered is the independent variable.

2. **Dependent Variable (outcome variable; متغير تابع):** is the **outcome or response** that you measure in a study. It is the variable that you expect to change as a result of variations in the independent variable.

E.g., in a drug study, the reduction in blood pressure or improvement in symptoms would be the dependent variable.

3. **Confounding Variables:** are **extraneous variables** that are not the focus of the study but can **affect the relationship** between the independent and dependent variables. Controlling for confounders is important to ensure that observed effects are not due to these variables.

2. Type of data

Categorical variables:

1. **Categorical (Nominal) Variables:** qualitative please don't mix it up with qualitative research ما لهم دخل and represent categories or groups. They cannot be ordered or ranked. These variables are often described using frequency counts and percentages.

E.g.: ethnicity, marital status, or type of car [sedan, SUV, truck].

2. **A binary variable:** is a categorical variable that takes one of two possibilities.

E.g., male/female, yes/no, positive/negative.

3. **Ordinal Variables:** represent categories or groups, but they have a natural order or ranking. Same as categorical but there is natural order.

E.g.: education level [high school, bachelor's degree, and master's degree], evaluation questionnaire high, medium, low (very common).

Categorical can't give median or mean, the best it can do is frequency.

Binary and Ordinal Variables can be changed to numbers, for binary usually 0 or 1

Continuous and discrete Variables are quantitative

Quantitative variables:

1. **Continuous Variables:** are numeric and can take on an infinite number of values within a range. أرقام تقبل الفاصلة

E.g., age, temperatures, BP, lab results usually.

2. **Discrete Variables:** are a subtype of continuous variables. They are numeric but can only take on specific, separate values (usually integers).

أرقام لا تقبل الفاصلة

E.g., the number of children in a family, the number of patients seen in a clinic, death.

Continuous and discrete can be changed to Categorical/ordinal

E.g., if we had age range: 3-95y. What should i do? Age groups

E.g., BP? High, normal, low. Then we have to define them

How to select appropriate study variables

1. **Define your research question or hypothesis:** Start by clearly articulating your research question or hypothesis. What specific aspect of health are you interested in studying? Make sure your research question is **specific, relevant, and measurable**.
2. **Identify the outcome variable (dependent variable):** The outcome variable **represents the effect or outcome** you want to measure or explain. In health research, this could be having a health condition, doing a behavior, or measure of disease prevalence, mortality rate, or assessment score.
3. **Determine the main independent variables:** Independent variables are factors that you believe **may influence the outcome** variable. For example, if you are studying the risk factors for a specific disease, independent variables **might include age, sex, (these usually confounders) type of diet, and smoking status**.
4. **Consider confounding variables:** Confounding variables are factors that **could distort the relationship** between your independent and dependent variables. **Identifying and controlling** for confounders is essential to ensure the **accuracy** of your results. *Can be adjusted, usually demographic are confounders.*
5. **Refinement:** Consider conducting a pilot study or a literature review to ensure that your selected variables are appropriate and relevant to your research question. *Or ask for experts opinion.* Make adjustments based on the feedback. *Useful when making questionnaire from scratch.*

Ethical considerations

Ensure that your choice of variables respects ethical guidelines and protects the rights and well-being of research participants. This may include obtaining **informed consent, protecting privacy, and minimizing any potential harm**

Analysis and reporting

- Once you have selected your study variables, **plan your data collection** methods and statistical analyses accordingly.
- **When presenting** your research findings, **provide** a **clear** and transparent **description** of the **variables** you used, their definitions, and how you measured them.
- **Discuss any limitations** related to your variable selection.

Sleep and Mental Health Outcomes

Examine the relationship between sleep duration, sleep quality, and the mental health disorders, such as depression and anxiety.

How can i measure sleep?

- Hours of sleep (continuous variable)
- There is a scale to measure quality of sleep

How can i measure mental health disorders?

- There is a scale to measure it

What are the confounding variables? (Variable that related to both)

- BMI (continuous or ordinal variable depending on how you want to analyze it)
- Age (older people have less sleep time and high risk of anxiety and depression, so you can exclude or analyze based on age groups)

Always when you think about confounders, think about demographic first

Dietary Patterns and Diabetes

Analyze dietary data from a large cohort of participants to identify specific dietary patterns associated with the development of type 2 diabetes.

What are the possible variables?

- Do you consuming fast food (binary variables).
- How often do you consume fast food (discrete variable (numbers), ordinal (rare, usually, always)).

How to measure diabetes?

- Are you diagnosed with diabetes? (binary variable).
- Pre-diabetes/diabetes/normal; high/low/normal (ordinal variable).
- Level of glucose (continuous variable).

What are the confounding variables? (Variables that related to both).

- Age.
- Ethnicity.

Workplace Stress and Cardiovascular Health

Investigate the impact of workplace stress on cardiovascular disease among employees.

- **To measure mental health we usually use a Score/scale.**

Longitudinal Study on Aging and Cognitive Function

Conduct a multi-year study to examine the relationship between aging, lifestyle factors (such as diet, physical activity, and social engagement), and cognitive decline in older adults. Assess cognitive function through standardized tests and track changes over time.

A longitudinal study is a research design that involves repeated observations of the same variables over long periods of time. It is often a type of observational study, although it can also be structured as longitudinal randomized experiment.

Smoking and Pregnancy Outcomes

Investigate the effects of maternal smoking during pregnancy on birth outcomes such as preterm birth, and low birth weight. Collect data through medical records and interviews with expectant mothers.

Air Quality and Respiratory Health in Urban Areas

Conduct a cross-sectional study to assess the relationship between air quality indices (e.g., PM2.5, ozone) and the prevalence of respiratory conditions (e.g., asthma, bronchitis) in urban populations. Use data from air quality monitors and health records.

القارة:
عبدالله الشهري وهي المتحفي

نواف التركي
ريان الفنامي

الأعضاء:

رغد النظيف
ريما الجريبة
شهد البخاري
نوف الضلعان
أمير الاحمري
وعد ابونخاع
نراء الهويش
في الدوسري
منار الزهراني

عبدالله التركي
محمد الزير
عثمان الدريهم
عبدالعزیز القوطاني
ناصر الفيت
سعد السهلي
رائد الماضي
سعود الشعلان
عبدالله المياح
عبدالله النجريس
تركي العتيبي
عبدالله القرني
عامر الفامري
سعد الاحمري
معاذ آل سلام
محمد الحصيني

MCQ:

Q1: What is a variable?

- A. A constant value that does not change
- B. A characteristic that cannot be observed or measured
- C. A characteristic that can be observed or measured and can take on different values
- D. A subjective opinion that cannot be quantified

Q2: Which variable is the presumed cause or predictor of a particular outcome in research?

- A. Dependent variable
- B. Confounding variable
- C. Independent variable
- D. Control variable

MCQ:

Q3: Ethnicity and type of car (sedan, SUV, truck) are examples of which type of variable?

- A. Continuous Variable
- B. Discrete Variable
- C. Ordinal Variable
- D. Categorical (Nominal) Variable

Q4: Which of the following is NOT an appropriate step in variable selection for health research?

- A. Identifying potential confounders
- B. Defining a vague and unmeasurable research question
- C. Determining the main independent variables
- D. Refining variable selection based on feedback