



Research Variables and Variable Relationships

Detty Nurdiati

Clinical Epidemiology & Biostatistics Unit

Department of Obstetric & Gynecology, Faculty of Medicine

Universitas Gadjah Mada/RSUP Dr. Sardjito, Yogyakarta

Variable

Some Definitions



- An image, perception or concept that is capable of measurement, hence capable of taking on different values.
- A symbol to which numerals or values are attached.
- Rational units of analysis that can assume any one of a number of designated sets of values.
- A concept that can be measured.

Concept vs Variable



Concept

- Effectiveness
- Satisfaction
- High academic achievement
- Self esteem
- Rich
- Domestic violence

Subjective impression
No uniformity
Cannot be measured

Variable

- Gender (male/female)
- Age (x years)
- Income (\$ per year)
- Weight (kg)
- Religion
- Attitude

Measurable, though the degree of precisions varies from scale to scale, from variable to variable (attitude-subjective, income-objective)

Concept, Indicator and Variable



Concepts	Indicators	Variables	Decision Level
Rich	a. Income b. Assests	a. Income/year b. Total value of home, car, etc	a. If $> \$10.000$ b. If $\leq \$10.000$
High academic achievement	a. Average marks obtained in exam b. Average marks obtained in practical work c. Aggregate marks	a. Percentage of marks b. Percentage of marks c. Percentage of marks	a. If $> 75\%$ b. If $> 75\%$ c. If $> 80\%$

Variable Requirements

Relevance

Measurable

Has operational definition

Has value for statistical test

Not ambiguous (mutually exclusive)

Types of Variable

Causal model

Independent variables

Intervening variables

Confounding/
Extraneous variables

Dependent variables

Study design

Active variables

Attributable variables

Unit of measurement

Categorical variables
(Quantitative)

Numerical variables
(Qualitative)

Causal Model

Independent Variable

- The cause supposed to be responsible for bringing about changes in a phenomenon or situation

Dependent Variable

- The outcome of the changes brought about by changes in an independent variable

Causal Model

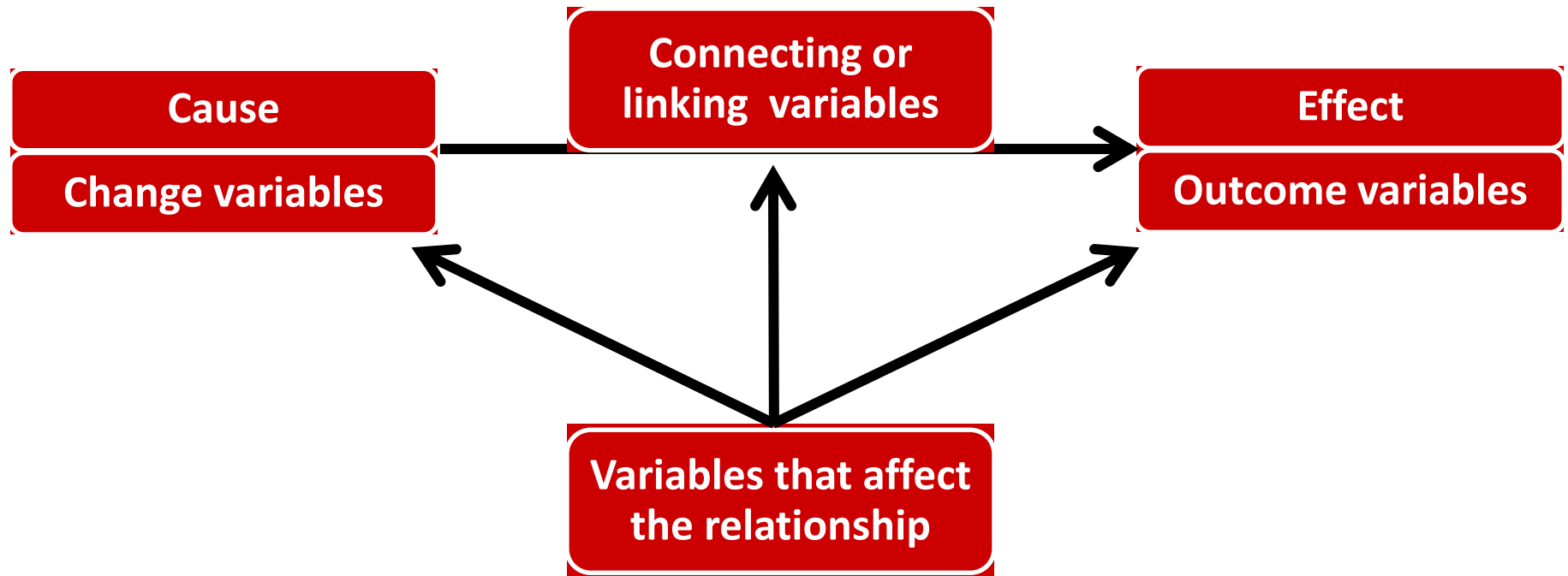
Extraneous/Confounding Variable

- Several other factors operating in real-life situation may affect changes attributed to independent variables.
- Not measured in the study, may increase or decrease the magnitude of strength of the relationship

Intervening Variable

- Link the independent and dependent variables
- In certain case, the cause variable will have the assumed effect only in the presence of an intervening variable

Causal Model



Causal Model

Smoking

Independent variable

Lung Cancer

Dependent variable

Affect the relationship

Extent of the smoking

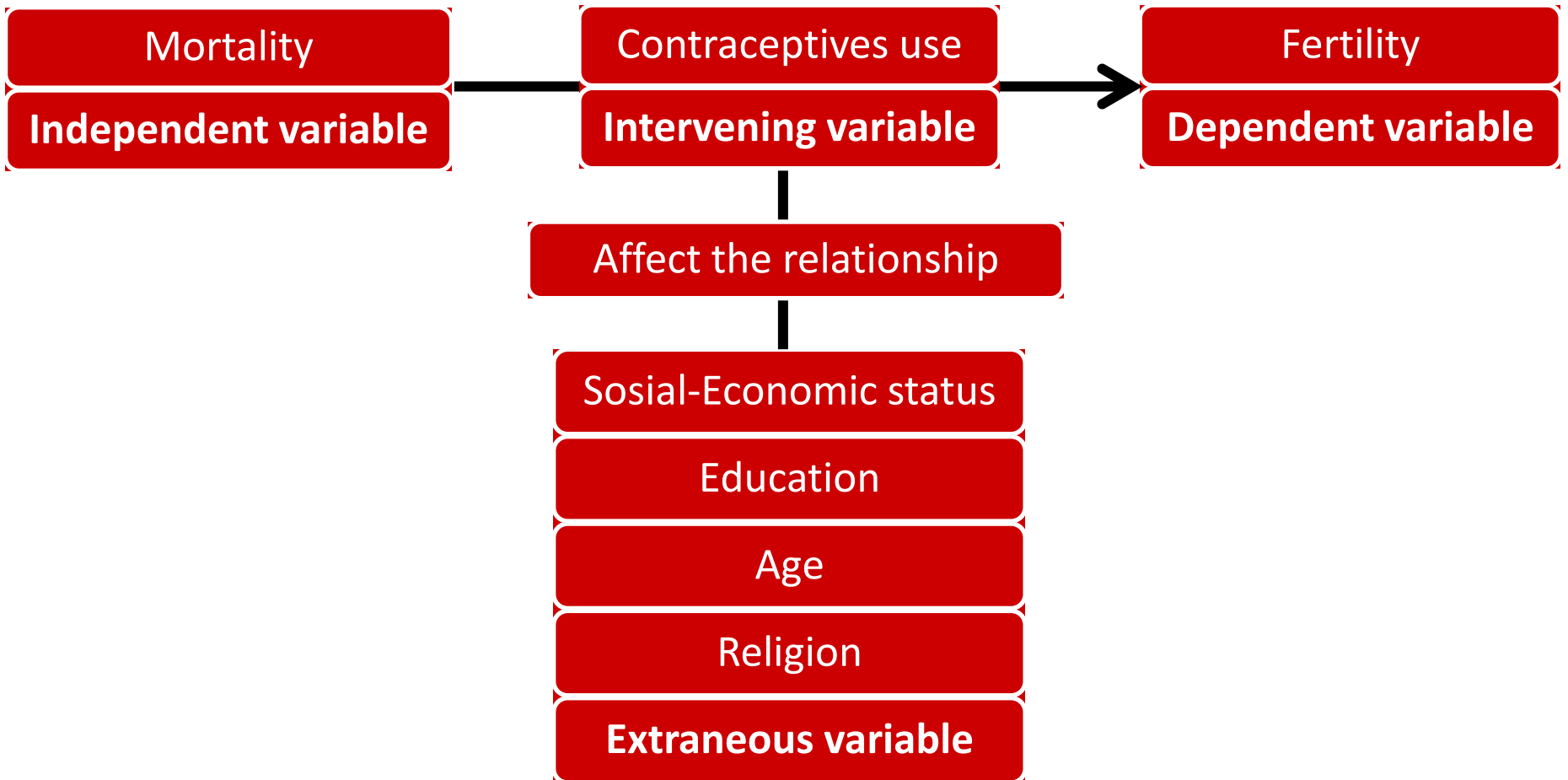
Duration of smoking

Age

Extent of daily exercise

Extraneous variable

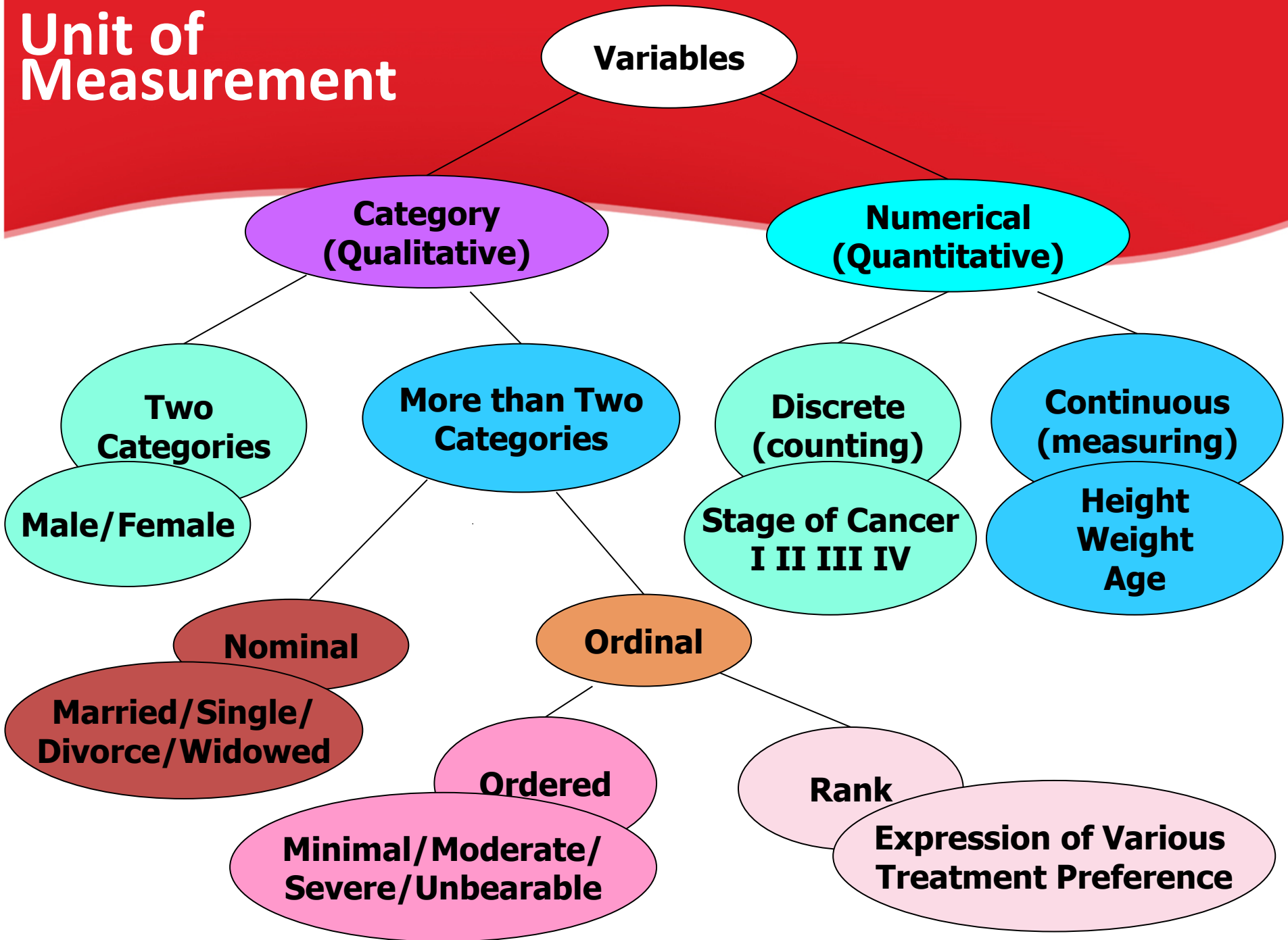
Causal Model



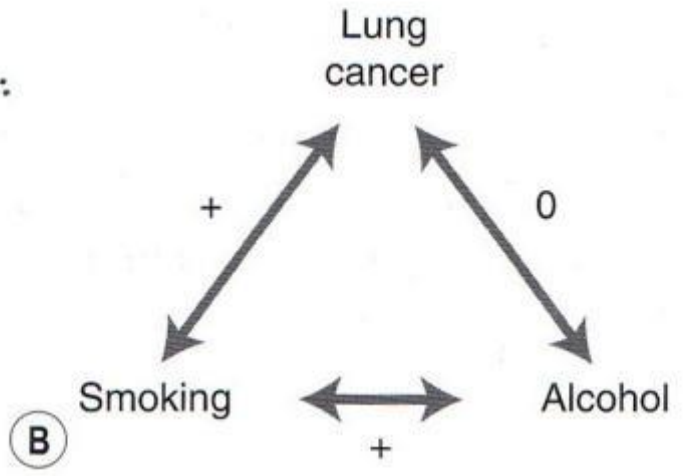
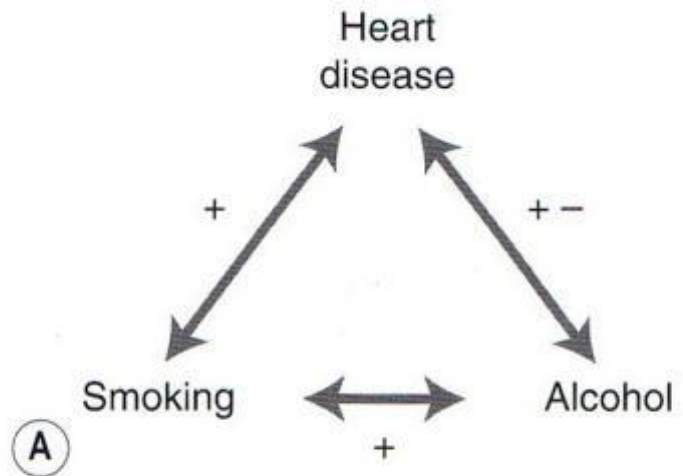
Study Design

Study Intervention <ul style="list-style-type: none">• Different teaching models• Experiment intervention• Program service• Etc	Study population's <ul style="list-style-type: none">• Age• Gender• Level of motivation• Attitudes• Religion• Etc
Active Variables	Attributable Variables
A researcher can manipulate	A researcher can not manipulate

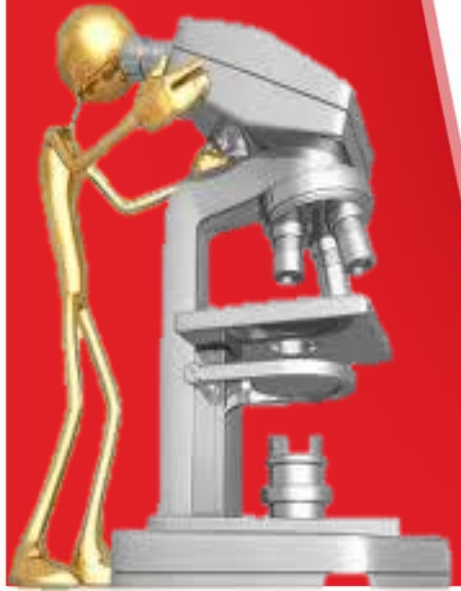
Unit of Measurement



Confounder



Confounding?



Literatures

- Altman DG. 1990. Practical statistics for medical research. Chapman & Hall, London.
- Bland M. 2000. An introduction to medical statistics, 3rd edn. Oxford University Press, Oxford.
- David AG , Kenneth FS. 2002. An overview of clinical research: the lay of the land. The Lancet.2002;359(9300):57-61. DOI: 10.1016/S0140-6736(02)07283-5.
- Greenhalgh T. 2012. How to read a paper: a basics of evidence-based medicine, 4rd edn. Willey-Blackwell, Chichester.
- Kirkwood B, Sterne J. 2003. Essential medical statistics, 2 nd edn. Wiley-Blackwell, Chichester.
- Kumar R. 1999. Research Methodology: A step-by-step guide for beginners. London: Sage Publications Ltd.

Thank You

