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Introduction to Research

Course for Ph.D. students
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3. Theory, models, observation

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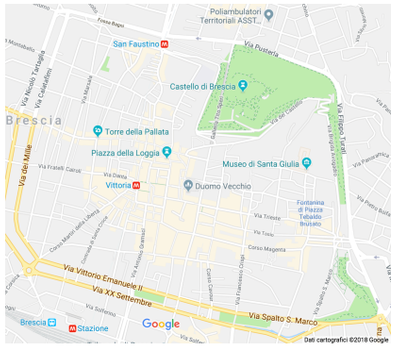
Model

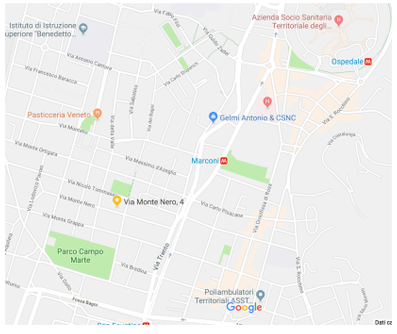
- A model is a theoretical object that is defined and constructed in such a way as to be capable to represent (or stand for) other objects that occupy a portion of the world (*representational view of models*)

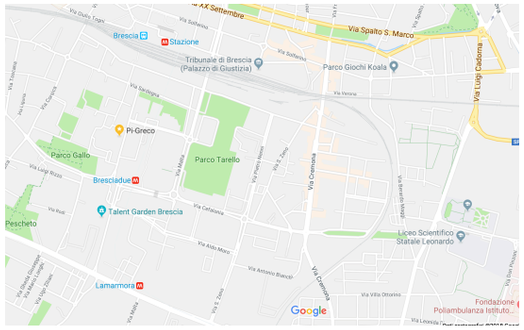
- What a model represents is defined by the researcher (community) (stipulation)

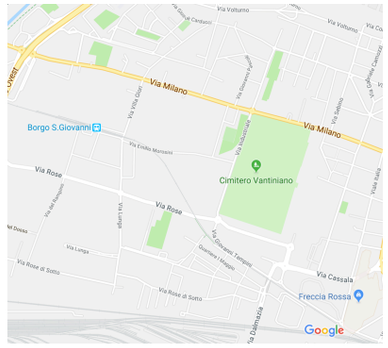
- So, models cannot be true or false. They can be differently similar to other objects (e.g., physical objects)

Theories and models









Semantic view of theories

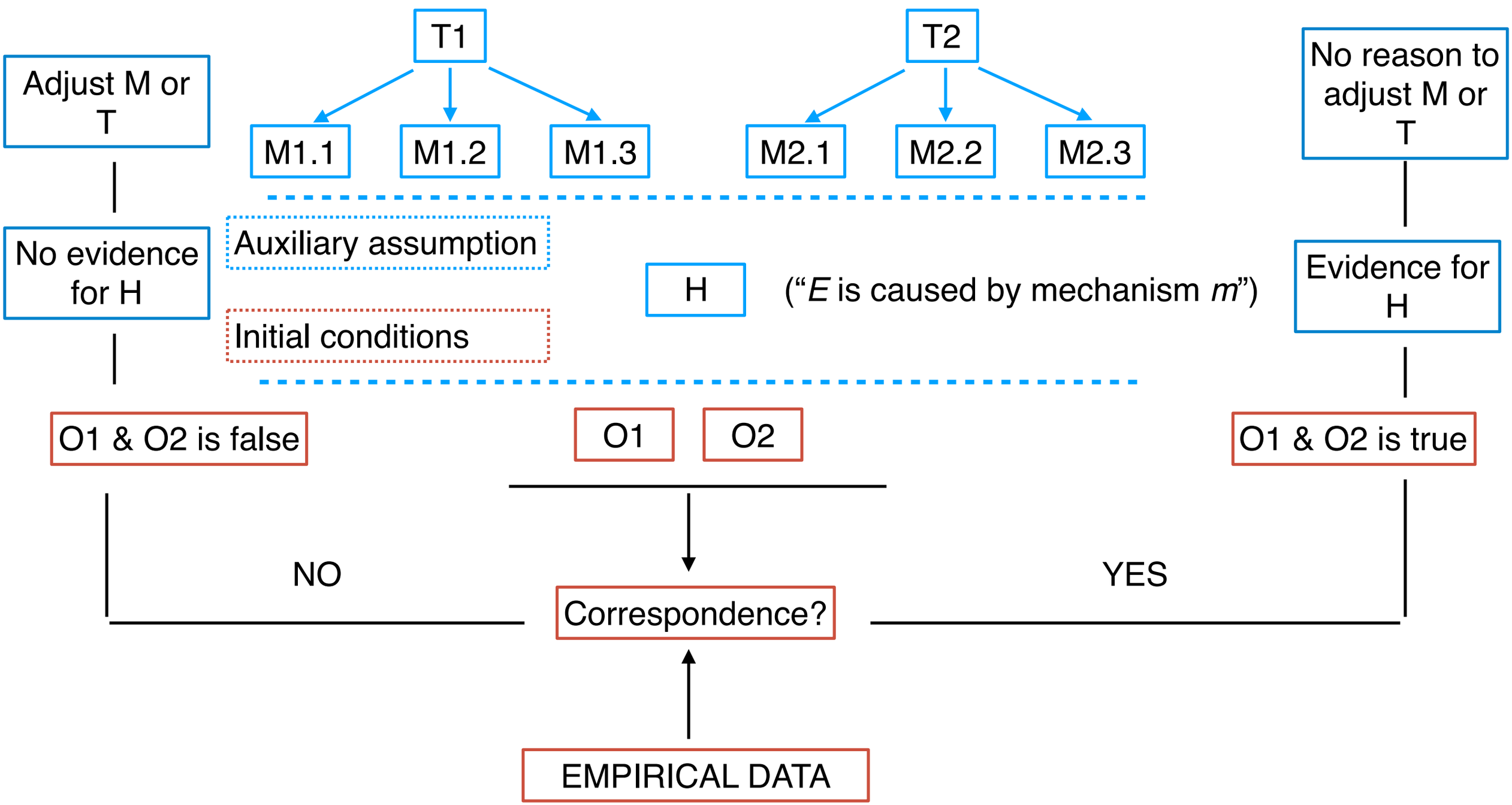
A theory is a representation of the world by means of models which account for causal explanations of classes of similar phenomena.

Theory and hypotheses

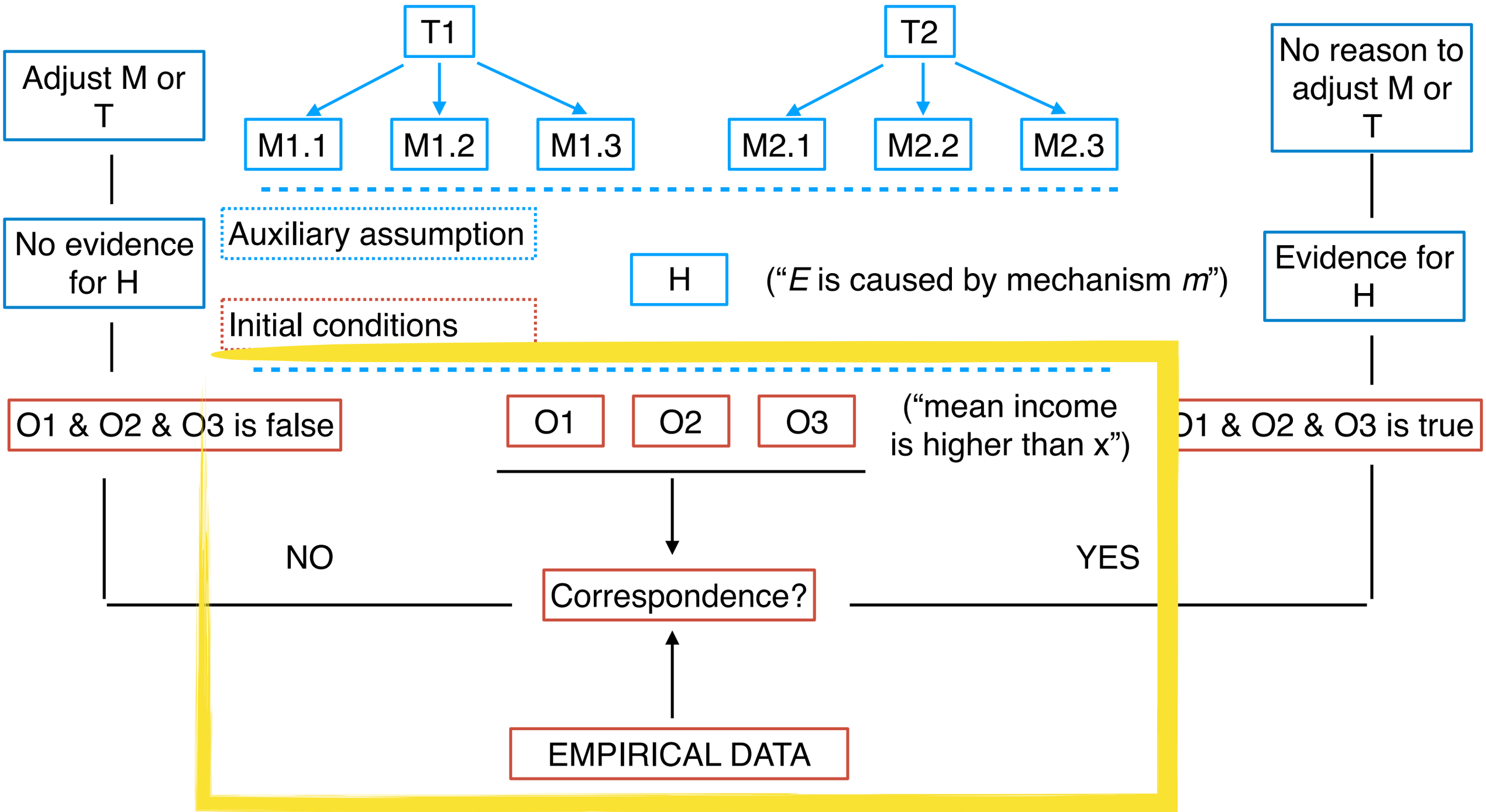
- When we explain a phenomenon by deducing hypotheses from a theory, we are also controlling the validity of that theory

- This is done by:
  - deducing hypotheses H from M
  - deriving O, observational consequences of H
  - testing the truth of O by comparing it to empirical data

From theory to data… and back again



Research design



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Research design

- The aim of an empirical research is to build the evidence supporting an argument in favor of a hypothesis.

- Never forget the link between theory and empirical data through the hypothesized causal mechanism.

- The observational consequences of a hypothesis should be logically derived with a parsimonious use of auxiliary assumptions.

- Empirical data should be collected through valid measurements of those real entities that are involved by hypotheses.

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Reliability

Measurement validity (reliability):

- Theories, models, and (therefore) hypotheses are made of concepts, which refer to real entities of the world.

- Measures should be exhaustively and exclusively referring to a particular class of entities.

Example:

Relative risk-aversion can be measured by asking subjects: "*From 1 to 10, to what extent are you satisfied with ending up in each of the following occupations: (a) accountant, (b) surveyor, (c) shop-owner, (d) clerk, (e) industrial technician.*"

Internal validity

- The degree to which a claim for a causal explanation is supported by the argument.

- It involves:
  - The logical consistency of the link between the hypothesis and the derived empirical predictions.

  - The correspondence between empirical predictions and empirical results.

External validity

The degree of generalizability of results to the whole population (universe) from which selected cases are drawn.

Example:

Hypothesis: a high number of friends decreases the risk of cognitive decay among elderly people

Sample: ca. 1,200 elderly persons living in the city of Brescia

Results support the hypothesis. To which population can these results be generalizable?

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RQ: Is smoking among adolescents affected by peer pressure?

H: Adolescents smoke because smoking is considered a high-status behaviour which consequently diffuses within groups of friends via imitation.

O: Positive correlation between the number of smoking friends (X) and smoking (Y).

Observational study

Population —> subjects

Smoking behaviour (Y/N)

Number of smoking friends

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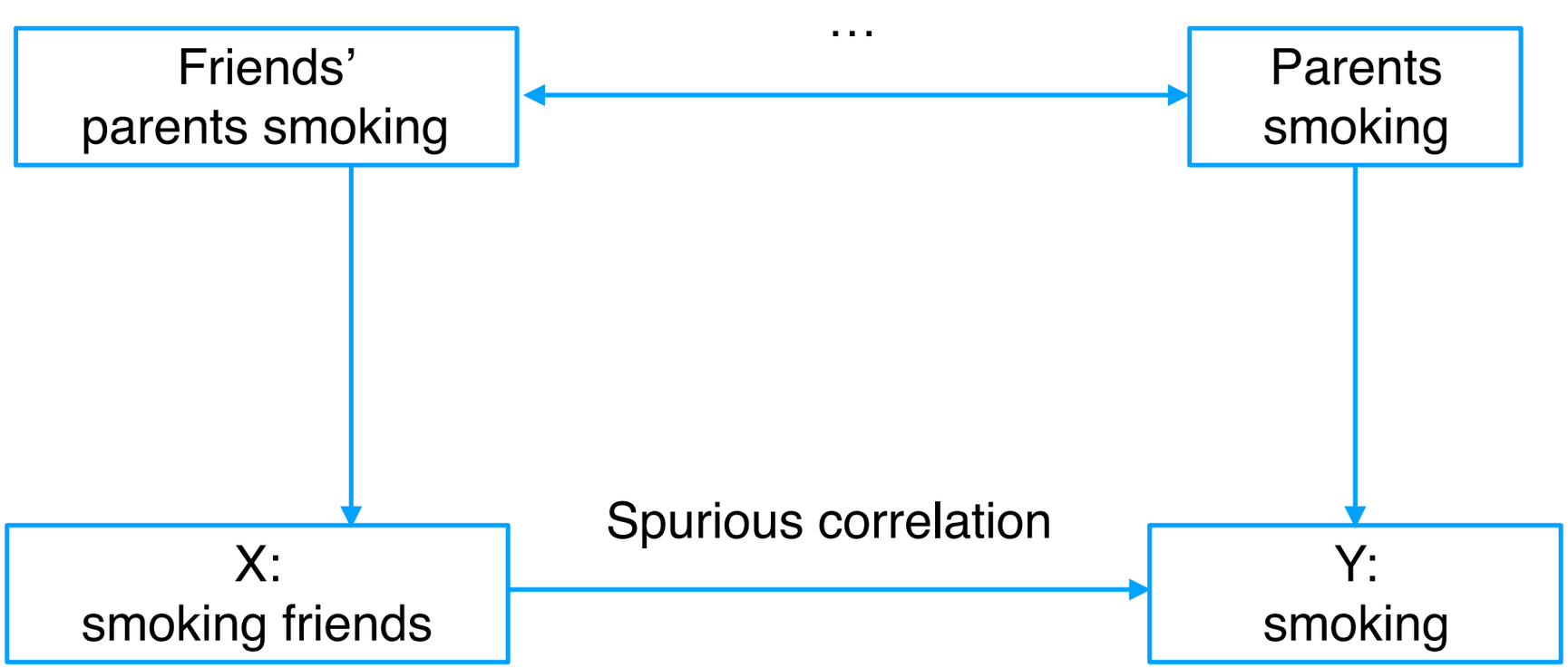
Observational study

Biased sample

Random sample


...
Friends' parents smoking
Parents smoking
Spurious correlation
X: smoking friends
Y: smoking

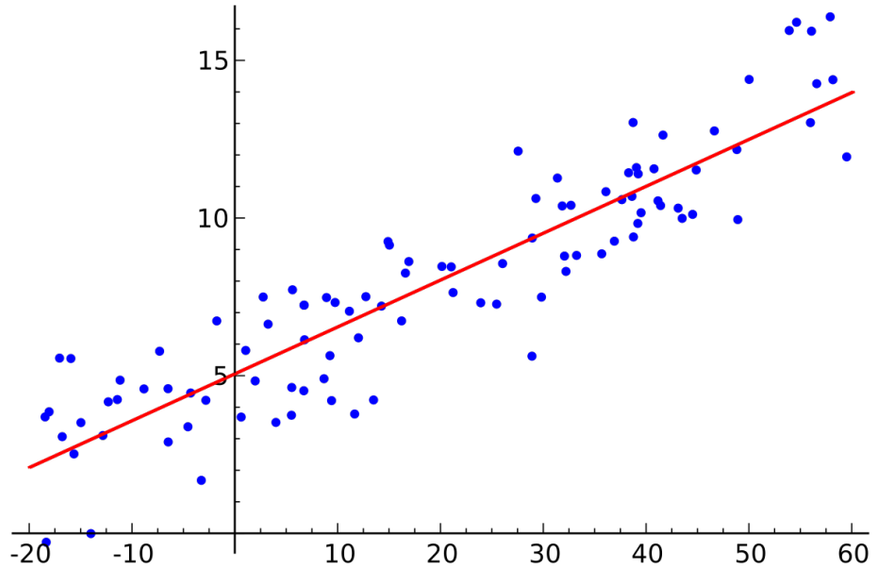
Observational (cross-sectional) study: quantitative data

Smoking behaviour (Y/N)

Number of smoking friends

Parents smoking

Other potential confounding factors (age, gender, social class, school performance, etc.)



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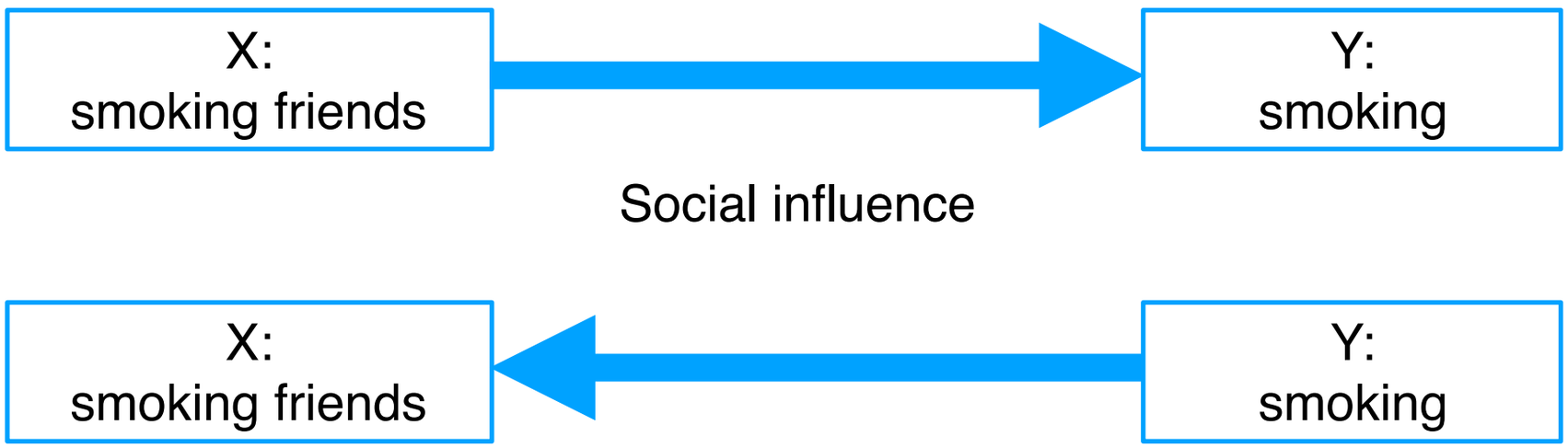
Observational (cross-sectional) study: qualitative data

Observational (longitudinal) design



# smoking friends	Smoking?
0	NO

Jan, 2017

# smoking friends	Smoking?
1	NO

Jul, 2017

# smoking friends	Smoking?
3	YES

Jan, 2018

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Background reading

Bryman (2012), Chapter 3

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Assignment

- 2-minute presentation with basic research design.

- Provide arguments in favour of that research design and against alternatives.