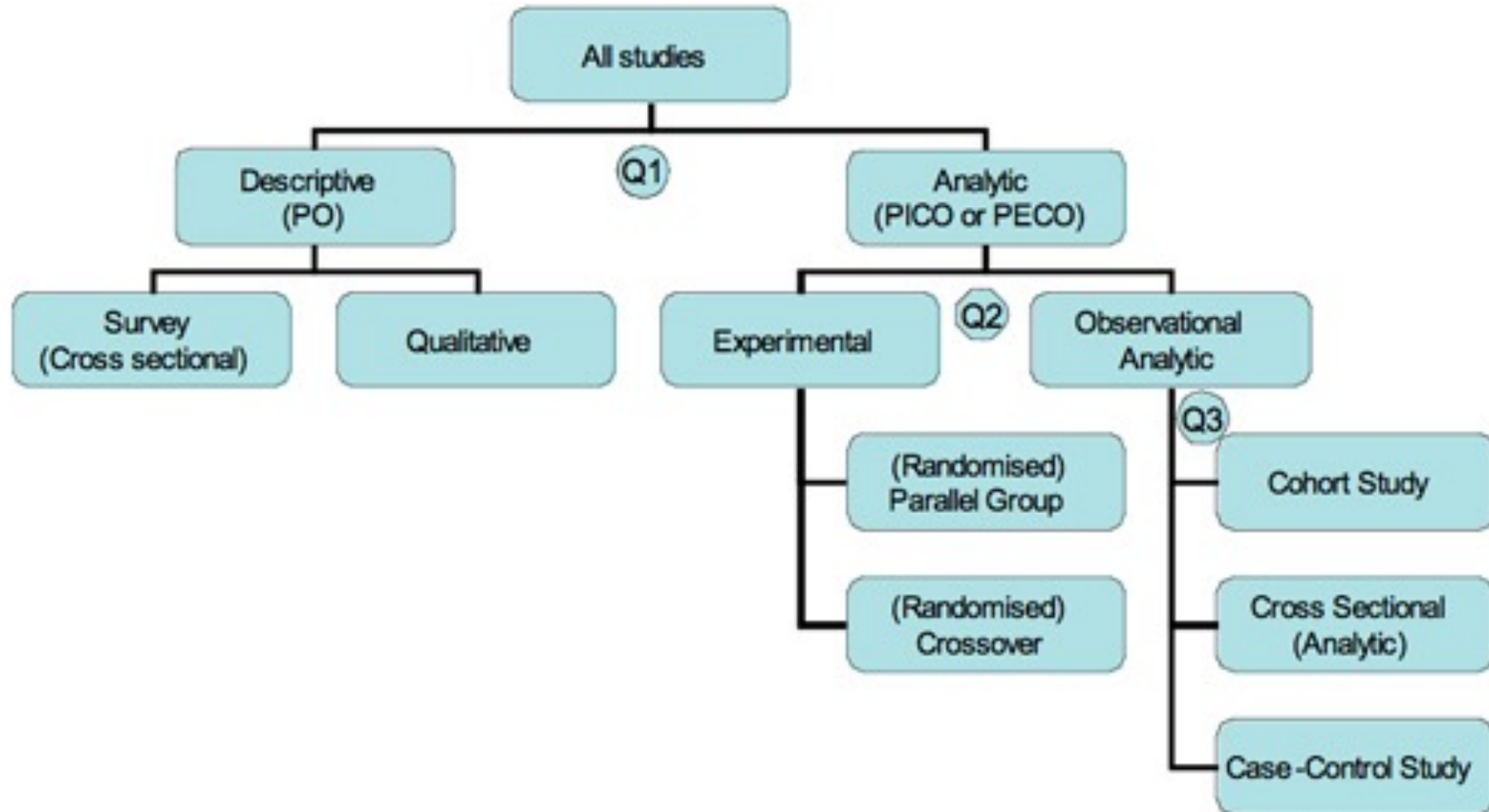


Study Design

ICS 491

Types of Study Designs



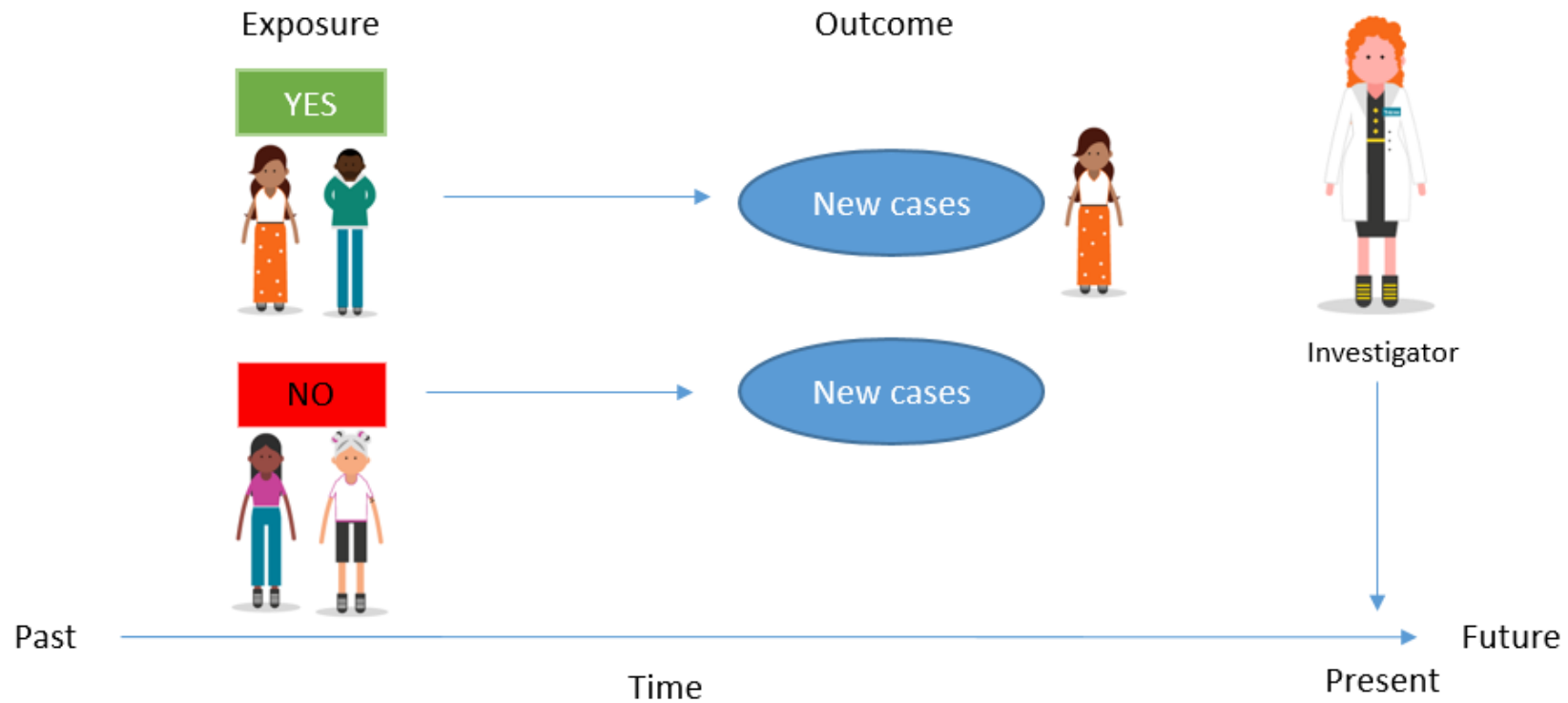
Analytical Studies: Observational

Cohort Study

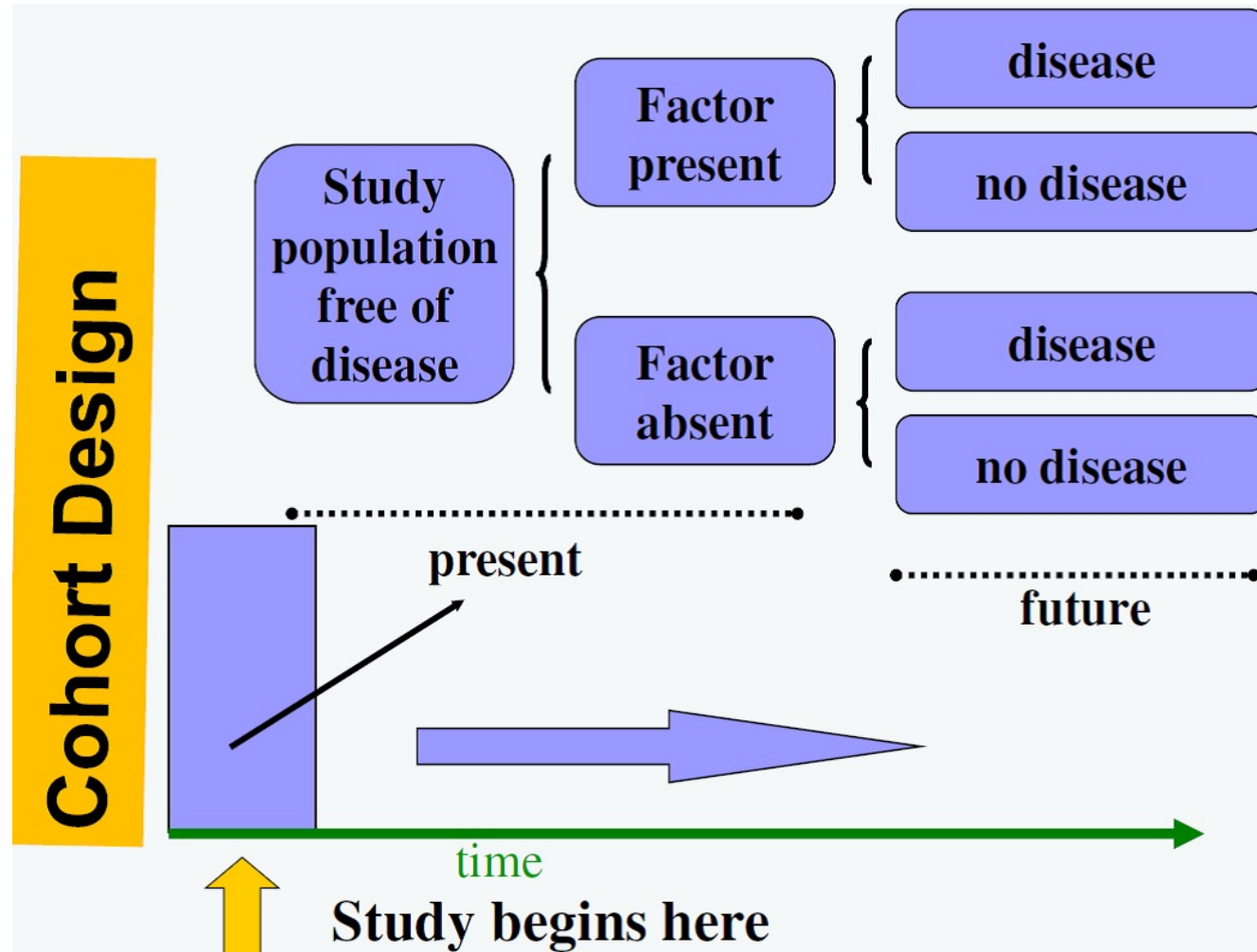
Cohort design is a type of nonexperimental or observational study design. In a cohort study, the participants do not have the outcome of interest to begin with. They are selected based on the exposure status of the individual. They are then followed over time to evaluate for the occurrence of the outcome of interest.

Cohort Study

Cohort Studies (Retrospective/Historical)



Cohort Study



Cohort Study Example

Prospective Cohort Study

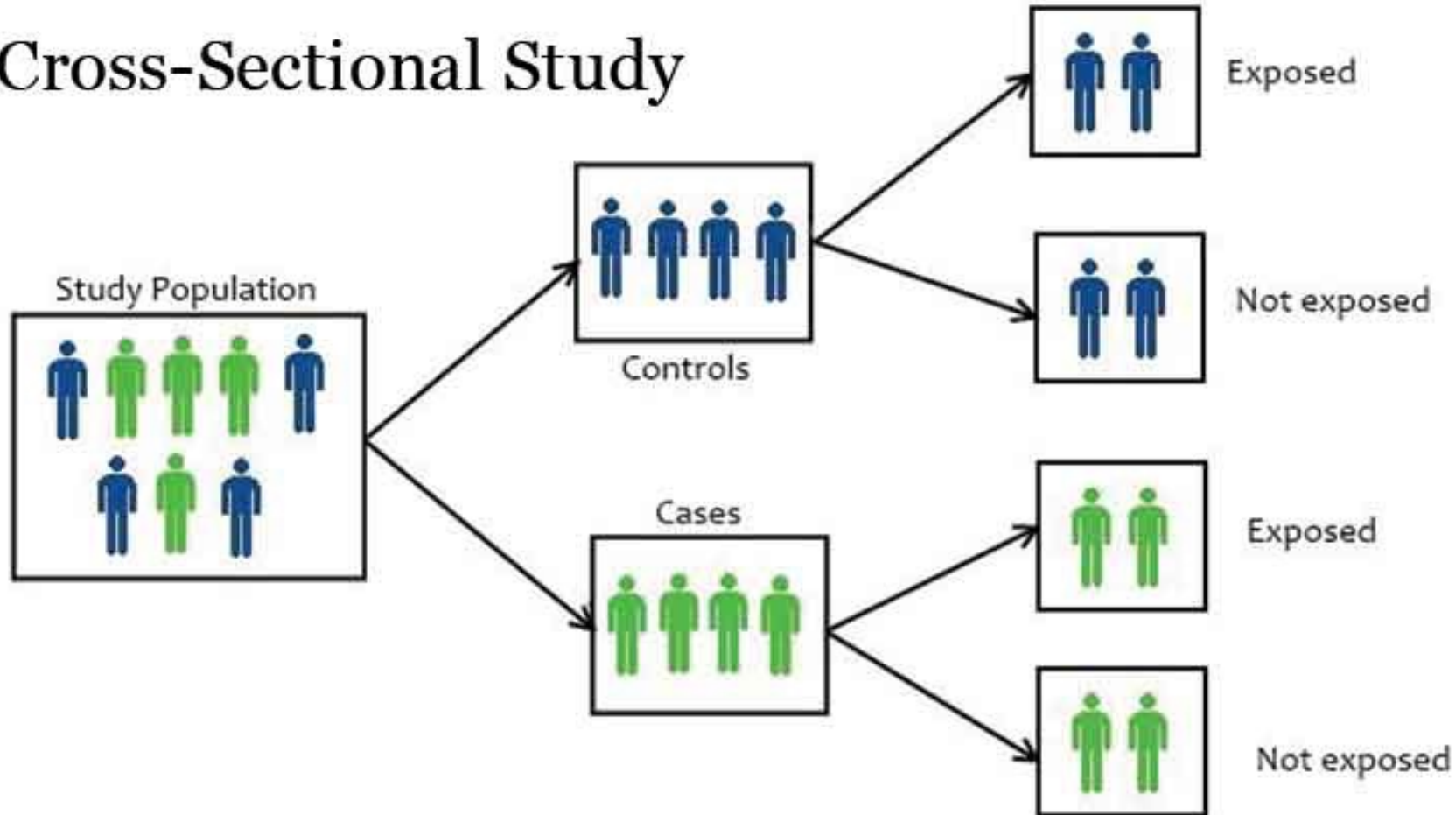


Cross-Sectional Study

A cross-sectional study is a type of research design in which you collect data from many different individuals at a single point in time. In cross-sectional research, you observe variables without influencing them.

Cross-Sectional Study

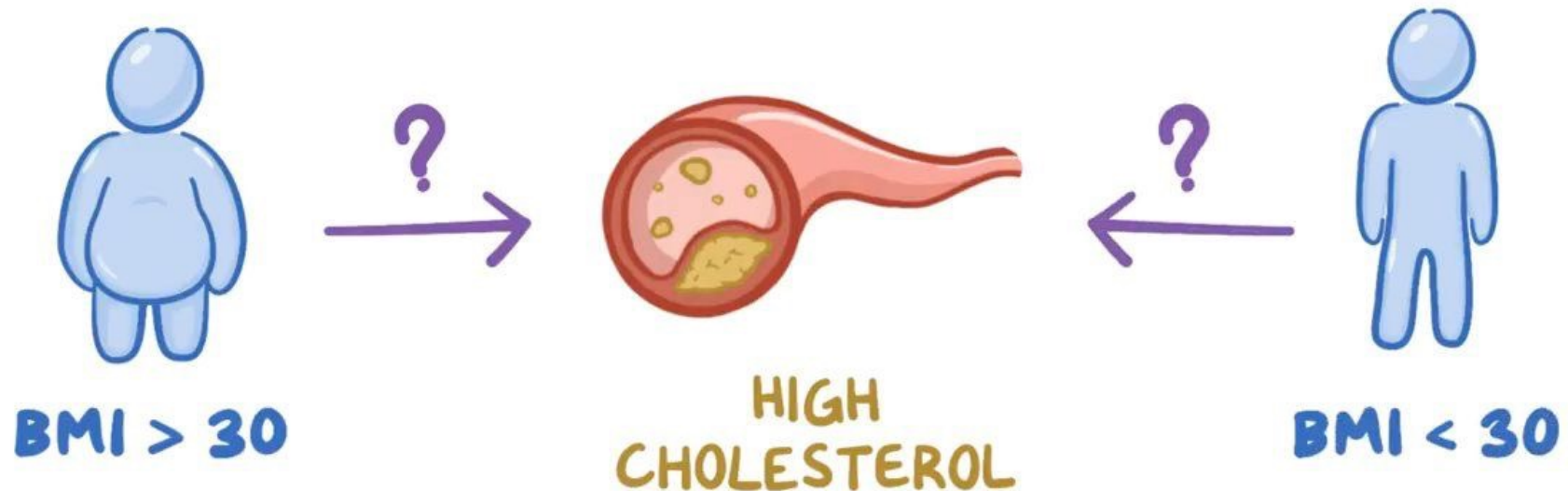
Cross-Sectional Study



Cross-Sectional Study Example

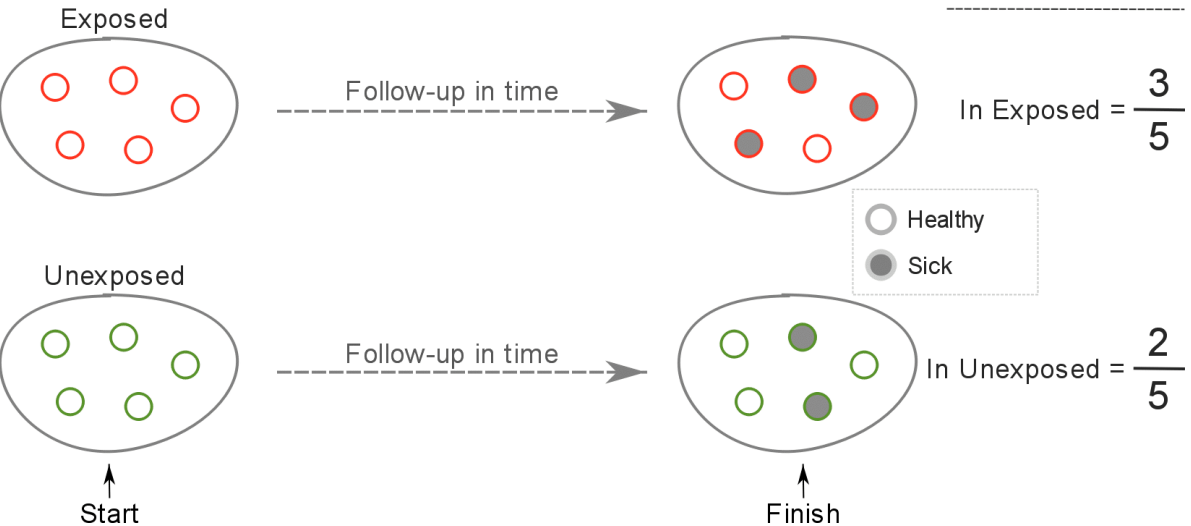
CROSS-SECTIONAL STUDY

~ WHERE an **EXPOSURE** & an **OUTCOME**
are MEASURED at the SAME TIME

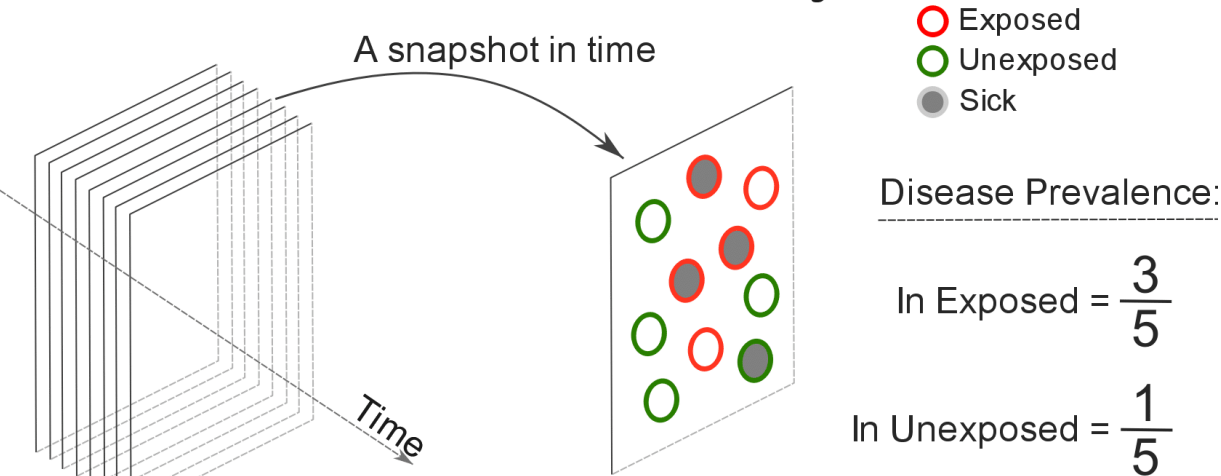


Cohort vs. Cross-Sectional Study

Cohort Study



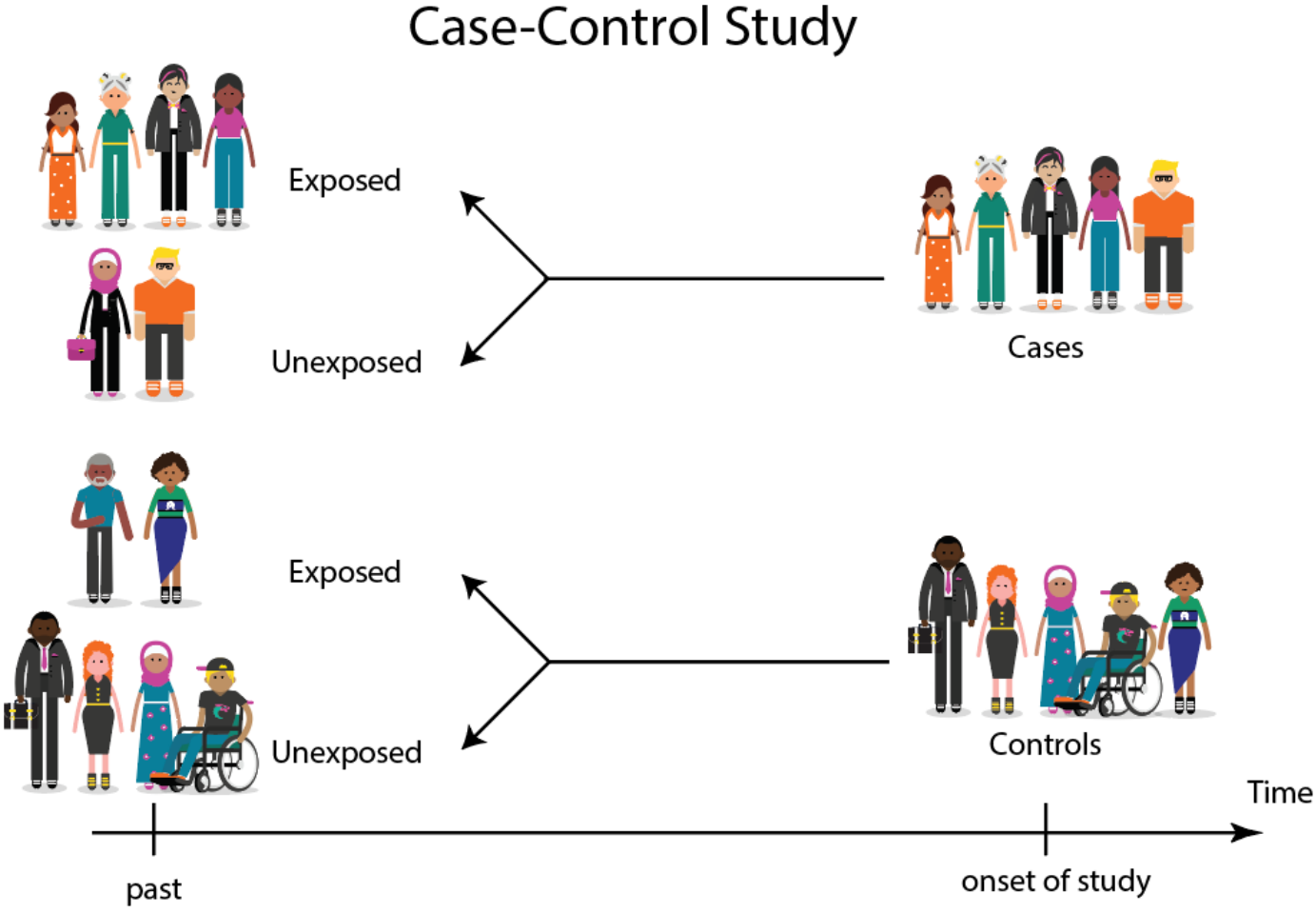
Cross-Sectional Study



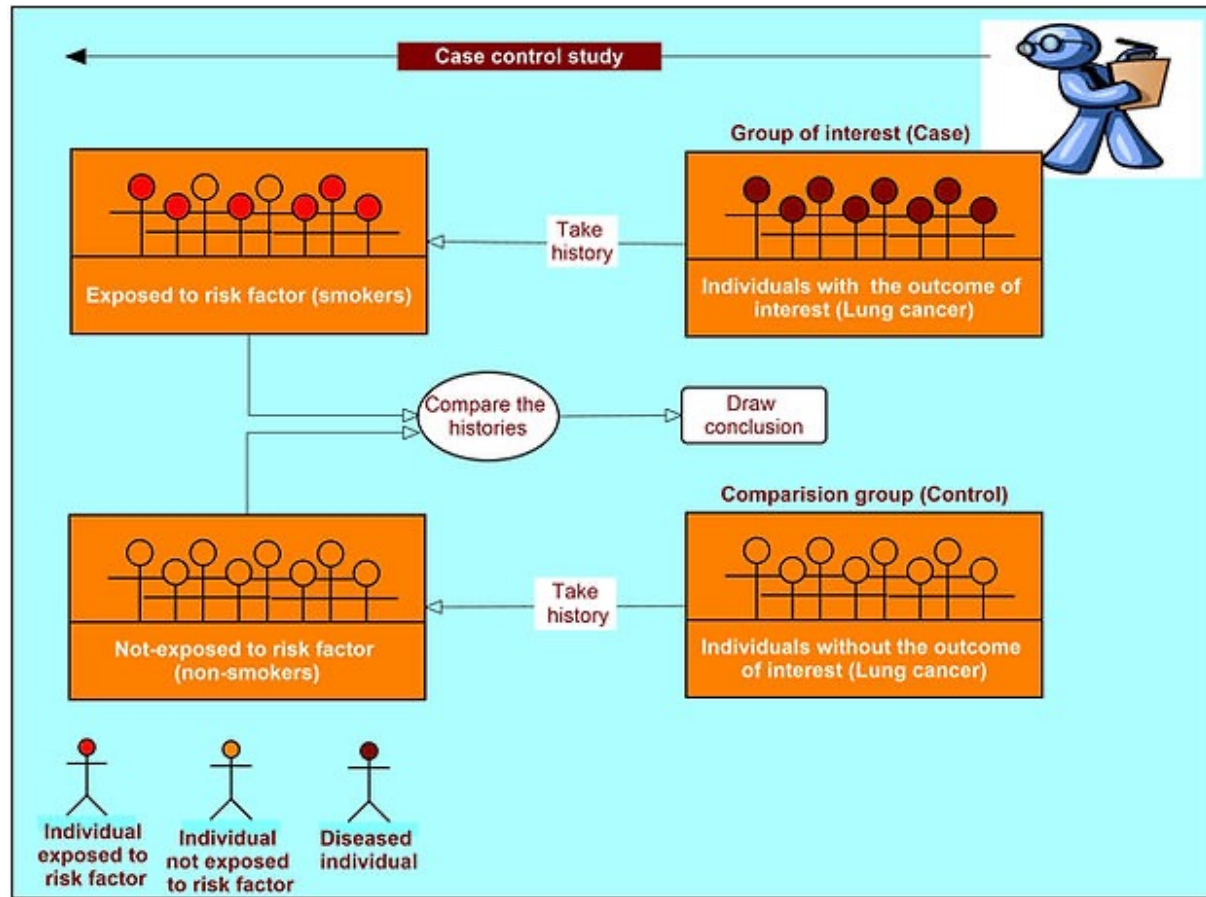
Case-Control Study

A case-control study is a type of observational study in which two existing groups differing in outcome are identified and compared on the basis of some supposed causal attribute.

Case-Control Study

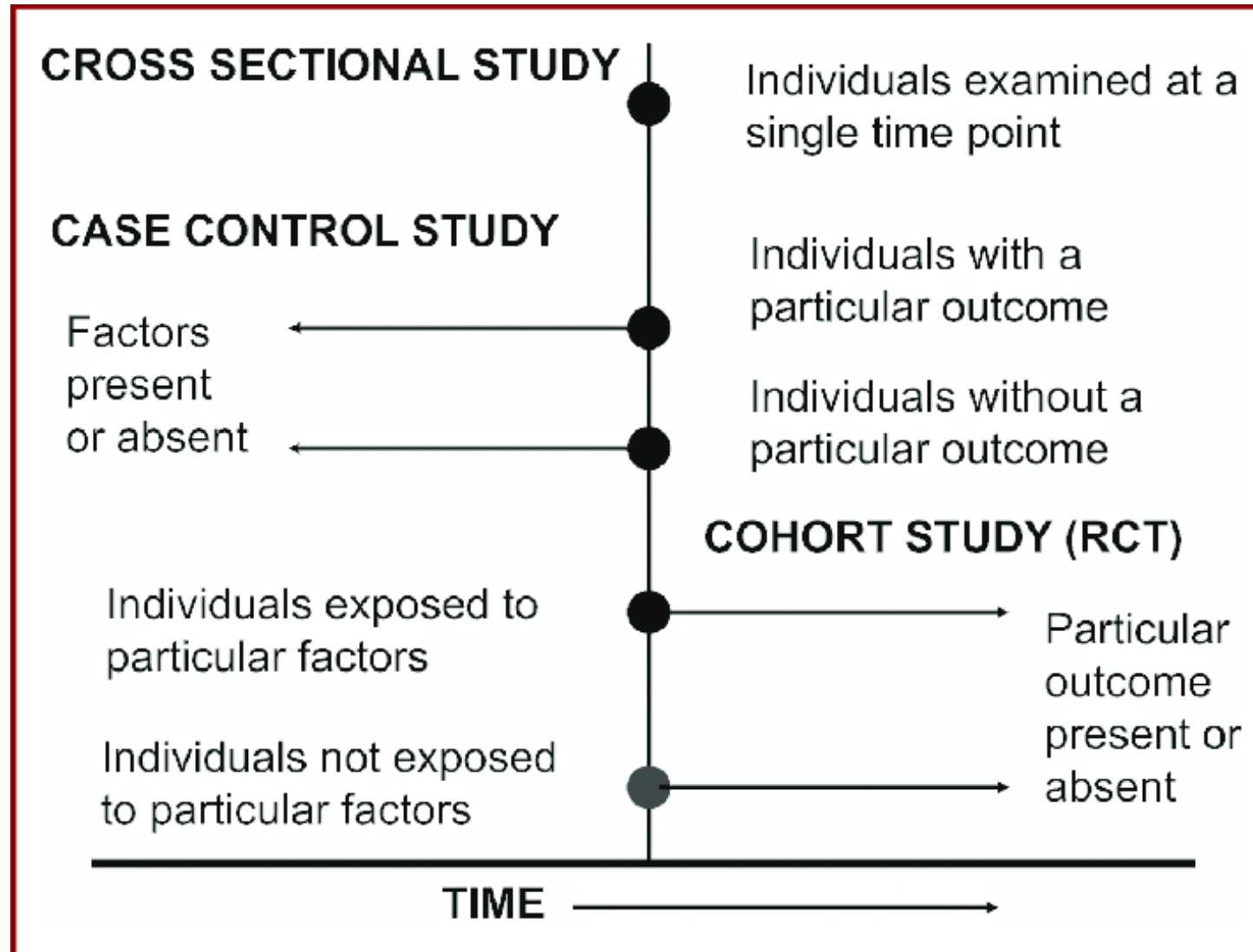


Case-Control Study Example



In a case-control study, researcher identifies the cases (presence of outcome of interest) and controls (absence of outcome of interest) and studies the histories to compare the frequency of exposure to a risk factor to understand the association between the exposure to risk factor (smoking) and occurrence of outcome (lung cancer) in the selected sample i.e., cohort.

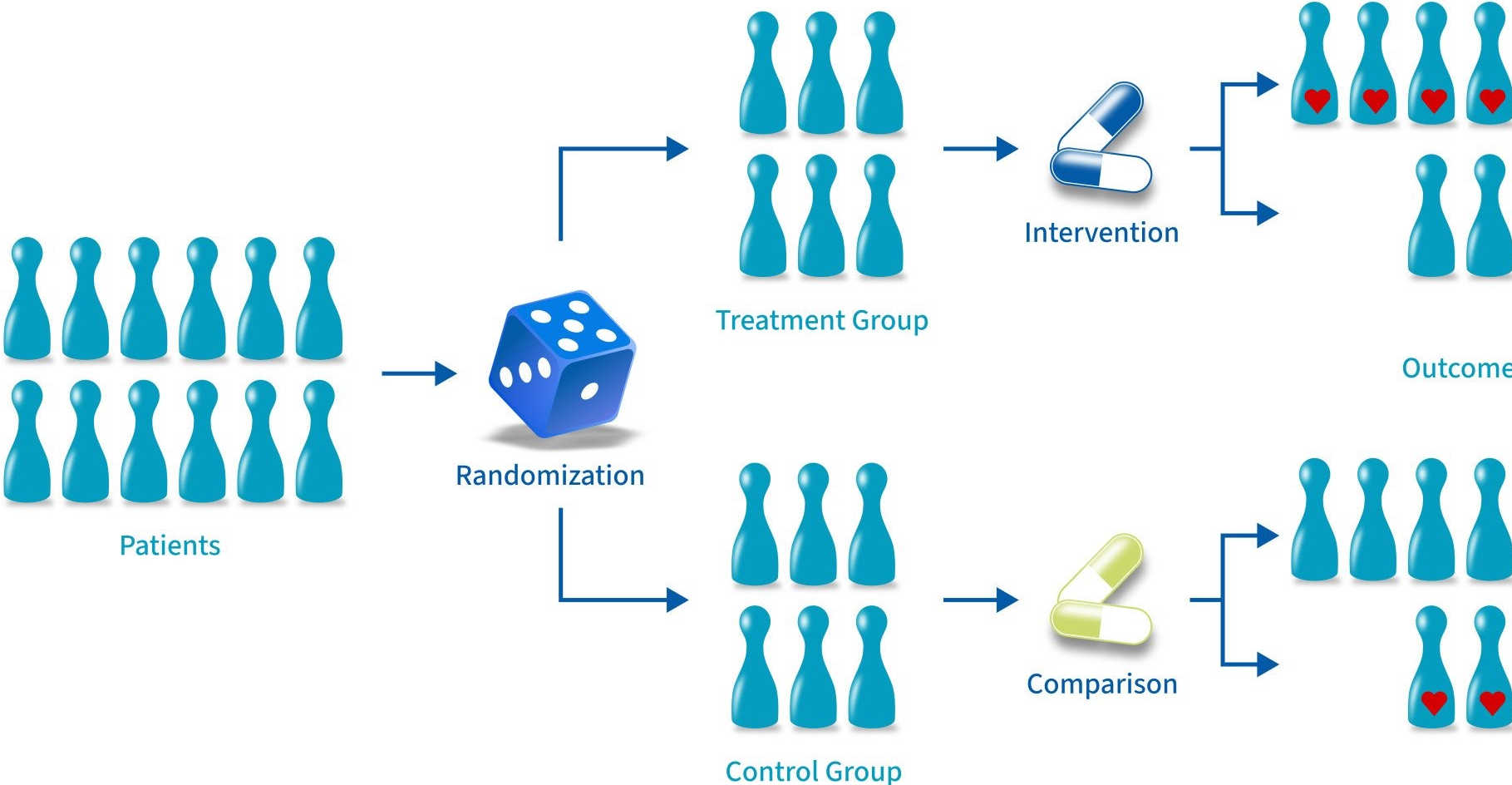
Summarization of Observational Studies



Analytical Studies: Experimental

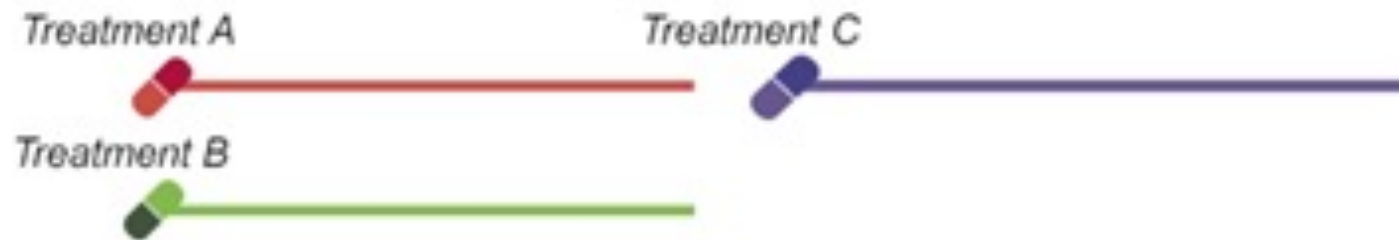
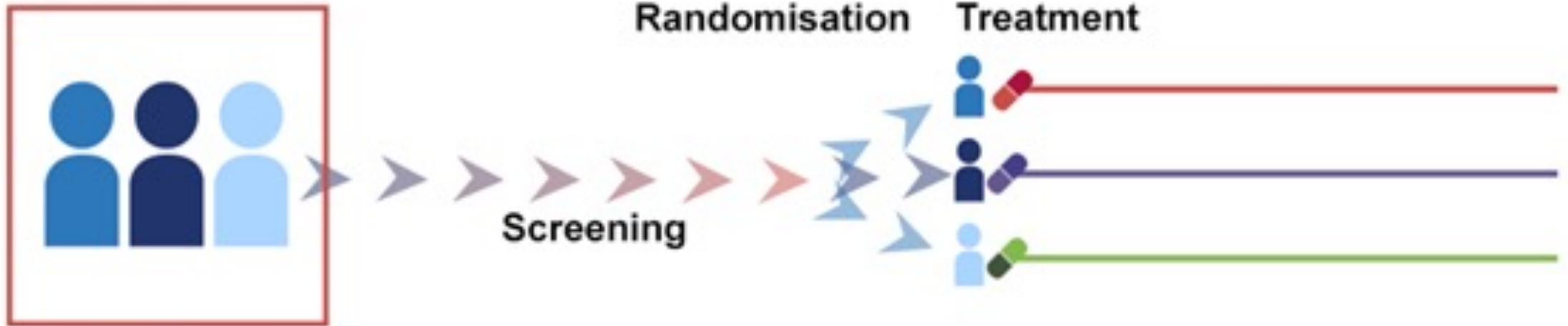
Randomized Controlled Trial (RCT)

Randomized Controlled Trial



Parallel Group Trial

Parallel Trial



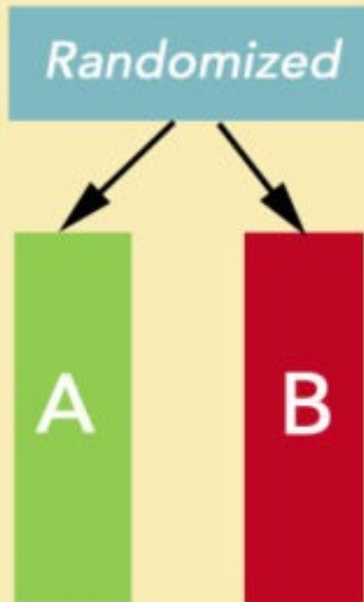
Crossover Trial

Cross-over Trial

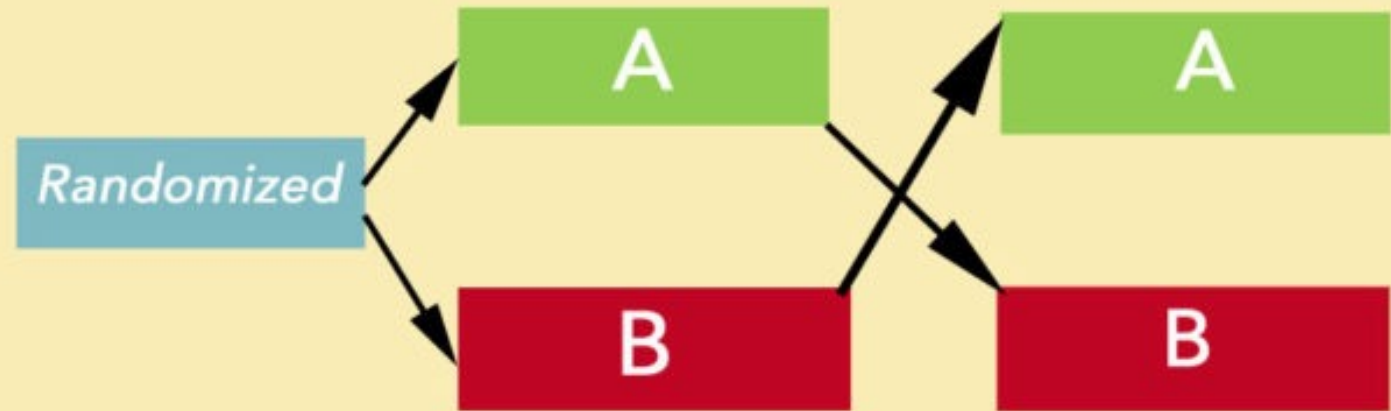


Parallel vs Crossover Trial

Parallel trial

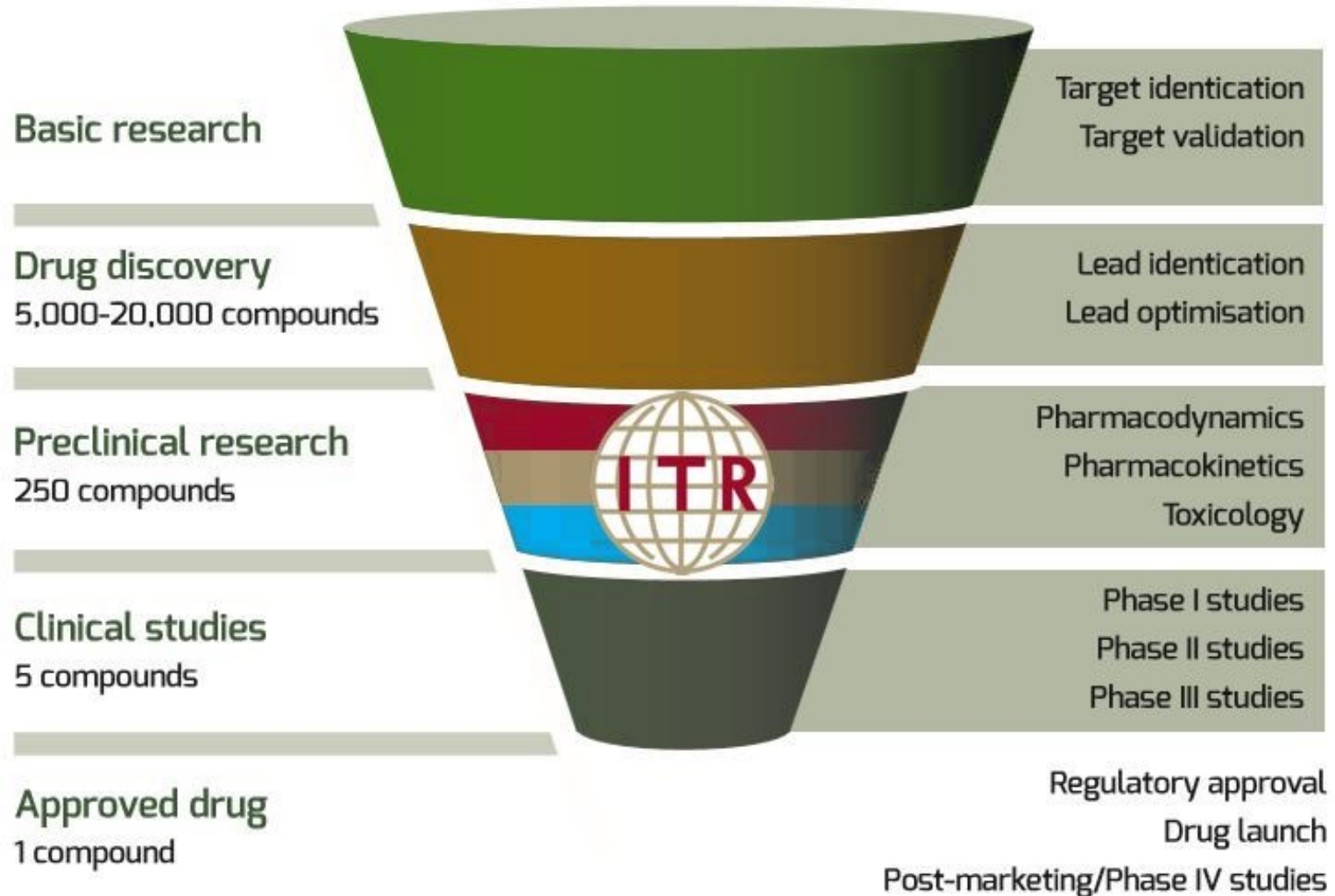


Crossover trial



Real-World Trials

Drug R&D Progress



Clinical Trial Phases

Phases of a Clinical Trial



PHASE I



- evaluate safety
- determine safe dosage
- identify side effects

Approximately 70% of drugs move to the next phase



PHASE II



- test effectiveness
- further evaluate safety

Approximately 33% of drugs move to the next phase



PHASE III



- confirm effectiveness
- monitor side effects
- compare to other treatments
- collect information

Approximately 25-30% of drugs move to the next phase



PHASE IV



- provide additional information after approval including risk, benefits, and best use

FDA Approval



What about industry?

Google Data Scientist Interview Question on Study Design



Facebook Data Scientist Interview Question on Study Design



By the way, all the probability and statistics we covered are also asked in Data Science interview questions



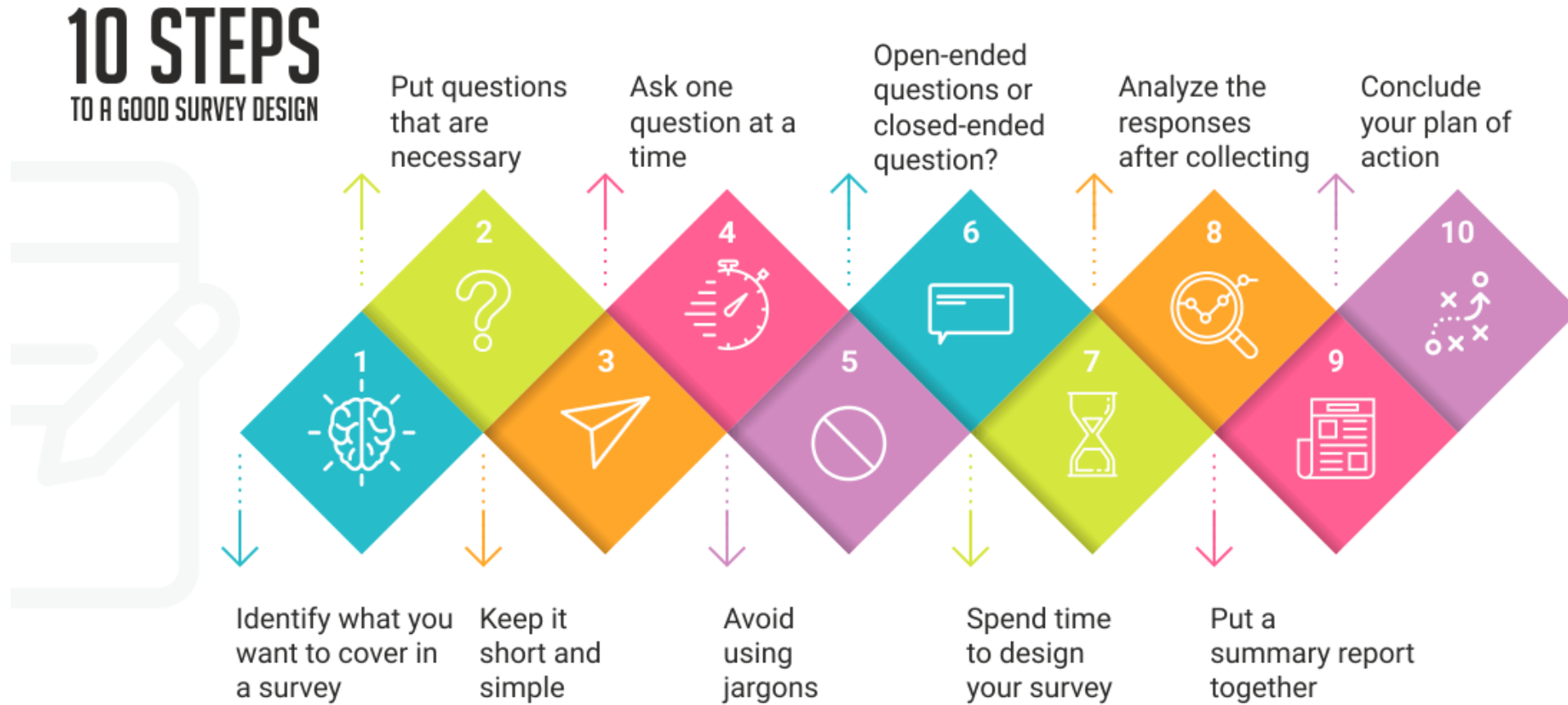
The image is a video thumbnail with a dark background. At the top center is the multi-colored Google logo. To the right of the logo is a circular inset showing a man with short dark hair, wearing a dark blue t-shirt, smiling. The background of the video is a chalkboard with white text and mathematical notations. Below the Google logo, there are several lines of text and equations:

- $X_1 = 0.1$ $X_2 = 0.4$ $X_3 = 3.9$
- Probability Teaser**
- Interview Question**
- $P(X > 3) = P(2 \text{ values} > 3) + P(3 \text{ values} > 3)$
- $\mu = 3.5$ $N(3.5)$

Descriptive Studies

Survey

10 STEPS TO A GOOD SURVEY DESIGN



Qualitative

Types of Qualitative Research Methods



One-on-one interview



Focus groups



Ethnographic research



Case study research



Record keeping



Qualitative observation

Example of Qualitative Studies at Google

