



EPIDEMIOLOGICAL STUDIES IN HEALTH CARE SYSTEM



EPIDEMIOLOGY

MAIN SCIENTIFIC DIRECTIONS OF RESEARCH IN THE FIELD OF HEALTH CARE

- ❖ organization and financing of medical care and health care system
- ❖ health policy
- ❖ healthcare economy

*The term "**epidemiology**" comes from the Greek words in the **epi**, which means on or over, + **demos** - people + **logos** - science*

Epidemiology is considered the basic science of public health.

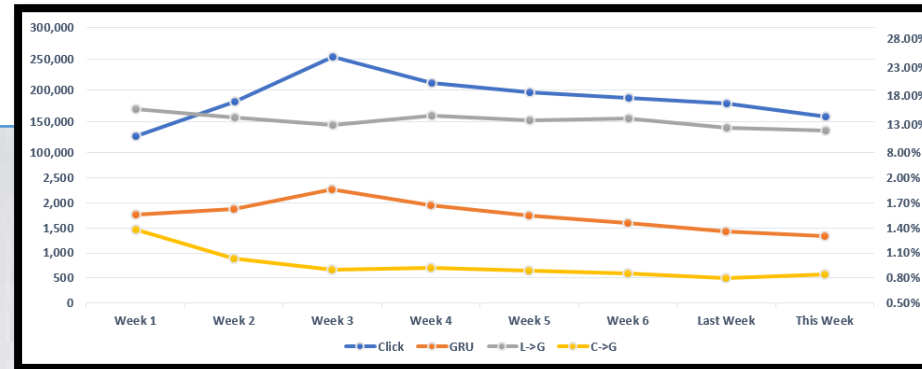
PURPOSE OF THE EPIDEMIOLOGY



- **Elimination or reduction of health problems and their consequences**
- **Prevention of health problems, their occurrence and repetition**

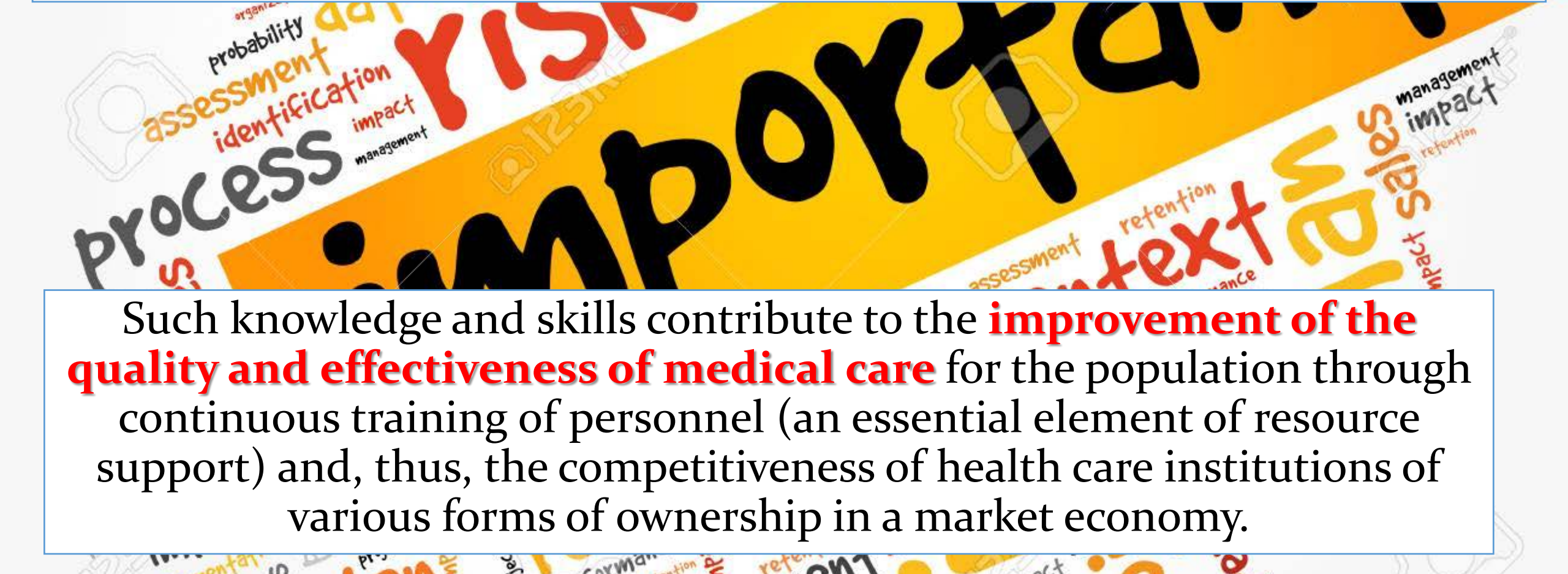
PRACTICE AND STATISTICAL RESEARCH

In practical and research activities, the **doctor analyzes the results of his activities** not only at the individual level, but also **at the group and population levels.**



This is necessary for the doctor **to confirm the level of qualification**, as well as for further improvement and professional specialization.

THE ABILITY TO PROPERLY ORGANIZE AND CONDUCT A STATISTICAL RESEARCH IS **NECESSARY FOR ALL PHYSICIANS** OF DIFFERENT PROFILES, HEADS OF INSTITUTIONS AND HEALTH AUTHORITIES.

The background of the slide features a collage of various terms related to business, healthcare, and statistics. The most prominent word is 'IMPORTANCE' in large, bold, black letters, which is partially obscured by a yellow diagonal band. Other visible words include 'process', 'assessment', 'identification', 'impact', 'management', 'retention', 'sales', 'context', 'probability', and 'organization'. The text is arranged in a way that suggests a complex, interconnected system of knowledge and skills.

Such knowledge and skills contribute to the **improvement of the quality and effectiveness of medical care** for the population through continuous training of personnel (an essential element of resource support) and, thus, the competitiveness of health care institutions of various forms of ownership in a market economy.

Healthcare managers in operational and prognostic work **CONSTANTLY USE** statistical data.

!!! ONLY A QUALIFIED ANALYSIS !!!

of statistical data, an assessment of events and relevant conclusions allow us:

- *to make the right managerial decision
- *contribute to a better organization of work
- *more accurate planning and forecasting

Statistics helps to:

- ♪ monitor the activities of the institution
- ♪ manage it quickly
- ♪ evaluate the quality and effectiveness of treatment and prevention work

The heads of healthcare system in the preparation of current and future work plans should be based on the study and analysis of trends and patterns in the development of both health care and the health status of the population in their district, city, region, etc.



MINISTRY OF HEALTH
AND SOCIAL SECURITY



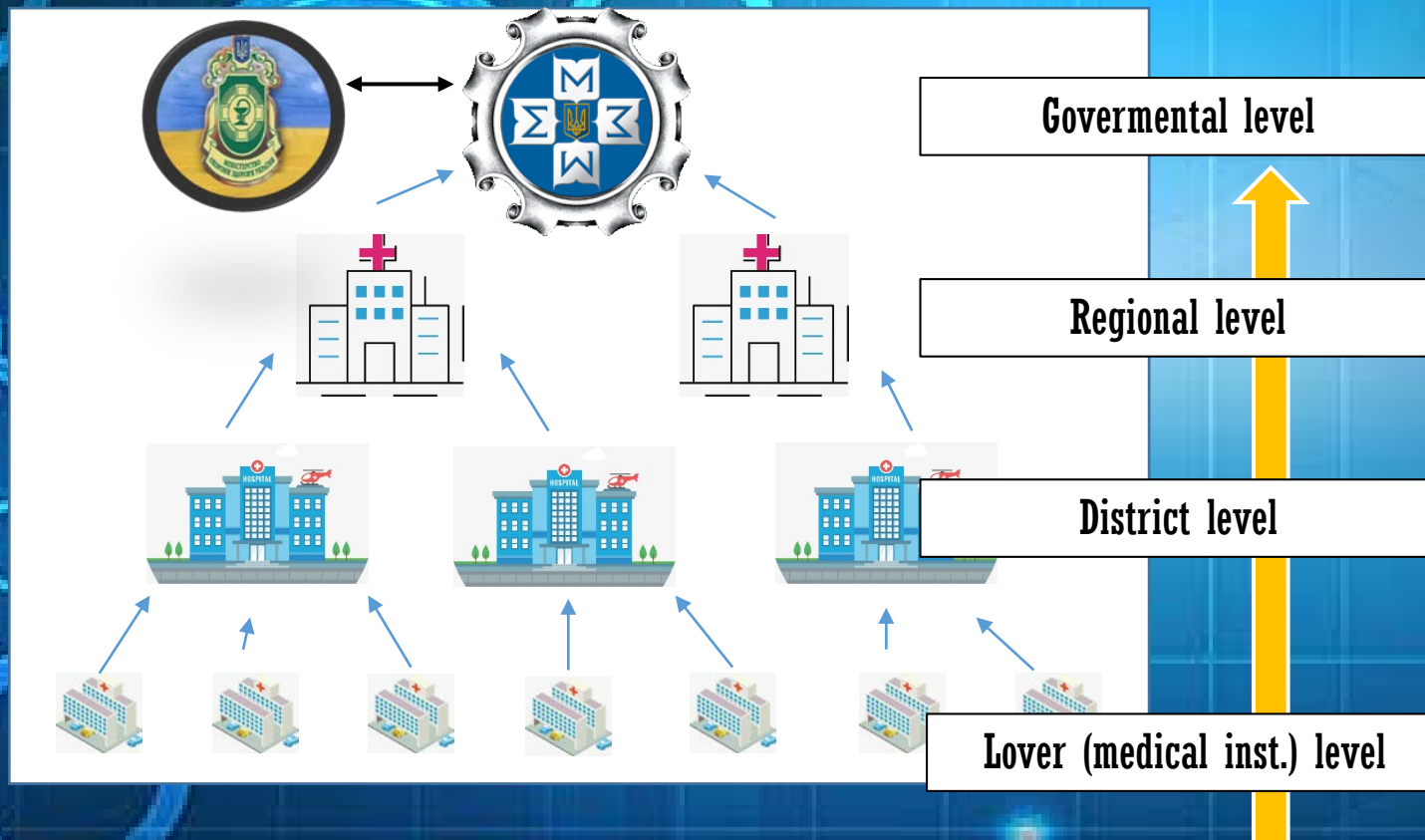
Ministry of Health



وزارة الصحة
MINISTRY OF HEALTH



The traditional statistical system in health care is based on obtaining data in the form of reports that are compiled in lower level institutions and then summed up at intermediate and higher levels.

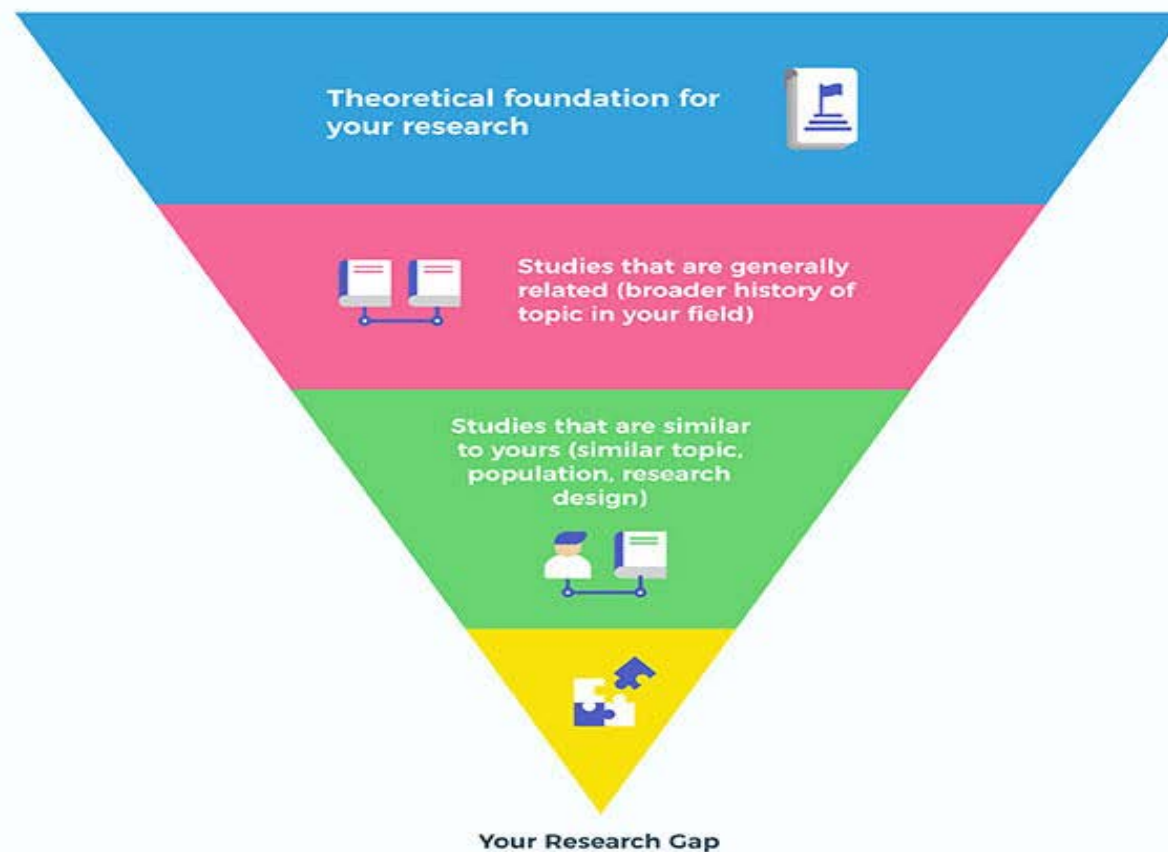


The reporting system has not only advantages (a single program, ensuring comparability, indicators of workload and use of resources, simplicity and low cost of collecting materials), but also certain disadvantages (low efficiency, rigidity, non-flexible program, limited information, uncontrolled accounting errors, etc.).



LITERATURE REVIEW

It helps to think of the organization of a good literature review as an inverse triangle. After first establishing the seminal theories and foundational research that inform your approach and topic, you then narrow your discussion to focus on the specific studies and methodologies that justify your research gap and design.



Determining the unit of observation and drawing up a material collection program

The unit of observation is each primary element of the statistical population.

The unit of observation is endowed with signs of similarities and differences that are subject to accounting and further observation, therefore, these signs are called counted (accounting).

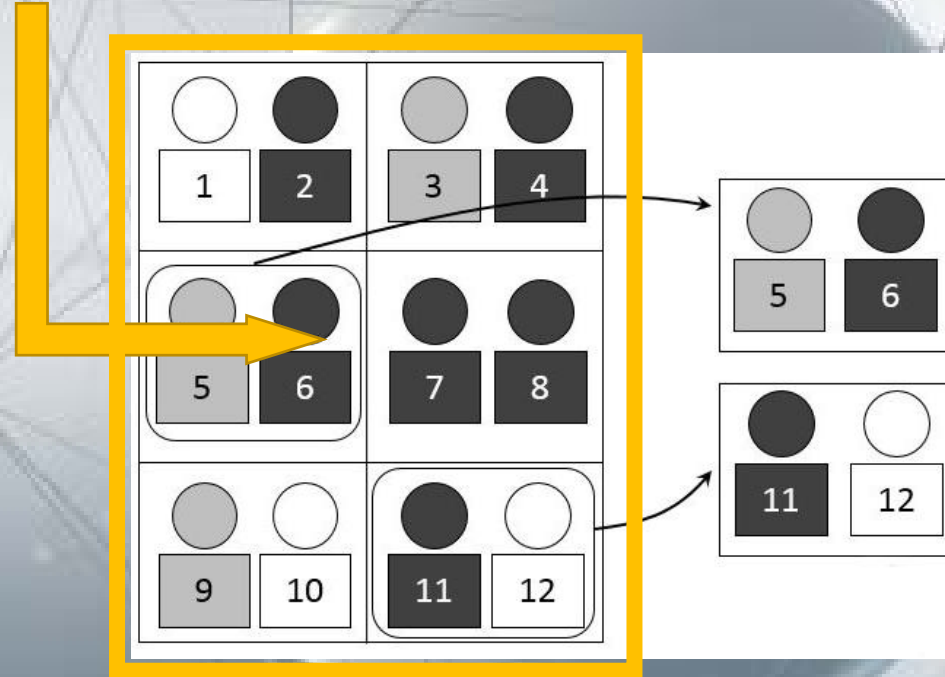
Signs taken into account - signs on which the elements of the observation unit in the statistical population differ.

Statistical aggregate is a set of units with mass character, typicalness, qualitative homogeneity, and the presence of variation.

The statistical aggregate consists of materially existing objects (workers, enterprises, countries, regions), is the object of statistical research.



Statistical aggregate is a group consisting of relatively homogeneous elements, taken together within the known boundaries of time and space in accordance with the goal. The structure of the statistical population: the statistical population consists of units of observation.



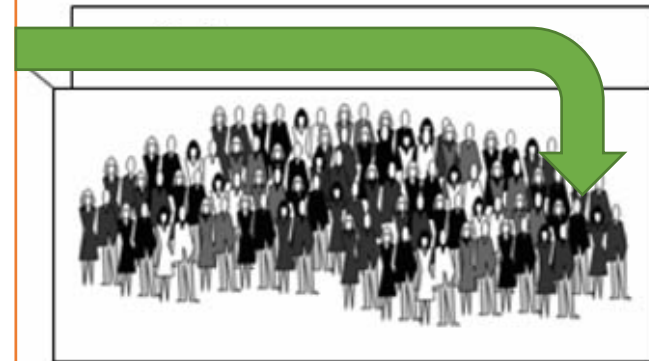
ON THE EXAMPLE OF OUR STUDY - statistical aggregate - these are students studying at a given university for the entire period of study.

THERE ARE TWO TYPES OF AGGREGATE - GENERAL AND SELECTIVE.

- ***The general aggregate (population)*** is a group consisting of all relatively homogeneous elements in accordance with the goal.



- ***Selective aggregate (set)*** - selected for the study part of the general set and designed to characterize the entire general set. It must be representative (representative) in quantity and quality in relation to the general population.

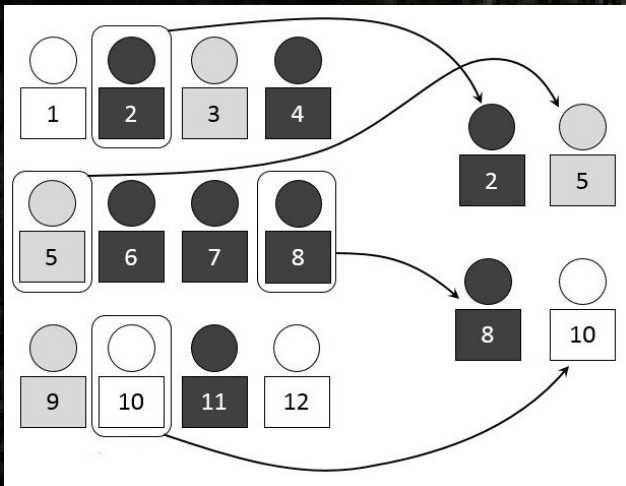


!!! REPRESENTATIVITY !!!

- **Quantitative representativeness** based on the law of large numbers and means a sufficient number of elements of the sample, calculated by special formulas and tables.

$$n = \frac{t^2 \sigma^2_N}{t^2 \sigma + \Delta^2_N}$$

- **Qualitative representativeness** is based on the law of probability and means conformity (uniformity) of features characterizing the elements of the sample in relation to the general one.



In our example, the general population is all medical students; selective aggregate - part of the students of each course and faculty of the university.

- ***The volume of the statistical population*** is the number of elements of the population taken for the study.

- ***The dates and place (territory) of the study*** - is the preparation of a calendar plan for the implementation of this study at this stage in a particular territory.

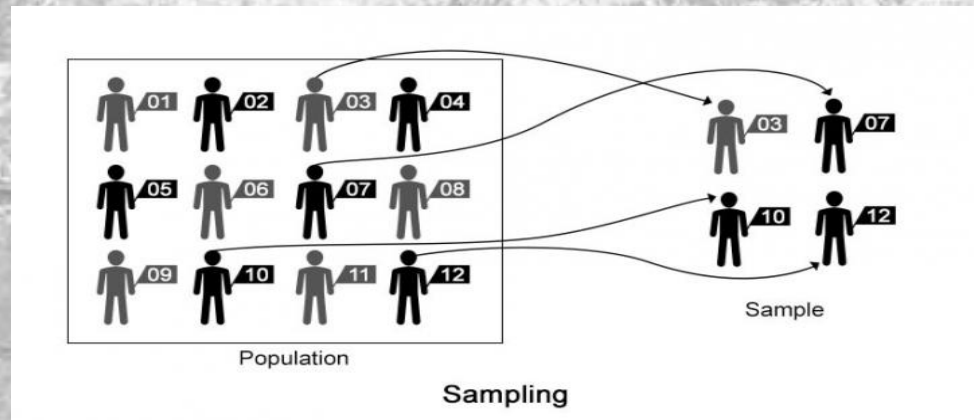
- ***Types of observation:***

- ***current (or constant) observation*** - when registration is carried out continuously as the units of observation appear.
- ***Example: every case of birth, death, treatment in medical institutions.***
- ***one-time observation*** - when the phenomena being studied are recorded for a specific moment (hour, day of the week, date).
- ***Example: population census, the composition of hospital bed capacity.***

WAYS OF CONDUCTING RESEARCH.

*For the researcher it is important to determine the method of conducting the study: **continuous observation or non-continuous (selective)**.*

- **Complete (continuous) observation** is the registration of all observation units constituting the entire population.
- **Non-continuous (selective) observation** - the study of only part of the totality to characterize the whole.



Methods of forming a sample

- **Random selection** is a selection carried out by lot (by the initial letter of the surname or by birthday, etc.).
- **Mechanical selection** is the selection when every fifth (20%) or tenth (10%) observation unit is mechanically selected from the entire population.
- **Serial selection** - when from the general population are selected not individual units, but nests (series), which are selected by random or mechanical sampling. **Example:** to study the incidence of the rural population of the M region, the incidence of the rural population of one, the most typical item is studied. The results apply to the entire rural population of the region.
- **Directional selection** is the selection, when from the general population in order to identify certain patterns are selected only those units of observation, which will reveal the influence of unknown factors while eliminating the influence of known ones. **Example:** when studying the influence of the experience of workers on injuries, workers of one profession, one age, one workshop, one educational level are selected.
- **Typological selection** is the selection of units from previously grouped, same-type qualitative groups. **Example:** when studying the pattern of mortality among the urban population, the studied cities should be grouped according to the population in them.

Characteristics of the performers (frames). How many people and what qualifications are doing the research. **Example:** a study on the study of the sanitary and hygienic regime of students in the senior classes of secondary schools of the district is carried out by two doctors and two assistants to the sanitary doctor of the center of hygiene and epidemiology of this administrative district.

Characteristics of technical equipment and the required material resources:

- laboratory equipment and devices corresponding to the purpose of the study;
- stationery (paper, letterheads);
- without additional allocations.

All about
ME

NAME _____

PETS _____

HOBBIES 

favorite MOVIE/TV show _____

FAMILY: how many?
Brothers _____
Sisters _____
Are you the oldest, youngest or middle _____

favorite PLACE 

favorite COLOR 

favorite MUSIC 

your BIRTHDAY 

favorite BOOKS to read 

favorite VACATION 

favorite SUBJECT in school 

favorite FOOD 



All about
ME

NAME Sam

PETS dog named Termite

HOBBIES 
playing Soccer
taking pictures
LEGOs

favorite MOVIE/TV show The LEGO movie

FAMILY: how many?
Brothers 2
Sisters 1
Are you the oldest, youngest or middle middle

favorite PLACE  my room

favorite COLOUR  blue

favorite MUSIC  Owl City

your BIRTHDAY  April 7th

favorite BOOKS to read  Harry Potter books

favorite VACATION  beach house

favorite SUBJECT in school  Science!

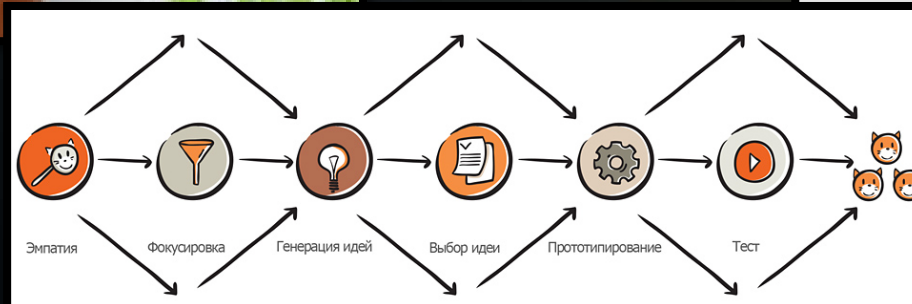
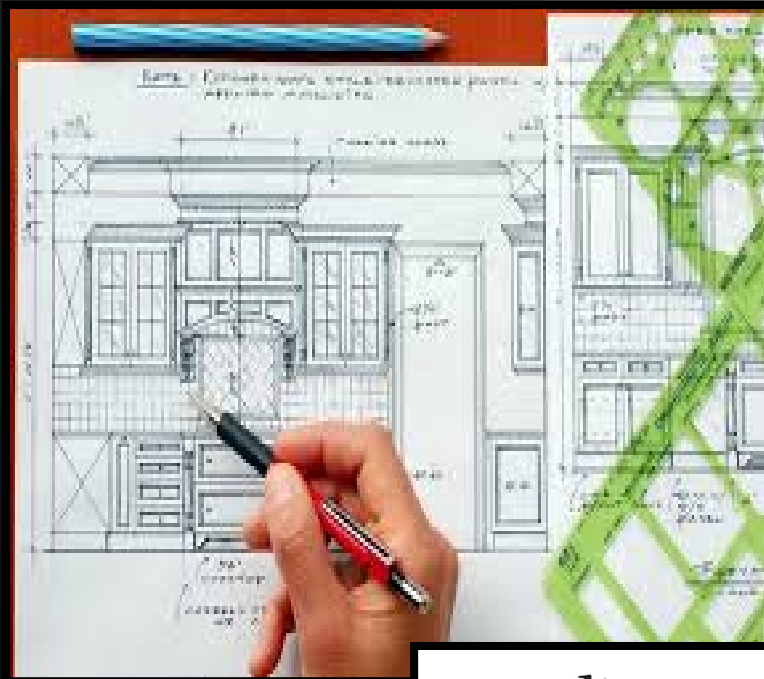
favorite FOOD  pizza

TITLE - Map for studying the prevalence of smoking among medical students

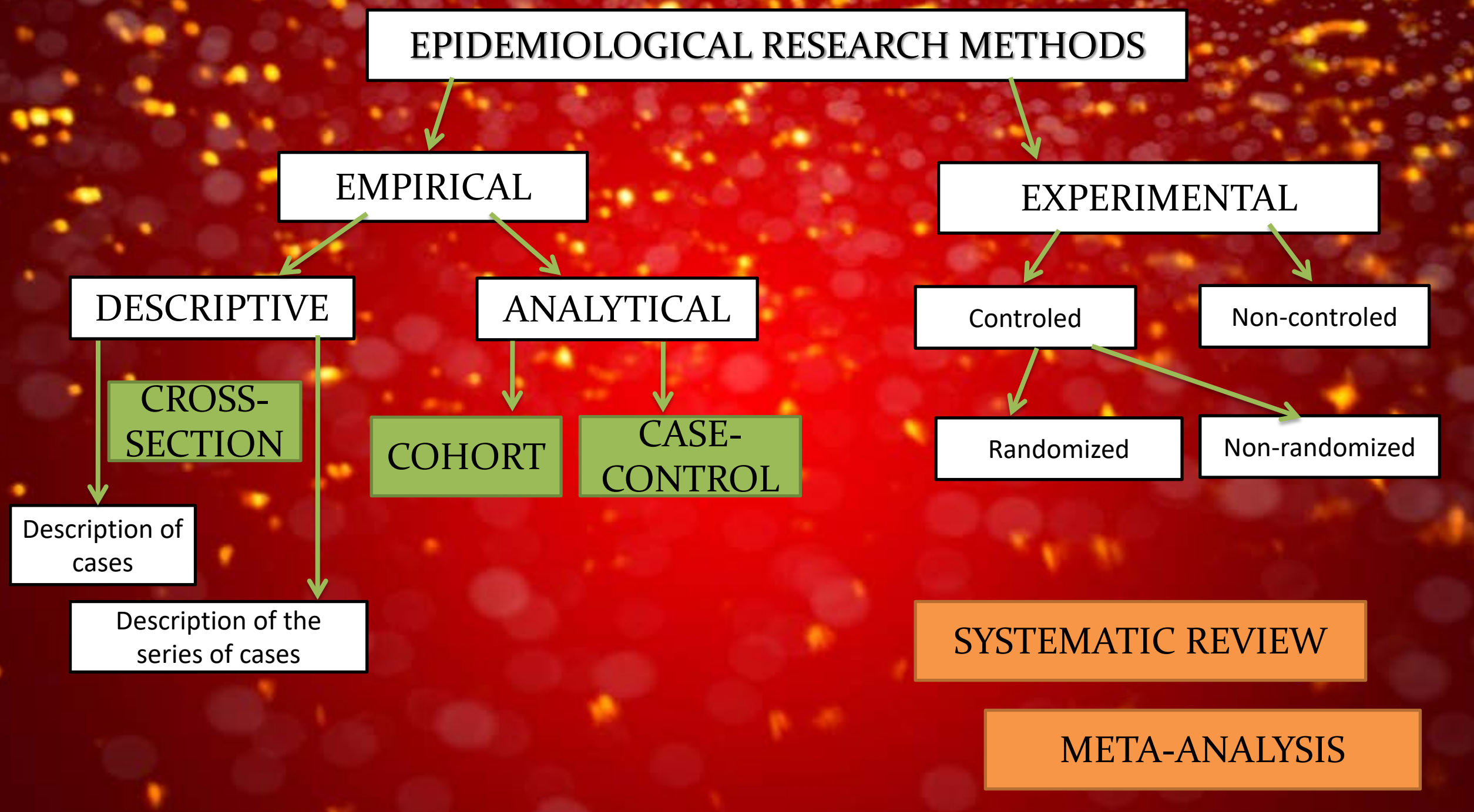
- Full name of the student _____ (write in full)
- Course: I, II, III, IV, V, VI
- Faculty: Medical, Dental, Pharmaceutical,
- Age: up to 20 years, 20, 21, 22, 23, 24, 25 and more
- Gender: Male / Female
- Do you admit that smoking is harmful to health? Yes, No, I do not know
- Who smokes from the people living with you: father, mother, brother, sister, husband, wife, comrade, nobody smokes
- Do you smoke? Yes, No
- Age when you smoked your first cigarette: up to 15 years old, 16-18 years old, over 18 years old
- How many cigarettes (cigarettes) do you smoke per day? 5-10, 11-20, more than 20
- What prompted you to smoke for the first time: an example of parents, an example of teachers, the influence of comrades, the desire to appear adults, the desire to lose weight, curiosity, the desire to keep up with fashion?

WHAT MEAN A TERM RESEARCH DESIGN?

DESIGN — plan, purpose, intention, creative idea.



EPIDEMIOLOGICAL RESEARCH METHODS



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graph TD; A[EPIDEMIOLOGICAL RESEARCH METHODS] --> B[EMPIRICAL]; A --> C[EXPERIMENTAL]; B --> D[DESCRIPTIVE]; B --> E[ANALYTICAL]; D --> F[CROSS-SECTION]; D --> G[Description of cases]; D --> H[Description of the series of cases]; E --> I[COHORT]; E --> J[CASE-CONTROL]; C --> K[Controlled]; C --> L[Non-controlled]; K --> M[Randomized]; K --> N[Non-randomized]; O[SYSTEMATIC REVIEW]; P[META-ANALYSIS];
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The diagram is a hierarchical flowchart titled 'EPIDEMIOLOGICAL RESEARCH METHODS'. It branches into 'EMPIRICAL' and 'EXPERIMENTAL'. 'EMPIRICAL' further branches into 'DESCRIPTIVE' and 'ANALYTICAL'. 'DESCRIPTIVE' leads to 'CROSS-SECTION' (in a green box) and two white boxes: 'Description of cases' and 'Description of the series of cases'. 'ANALYTICAL' leads to 'COHORT' and 'CASE-CONTROL' (both in green boxes). 'EXPERIMENTAL' branches into 'Controlled' and 'Non-controlled'. 'Controlled' further branches into 'Randomized' and 'Non-randomized'. At the bottom, 'SYSTEMATIC REVIEW' and 'META-ANALYSIS' are shown in orange boxes, with 'SYSTEMATIC REVIEW' positioned above 'META-ANALYSIS'. Arrows indicate the flow from parent to child categories.

EMPIRICAL

EXPERIMENTAL

DESCRIPTIVE

ANALYTICAL

Controlled

Non-controlled

CROSS-SECTION

COHORT

CASE-CONTROL

Randomized

Non-randomized

Description of cases

Description of the series of cases

SYSTEMATIC REVIEW

META-ANALYSIS

EPIDEMIOLOGICAL RESEARCH

1. For character :

- Empiric
- Experimental

2. By time of research:

- One-moment (cross)
- Dynamic (longitudinal)

EPIDEMIOLOGICAL RESEARCH

3. By time of data collection

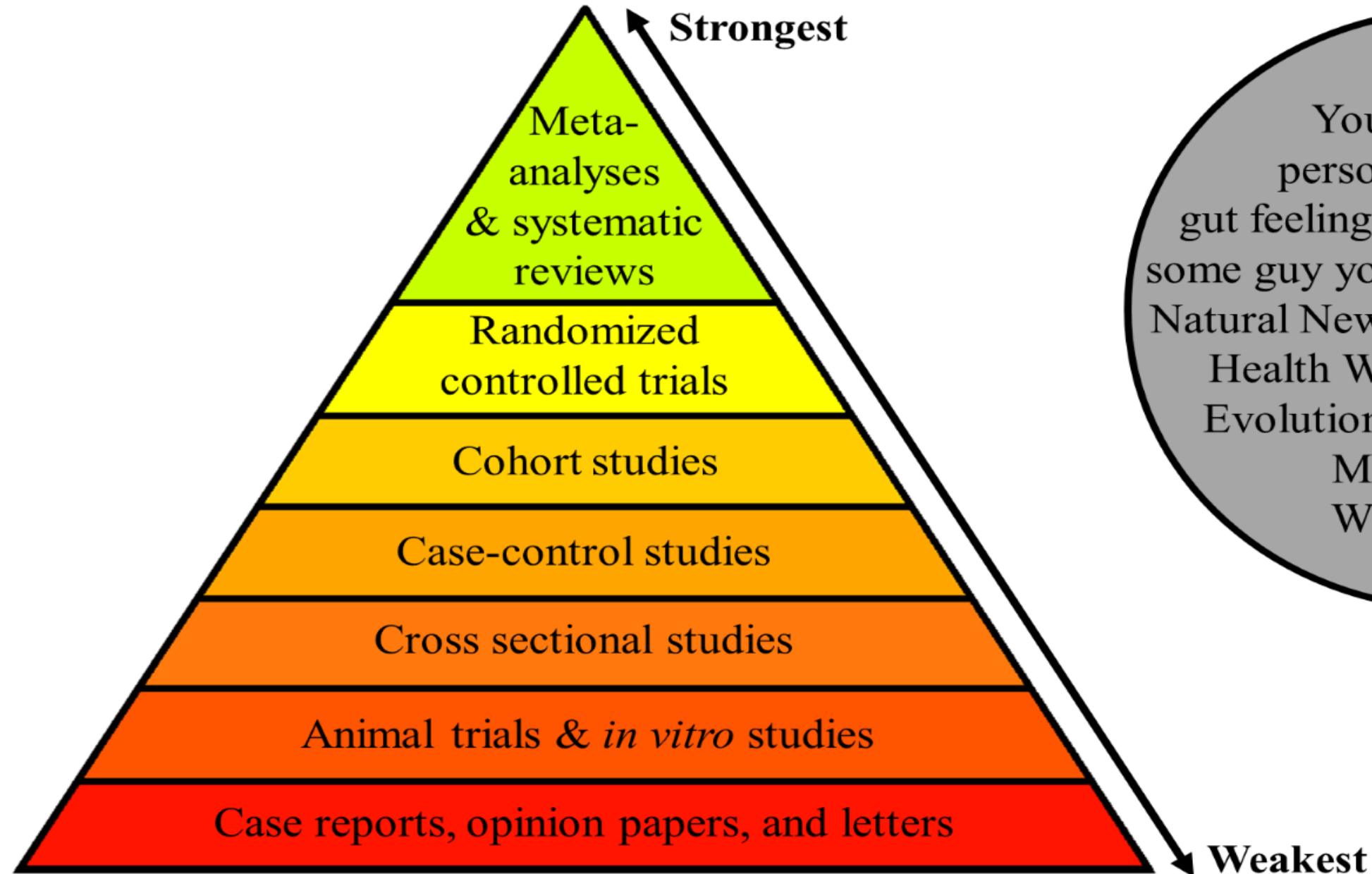
- Prospective
- Retrospective

4. By statistical aggregate:

- Total
- Selective

Hierarchy of Scientific Evidence

Not Scientific Evidence

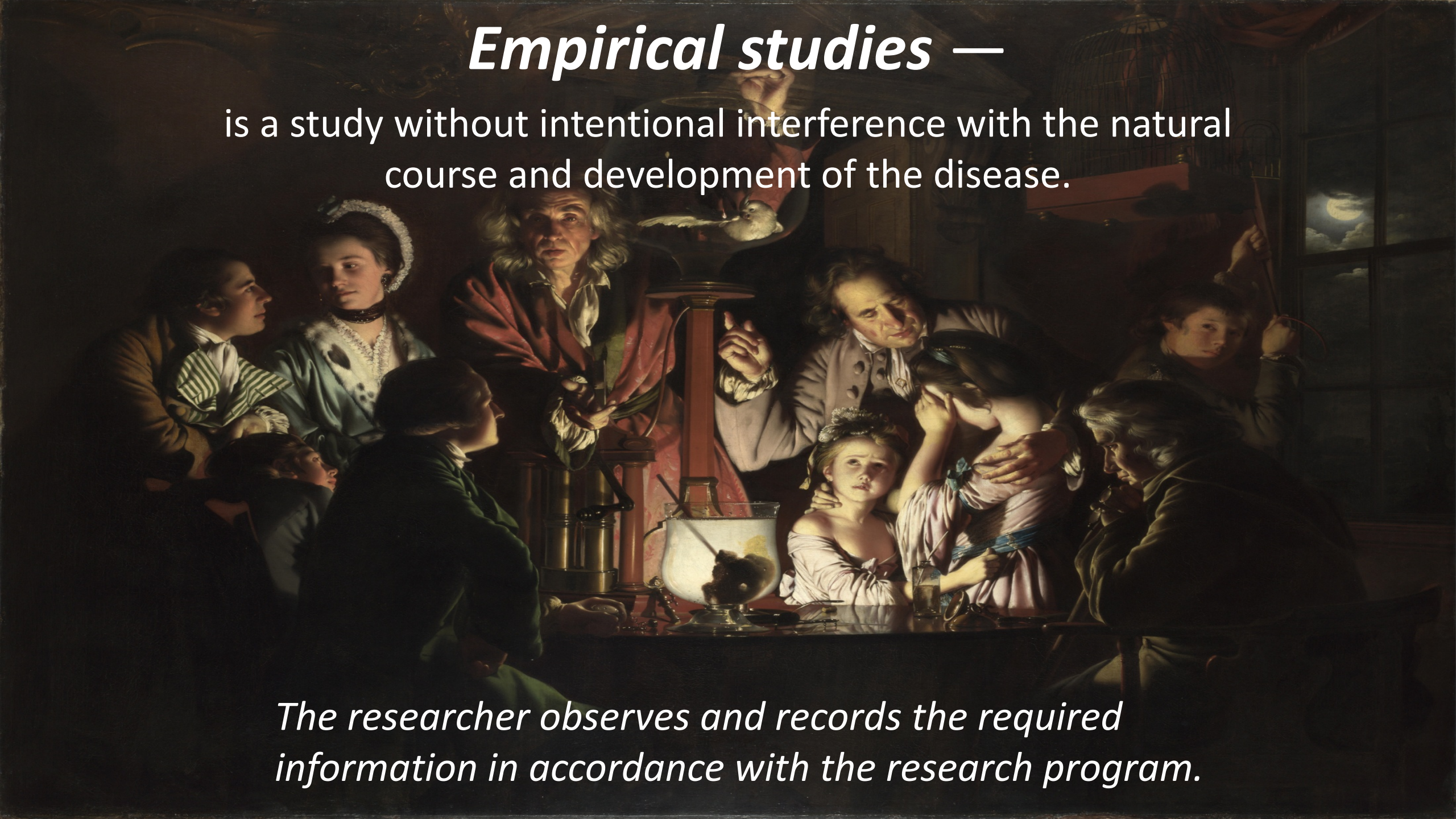


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Empirical studies —

is a study without intentional interference with the natural course and development of the disease.

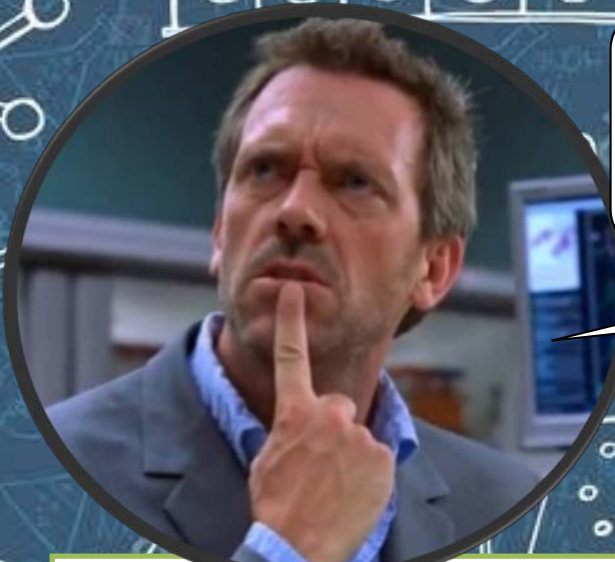
The researcher observes and records the required information in accordance with the research program.



DESCRIPTIVE RESEARCH

(observational study)

- 
- Investigation which **does not involve interference.**
 - Based **on observation** by participants.



When we use Descriptive research?

- **We need only descriptive information is required**
(for example, whether the incidence of diabetes is increasing?)
- **We must find the causes of any problem, without violating the conditions under which it arises**
(for example, why some participants do not go to the training?)
- **When you can not make an experiment**
(for example, at what speed the Earth rotates around the Sun.)
- **When an experiment is unacceptable**
(for example, how condom use reduces the risk of HIV?)

DESCRIPTION OF A CASE

DESCRIPTION OF SERIES OF CASES

AIM: A description of the interesting features of a group of patients or a separate clinical case.

TASK: to find a problem.

ADVANTAGES	DISADVANTAGES
• Quick reception of information • Minimum cost • Simple data collection procedure • Maybe the first step in the way of generating a hypothesis	• Absence of control group • High probability of occurrence of systematic and random errors • The influence of additional factors is not taken into account

Frequency
and
prevalence of
diseases

Prevalence
of potentially
dangerous
factors

The course
of diseases

***DESCRIPTIVE
EPIDEMIOLOGICAL
STUDY***

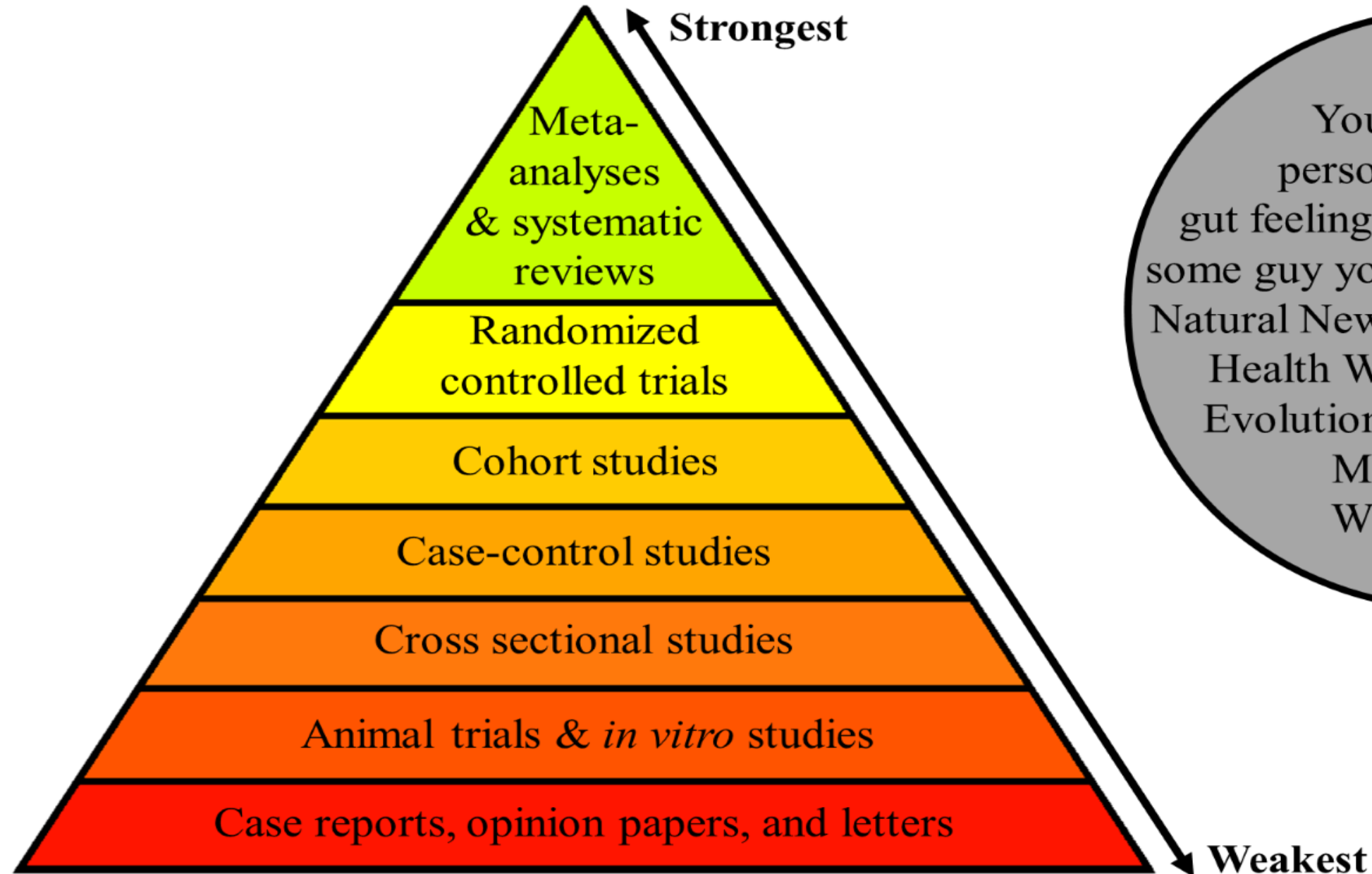
DESCRIPTION OF INDIVIDUAL CASES

is a method of medical research consisting in a detailed description of the data obtained by monitoring one or more cases of diseases (not more than 10 patients) and allows you to attract the attention of doctors to new or less-known diseases, their manifestations or combinations of diseases.



Hierarchy of Scientific Evidence

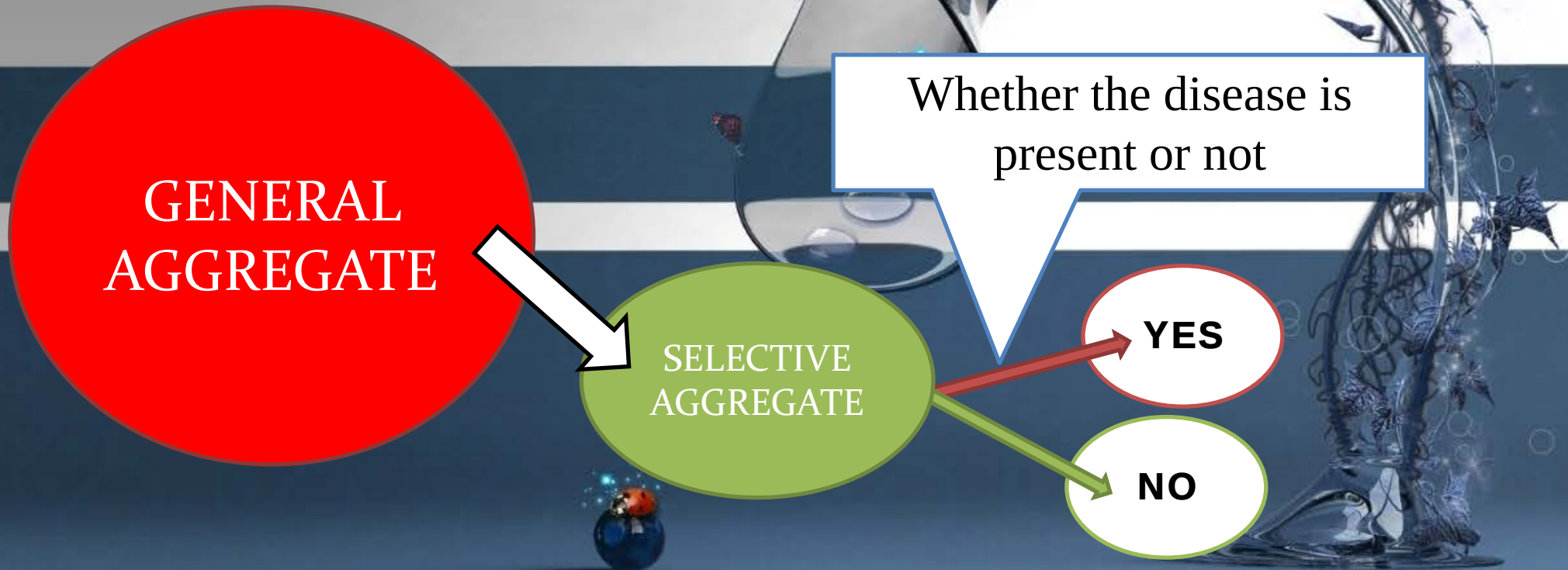
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CROSS-SECTIONAL STUDY

The sample is formed from a predetermined population and is investigated once to receive both risk information and the investigated effects at the same time. Data obtained during a one-time study are **quantitative**.

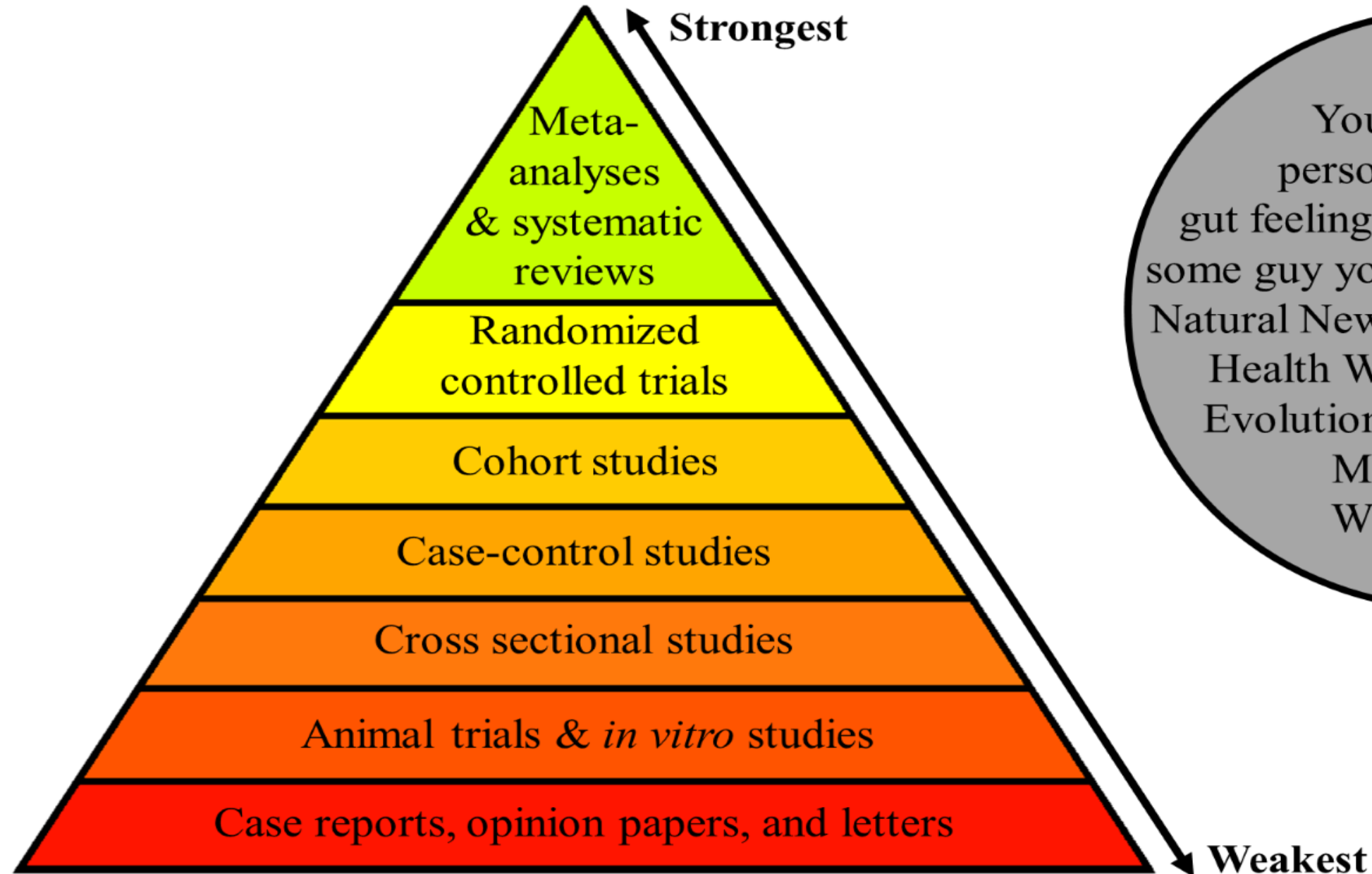


CROSS-SECTIONAL STUDY

ADVANTAGES	DISADVANTAGES
• Mild (short) durability • Relatively low cost • Provides a large amount of data • Suitable for determining risk factors • Useful for assessing the needs of different categories of the population (vulnerable groups) • Ability to track trends (provided on a regular basis [repeteable])	• One-time cut in time • Not intended for the current registration of changes • Causal link can not be established

Hierarchy of Scientific Evidence

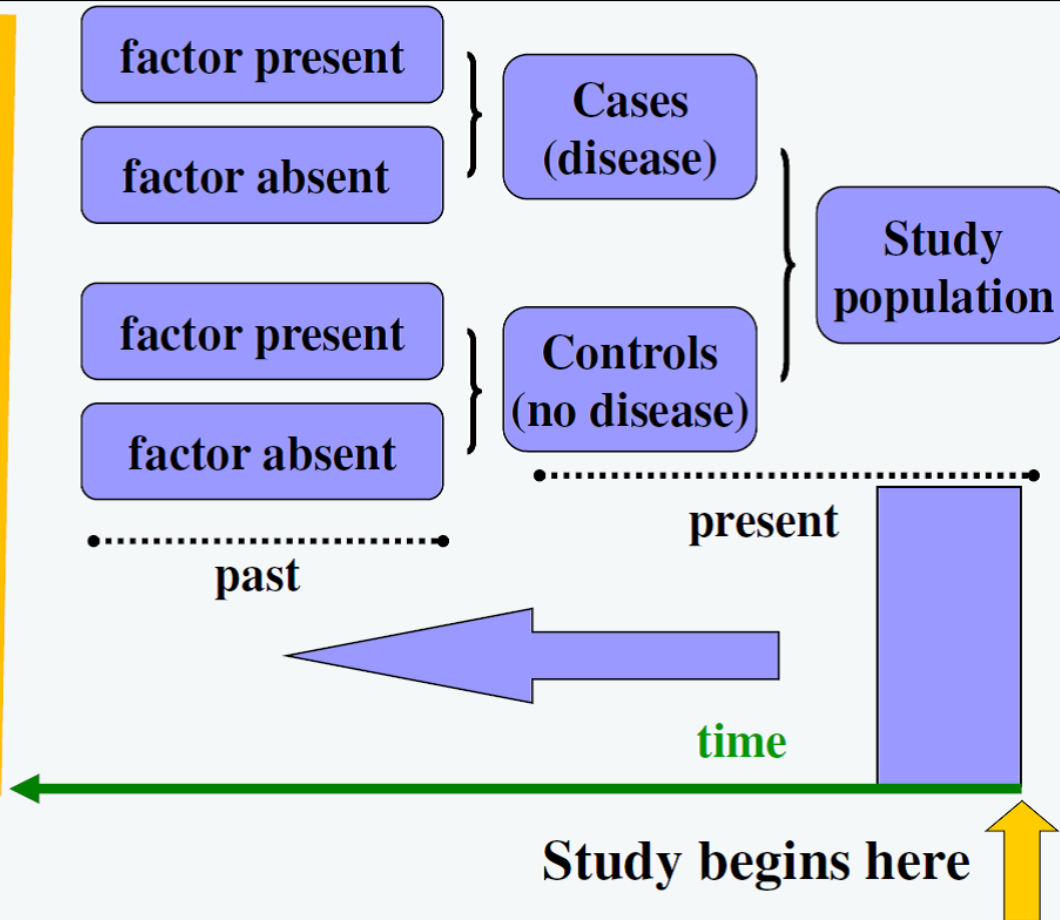
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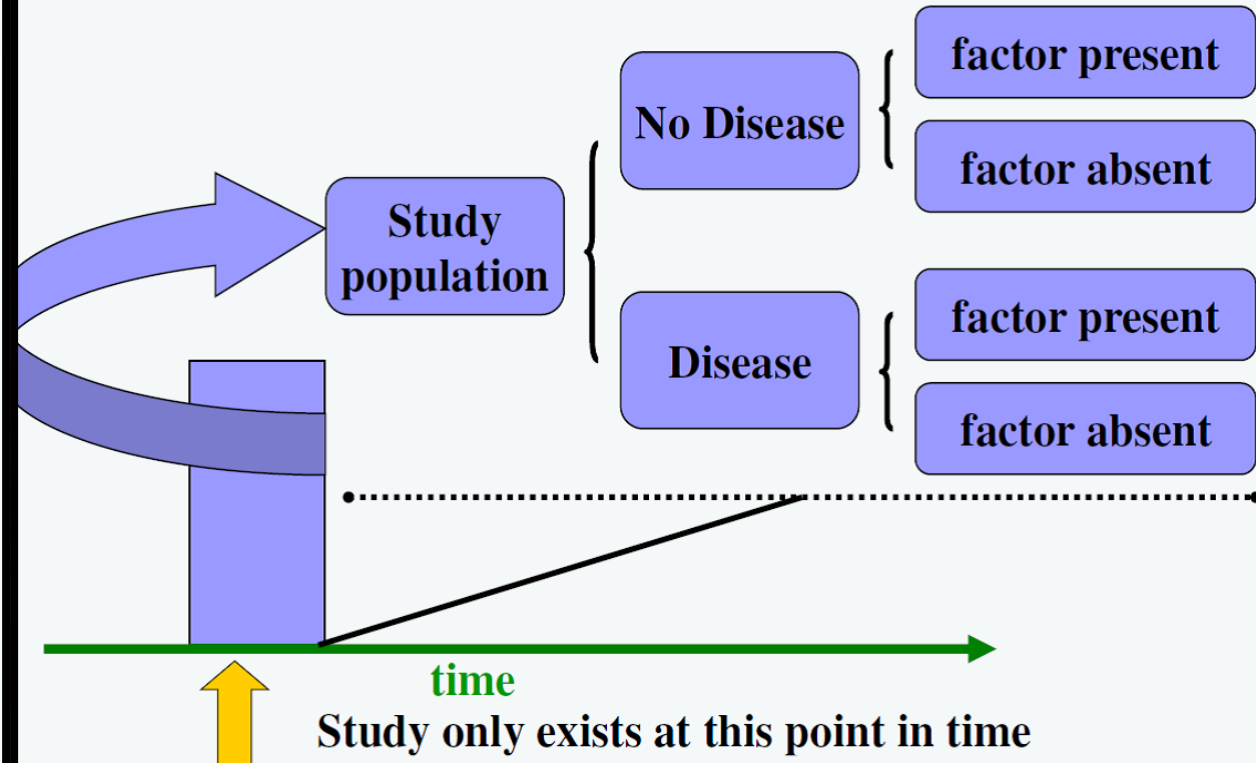
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EMPIRICAL ANALYTICAL RESEARCH

Case-Control Design



Cross-sectional Design



CASE-CONTROL STUDY

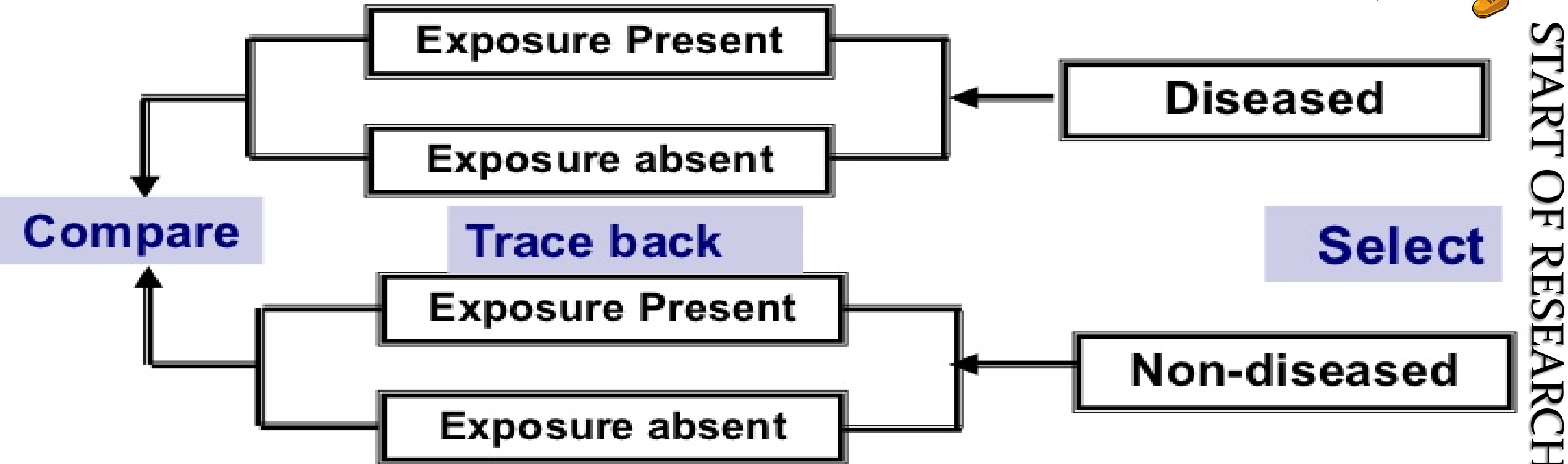


A study that compares patients who have a disease or outcome of interest (cases) with patients who do not have the disease or outcome (controls), and looks back retrospectively to compare how frequently the exposure to a risk factor is present in each group to determine the relationship between the risk factor and the disease.

Case Control Study design



Influence of risk factor



Case control study proceed from effect to the cause

CASE-CONTROL STUDY

AIM: to assess the relationship between the influence of any factor (s) with the current status: the presence / absence of the disease (cause-effect relationship).

ADVANTAGES	DISADVANTAGES
• Simplicity, relative cheapness. • Response rate. • Ability to explore a wide range of risk factors • Suitable for determining cause-effect relationship • Good for studying rare diseases • Allows you to calculate risk (odds ratio)	• Probability of systematic study errors (memory errors) • It is impossible to clearly establish the cause-effect relationship (the influence of many other factors) • Difficult to pick up a control group • To study the effects of rare factors, a very large group of research is required

SELECTION OF PATIENTS IN QUALITY OF CASES

The study includes new cases of diseases with a well-established diagnosis.

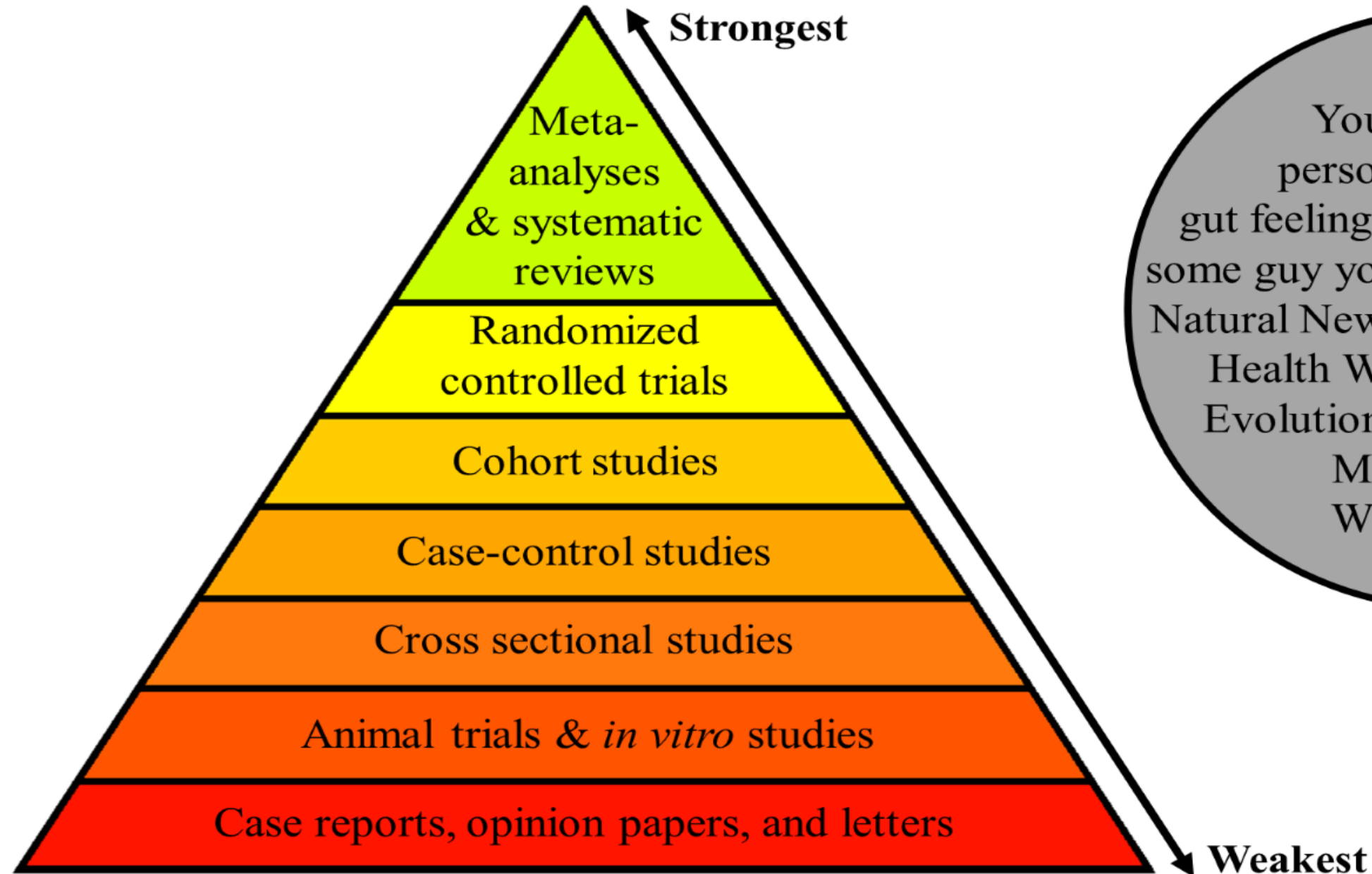


There must be a clinical, radiological, morphological confirmation of the diagnosis.



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COHORT STUDY



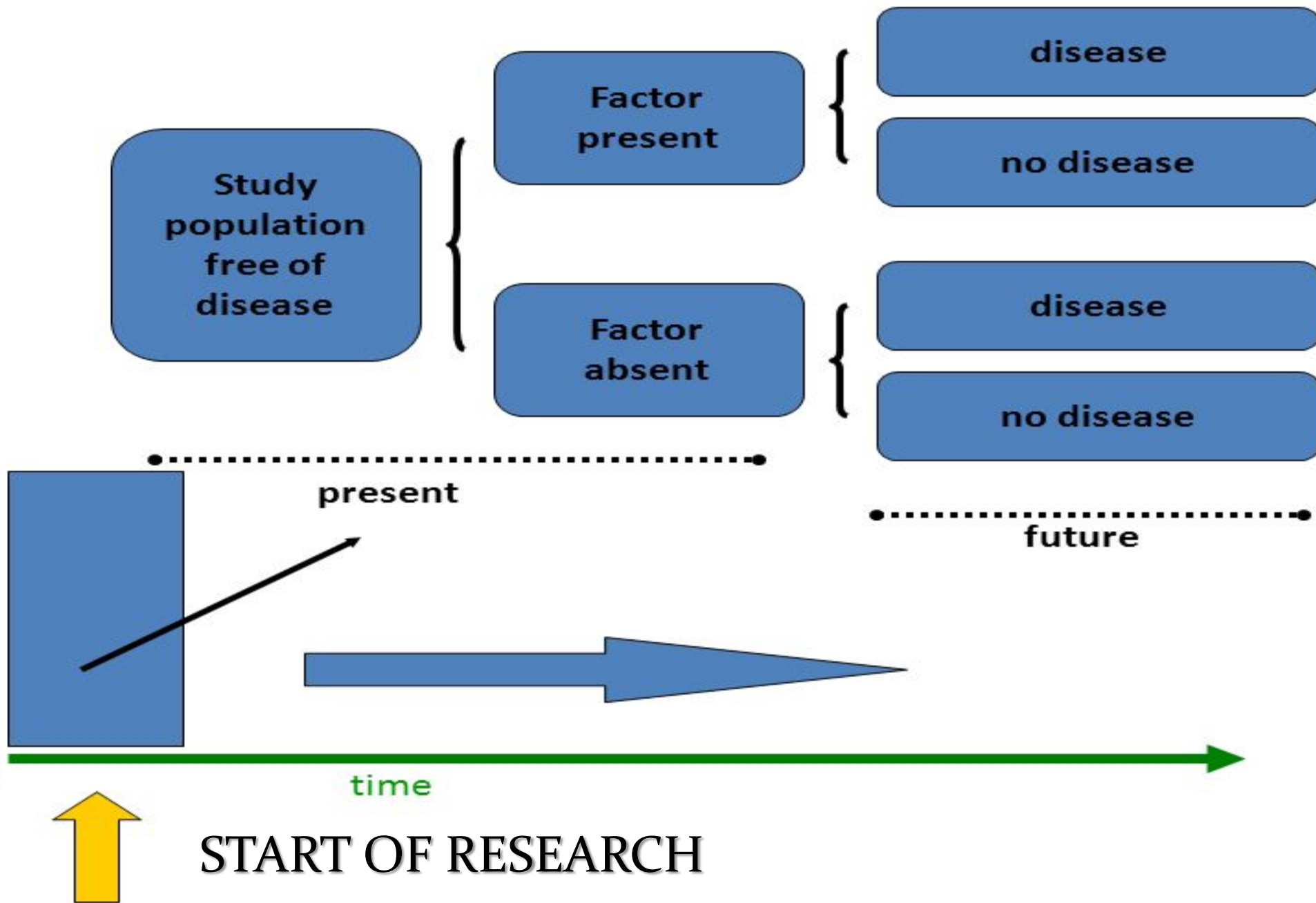
A study design where one or more samples (called cohorts) are followed prospectively and subsequent status evaluations with respect to a disease or outcome are conducted to determine which initial participants exposure characteristics (risk factors) are associated with it. As the study is conducted, outcome from participants in each cohort is measured and relationships with specific characteristics determined.

COHORT RESEARCH

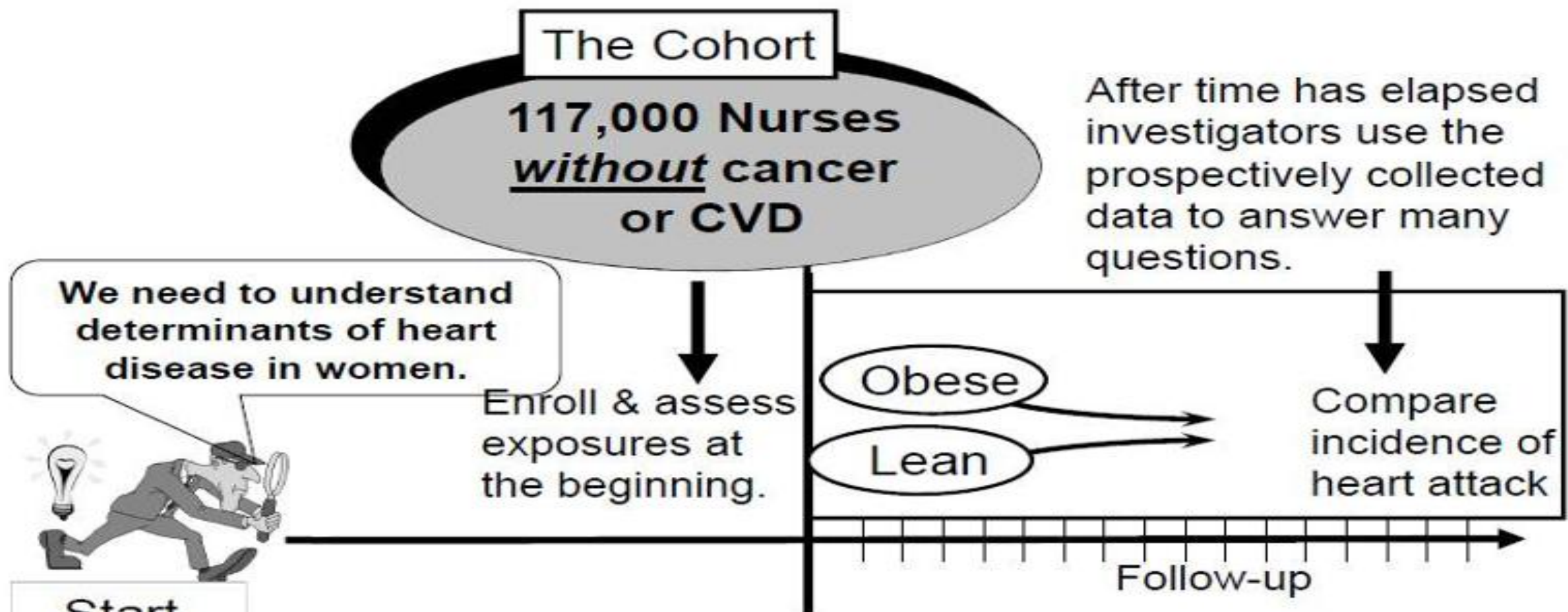
The term "cohort" means a group of persons, united by a certain general sign, which is observed over a specified period of time, in order to trace what will happen to them in the future.



Cohort Design



A Prospective Cohort Study



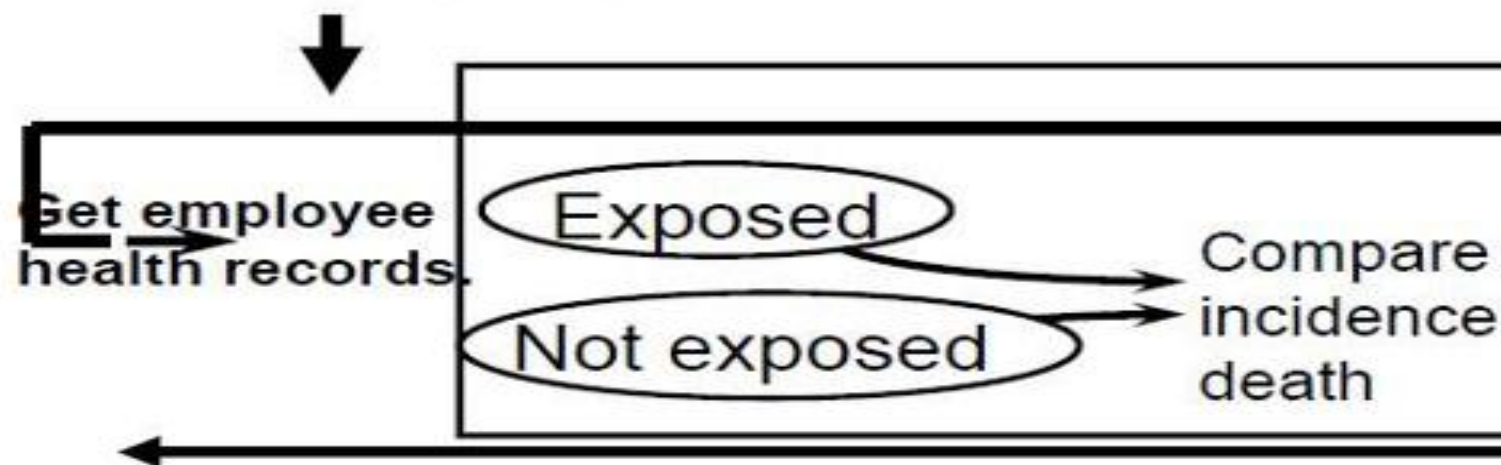
The study is planned & designed to answer questions in a specific area. Non-diseased subjects meeting eligibility criteria are enrolled. Detailed baseline information on lifestyle & exposures is collected from each & they are followed over time.

A Retrospective Cohort Study

The Cohort

**Employees of
a tire manufacturing
company.**

Do chemicals used in tire
manufacturing increase
risk of death?



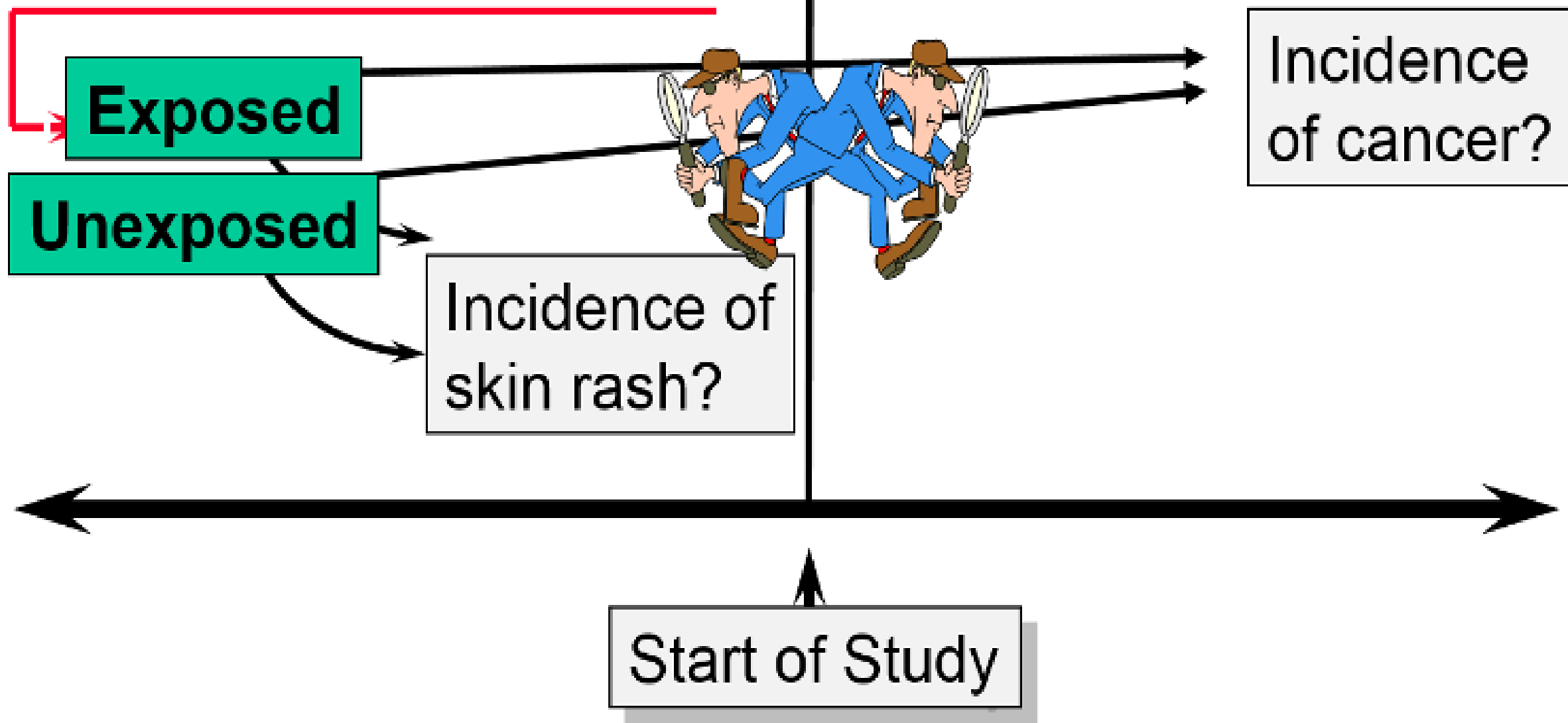
Past

This study was not preplanned. The investigator has to go back to pre-existing data that was not necessarily acquired in a precise, predetermined way. Follow up may have been incomplete.

Start
of Study

Retrospective part

Prospective part



COHORT STUDY

ADVANTAGES

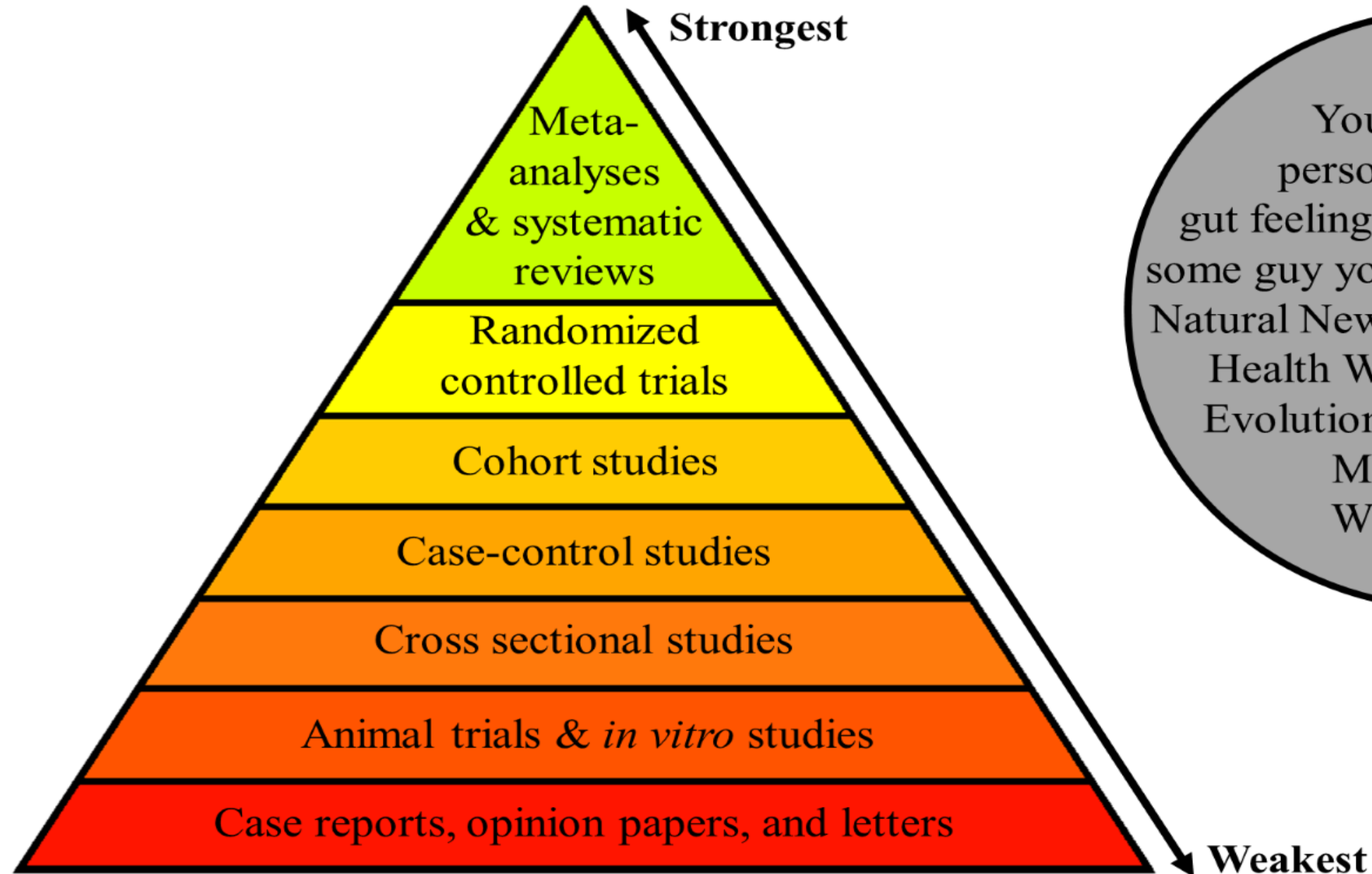
- The only way to directly assess the incidence, relative risk (the indicator of the strength of the relationship between exposure and disease)
- Ability to study the development of the disease
- Good for studying rare risk factors
- The lower the probability of a systematic error, because the disease is absent at the start of the study
- Ability to determine the timing of the risk factor with the result that has arisen

DISADVANTAGES

- Long-term and costly research (prospective)
- Loss of subjects of observation (refusal of observation, death, migration)
- Not suitable for the study of rare diseases

Hierarchy of Scientific Evidence

Not Scientific Evidence

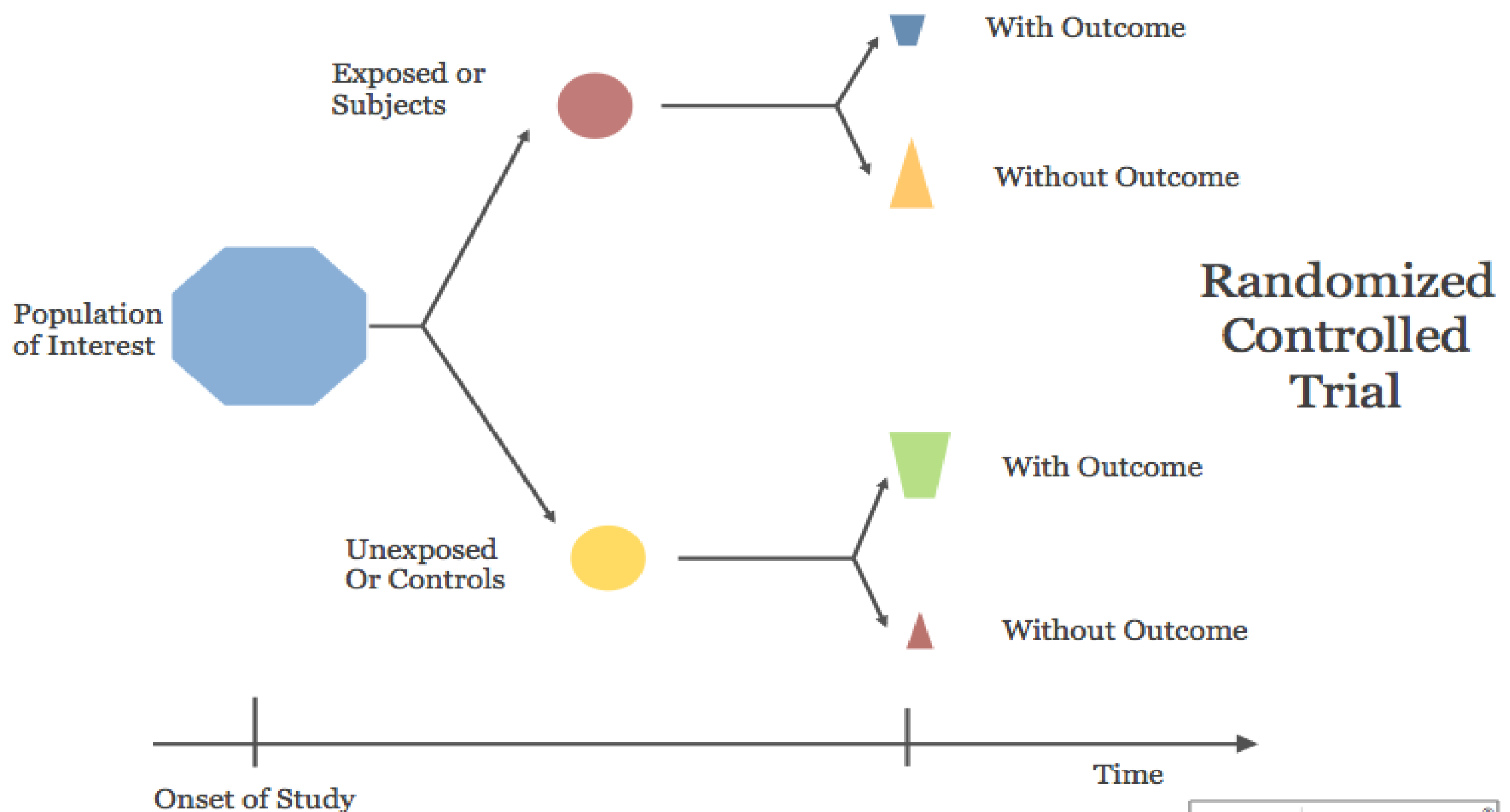


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Randomized Controlled Trial

Definition

A study design that randomly assigns participants into an experimental group or a control group. As the study is conducted, the only expected difference between the control and experimental groups in a randomized controlled trial (RCT) is the outcome variable being studied.



Advantages

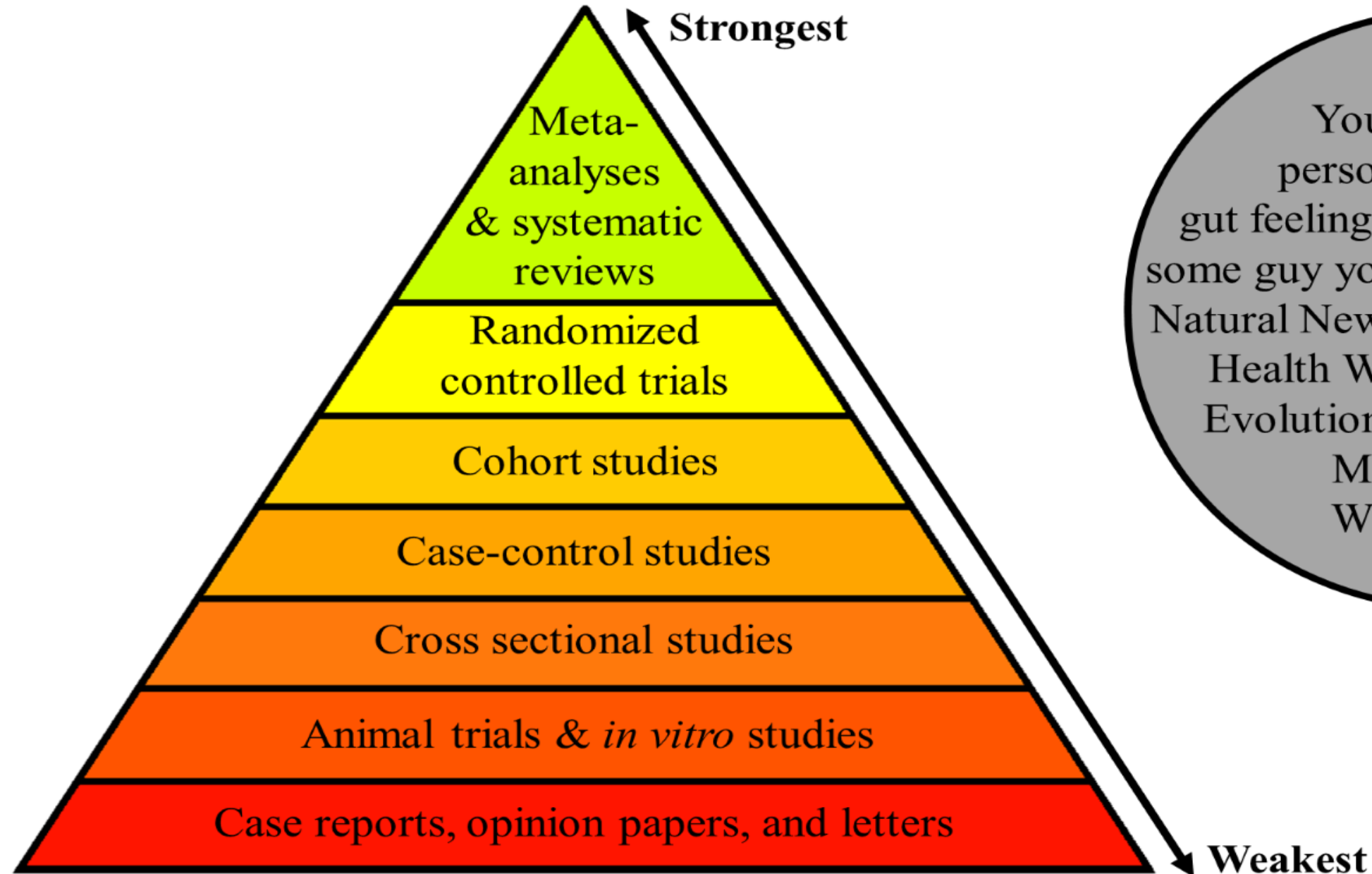
- Good randomization will "wash out" any population bias
- Easier to blind/mask than observational studies
- Results can be analyzed with well known statistical tools
- Populations of participating individuals are clearly identified

Disadvantages

- Expensive in terms of time and money
- Volunteer biases: the population that participates may not be representative of the whole
- Loss to follow-up attributed to treatment

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Practice Guideline

Definition

- A statement produced by a panel of experts that outlines current best practice to inform health care professionals and patients in making clinical decisions. The statement is produced after an extensive review of the literature and is typically created by professional associations, government agencies, and/or public or private organizations.
- Good guidelines clearly define the topic; appraise and summarize the best evidence regarding prevention, diagnosis, prognosis, therapy, harm, and cost-effectiveness; and identify the decision points where this information should be integrated with clinical experience and patient wishes to determine practice. Practice guidelines should be reviewed frequently and updated as necessary for continued accuracy and relevancy.

Assessing impacts, vulnerability
and risks

Planning for adaptation

Implementing adaptation
measures

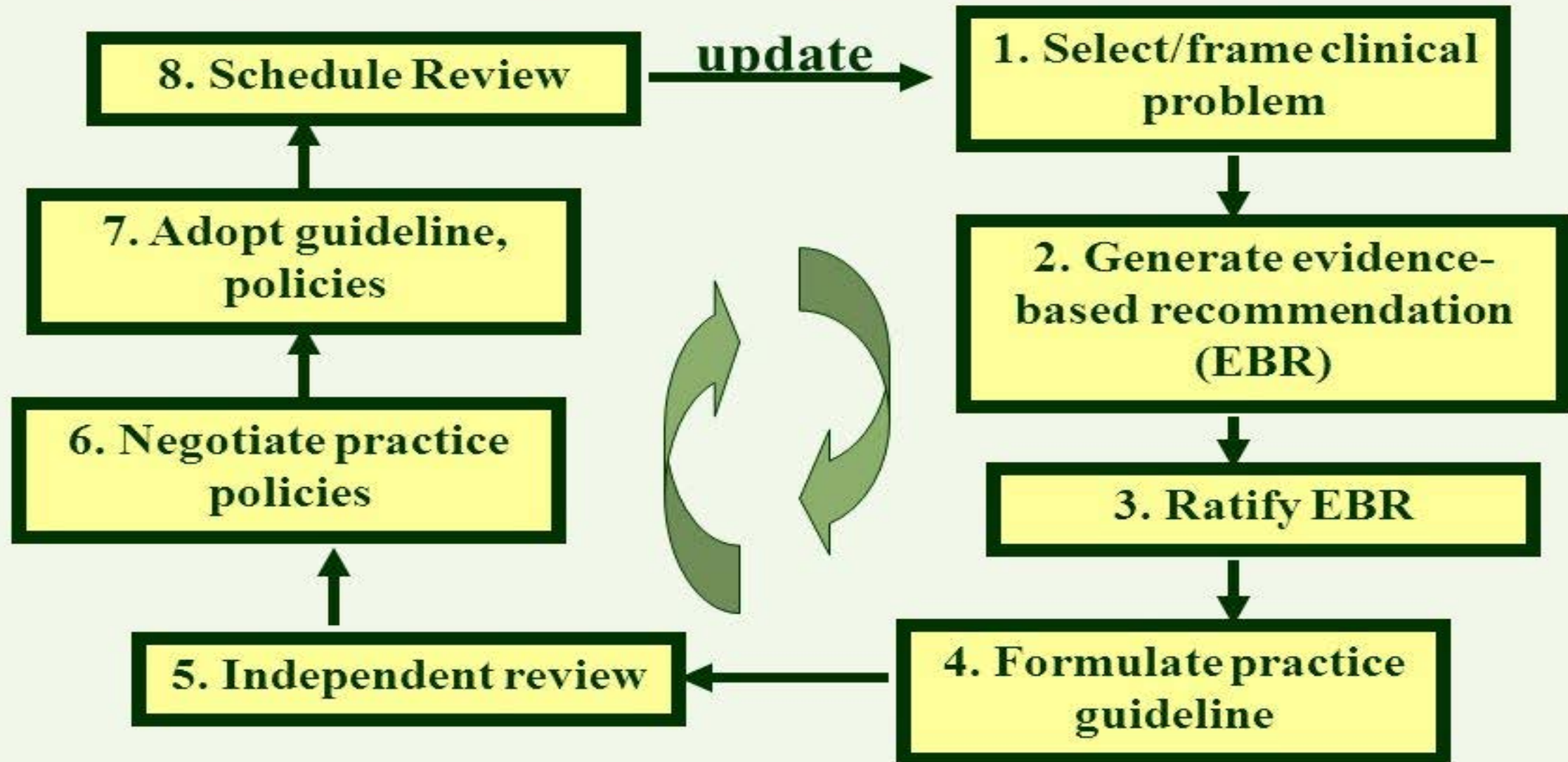
Monitoring and evaluating

*Learning on adaptation
effectiveness*

Learning on climate risks



Practice Guidelines Development Cycle



Advantages

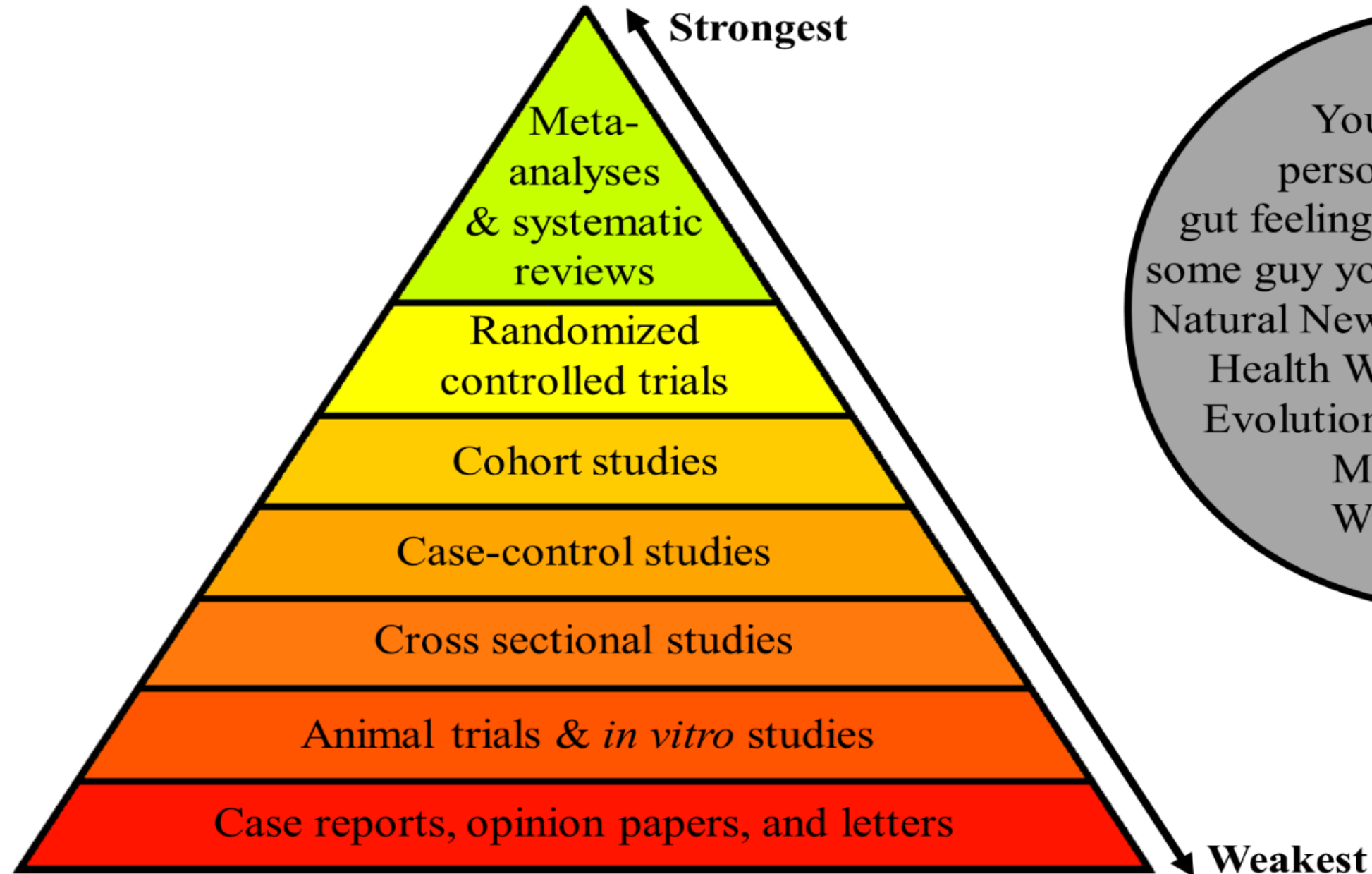
- Created by panels of experts
- Based on professional published literature
- Practical guidance for clinicians
- Considered an evidence-based resource

Disadvantages

- Slow to change or be updated
- Not always available, especially for controversial topics
- Expensive and time-consuming to produce
- Recommendations might be affected by the type of organization creating the guideline

Hierarchy of Scientific Evidence

Not Scientific Evidence



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Systematic Review

Definition

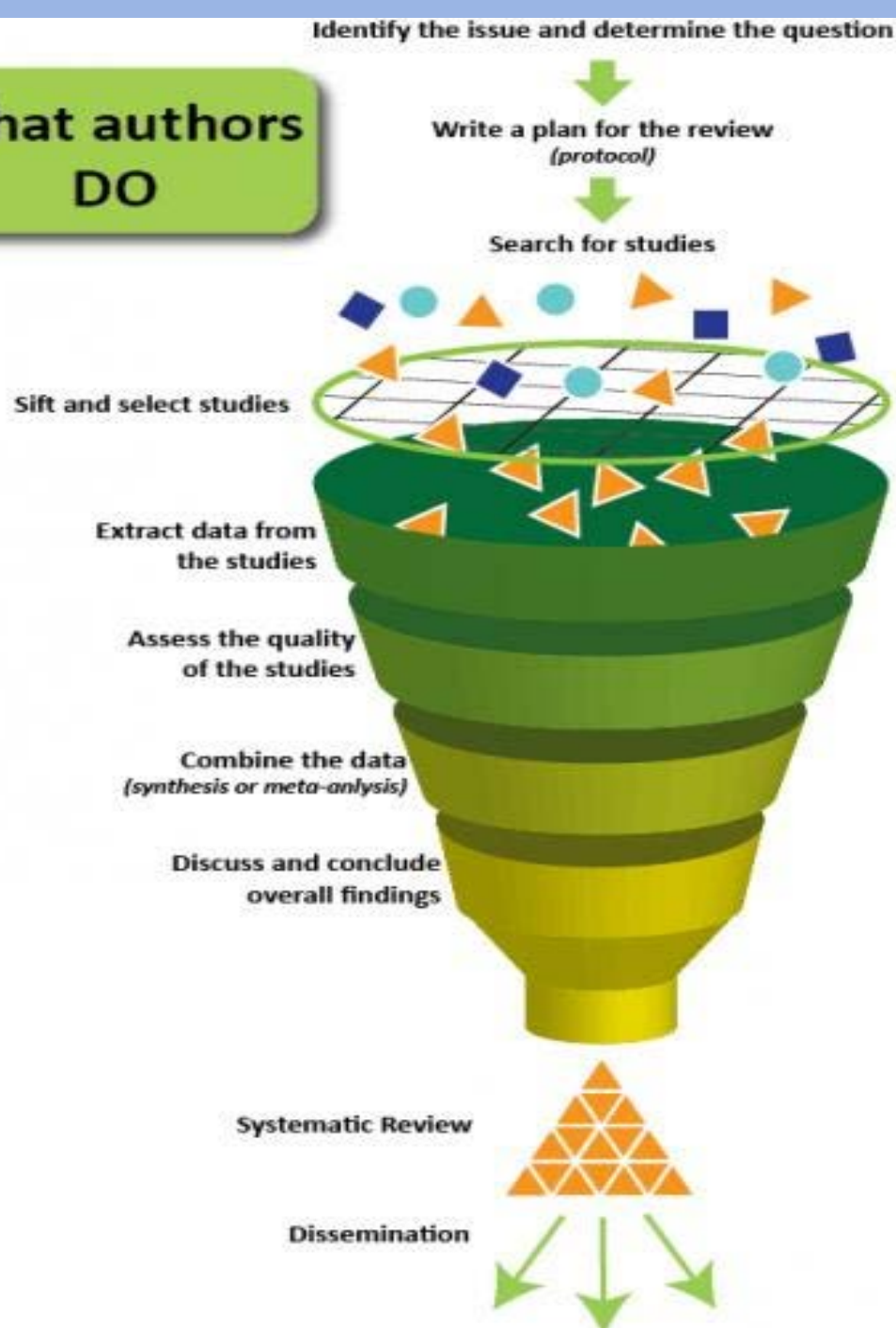
- A document often written by a panel that provides a comprehensive review of all relevant studies on a particular clinical or health-related topic/question. The systematic review is created after reviewing and combining all the information from both published and unpublished studies (focusing on clinical trials of similar treatments) and then summarizing the findings.

STEPS IN A SYSTEMATIC REVIEW

1. Determine the research question
2. Assemble the research team
3. Determine if there are any registered (in process) or published systematic reviews on your topic
4. Develop & register the protocol for the study
5. Develop a comprehensive search strategy, informed by your inclusion & exclusion criteria.
6. Select studies for include based on the predefined inclusion/exclusion criteria as detailed in the protocol.
7. Extract & analyze data
8. Interpret & synthesize results for publication
9. Update review as required



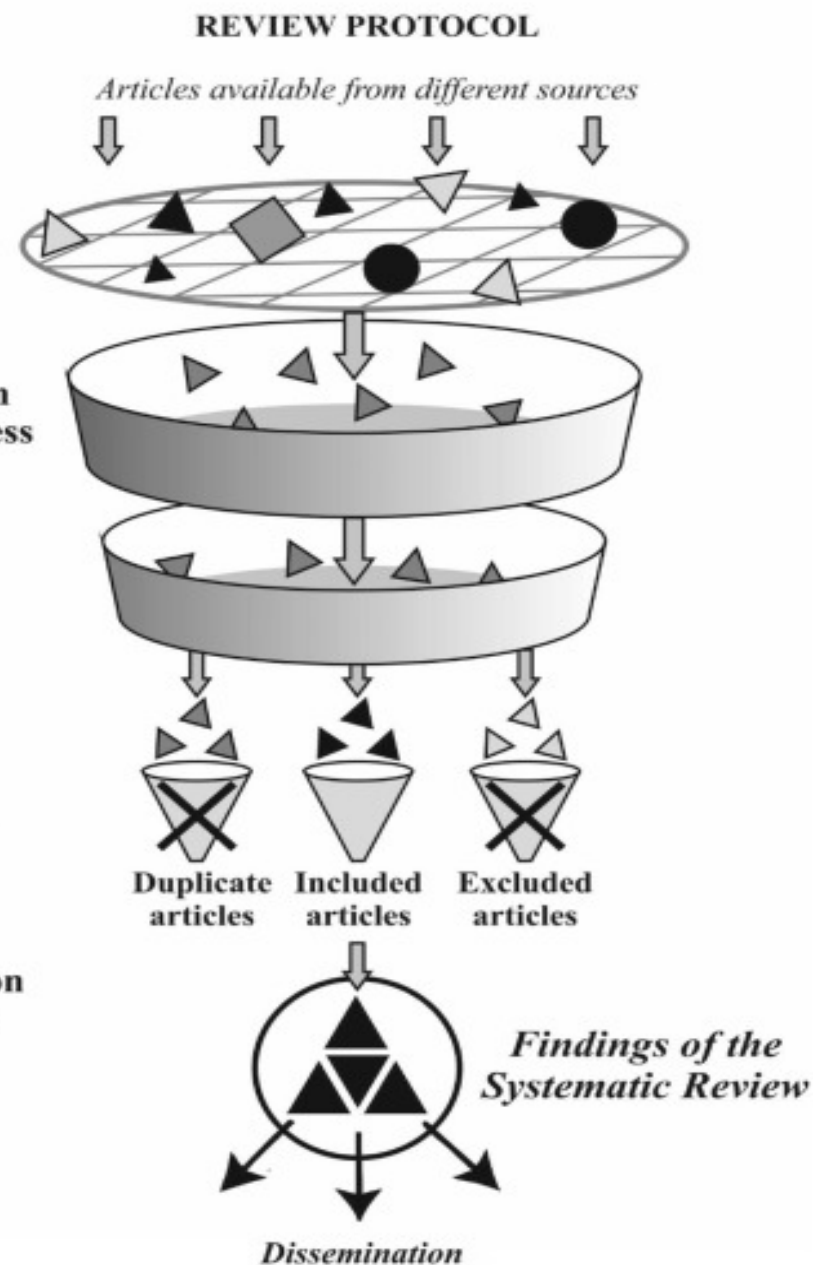
What authors DO



Steps for performing an effective Systematic Review

- 01 | Scoping
- 02 | Planning
- 03 | Identification Search process
- 04 | Screening articles
- 05 | Eligibility Assessment
- 06 | Interpretation Presentation

Systematic Review Process Diagram



SYSTEMATIC REVIEW

Advantages

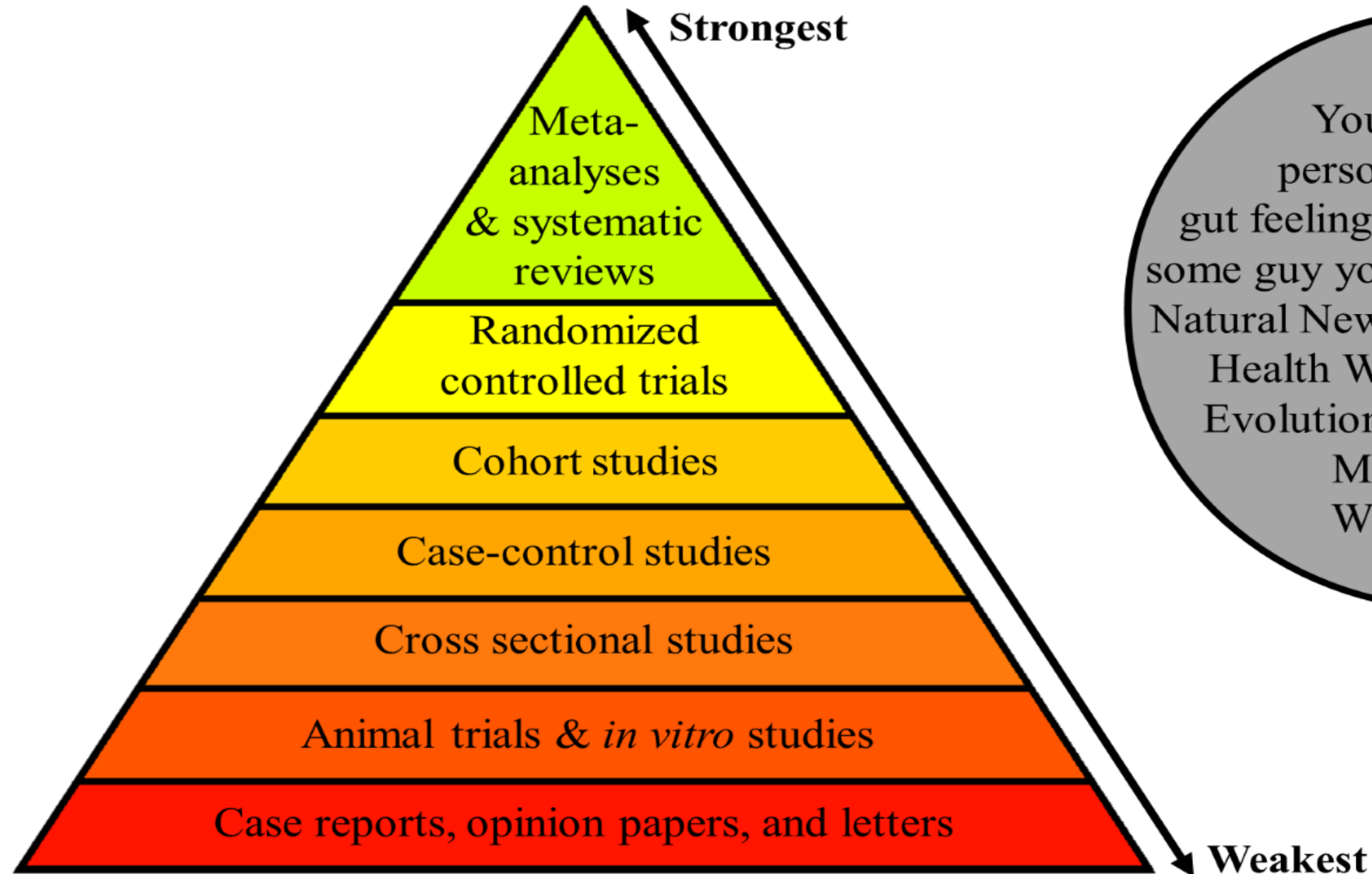
- Exhaustive review of the current literature and other sources (unpublished studies, ongoing research)
- Less costly to review prior studies than to create a new study
- Less time required than conducting a new study
- Results can be generalized and extrapolated into the general population more broadly than individual studies
- More reliable and accurate than individual studies
- Considered an evidence-based resource

Disadvantages

- Very time-consuming
- May not be easy to combine studies

Hierarchy of Scientific Evidence

Not Scientific Evidence

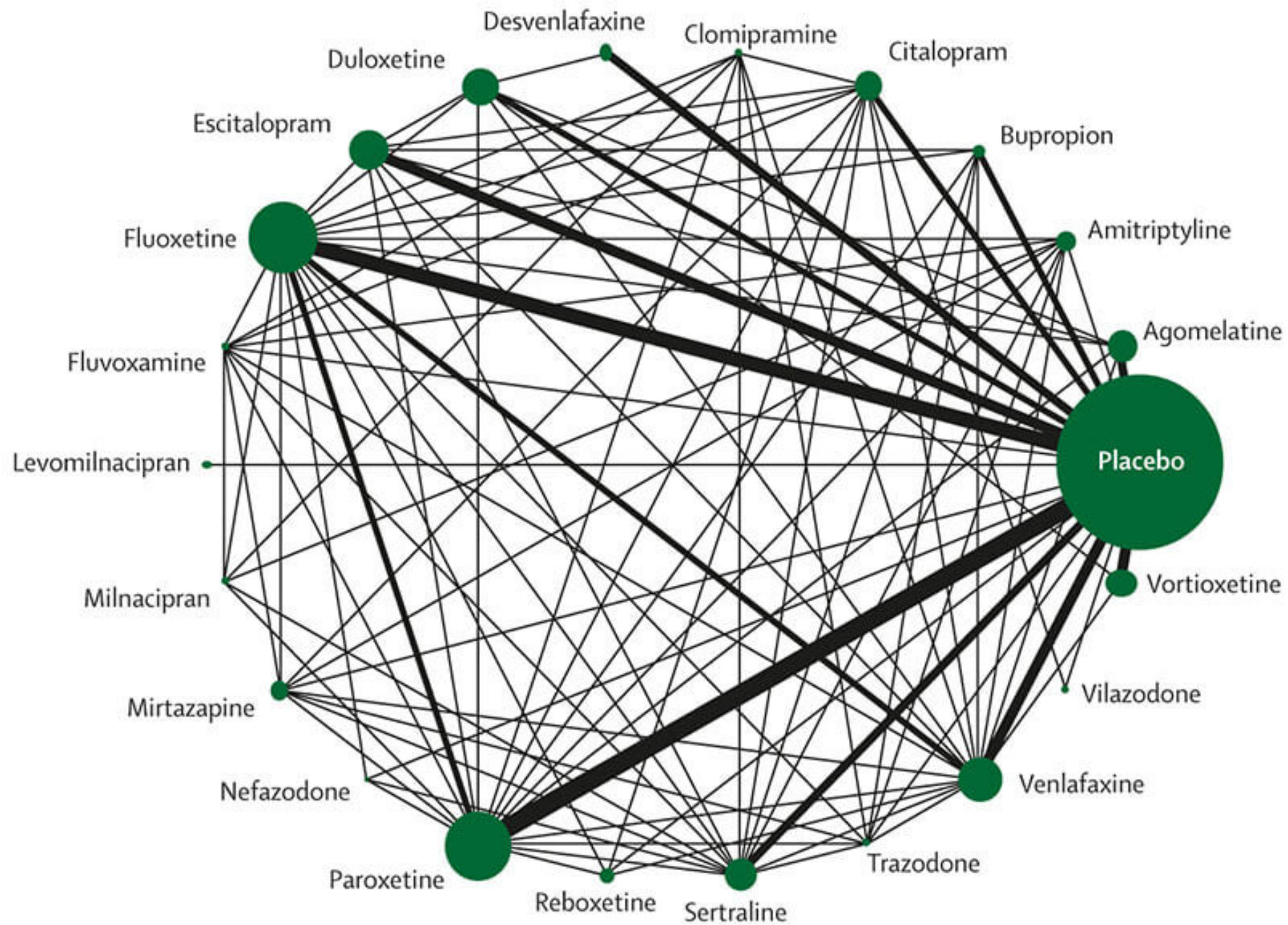


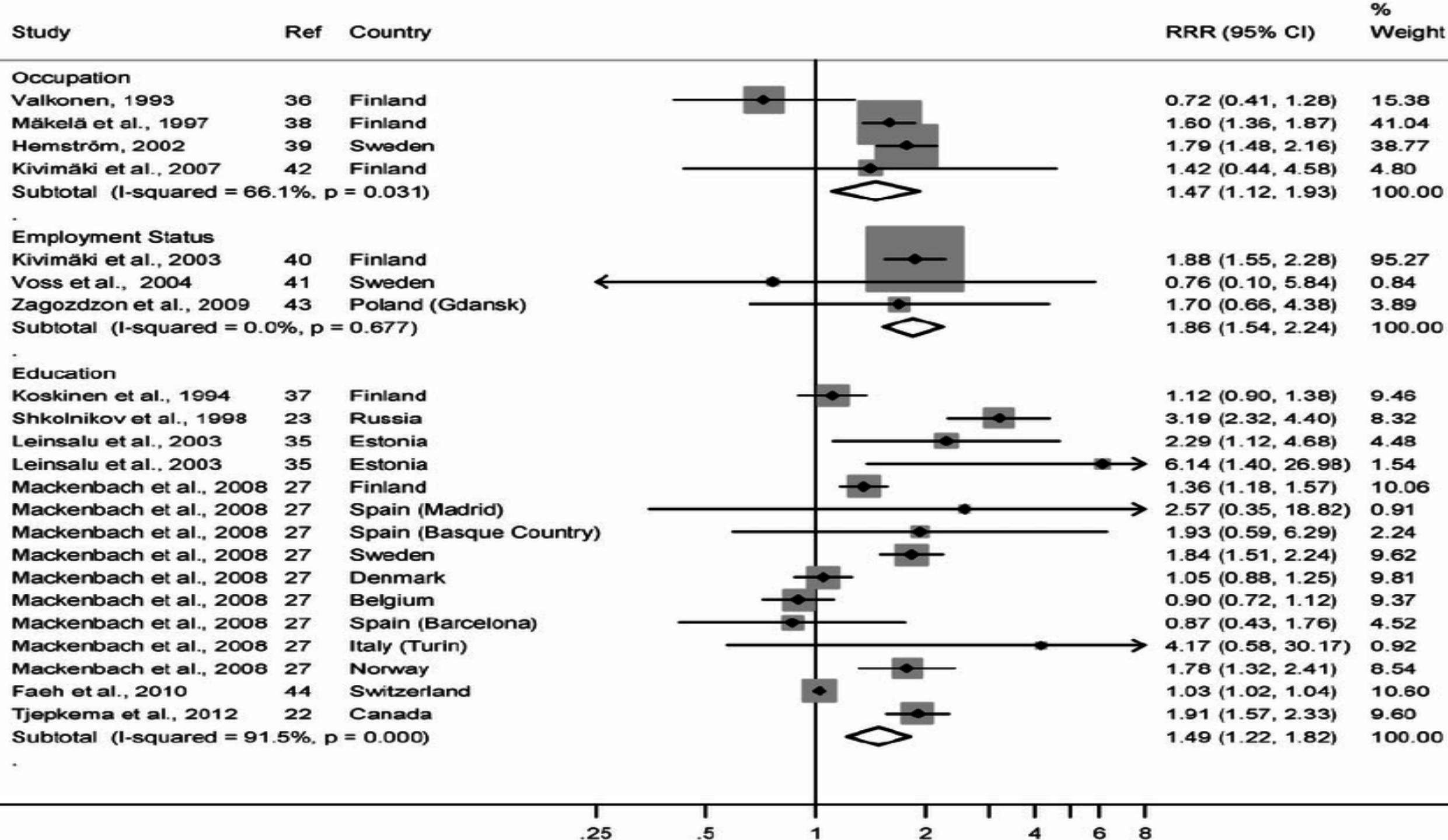
Youtube videos,
personal anecdotes,
gut feelings, parental instincts,
some guy you know, websites like
Natural News, Info Wars, Natural
Health Warriors, Collective
Evolution, Green Med Info,
Mercola.com,
Whale.to, etc.

Meta-Analysis

Definition

- A subset of systematic reviews; a method for systematically combining pertinent qualitative and quantitative study data from several selected studies to develop a single conclusion that has greater statistical power. This conclusion is statistically stronger than the analysis of any single study, due to increased numbers of subjects, greater diversity among subjects, or accumulated effects and results.
- Meta-analysis would be used for the following purposes:
 - To establish statistical significance with studies that have conflicting results
 - To develop a more correct estimate of effect magnitude
 - To provide a more complex analysis of harms, safety data, and benefits
 - To examine subgroups with individual numbers that are not statistically significant
- If the individual studies utilized randomized controlled trials (RCT), combining several selected RCT results would be the highest-level of evidence on the evidence hierarchy, followed by systematic reviews, which analyze all available studies on a topic.





META-ANALYSIS

Advantages

- Greater statistical power
- Confirmatory data analysis
- Greater ability to extrapolate to general population affected
- Considered an evidence-based resource

Disadvantages

- Difficult and time consuming to identify appropriate studies
- Not all studies provide adequate data for inclusion and analysis
- Requires advanced statistical techniques
- Heterogeneity of study populations

A scenic autumn landscape featuring a calm river reflecting the surrounding trees. The foliage is in various shades of yellow and orange. A large, thick tree trunk is prominent on the right side of the frame. The sky is visible through the branches, showing a mix of blue and white clouds. The overall atmosphere is peaceful and serene.

THANK YOU FOR
ATTENTION
VALLELLION
LEWYK TOOK FOR