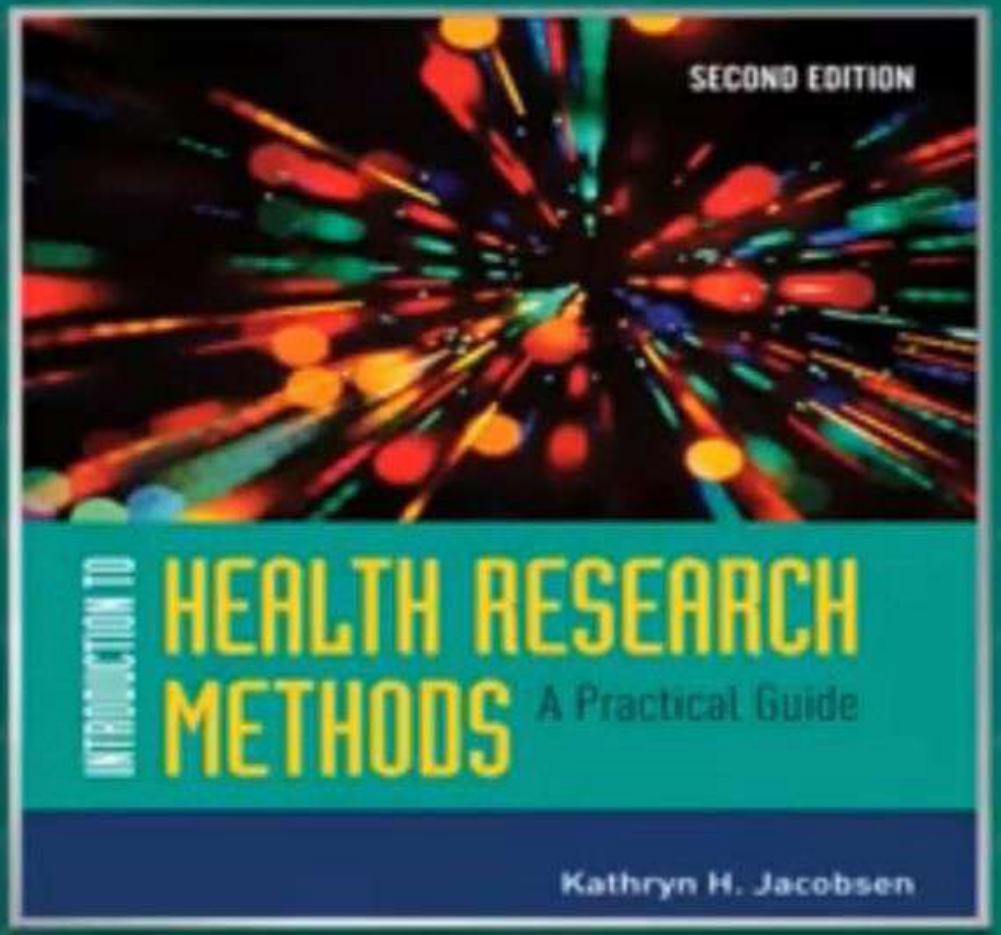
SCIENTIFIC MEDICAL RESEARCH

Week 8

Surveys & Interviews

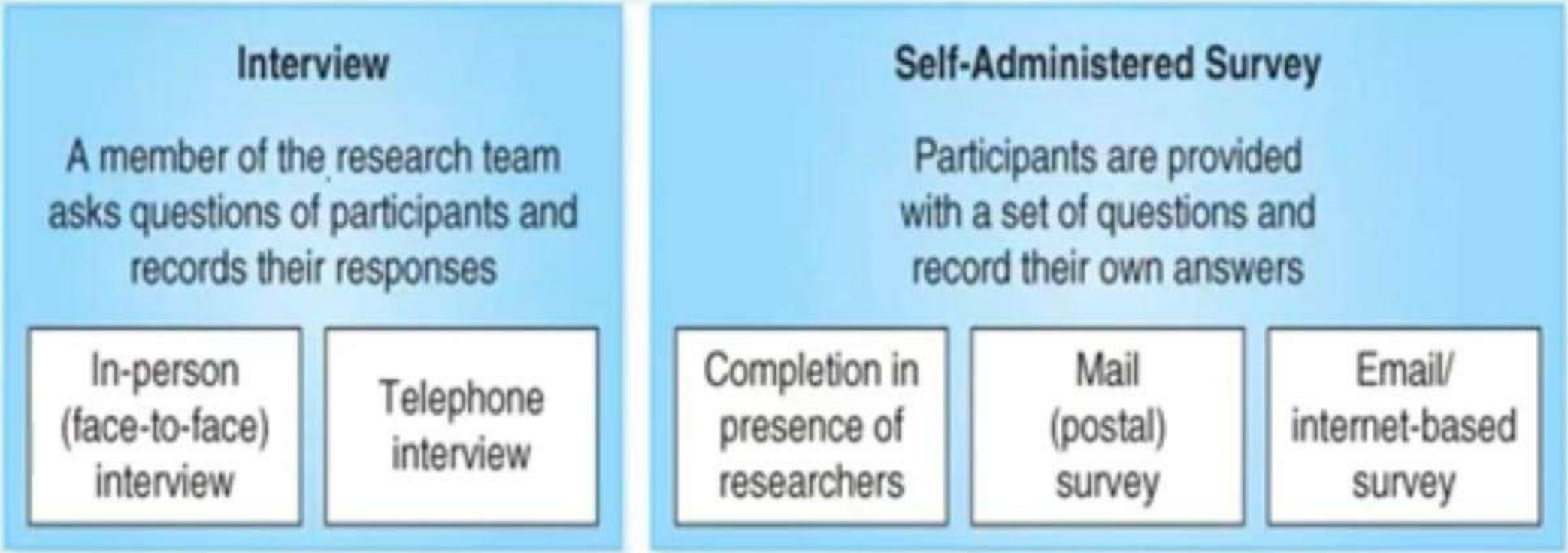
Chapter 19



19.1 Interviews vs. Self-Administered Surveys

- Interviews may promote accuracy & completeness but may be expensive because of personnel costs.
- Self-administered surveys may yield a higher sample size, be more cost-effective, and be preferable for sensitive questions.

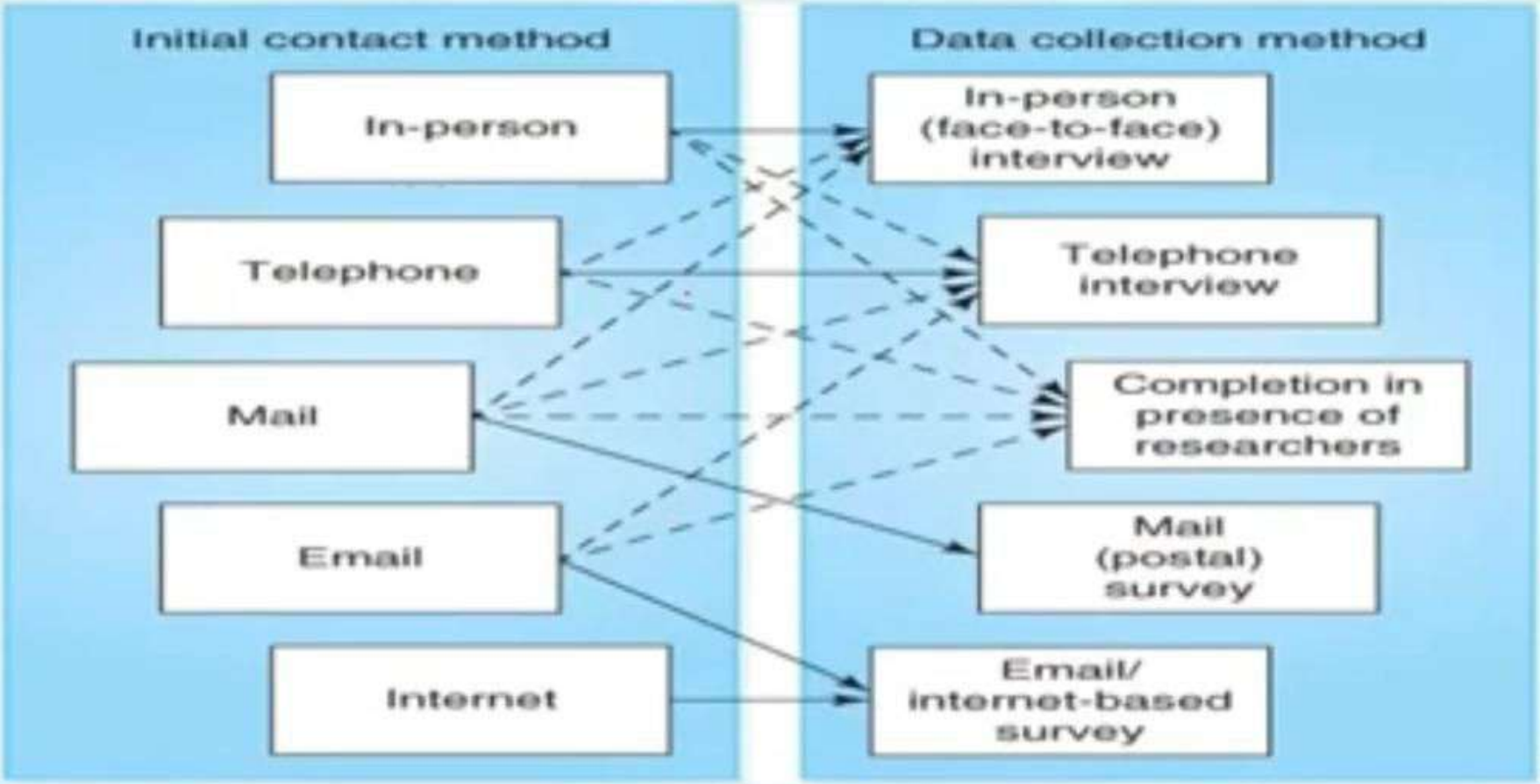
Figure 19-1: Examples of Methods for Collecting Data



19.2 Recruiting Methods

- The goal is to maximize the participation rate among sampled individuals.
- The recruitment methods are often paired with the data collection method (e.g., using online methods to recruit for an Internet-based survey).
- Provide multiple opportunities to participate (e.g., follow-up mailings).
- Consider appropriate incentives.

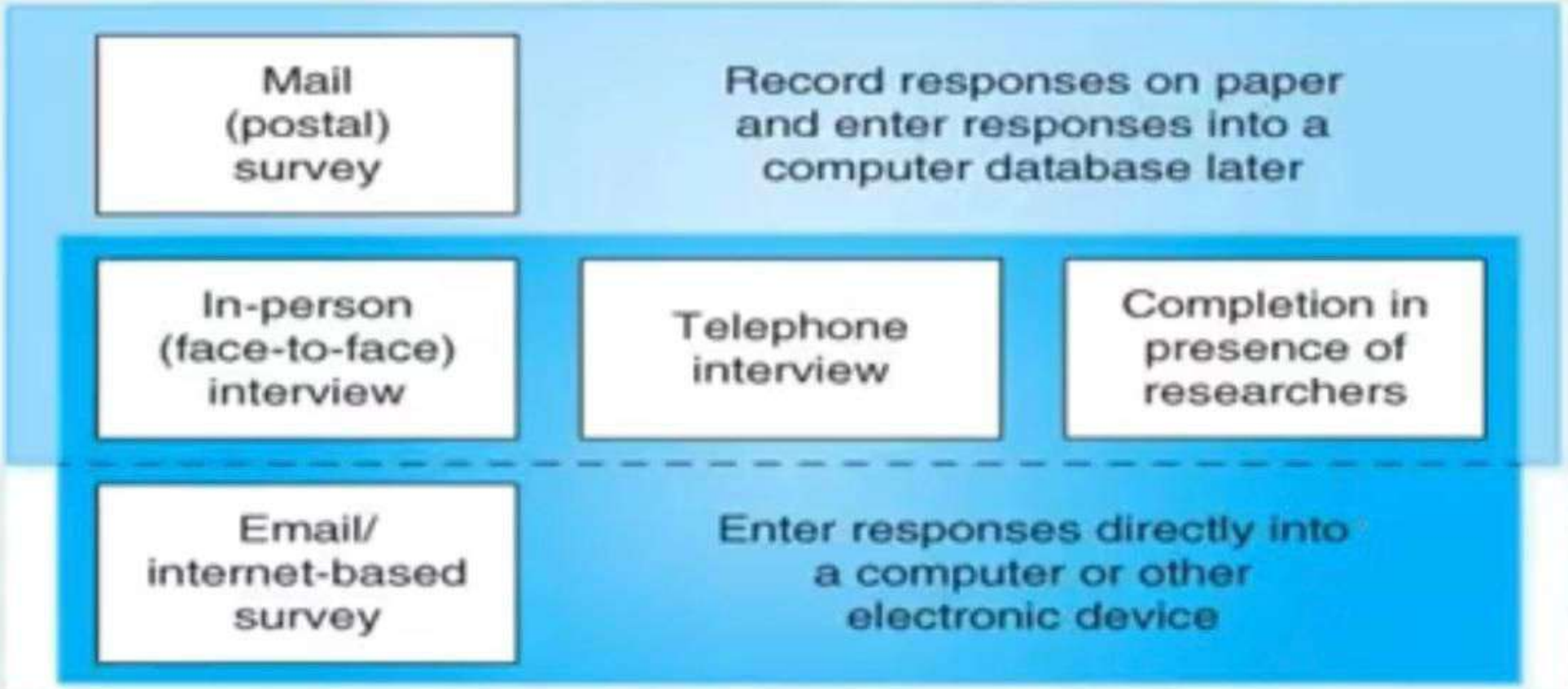
Figure 19-2: Examples of Methods for Contacting Members of the Sample Population



19.3 Data Recording Methods

- **Paper-based surveys** must later be scanned or typed into computers; this can be expensive & time-consuming, but they also allow a large number of people to take the survey at one time & place.
- **Computer-assisted surveys** input survey responses directly into a computer and can have built-in checks & "skips," but not all populations are comfortable with computers.

Figure 19-3



19.4 Training Interviewers

- Uniformity in data collection procedures is important.
- Interviewers need access to comprehensive handbooks & training sessions when they can practice their skills.
- Inter-rater reliability needs to be established

FIGURE 19-4 Characteristics of Well-Trained Interviewers (continued)

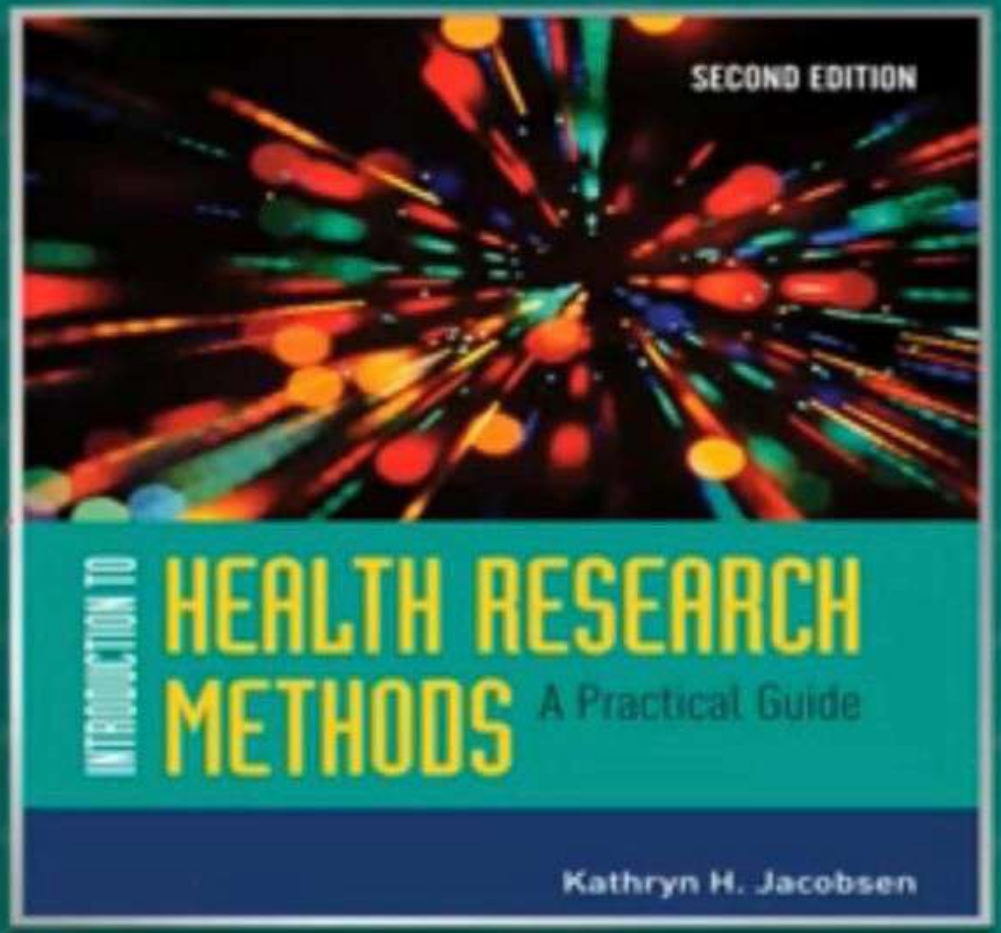
Characteristic	Actions That Demonstrate the Characteristic
Consistent	• Reads the script exactly as it is written • Probes for answers only when the script indicates that probing is approved • Does not provide explanations for any question unless an explanation is provided in the script or approved in the interviewer handbook
Impartial	• Avoids verbal and nonverbal expressions of approval or disapproval • Does not express personal opinions • Avoids leading interviewees toward a particular answer (for example, by placing special emphasis on particular words in a question or by probing until receiving a particular desired response)
Honest	• Does not fabricate or falsify reports • Records responses to open-ended questions verbatim, without rephrasing, paraphrasing, "correcting," or interpreting them
Careful	• Completes all steps of the interview process in the correct order, as prescribed by the interviewer handbook • Documents informed consent prior to conducting an interview • Does not skip any component of the interview • Completes all response forms correctly

FIGURE 19-4 Characteristics of Well-Trained Interviewers

Characteristic	Actions That Demonstrate the Characteristic
Respectful	• Communicates pleasantly and professionally with all study participants and members of the research team • Has practiced interviewing enough to be comfortable with both the script and the interview process • Asks supervisors for assistance when it is needed
Organized	• Begins each scheduled interview session on time • Has all necessary materials on hand prior to the start of each interview session • Maintains meticulous records and completes all files and paperwork promptly
Considerate	• Dresses and grooms appropriately for in-person interviews • Is alert to modifiable conditions that may make interviewees uncomfortable, such as loud background noises or dim lighting • Allows adequate time for participants to respond to each question
Articulate	• Speaks at an appropriate pace and volume • Enunciates clearly • Uses an appropriate tone of voice (and, for in-person interviews, appropriate facial expressions and gestures) • Rereads questions and/or the list of closed-ended responses when a participant does not understand the question or the acceptable responses

Additional Assessments

Chapter 20



20.1 Supplementing Self-Reported Information

- Laboratory tests & other objective measures can be used to supplement & validate self-reported data.

20.2 Anthropometric Measures

- ***Anthropometry*** is the measurement of the human body.
- Examples include height, weight, & waist circumference.
- Calibration should be done before measurement
- Ensure privacy for participants being measured.

20.3 Vital Signs

- Examples include body temperature, blood pressure, & pulse (heart rate).
- The research protocol should state exactly how each measurement should be taken.
- Strict guidelines should be applied to guarantee reliability
- Inter-rater reliability needs to be established

20.4 Clinical Examination

- Examples include breath sounds, range of motion, & oral health status.
- An assessment form can guide the procedures that will be used for all participants.

20.5 Tests of Physiological Function

- Examples include spirometry for lung function, EEG for brain function, & audiometry for hearing acuity.
- Consider the costs of these tests.
- From care plan vs. for study purpose

20.6 Laboratory Analysis of Biological Specimens

- Examples include immunologic, genetic, & other tests of blood, urine, saliva, & other body fluids.
- Decide ahead of time whether results will be shared with participants.

20.7 Medical Imaging

- Examples include X-rays, CT scans, MRIs, & ultrasound.

20.8 Tests of Physical Fitness

- Examples include tests of strength, endurance, & flexibility.
- Safety must be the top priority.

20.9 Environmental Assessment

- Environmental risks to human health can be assessed by trained observers with checklists and by laboratory tests (e.g., tests for lead & radon).

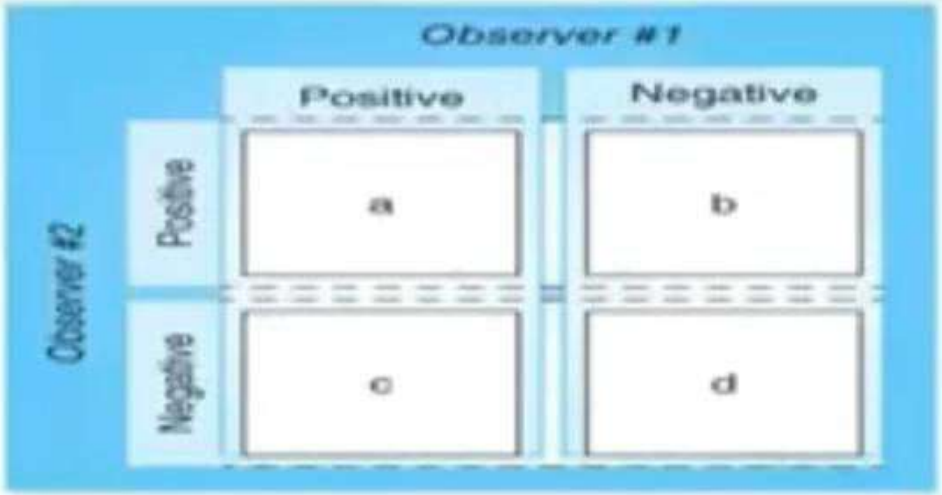
20.10 GIS (Geographic Information Systems)

- Use a GPS (global positioning system) to gather the latitude & longitude for key places, so that they can be mapped & incorporated into spatial analysis.

20.11 Inter-Rater Reliability

- Use the kappa statistic or another test to demonstrate that two assessors are making consistently valid measurements.

Figure 20-1: Inter-Rater Agreement



Concordant pairs: Observers agree
Both positive = a
Both negative = d

Discordant pairs: Observers disagree
One positive and
one negative = b, c

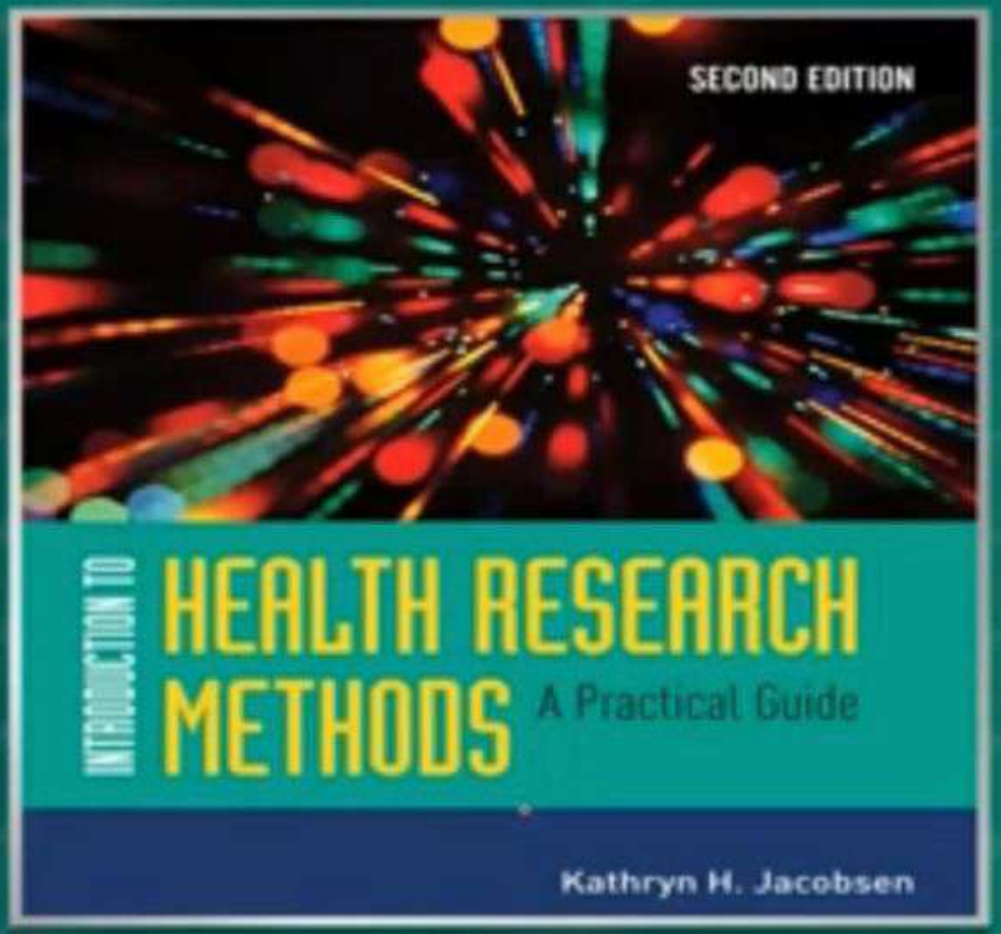
$$\text{Expected agreement:} = \frac{((a+b)(a+c)) + ((c+d)+(b+d))}{(a+b+c+d)^2}$$

$$\text{Observed agreement:} = \frac{a+d}{a+b+c+d}$$

$$\text{Kappa coefficient} = \kappa = \frac{\text{Observed agreement} - \text{Expected agreement}}{1 - \text{Expected agreement}}$$

Secondary Analyses

Chapter 21



21.1 Overview of Secondary Analysis

- In a *secondary analysis*, the researcher conducting the statistical analysis has not had (and does not have) any contact with the individuals whose data are being examined.

21.2 Publicly Available Data Sets

- Many datasets are available online, such as a diversity of cross-sectional studies from the CDC:
  - National Health and Nutrition Examination Survey (NHANES)
  - National Health Interview Survey (NHIS)
  - Behavioral Risk Factor Surveillance System (BRFSS)
- The data may be downloadable to all, or there may be an application process for acquiring the relevant data.
- Read all relevant supporting documentation, and be aware of possible costs & authorship issues.

21.3 Private Data Sets

- Professors (and others) may make not-yet-analyzed data files available to students & other investigators.
- Ethical approval, careful review of the data collection methods, & frank conversations about authorship are required.

21.4 Clinical Records

- Ethical review of a research protocol is required before data are accessed. (e.g., **HIPAA** Act in USA)
- Some data are electronic; others may be on paper and require data entry.
- Records are often incomplete. However, absence of information in a file cannot be assumed to mean that the symptom or sign was not present in the patient.

21.5 Health Informatics, Big Data, & Data Mining

- ***Health informatics***: applies advanced techniques from information science & computer science to the compilation & analysis of health data
- ***Big data***: the analysis of data sets that are so large & complex that they require access to powerful hardware & special statistical software applications
- ***Data mining***: can be used to extract particular phrases from large sets of files
- ***Data sources***: electronic health records (EHRs), billing records, lab records, medication records, social media, & others

21.6 Ethics Committee Review

- Any data file containing possibly identifiable information requires review by an ethics committee prior to beginning analysis.
- For all other data files, check with the appropriate committees about what review is required.

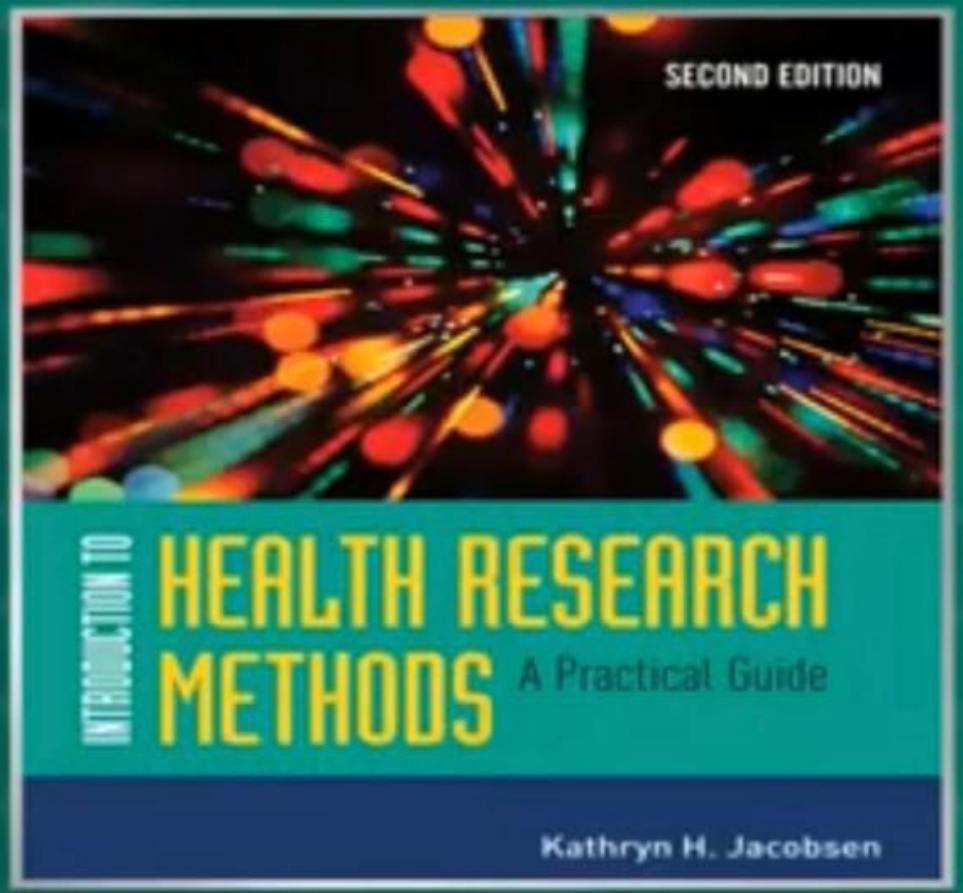
The End
Good Luck

SCIENTIFIC MEDICAL RESEARCH

Week 9

Systematic Reviews and Meta-Analyses

Chapter 22



22.1 Overview

All reviews require:

1. An extensive search of the literature;
2. The extraction of key information from relevant articles;
3. The clear & concise presentation of this information.

FIGURE 22-1 Key Characteristics of Reviews and Meta-Analyses

Approach	Narrative Review	Systematic Review	Meta-Analysis
Objective	Synthesize existing knowledge	Synthesize existing knowledge	Synthesize existing knowledge
Primary study question	What conclusions about this topic are supported by previous studies?	When all previously published studies on this topic are examined, what conclusions can be drawn?	When the results of all previously published studies on this topic are merged, what is the summary statistic?
Population	Published literature	Published literature	Published literature
When to use the approach	The goal is to describe a new perspective on a topic that can be supported by the existing literature.	The goal is to compare the findings of previous studies on a well-defined topic.	The goal is to summarize previous findings using pooled statistics.
Requirements	The researcher has excellent library access.	The researcher has excellent library access.	The researcher has excellent library access.
	The researcher has a unique perspective on the topic.	The researcher can obtain every relevant article.	The researcher has strong quantitative skills.

FIGURE 22-1 (continued)

Approach	Narrative Review	Systematic Review	Meta-Analysis
First steps	1. Decide what story the article will tell.	1. Decide on the specific objectives of the review. 2. Select the search methods that will be used to find potentially relevant articles. 3. Select inclusion and exclusion criteria for articles.	1. Decide on the specific objectives of the review. 2. Select the search methods that will be used to find potentially relevant articles. 3. Select the inclusion and exclusion criteria for the articles. 4. Decide how to assess the quality of the studies. 5. Decide how the results of the studies will be combined into one summary statistic.
What to watch out for	Limited publication venues	Publication bias	Studies that cannot be fairly compared
Key statistical measure	No statistics are required.	No statistics are required, but providing some results from included studies may be helpful.	Summary measures for included studies must be reported.

22.2 Selecting a Topic

- Each review needs to have an appropriate scope
- Most successful reviews have more than just a few articles & less than hundreds of articles.

22.3 Library Access

- Check with an institutional librarian about policies & prices for accessing articles that are not part of the library's collection.

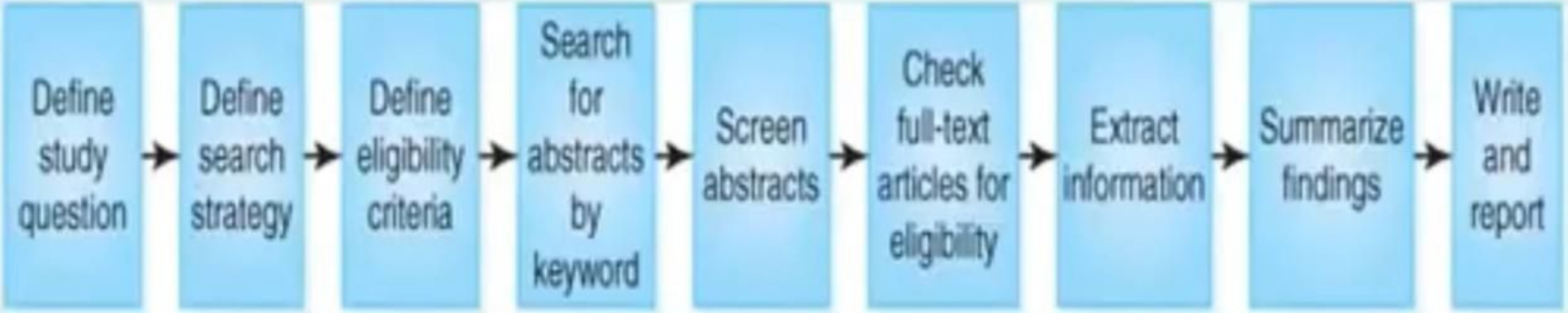
22.4 Narrative Reviews

- *Narrative reviews* tell a story about a topic using evidence from the literature to support the "plot".
- A narrative review works best when the researcher has a unique perspective on a topic and/or a particular expertise in the field.

22.5 Systematic Reviews

- *Systematic reviews* use a predetermined & comprehensive searching & screening method to identify relevant articles while minimizing bias.
- The systematic review process:
  - Identification of an appropriately narrow study question
  - Selection of a well-defined & valid search strategy
  - Screening of all potentially relevant articles
  - Extraction of relevant information from all eligible articles
  - Summarization of the findings of these articles

Figure 22-2



22.6 Search Strategy

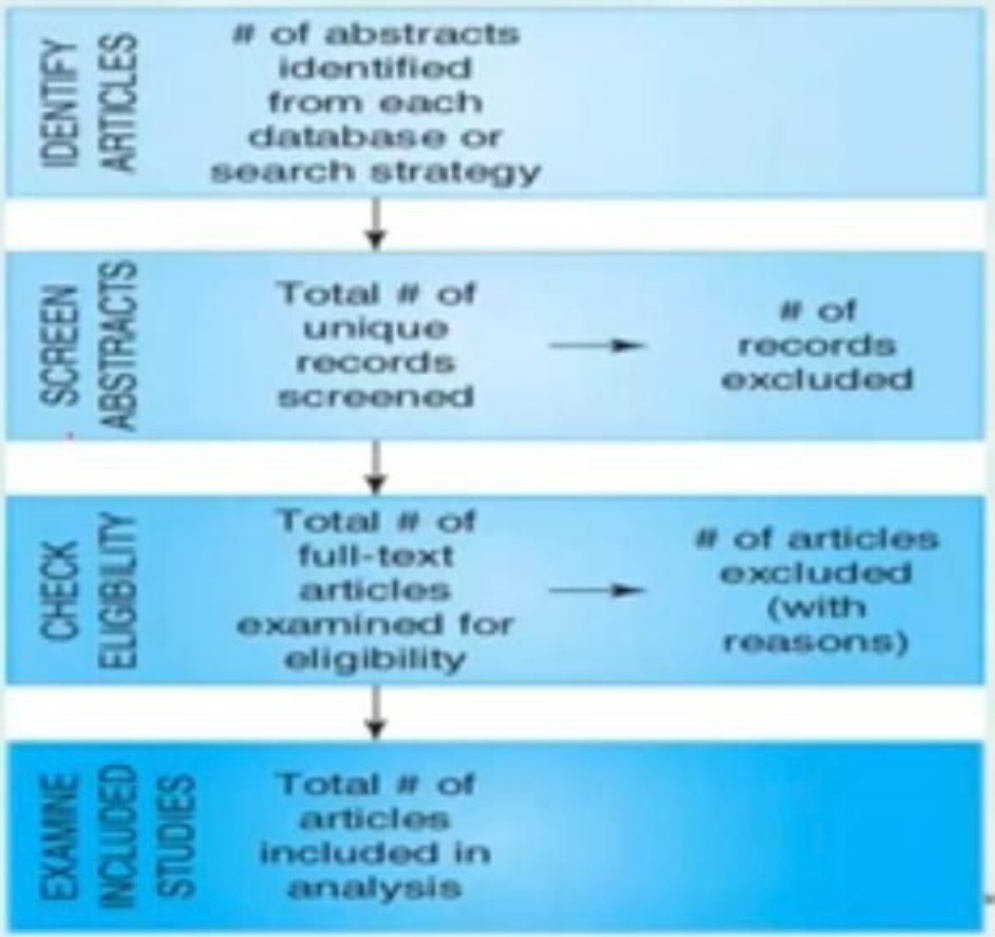
- The MeSH dictionary (available through PubMed.org) can help with focusing or expanding search terms.
- Use *Boolean operators* such as AND, OR, and NOT.
- Confirm that the selected search string will capture several articles known to meet the eligibility criteria.

FIGURE 22-3 Examples of Using Boolean Operators to Expand or Restrict the Number of Abstracts Identified in a Database

Search String	Approximate Number of "Hits" in PubMed
cancer	3.5 million
bladder cancer	70,000
schistosomiasis	25,000
"schistosomiasis"[Mesh]	21,000
Schistosomiasis mansoni	10,000
cancer AND schistosomiasis	1500
bladder cancer AND schistosomiasis	650
bladder cancer AND *Schistosomiasis mansoni*	40
bladder cancer OR schistosomiasis	90,000
bladder cancer NOT schistosomiasis	65,000
colorectal cancer	200,000
colorectal cancer AND schistosomiasis	150
bladder cancer AND colorectal cancer AND schistosomiasis	20
(bladder cancer OR colorectal cancer) AND schistosomiasis	800

Note: Because the PubMed database is constantly adding new abstracts, the numbers in this table will not exactly match the results of a new search.

Figure 22-4: **Systematic Search Strategy & Counts to Report**



22.7 Search Limiters

- Be careful about decisions to limit the search databases screened, the languages or publication years of articles, and other choices that may reduce the number of articles identified by the search.

22.8 Eligibility Criteria

- Create both a list of inclusion criteria & a list of exclusion criteria prior to screening the articles.
- Be prepared to justify all criteria, especially those related to quality screening.
- Consider whether to use *snowballing* & the *gray literature* to expand the search.

22.9 Data Extraction

- A data extraction table allows for easy compilation & comparison of observations relevant to the study question.

22.10 Systematic Review Results

- Record & report both statistically significant findings and those showing no association.
- Watch out for the ***publication bias*** that occurs when articles with statistically significant results are more likely to be published than those with null results.

22.11 Meta-Analysis

- *Meta-analysis* combines into one summary statistic the results of several high-quality quantitative studies that used similar methods to collect & analyze their data.
- The meta-analysis process:
  - Use a systematic search strategy to identify relevant articles.
  - Carefully read each study.
  - Assess the quality & comparability of each study.
  - Extract statistical results from each of the eligible studies.
  - Combine comparable statistical results into one summary statistic.

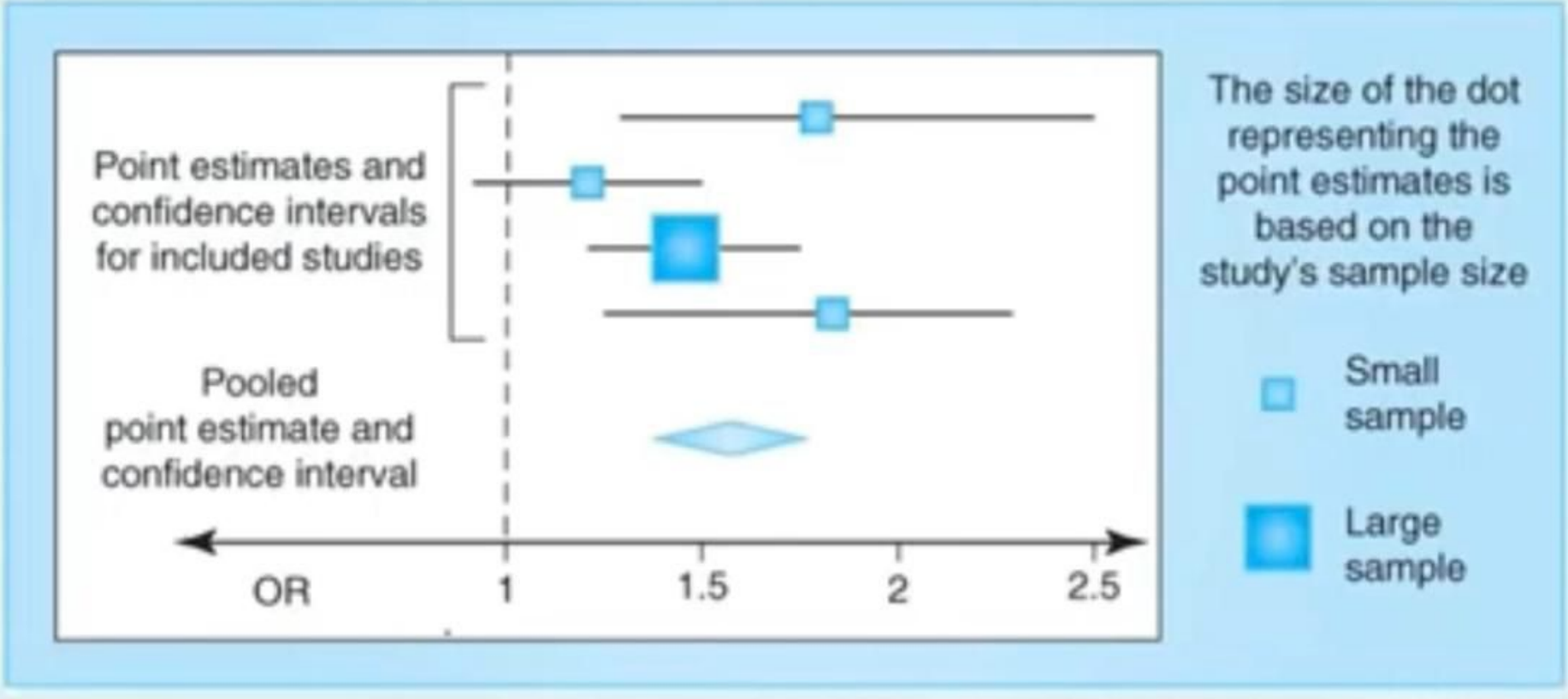
22.12 Pooled Analysis

- *Homogeneous* (similar) studies can be combined into a summary statistic, but caution should be used if the studies are *heterogeneous* (dissimilar).
- The amount of variability in the measure between studies can be examined using a *Cochran's Q* statistic for homogeneity and the I^2 statistic.
- A *fixed effects model* can be used to create a pooled estimate when the studies are fairly homogenous.
- A *random effects model* is required when the tests of heterogeneity show that the included studies are dissimilar.

22.13 Forest Plots & Funnel Plots

- A ***forest plot*** displays the contributing studies and the summary measure for a meta-analysis.
- A ***funnel plot*** visually displays the likelihood of studies missing from the analysis because of publication bias.

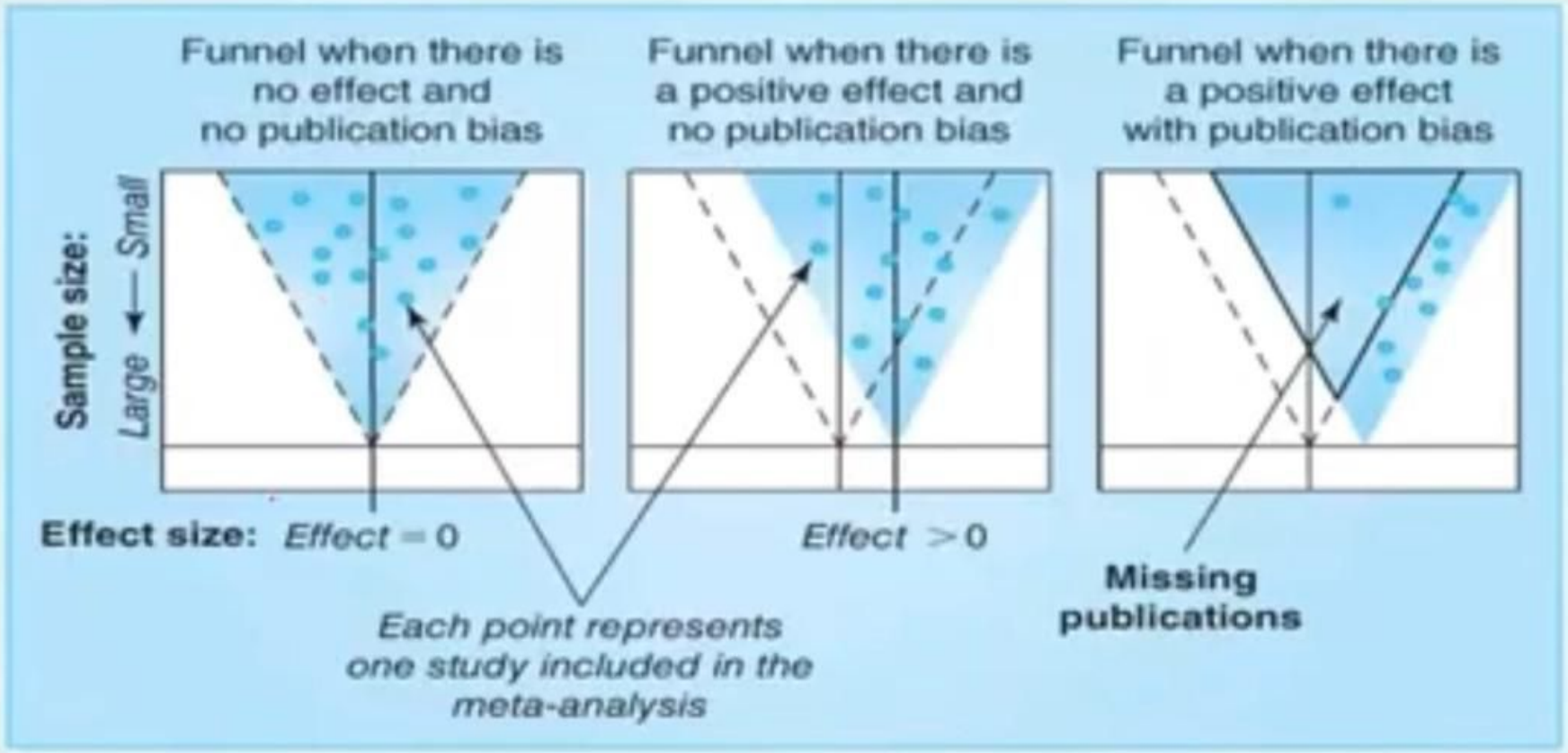
Figure 22-5: **Example of a Forest Plot**



22.13 Forest Plots & Funnel Plots

- A ***forest plot*** displays the contributing studies and the summary measure for a meta-analysis.
- A ***funnel plot*** visually displays the likelihood of studies missing from the analysis because of publication bias.

Figure 22-6: **Example of a Funnel Plot**



The End
Good Luck