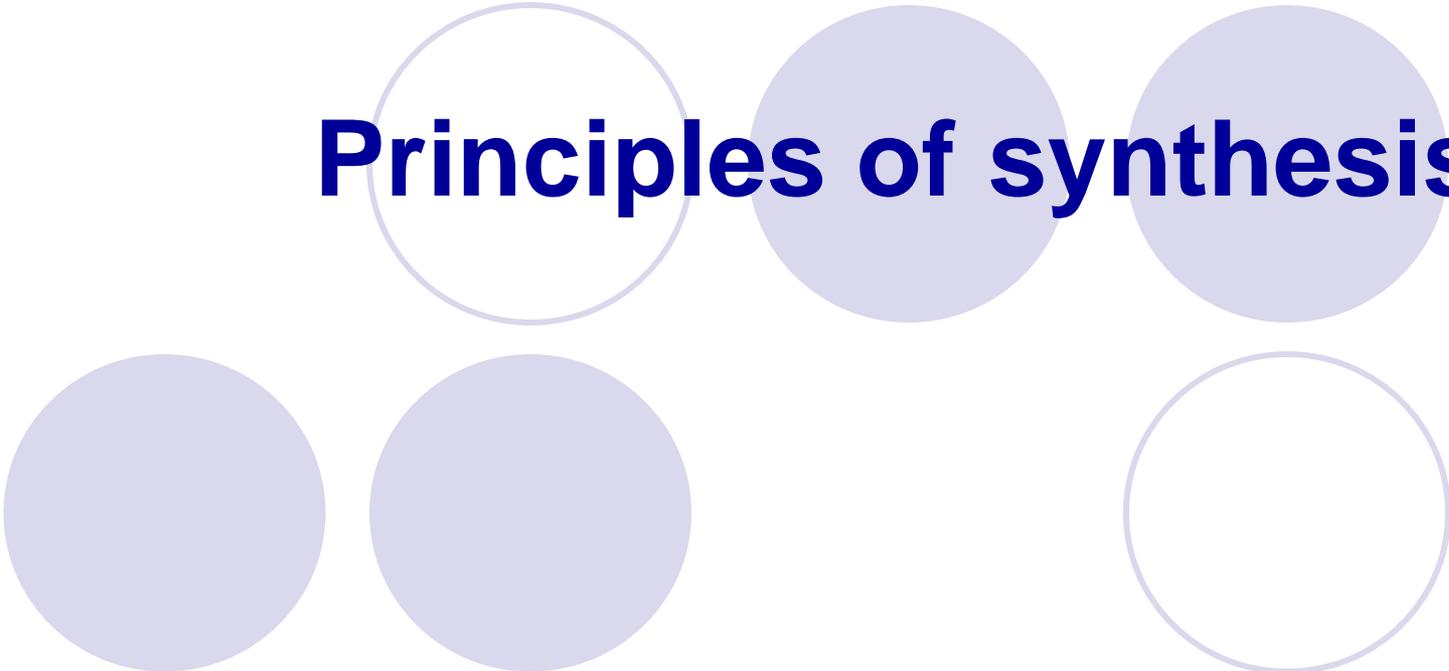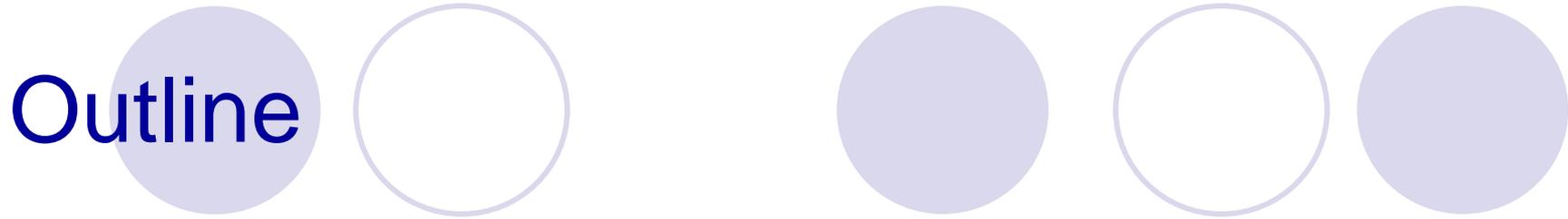# Principles of synthesis

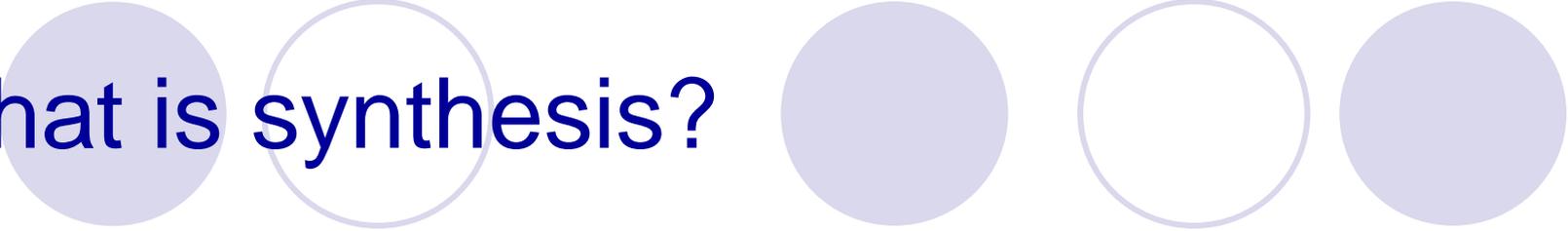MRC | Medical Research Council

Outline

- Different types of synthesis

- Use of heterogeneity in synthesis

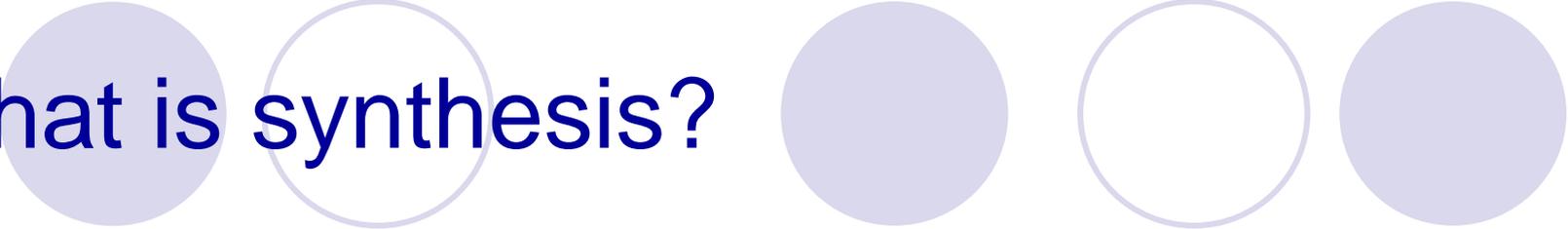- Principles of synthesis

- Preparing for synthesis

What is synthesis?

"The process or result of building up separate elements, especially ideas, into a connected whole, especially a theory or system."

Oxford English Dictionary

What is synthesis?

- More than just summary of study findings

- Transformation of collection of findings in a new connected whole

- Product rather than sum

Generic terms for types of synthesis

- **Statistical: meta-analysis:** Combining/pooling standardised effect sizes across studies to get an overall effect size
  - Weighted according to study characteristics, e.g. Standard error/sample size
  - Final effect estimate benefits from accumulation of sample sizes
    - greater statistical power & precision

- **Narrative** synthesis: textually describing the overall effect noting variations in: study characteristics, implementation etc

- Many other names used and some specialist types

Other terms
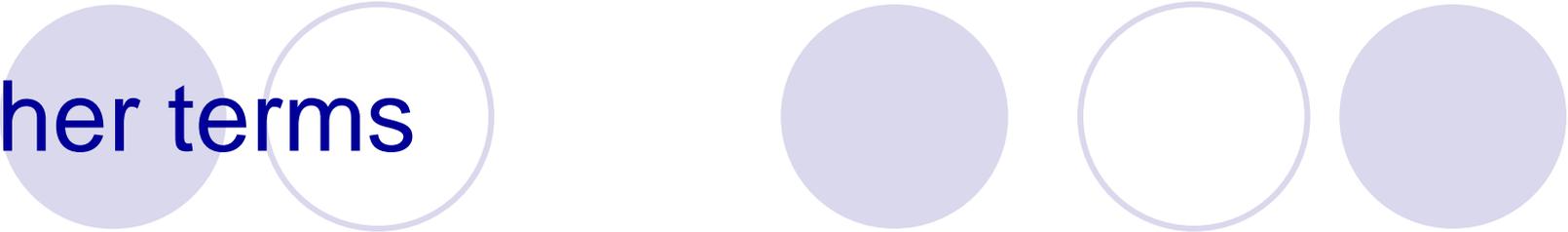
- Critical interpretive synthesis
- Ecological triangulation
- Meta-ethnography
- Meta-narrative
- Meta-study
- Meta-synthesis
- Meta-summary
- Framework synthesis
- Qualitative synthesis

Realist synthesis
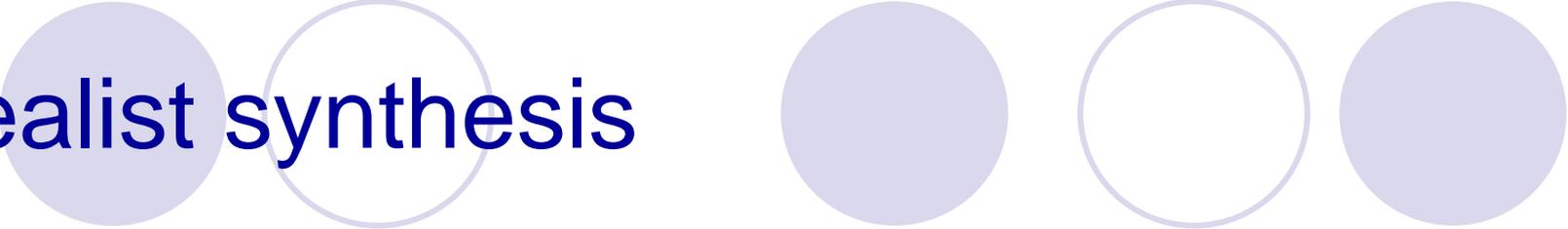
- Theory-driven interpretative techniques
  - Review driven by pre-specified theory

- Unpack the relationships between context, mechanism and outcomes
  - What works for whom in what circumstances?
    - Extract data on context, population, intermediate outcomes

Principles of synthesis
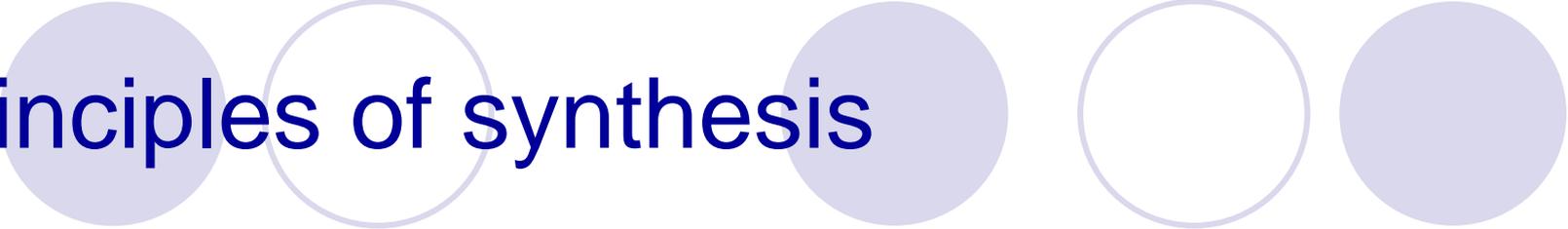
- Combine outcomes from studies
  - Outcomes should be similar
  - Study methods & quality should be similar
  - Must be conceptually appropriate- open to interpretation

- Produce estimate of overall effect in light of study quality or weight of the evidence
  - Consider key variations which might influence impacts
    - Group studies appropriately
    - Don't just consider the final outcome- how/why do outcomes vary across studies

- Transparent: clear to reader how conclusions were made

Why critical appraise?

- Evidence informed decision-making assumes people make better decisions if informed by **best available evidence**

- Systematic reviews should distinguish between studies that are **more susceptible or less susceptible to bias**
  - Prioritise best available evidence

- Conclusions of a systematic review should interpret the evidence in light of the quality of evidence (i.e. least biased) studies on a given subject

Critical appraisal allows you to

1. Exclude studies that fail to meet your methodological criteria

OR

2. Stratify included studies by those with relatively high or relatively low risks of bias

OR

3. A mixture of the two

Synthesis of apples & oranges

- Principles of synthesis require similar concepts

But what about fruit salad?!
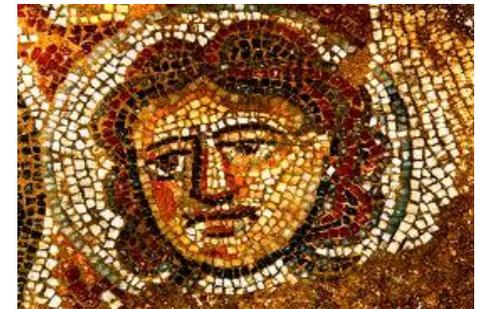
Approaches to reviews

- Aggregative
  - Synthesis of similar data to test hypothesis
  - Deductive
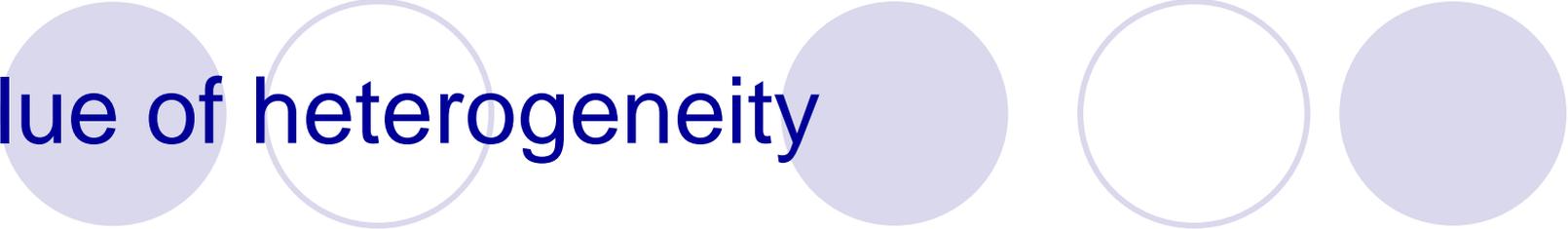 - Likened to adding stones to build a cairn

- Configurative
  - Synthesis of data with some level of commonality but incorporates high level of variation- used to generate hypothesis
  - Inductive
  - Likened to mosaic- contrasts create image

- Most reviews will involve a mix of approaches (especially of complex interventions)

Value of heterogeneity

- Complexity & heterogeneity may be matter of perspective
  - Even clinical interventions may be complex

- Identify commonality across diverse interventions

- Diversity is used to test and refine emerging theory- like use of deviant case in qualitative analysis

- Contribute to development of broader theory
  - May be more useful than numerical synthesis

# Heterogeneity & synthesis of complex interventions

- **Heterogeneity often extreme**
  - Study design
  - Other aspects of study methods- selection bias, contamination etc
  - Intervention
  - Population & context
  - Implementation
  - Outcomes

- **Heterogeneity likely to influence impact**
  - especially important in reviews of complex interventions to look at the influences of heterogeneity on reported effects across studies

- **Synthesis is not just about the outcomes**
  - A good/useful synthesis should consider explanations for effect variation, i.e. what works for who and in what circumstances
 - Whether meta-analysis or narrative
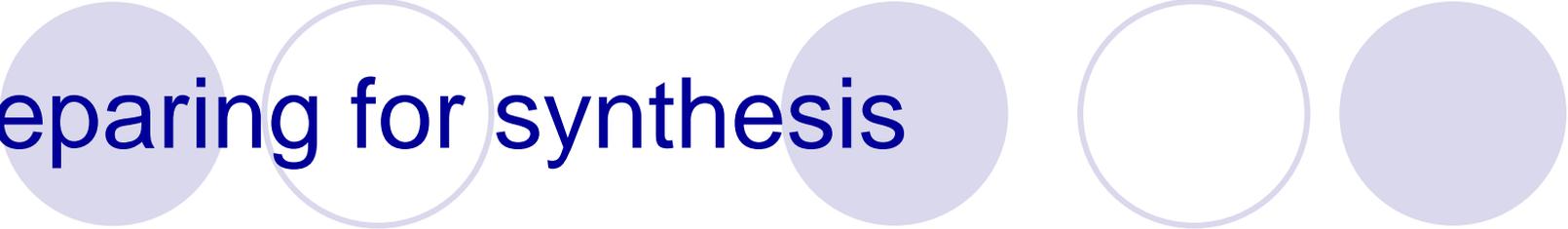
Preparing for synthesis

- Become familiar with your data- get a feel for the studies
  - This is likely following data extraction
  - Also good to systematically tabulate key features of the studies to allow cross-study analysis
    - Compare reported results by study context, intervention, population, data of study, etc

Preparing for synthesis
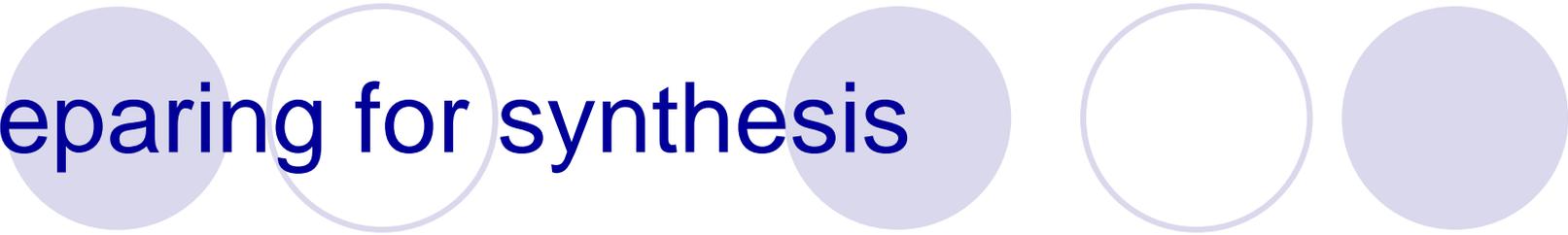
- Discuss with co-reviewers issues with the data and how the synthesis should be approached,
  - e.g. should some studies be excluded, should some be grouped together? What is conceptually appropriate and useful?

  - How will you prioritise by study quality?
    - Varying study quality needs to be reflected in the synthesis
    - Be careful not to confuse "best available" with "best possible"

  - How should variation in outcome type be managed?
    - Different measures of health

  - Your decisions will likely depend on the quality and quantity of data you have identified
    - Use good tables to help see patterns in your data
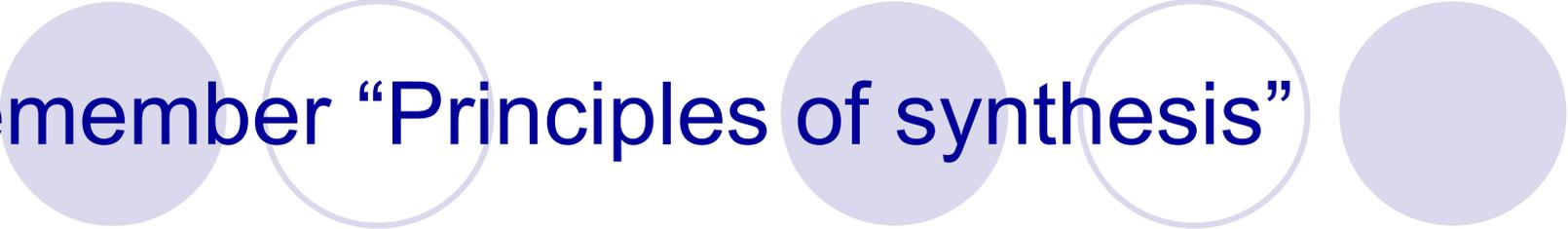
Remember "Principles of synthesis"

- Combine conceptually similar outcomes from similar studies: study design & intervention

- Produce estimate (narrative or statistical) of overall effect in light of study quality or weight of the evidence

- Transparent: clear to reader how conclusions were made
  - Good tables and clear signposting in the text

- This is relevant to both qualitative & quantitative data