

How is Qualitative Comparative Analysis (QCA) used in systematic reviews to identify critical intervention components?

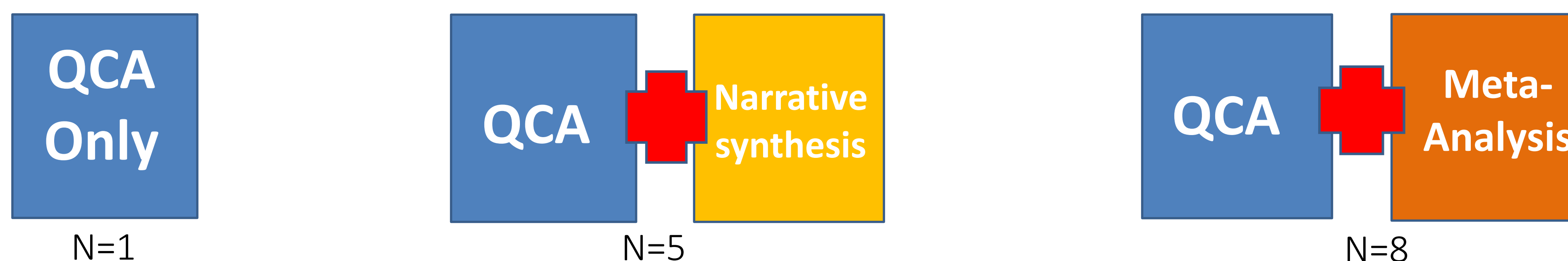
What is QCA?: a promising new review method for examining the complex causal recipes of multi-component interventions.
Aim: to identify mechanisms through which interventions have impact they do - not 'what works, on average'
How: Identifies combinations of intervention/contextual features that are (or are not) present when an intervention is successful (or not) in obtaining desired outcome
Logic:

- Case rather than variable oriented – deep holistic understanding of interventions, features and context
- Set-theoretic logic – systematic comparison of cases (interventions) within sets (e.g. effective vs ineffective) to identify necessary and sufficient conditions
- Analysis informed or underpinned by existing theories

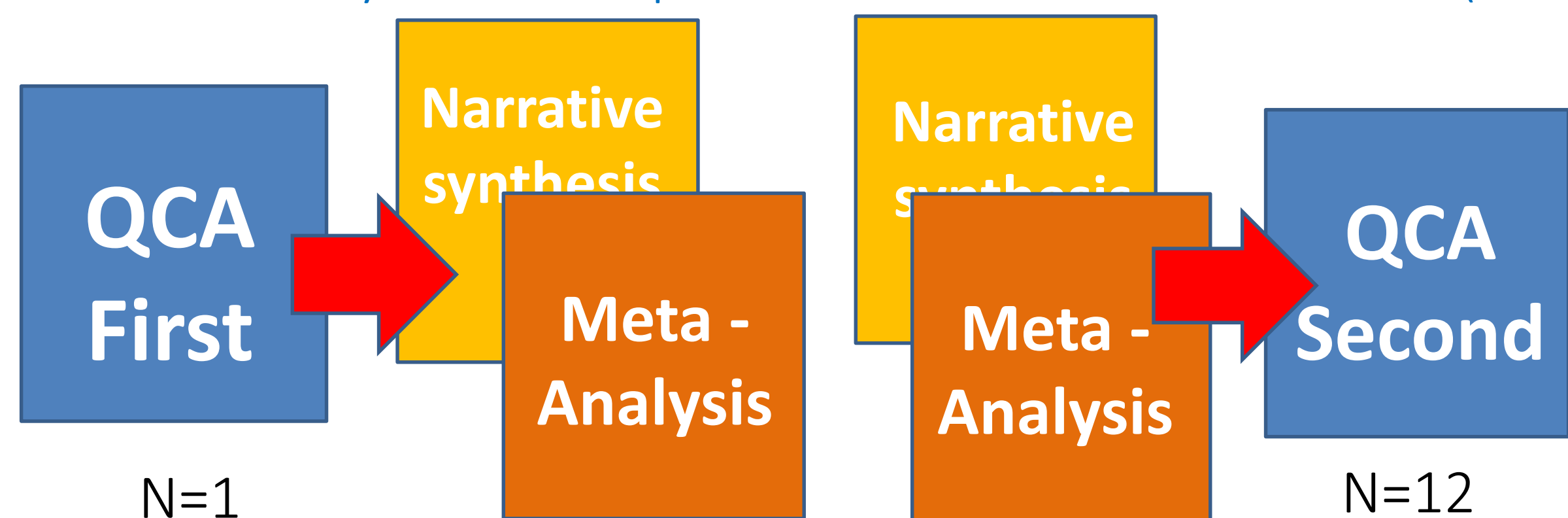
How has QCA been used in systematic reviews?

We identified 14 systematic reviews that used QCA as a method of analysis. We examined the diversity of approaches for employing QCA.

1. Was QCA conducted in combination with other synthesis methods? (n=14)



2. What was the synthesis sequence in combination reviews? (n=13*)



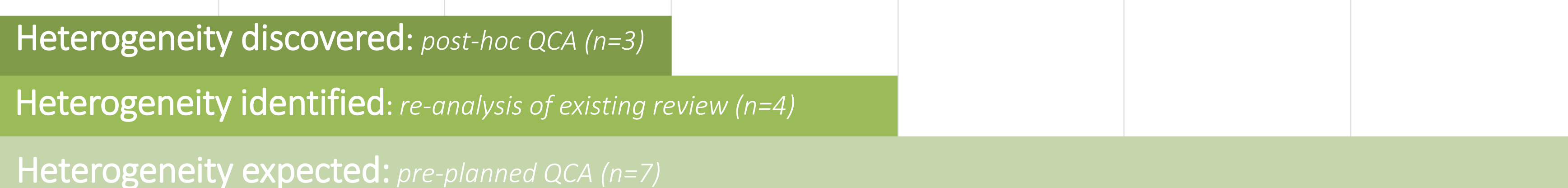
*As illustrated in Q1 - one review was not a combination review - i.e. it used QCA only

3. What was the source of underpinning theory? (n=14*)

*One QCA conducted a synthesis of theory alongside QES



4. What was the reason for using QCA? (n=14)



Objective: To describe the diversity of approaches for employing QCA in systematic reviews to explore intervention complexity.

Design: A systematic map of systematic reviews employing QCA as a method of analysis.

Inclusion criteria: Systematic reviews involving QCA.

Searches: Multiple databases searched from inception to 2019 - "Systematic review" AND "Qualitative Comparative Analysis".

Analysis: Asked 4 Qs:-

1. What combination of methods are used in the review?
 - No combination: QCA alone
 - Combination: QCA and meta-analysis
 - Combination: QCA and narrative synthesis
2. Sequence of synthesis in combination reviews?
 - QCA first: QCA is used to inform MA or NS
 - QCA second: QCA used to explain findings of MA or NS
3. Sources of underpinning theory?
 - Existing theory
 - Qualitative evidence synthesis
 - Not stated / unclear
4. Reason for using QCA?
 - Heterogeneity expected: pre-planned QCA
 - Heterogeneity discovered: post-hoc QCA as alternative method
 - Heterogeneity identified: reanalysis of existing review

Included reviews:

1. Candy et al. (2013). Using qualitative evidence on patients' views to help understand variation in effectiveness of complex interventions: a qualitative comparative analysis. *Trials*, 14(1), pp.179-179.
2. Brunton et al. (2014). The 'active ingredients' for successful community engagement with disadvantaged expectant and new mothers: a qualitative comparative analysis. *Journal of Advanced Nursing*, 70(12), pp.2847.
3. Kahwati et al. (2016). Using qualitative comparative analysis in a systematic review of a complex intervention. *Systematic Reviews*, 5.
4. Forman-Hoffman et al. (2017). Quality improvement, implementation, and dissemination strategies to improve mental health care for children and adolescents: a systematic review. *Implementation Science*, 12, pp.1-21.
5. Bianchi et al. (2018). Interventions targeting conscious determinants of human behaviour to reduce the demand for meat: a systematic review with qualitative comparative analysis. *The international journal of behavioral nutrition and physical activity*, 15(1), pp.102.
6. Burchett et al. (2018). Lifestyle weight management programmes for children: A systematic review using Qualitative Comparative Analysis to identify critical pathways to effectiveness. *Preventative Medicine*, 106, pp.1-12.
7. Hartmann-Boyce et al. (2018). Grocery store interventions to change food purchasing behaviors: a systematic review of randomized controlled trials. *The American journal of clinical nutrition*, 107(6), pp.1004-1016.
8. Langer et al. (2018). Women in wage labour a systematic review of effects. London: EPPI-Centre, Social Science Research Unit, UCL Institute of Education, University College London.
9. Melendez-Torres et al. (2018). Weight management programmes: Re-analysis of a systematic review to identify pathways to effectiveness. *Health Expectations*, 21(3):574-584.
10. Miller (2018). The quest for the grail: Scaling social impact. *Dissertation Abstracts International*, 79(10-A(E)).
11. Moore et al. (2018). School-based interventions for attention-deficit/hyperactivity disorder: A systematic review with multiple synthesis methods. *Review of Education*, 6(3), pp.209-263.
12. Parrott et al. (2018). Managing Complexity in Evidence Analysis: A Worked Example in Pediatric Weight Management. *Journal of the Academy of Nutrition & Dietetics*, 118(8), pp.1526-1542.e3.
13. Harris et al. (2019). School-based self-management interventions for asthma in children and adolescents: a mixed methods systematic review. *The Cochrane database of systematic reviews*, CD011651.
14. Melendez-Torres et al. (2019). What are the optimal combinations of parenting intervention components to reduce physical child abuse recurrence? Reanalysis of a systematic review using qualitative comparative analysis. *Child Abuse Review*, 28: 181-197.

Discussion: QCA has been employed in diverse ways in systematic reviews. Since QCA has only recently begun to be employed in systematic reviews (the earliest study included in our map was from 2013) it is unsurprising that conventions have not yet established.

QCA has been mostly used in combination with other methods of analysis. Employing QCA in advance of meta-analysis can provide a sound basis for theoretically informed sub-group analysis. When employed after another type of synthesis, QCA can successfully unpack observed heterogeneity. No reviews adopted both approaches - i.e. used QCA to unpack observed heterogeneity in a meta-analysis and then to inform further sub-group analyses.

As QCA is an *abductive* method (i.e. it seeks to identify the simplest and most likely explanation for an *already observed outcome*) the conclusions that may be drawn are less secure than those drawn from *deductive* methods (i.e. where a hypothesis is expressed *before knowing the outcome*). To avoid fishing and arriving at spurious conclusions, a **vital feature of QCA** is that the analysis is supported by existing theory. Most reviews were explicit about how existing theory or theory generated from a qualitative evidence synthesis (QES) was used to support the analysis, two reviews, however, were not.

QCA has largely been employed as a pre-planned approach to examine complex interventions where heterogeneity of outcome is expected. Some systematic reviewers have conducted a re-analysis of an existing review in which heterogeneity remained unexplained. In only a few reviews, researchers decided to employ QCA after they were unable to conduct a satisfactory synthesis using another method because of extensive heterogeneity. Future reviews may expand on these existing approaches and we are likely to see further methodological innovation in this area.

Further work: We will seek to understand how diversity in the application of QCA may affect the findings, e.g. is a QCA undertaken in advance of meta-analysis likely to achieve less coverage (i.e. a less successful explanation of patterns) than one conducted after a meta-analysis? Does a QCA informed by QES in addition to existing theory achieve greater coverage than QCA informed by existing theory alone? We are also developing a quality appraisal tool for QCA - CARU-QCA (Critical Appraisal of Reviews Using QCA) which we aim to publish in the near future.

Diversity in the use of Qualitative Comparative Analysis in systematic reviews: a typology of approaches

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The Department of Health and Social Care Policy Reviews Facility - a collaboration between three centres of excellence