

This is a repository copy of *Cochrane Qualitative and Implementation Methods Group Guidance Paper 3 : Methods for Assessing Evidence on Intervention Implementation*.

White Rose Research Online URL for this paper:

<https://eprints.whiterose.ac.uk/126118/>

Version: Accepted Version

Article:

Cargo, M, Harris, J., Pantoja, Tomas et al. (7 more authors) (2017) Cochrane Qualitative and Implementation Methods Group Guidance Paper 3 : Methods for Assessing Evidence on Intervention Implementation. *Journal of Clinical Epidemiology*. ISSN 0895-4356

<https://doi.org/10.1016/j.jclinepi.2017.11.028>

Reuse

This article is distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivs (CC BY-NC-ND) licence. This licence only allows you to download this work and share it with others as long as you credit the authors, but you can't change the article in any way or use it commercially. More information and the full terms of the licence here: <https://creativecommons.org/licenses/>

Takedown

If you consider content in White Rose Research Online to be in breach of UK law, please notify us by emailing eprints@whiterose.ac.uk including the URL of the record and the reason for the withdrawal request.

Accepted Manuscript

Cochrane Qualitative and Implementation Methods Group Guidance Paper 3:
Methods for Assessing Evidence on Intervention Implementation

Assoc/Prof Margaret Cargo, Dr Janet Harris, Assoc/Prof Tomas Pantoja, Dr Andrew Booth, Prof Angela Harden, Assoc/Prof Karin Hannes, Prof James Thomas, Dr Kate Flemming, Dr Ruth Garside, Prof Jane Noyes

PII: S0895-4356(17)31334-3

DOI: [10.1016/j.jclinepi.2017.11.028](https://doi.org/10.1016/j.jclinepi.2017.11.028)

Reference: JCE 9546

To appear in: *Journal of Clinical Epidemiology*

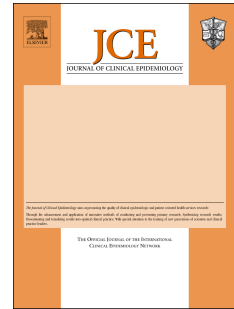
Received Date: 13 May 2016

Revised Date: 2 November 2017

Accepted Date: 9 November 2017

Please cite this article as: Cargo M, Harris J, Pantoja T, Booth A, Harden A, Hannes K, Thomas J, Flemming K, Garside R, Noyes J, Cochrane Qualitative and Implementation Methods Group Guidance Paper 3: Methods for Assessing Evidence on Intervention Implementation, *Journal of Clinical Epidemiology* (2018), doi: 10.1016/j.jclinepi.2017.11.028.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



1 **Title.** Cochrane Qualitative and Implementation Methods Group Guidance Paper 3: Methods for
2 Assessing Evidence on Intervention Implementation

3
4 **Author names and affiliations**

5
6 Assoc/Prof Margaret Cargo^{1,2} (Corresponding author), Dr Janet Harris³, Assoc/Prof Tomas
7 Pantoja⁴, Dr Andrew Booth⁵, Prof Angela Harden⁶, Assoc/Prof Karin Hannes⁷, Prof James
8 Thomas⁸, Dr Kate Flemming⁹, Dr Ruth Garside¹⁰, Prof Jane Noyes¹¹

9
10 ¹Health Research Institute
11 University of Canberra
12 University Drive, 22-B17
13 Email: margaret.cargo@canberra.edu.au

14
15 ²Centre for Population Health University of South Australia
16 8th Floor Office 310, SAHMRI Building (North Terrace)
17 Adelaide, Australia

18
19 ³ School of Health and Related Research (SchARR)
20 University of Sheffield
21 Regent Court, 30 Regent Street
22 Sheffield, UK
23 Email: janet.harris@sheffield.ac.uk

24
25 ⁴ Department of Family Medicine, Faculty of Medicine
26 Pontificia Universidad Católica de Chile
27 Centro Médico San Joaquín, Av. Vicuna Mackenna 4686, Macul
28 Santiago, Chile
29 Email: tpantoja@med.puc.cl

30
31 ⁵ School of Health and Related Research (SchARR)
32 University of Sheffield
33 Regent Court, 30 Regent Street
34 Sheffield, UK
35 Email a.booth@sheffield.ac.uk

36
37 ⁶ Institute for Health and Human Development
38 The University of East London
39 Stratford Campus
40 Water Lane
41 London, UK
42 Email: a.harden@uel.ac.uk

43
44 ⁷Social Research Methodology Group, Centre for Sociological Research
45 Faculty of Social Sciences
46 KU Leuven
47 Leuven, Belgium

48 Email: karin.hannes@kuleuven.be

49

50

51 ⁸ UCL Institute of Education

52 University College London

53 20 Bedford Way

54 London, UK

55 Email: james.thomas@ucl.ac.uk

56

57 ⁹ Department of Health Sciences,

58 Faculty of Science, University of York

59 Seebohm Rowntree Building

60 Heslington

61 York, UK

62 Email: kate.flemming@york.ac.uk

63

64 ¹⁰ European Centre for Environment & Human Health

65 University of Exeter Medical School

66 Knowledge Spa, Royal Cornwall Hospital

67 Truro, Cornwall, UK

68 Email: r.garside@exeter.ac.uk

69

70 ¹¹ School of Social Sciences

71 Bangor University

72 Bangor

73 Gwynedd, UK

74 Email: jane.noyes@bangor.ac.uk

75

76

77

78 **Abstract**

79 Objective: This article provides reviewers with guidance on methods for identifying and
80 processing evidence to understand intervention implementation. Study Design and Setting:
81 Strategies, tools and methods are applied to the systematic review process to illustrate how
82 process and implementation can be addressed using quantitative, qualitative and other
83 sources of evidence (i.e., descriptive textual, non-empirical). Results: Reviewers can take
84 steps to navigate the heterogeneity and level of uncertainty present in the concepts,
85 measures and methods used to assess implementation. Activities can be undertaken in
86 advance of a Cochrane quantitative review to develop program theory and logic models that
87 situate implementation in the causal chain. Four search strategies are offered to retrieve
88 process and implementation evidence. Recommendations are made for addressing rigour or
89 risk of bias in process evaluation or implementation evidence. Strategies are recommended
90 for locating and extracting data from primary studies. The basic logic is presented to assist
91 reviewers to make initial review level judgements about implementation failure and theory
92 failure. Conclusion: Although strategies, tools and methods can assist reviewers to address
93 process and implementation using quantitative, qualitative and other forms of evidence,
94 few exemplar reviews exist. There is a need for further methodological development and
95 trialling of proposed approaches.

96 **Running Title:** Methods for Assessing Evidence on Intervention Implementation

97 **Keywords:** Systematic reviews, process evaluation, implementation, Cochrane, qualitative
98 evidence synthesis; mixed-method synthesis

99 **Funding sources**

100 This research did not receive any specific grant from funding agencies in the public,
101 commercial, or not-for-profit sectors.

102

103

Key findings:

Strategies, tools and methods are available to support reviewers to address process and implementation using qualitative and process evaluation evidence and other evidence from quantitative studies included in Cochrane reviews.

What this paper adds to what was known?

Cochrane quantitative reviews of interventions should include steps to identify, synthesise and then integrate evidence to address reach, dose, fidelity, co-intervention, contamination and the role of contextual factors on implementation.

What is the implication and what should change now?

Cochrane quantitative reviews use risk of bias tools to rule out evaluation failure. This guidance suggests that systematic reviewers use complementary tools to make informed judgements about implementation failure and theory failure to strengthen internal validity and enhance the uptake of review findings by decision-makers.

104

105

106 In 2013, the Cochrane Qualitative and Implementation Methods Group (CQIMG) expanded

107 its remit to include issues related to assessing implementation in systematic reviews of

108 interventions. The CQIMG focus on implementation complements the scope of work of the

109 Cochrane Effective Practice and Organisation of Care Group which undertakes systematic

110 reviews of educational, behavioural, financial, regulatory and organisational interventions

111 designed to improve health professional practice and the organisation of health care

112 services.

113 Implementation, conceptualized as a planned and deliberately initiated effort with the

114 intention to put an intervention into practice (1), occupies the space between the 'blueprint

115 for the intervention' (i.e., assumptions articulating how and why an intervention is supposed

116 to work) and the 'outcomes observed in practice'. Process evaluation investigates the

117 activities and internal dynamics of an intervention during its implementation to determine

118 how well an intervention operates (2, 3). This article provides reviewers with guidance on

119 how to approach process and implementation in a Cochrane quantitative review of the

120 effects of an intervention. Some of the issues discussed are relevant for both qualitative
121 and quantitative reviews. This paper should be read in conjunction with the articles in this
122 series about question formulation (4), evidence-appropriate methods for qualitative
123 synthesis of evidence on implementation(5) and methods for integrating findings from
124 qualitative syntheses with intervention effectiveness reviews (6), as it provides complementary
125 information on how to refine implementation questions, retrieve process evaluation
126 evaluations or implementation data and rule out implementation failure and theory failure
127 when integrating the findings from qualitative syntheses with intervention effectiveness
128 reviews.

129 **Why is implementation important?**

130 Too often quantitative reviews assess intervention outcomes (i.e., does it work) without
131 considering how the process of implementation influences observed outcomes. In these
132 reviews, causal inferences can be undermined from limitations in the design, data collection
133 and analysis of primary studies and lead to an under- or overestimation of the true
134 intervention effect. To assess the internal validity of primary quantitative studies, review
135 authors apply risk of bias tools to make judgements about a number of methodological
136 biases (i.e., selection, performance, detection, attrition, reporting) (7). Assessing risk of bias
137 can rule out evaluation failure due to methodological biases that compromise internal
138 validity (2). Although risk of bias is necessary to assess the strength of causal inferences in
139 determining whether interventions are successful, it is not sufficient. Reviewers additionally
140 need to establish the presence of a functional relationship between intervention
141 implementation (i.e., independent variable) and a change in the outcome (i.e., dependent
142 variable). To draw valid conclusions both need to be defined and evaluated. At a practical
143 level information needs to be extracted from each primary study to inform a judgement
144 about the integrity of implementation, and to examine whether specified procedures in the
145 primary studies were implemented as outlined in the intervention protocols.

146 Formal evaluation of implementation in a process evaluation enables reviewers to
147 determine whether key implementation outputs were achieved (8). Synthesising this
148 information across primary studies can enhance the internal validity of systematic reviews
149 by ruling out implementation failure and theory failure and provide decision-makers with
150 insights into the conditions needed to generate positive outcomes in the target population

151 (8). Implementation failure is suspect when the lack of expected outcomes is attributed to
152 poor implementation practices. Theory failure is suspect when intervention activities are
153 implemented according to the specified standards, guidelines or intervention design
154 strategy but expected outcomes are not observed. This suggests that the theory, logic or set
155 of assumptions that specify how the intervention was expected to bring about change was
156 incorrect (9). It is additionally important to consider the important role of contextual factors
157 as interventions can be implemented and received differently in different contexts (10).
158 Moreover, an unfavourable context can have a significant impact on the feasibility to
159 implement or scale-up an intervention (11).

160 The example in Box 1 illustrates how the behavioural effects of a school-based program for
161 children are influenced by implementation.

Box 1: Example highlighting the importance of accounting for implementation in quantitative reviews of interventions.

Aspects of implementation were accounted for in a systematic review that assessed the effects of universal school-based social information processing interventions on the aggressive and disruptive behaviour of school-age children(12). Studies reporting problems with program implementation produced smaller effect sizes compared to those not reporting such problems. Moreover, programs delivering more frequent treatment sessions per week were more effective than programs delivered less frequently. Review authors hypothesise that the cognitive skills emphasised by these types of programs may be hard to master and that more frequent delivery provides children with more opportunities for practice and reinforcement. These measures of implementation provide decision-makers with useful information on the conditions under which social information programs are more likely to reduce aggressive and disruptive behaviour in children.

162

163 **What aspects of implementation are assessed and how?**

164 Assessing implementation is a crucial component in the systematic reviews of quantitative
165 health and social care interventions. Lack of information on intervention implementation

166 weakens internal validity and inhibits the translation and uptake of evidence by decision-
167 makers to inform policy and practice. Aspects of implementation can be quantitatively
168 assessed in different types of studies. These studies include randomised trials which answer
169 questions pertaining to “*Can this intervention work in highly controlled or ideal conditions?*”
170 positioned at the explanatory end of the pragmatic-explanatory spectrum (10) (i.e.,
171 ‘*efficacy*’ studies) and “*Does this intervention work in real world or usual care conditions?*”
172 positioned at the pragmatic end of the pragmatic-explanatory spectrum (i.e., ‘*effectiveness*’
173 studies). Dissemination studies evaluate how the targeted distribution of intervention
174 materials to a specific audience can be successfully implemented so the increased spread of
175 knowledge about the evidence-based achieves greater use and impact of the evidence-
176 based interventions(13). Implementation studies evaluate how a specific set of activities and
177 designed strategies are used to successfully integrate and sustain an evidence-based
178 interventions within specific settings (13). Scale-up studies evaluate deliberate efforts to
179 increase the impact of evidence-based interventions to benefit more people and to foster
180 policy and program development on as lasting basis(13). Policy analysis, which involves
181 identifying the possible policy options to address a health and social care problem and then
182 using the appropriate methods to determine the most effective, feasible and efficient
183 option, is featured in dissemination, implementation and scale-up studies. In addition, it is
184 increasingly common that qualitative ‘sibling’ studies and mixed-method process
185 evaluations are undertaken alongside a trial, which can be synthesised to better understand
186 the political and operational factors associated with the implementation of health policy,
187 health systems, behavioural, environmental or clinical interventions. A synthesis of
188 qualitative studies that are unrelated to trials can also be helpful in understanding the
189 factors that affect intervention implementation (14, 15).

190

191 Process evaluations focus on one or more aspects of implementation, including reach, dose
192 delivered, dose received, fidelity, adaptation, intervention quality, recruitment, provider
193 engagement, participant engagement and contamination, co-intervention. Contamination
194 and co-intervention are commonly included in risk of bias assessments (10, 16, 17). Table 1
195 provides definitions for these terms with example quantitative indicators and qualitative
196 questions. At a minimum, it is recommended that a process evaluation includes information
197 on reach, dose delivered/ received, fidelity and co-intervention, contamination (17) and

198 supplementary information on contextual factors (10, 17, 18). Including the latter in
199 process evaluation aligns with the growing body of literature on complex interventions
200 which recognises that intervention outcomes and implementation are highly influenced by
201 contextual factors (1). The specific measures used to assess implementation in
202 interventions will vary depending on whether reviews include efficacy, effectiveness,
203 dissemination, implementation, policy or scale-up studies. The reason for this is that
204 implementation is defined relative to the intervention content and as studies move from
205 bench to bedside to population, the concepts of reach, dose and fidelity pertain to different
206 aspects of the health and social care system. In complex reviews it is possible that these
207 concepts may be assessed at two levels of the system (e.g., extent to which patients adhere
208 to a treatment and the extent to which clinicians adhere to practice guidelines). In this
209 regard, Harris (4) provides strategies for reviewers to apply in formulating review questions
210 for complex interventions, which may include those with multiple implementation chains.
211 We recommend review authors consider these dimensions as minimum requirements for
212 inclusion in systematic reviews, and further consider reach, dose delivered/ received,
213 fidelity and co-intervention, contamination as 'Other sources of bias' in the Cochrane 'Risk
214 of bias' tool (7). When process evaluations in quantitative reviews are lacking, or results do
215 not adequately address decision-makers concerns and qualitative perspectives on
216 implementation are sought (Table 1) we recommend review authors collaborate with
217 qualitative review teams to meet these minimum requirements (19).

218

219 **Context-dependence of implementation**

220 As a process, implementation is context-dependent and concerns the actions required to
221 put an 'intervention blueprint' into practice (10). Context includes the immediate
222 environment in which an intervention is implemented and broader environment that shapes
223 the resources, political support and norms influencing engagement of the target audience
224 (e.g., patients, practitioners). It can be difficult for reviewers to grasp these dimensions of
225 implementation and locate them in a process evaluation. The UK Medical Research Council
226 (MRC) Guidance on process evaluation of complex interventions provides a framework that
227 links context, with the intervention description, implementation and the mechanisms of
228 impact on outcomes (10). The framework in Figure 1 situates an intervention and its
229 designated target populations in relation to the immediate and broader contexts within
230 which the intervention is planned, implemented and evaluated (20). It can be used in
231 conjunction with the MRC framework to help reviewers frame implementation in a formal
232 logic model within their Cochrane review of quantitative interventions. The red line drawn
233 around the intervention, target populations and program implementation boxes in Figure 1
234 visually depicts how resources and the external environment in addition to factors internal
235 to the program environment (i.e., action model), are instrumental to shaping
236 implementation. Box 2 illustrates how intervention outcomes can vary according to
237 contextual factors.

Box 2: Example of contextual factors influencing program outcomes

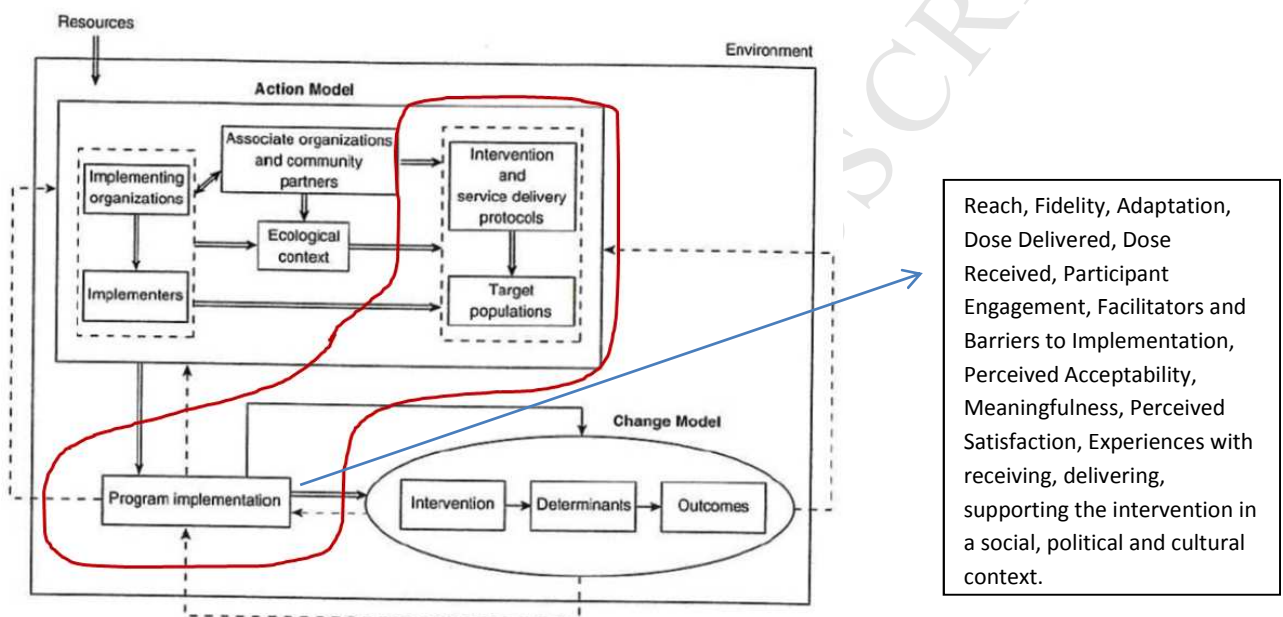
A meta-analysis of school-based programs to reduce bullying and victimisation found the impacts of these programs to vary by country of implementation (21). The programs worked better in Norway specifically and Europe more generally as compared to North America. The review authors posit that Scandinavian schools have a tradition of state intervention in social welfare and that the program context (i.e., high quality schools with small classes and well-trained teachers) may also contribute to the observed differences in outcomes.

238

239 Intervention delivery and service delivery protocols specify the nature, content and
240 activities of an intervention, including its operating procedures, and the particular steps that

241 need to be taken to implement the intervention(20). This is the ‘blueprint for the
 242 intervention’. What is implemented and how it is implemented to reach its designated
 243 target populations is documented through process evaluation. Implementation can be
 244 measured quantitatively through self-report surveys, structured observations, and
 245 secondary analysis of routine monitoring data or qualitatively through focus groups,
 246 individual interviews, unstructured observations (10) and open-ended survey questions.

247 Figure 1. Conceptual Framework to Situate Implementation in Relation to Context



248

249 Source: Chen H-T. Practical Program Evaluation. Thousand Oaks, CA: Sage Publications, 2005.
 250 Reprinted with permission from Sage Publications.

251 Steps of the Systematic Review Process

252 Increasingly, review authors of both quantitative and qualitative reviews are being called to
 253 address issues relevant to context and implementation to make the findings more
 254 applicable to decision-makers. We used the steps of the review process to illustrate how
 255 qualitative and other sources of evidence on implementation can be synthesised and then
 256 integrated with evidence of effect.

257 Step 1 - Framing the Problem and Refining Implementation Questions

258 The first step in a quantitative systematic review frames the problem and identifies which
 259 aspects of implementation are relevant. Framing the problem is driven by a number of

260 factors including the state of knowledge on a review topic, level of resourcing, timeframe,
 261 expertise, stakeholder input, and expectations from the review commissioners. Knowing
 262 where to start can be challenging for review authors especially if one or more of the
 263 following conditions is present: (a) there is considerable heterogeneity in the interventions
 264 considered for a review; (b) there is little understanding of how interventions work to
 265 produce outcomes for the population or context(s) of interest; (c) aspects of
 266 implementation are not clearly understood, are poorly defined or the evidence needed to
 267 address implementation cannot be clearly specified; (d) it is not clear how to frame the
 268 review question from an implementation perspective; or (e) stakeholders raise questions
 269 that are pertinent to implementation, and it is not clear how to address them. If one or
 270 more of these situations is apparent, we recommend a scoping review or other review
 271 activity with an implementation focus be undertaken, as outlined in Table 2, to help define
 272 or refine implementation issues and questions of interest (22) and inform a subsequent
 273 Cochrane systematic review of interventions. These methods align with current systematic
 274 review practices and guidance to formulate review questions that are inclusive of process
 275 and implementation issues (23, 24). Brief descriptions of the methods are provided in
 276 Appendix 1, available online as supplementary material (www.iclinepi.com).

277 Table 2: Strategies, methods and tools to help refine the questions and scope of a Cochrane
 278 effectiveness review.

Issue or circumstance	Review activity	Tools to assist	Product
When a broad range of interventions have been implemented to address a health issue.	Critical Review (25) Textual Narrative Synthesis(26)	Principles of simple, complicated and complex interventions (27); Template for Intervention	Classification of interventions; identification of program theory, logic model, implementation measures/ processes.
Lack of clarity in implementation concepts, definitions, measures or methods for a review.	Scoping Review [13] Concept Analysis(29)	Description and Replication (TiDIER) (28); Logic model template to situate implementation(23)	Implementation definitions for an effectiveness review; implementation concepts to assess in a qualitative synthesis.
An intervention model or framework for an effectiveness review requires adaptation to another topic or context.	Best-fit framework (30)	Logic model template to situate implementation(23)	Framework to guide the review with implementation situated in the framework.
Poor understanding of	Grounded Theory,	Logic model	Program theory and

program theory and how implementation relates to outcomes; review resources are available.	Realist Synthesis, Meta-Ethnography, Meta-Interpretation (24)	template to situate implementation (23)	logic model with implementation concepts and indicators identified.
As above, but review resources are not available.	Program theory mapping workshop	Logic model template; 'how-to' resources (27); engage consultant.	Program theory and logic model with implementation concepts identified.

279 Following Harris (4) and the Evidence for Policy and Practice Information and Co-ordinating
 280 Centre (EPPI-Centre)(31, 32), we recommend that reviewers engage stakeholders in the
 281 preparatory stage to ensure that the review scope is appropriate and resulting products
 282 address the implementation inquiry questions and concerns of decision-makers. These
 283 review activities will increase the internal validity of constructs, measures and methods
 284 used in a quantitative review which can reduce the likelihood of evaluation failure and
 285 strengthen the basis for making judgements that rule out implementation and theory
 286 failure.

287 **Step 2 - Searching**

288 As shown in Table 1, a search for the following types of evidence may potentially help with
 289 understanding intervention implementation:

- 290 • 'Implementation evidence' from quantitative studies (e.g. RCTs included in the effect
 291 review) on dose and reach etc.
- 292 • 'Process evaluation evidence' - qualitative and quantitative evidence from process
 293 evaluations conducted alongside trials
- 294 • 'Trial sibling qualitative studies' – conducted alongside trials
- 295 • 'Unrelated qualitative studies' – with no relationship to trials
- 296 • Economic evaluations – conducted alongside trials

297
 298 Retrieval of process evaluations and implementation evidence of all types is problematic for
 299 at least three reasons. First, process evaluations may not exist. Second, when they do exist,
 300 they may not be clearly identifiable in terms of key terms for their retrieval. Third, process
 301 evaluations may not be published in the peer reviewed literature (33) and, therefore, carry
 302 the challenges associated with retrieving grey or fugitive literature (34). The CQIMG has
 303 identified four potential approaches to identify process evaluations in a systematic review
 304 (35). The approach that is used will be determined by factors such as the review purpose,
 305 time and resource constraints and the perceived risk of how deficiencies in the search

306 process will impact upon the uncertainty of the review results. The first approach for
307 retrieving process evaluations is to transfer identification from the search process to the sift
308 process. This involves conducting a sensitive topic search without any publication
309 restrictions (36). The review team works its way systematically through the titles and
310 abstracts of retrieved references looking for indications of process data by using the
311 dimensions highlighted in Table 1. This approach is feasible when a review question involves
312 multiple publication types e.g. RCT, qualitative research and economic evaluations, which
313 are not being searched for separately. The second approach retrieves process evaluations
314 within randomised control trials for which the Cochrane has developed a highly sensitive
315 search strategy (filter) (37). If a process evaluation has been published in a journal article
316 and mentions the trial in the abstract, this method proves effective. The third option is to
317 use unevaluated filter terms to retrieve process evaluations or implementation data.
318 Approaches using strings of terms associated with the study type or purpose is considered
319 experimental. There is a need to develop and test such filters. It is likely that such filters
320 may be derived from the study type (process evaluation), the data type (process data) or the
321 application (implementation). The last of these is likely to prove problematic because a
322 study can describe implementation without necessarily using the word “implementation”
323 (38). The fourth approach relies on citations-based approaches. We have proposed the
324 identification of ‘clusters’ containing all accounts, published or unpublished, of a particular
325 study (39). These can offer additional contextual detail but, importantly in this context, may
326 provide implementation or process data (40).

327 At present, the CQIMG suggests that review teams either use methods 2 and 3 in
328 conjunction with 4, most likely in a Cochrane setting, or use method 1 in conjunction with 4
329 for a wider health technology assessment type ‘multi-review’ (35). Guidance on searching
330 for trials can be found in the Cochrane Handbook (37) and paper 2 in this series outlines
331 principles for searching for qualitative studies (5).

332 **Step 3 - Data Extraction**

333 To extract relevant information on implementation from primary studies it is crucial to have
334 a detailed understanding of the intervention because implementation measures (e.g.,
335 fidelity, dose) and the barriers and facilitators experienced during implementation can

336 pertain to different aspects of complex interventions (10, 17). We therefore recommend
337 use of the 10-dimension Complexity Assessment Tool for Systematic Reviews (iCAT-SR) to
338 assist with classifying and grouping interventions (41). For quantitative intervention
339 reviews, this can inform sub-group or sensitivity analyses, and aid in developing logic models
340 and identifying causal pathways that explicitly feature implementation (Lewin,
341 forthcoming). For qualitative evidence syntheses, the ICAT-SR may facilitate comparisons of
342 staff experiences with implementation or the construction of implementation chains for
343 different types of programs, enhancing the theoretical and interpretive validity of the
344 review.

345 A review of 27 systematic reviews of interventions uncovered several issues impacting the
346 extraction of information on implementation from primary studies (42). Process evaluation
347 terms are not always defined and reviewers may find aspects of implementation described
348 (i.e., ‘the evaluation assessed whether the intervention was implemented as intended’) but
349 not linked to a specific definition (i.e., fidelity). Terms or definitions are not located in the
350 methods section which is where review authors might expect to find them; sometimes they
351 appear in the discussion section. Aspects of implementation are defined in ways that
352 deviate from commonly accepted definitions. For example, studies can define intervention
353 ‘quality’ as the intervention being delivered as intended, which is the definition commonly
354 used for fidelity (43). Like the intervention, information on program operations
355 (‘implementation’) is often descriptive (i.e, textual) and not empirical and can appear in the
356 background and methods section of a primary outcome evaluation paper, or in a non-
357 empirical ‘sibling’ study. Additionally, authors often provide reflections on implementation
358 in the discussion section. To counteract some of these limitations, following the techniques
359 used in Intervention Component Analysis (44) we recommend that descriptive information
360 and author reflections on the experience of implementing the intervention are used from
361 trial and ‘sibling’ reports and further, that corresponding authors be contacted for specific
362 information on implementation. Such information strengthens the descriptive validity of
363 qualitative and quantitative reviews. We also recommend that review authors develop a
364 glossary of terms and definitions supported by existing resources such as the Oxford
365 Implementation Index (45), Checklist for Implementation (42) and the MRC Guidance on
366 process evaluation of complex intervention (10) to reduce the likelihood of conceptual

367 slippage and inconsistent interpretation of measures of events between studies. For
368 systematic reviews, this can guide the consistent extraction of information across studies.
369 For a qualitative evidence synthesis, a common set of understandings of key
370 implementation terms and processes can facilitate comparisons of experiences between
371 studies which, again, can enhance theoretical and interpretive validity.

372 **Step 4 – Assessing Rigour and Risk of Bias in the process evaluation or intervention** 373 **implementation evidence**

374 Review authors should determine if the absence of a favourable intervention effect within
375 primary studies and at the review level is due to problems with implementation (i.e.,
376 implementation failure) or a poorly conceptualised intervention (i.e., theory failure). Few
377 assessment tools for primary studies or reviews explicitly address the rigour or risk of bias in
378 process evaluation or implementation evidence. Table 1 in Noyes et al (this series (5))
379 reports comparable terms (such as risk of bias and rigour) to describe similar domains across
380 quantitative and qualitative research. Building on previous recommendations(46), we
381 provide recommendations for assessing the rigour/risk of bias of process and
382 implementation in primary studies and reviews.

383
384 The literature was systematically searched to retrieve tools to critically appraise process and
385 implementation. This entailed keyword searches of PubMed MEDLINE, the ISI Web of
386 Science, the worldwide web, Google Scholar, the webpages of systematic review centres/
387 collaborations and perusing the reference lists of relevant documents. This search was
388 initially conducted in 2009(47) and updated periodically through CQIMG-affiliated work.
389 One assessment tool specific to process evaluation was located. This 8-item tool developed
390 by the EPPI-Centre is flexible and can be applied to qualitative, quantitative and mixed-
391 method primary studies (48, 49). Six questions tap rigour related to sampling, data
392 collection, data analysis, interpretation, breadth/scope of findings, and whether the study
393 privileges the perspective of the target group. The last two items assess the reliability and
394 usefulness of the findings. The question on usefulness (*'how well the intervention processes*
395 *were described and whether or not the process data could illuminate why or how the*
396 *interventions worked or did not work'*) offers insight into process mechanisms. Ideally
397 process evaluation should gather both qualitative and quantitative information. Qualitative

398 data is particularly important to understand how features of context influence
399 implementation and issues related to acceptability, meaningfulness and generalisability of
400 the intervention. As outlined below, we recommend this 8-item tool supplement existing
401 critical appraisal tools for primary qualitative and quantitative studies. Given that existing
402 critical appraisal tools for systematic reviews do not address process evaluation and
403 following recent guidance on the process evaluation of complex interventions(10) we
404 recommend that questions be developed to supplement these tools.

405

406 For qualitative primary studies we recommend the 8-item process evaluation tool (49) be
407 used in conjunction with a qualitative critical appraisal tool such as the Evaluation Tool for
408 Qualitative Studies (ETQS)(50). The ETQS was the only tool of three qualitative tools
409 reviewed to cover all forms of validity (i.e., descriptive, theoretical, evaluative, interpretive,
410 generalisability)(51) and it additionally enquires into study context, specifically setting
411 factors and the sampling of events, persons, times and settings both of which are important
412 to understanding implementation. While the process evaluation specific tool captures rigour
413 relevant to implementation, the ETQS captures rigour relevant to qualitative validity
414 (credibility and transferability). These tools should be used in addition to tools to assess
415 methodological strengths and limitations that feed into CERQual assessments of confidence
416 in synthesised qualitative findings (52).

417 Assessment tools for quantitative primary studies do not address dimensions of process
418 evaluation other than contamination, co-intervention, and participation. The Effective Public
419 Health Practice Project Quality Assessment Tool (EPHPP) (53) is the only tool that asks a
420 question on fidelity, operationalised as consistency of implementation. Overall integrity is
421 judged by responses to three questions on fidelity, contamination/ co-intervention and
422 percentage of participants receiving the allocated intervention. The Cochrane Risk of Bias
423 Tool (CRBT) was introduced to establish consistency and avoid discrepancies in the
424 assessment of methodological strengths and limitations. Considering that Cochrane
425 reviewers are required to use the CRBT we recommend its use be supplemented with the 8-
426 item process evaluation assessment tool (49). This tool is flexible and allows Cochrane
427 reviewers to make an assessment of the methodological strengths and limitations of an

428 embedded or sibling process evaluation study that includes one or more of the dimensions
429 in Table 1 using quantitative, qualitative or mixed methods

430 **Step 5 – Analysis, Synthesis and Interpreting the Evidence with an Implementation Lens**

431 Papers 2(5) and 4(6) in the series provide an overview of evidence-appropriate methods for
432 synthesis of evidence on implementation, and paper 4 outlines methods for integrating
433 qualitative and process evaluation evidence with evidence of intervention effect.

434 At the final stage, evidence from the qualitative and quantitative reviews need to be
435 brought together to inform a judgement about ‘implementation success or failure’ and
436 ‘theory success or failure’ (either partial or complete) at the integrated review level. At
437 present no Cochrane reviews of interventions formally do this, however, information, in
438 some reviews allows for less formal retrospective or ad-hoc judgements of theory failure
439 and implementation failure (Box 3).

Box 3: Ruling out implementation failure and theory failure

Petrosino et al (54) reviewed the effects of programs comprised of organised visits to prisons by juvenile delinquents or pre-delinquents to deter them from delinquency (‘Scared Straight’). The meta-analysis found the organised prison visits to be more harmful than doing nothing. Problems with implementation were considered as a potential source of bias. All included studies were considered low risk of bias as no investigator reported problems with implementation. Since the programs were implemented with fidelity, the harmful effect suggests fault in the program’s logic that exposing at-risk juveniles to prison life would deter delinquency. The authors posit peer contagion theory as a potential explanation for the observed effect; the potential intervention benefit was offset by deviant youth interacting with each other in a group setting. This alternate causal pathway could be explored in a qualitative evidence synthesis.

440

441 We argue that reviews need to be designed at the problem description stage to address this,
442 specifically by generating a program theory or logic model that depicts implementation
443 outputs or measures captured quantitatively, or core processes captured qualitatively. The

444 basic logic for informing such judgements is outlined in Figure 2a-c. Implementation failure
445 and theory failure do not operate in isolation. To determine whether theory failure is
446 suspect in interpreting the overall intervention effect of a primary study, it is necessary to
447 first rule out implementation failure. If a review does not systematically extract qualitative
448 and/or quantitative evidence on implementation and finds that the primary outcome did
449 not favour the treatment condition, reviewers do not have a basis for determining, at the
450 interpretation stage, whether the intervention design was deficient (theory failure) or
451 whether the outcome was marred due to implementation problems (implementation
452 failure). This compromises the overall internal and external validity of the review. The
453 example in Box 3 additionally highlights the need to assess implementation in order to be
454 able to make a judgement about underlying program theory.

455 The activities in Table 2 increase the chance that reviews are guided by plausible and
456 testable program theory. The MRC Process Evaluation Framework(10) and the framework
457 outlined in Figure 1 provides reviewers with the conceptual building blocks to develop
458 program theory. For any given review, program theory visually depicted in a logic model
459 acts as a 'coat rack' of sorts to hang the most appropriate measures and methods to capture
460 the uniqueness of intervention contexts in primary studies. Hence, context becomes
461 'reproducible' by virtue of the conceptual frameworks, methods, measures and tools used
462 to construct the logic that guide reviews. The synthesis methods described in papers 2(5)
463 and 4(6) in the series provide insight into differential intervention effects, context by
464 implementation interactions and inform judgements about partial or complete breakdowns
465 in implementation. Methodological work is required to inform review level judgements of
466 implementation and theory failure, whether partial or complete.

467 Figure 2a-c¹. Depictions of implementation and theory failure

Implementation failure is ‘diagnosed’ by determining whether intervention activities produce the requisite operation outputs, depicted as the first intervening variable in Figure 2a. These outputs pertain to key implementation measures (e.g., dose delivered, reach, fidelity) and processes. If these outputs are not achieved the causal pathway has been disrupted and we wouldn’t expect to see a change in the short-term goal or bridging variable, or the primary outcome.

Figure 2a. Implementation Failure



Theory failure is suspect when a process evaluation shows that an intervention achieved its key operation outputs (i.e., intervention implemented with integrity) but not its short-term goal (e.g., increase in physical activity), depicted as the intervening bridging variable in Figure 2b.

Figure 2b. Theory Failure (Case 1)



Theory failure is also suspect when an intervention achieves its operation outputs (i.e., implementation integrity) and short-term goal (e.g., increase in physical activity) but the short-term goal or bridging variable doesn’t translate to a change in the primary outcome (e.g., body mass index) (Figure 2c).

Figure 2c. Theory Failure (Case 2)



468 ¹Adapted from (9)

Conclusions

Assessing implementation in Cochrane systematic reviews of interventions is challenging for a number of reasons, including, but not limited to, poor reporting of intervention and implementation in primary studies, knowing the starting point to address implementation on a given topic, and pressures to accommodate knowledge translation concerns of research consumers despite reporting and review resource limitations. Depending on the review objectives, synthesis of evidence on implementation can add interpretive value to Cochrane reviews and the decision-makers who use them. This paper provides guidance for reviewers to navigate the heterogeneity and uncertainty that they are confronted with at different stages of the review process.

Table 1: Definitions of key dimensions of implementation with corresponding examples of quantitative indicators and qualitative questions.

Dimension	Quantitative	Qualitative
Dose Delivered: Amount of a program delivered to participants (i.e., frequency, duration, intensity) by staff and/or implementing agency.	<ul style="list-style-type: none"> • Total # contact hours • # water fountains installed 	<ul style="list-style-type: none"> • How did participants feel about the format and time commitment of the program?
Dose Received: Characteristic of the target population's utilisation or interaction with program strategies or resources ('active participation').	<ul style="list-style-type: none"> • Dosage of medicine ingested • # people drinking water from fountain 	<ul style="list-style-type: none"> • What factors influenced whether clients read the take home educational materials?
Reach: Degree to which target group participates by their presence.	<ul style="list-style-type: none"> • # of patients served by eligible clinics 	<ul style="list-style-type: none"> • What motivated clients to attend the clinic?
Recruitment: Specific information on procedures used to recruit or attract participants to the intervention.	<ul style="list-style-type: none"> • % of clients recruited by type of recruitment strategy 	<ul style="list-style-type: none"> • How did participants feel about the methods used to recruit them?
Fidelity: Reflects implementation integrity, adherence, extent to which a program is implemented as intended.	<ul style="list-style-type: none"> • % of activities critical to behaviour change completed 	<ul style="list-style-type: none"> • What factors enabled clinical staff to adhere to practice guidelines?
Adaptation: Whether aspects of a program were intentionally changed during delivery to enhance outcomes.	<ul style="list-style-type: none"> • % of activities that changed during intervention period 	<ul style="list-style-type: none"> • What factors influenced staff adaptation of intervention activities?
Co-intervention: When interventions other than the treatment are applied differently to intervention conditions.	<ul style="list-style-type: none"> • % of control group participants getting other treatments 	<ul style="list-style-type: none"> • Why did participants engage in other activities related to the outcome?
Contamination: Unintentional delivery of intervention to the control group or inadvertent failure to deliver intervention to experimental group.	<ul style="list-style-type: none"> • % of control group participants exposed to the treatment 	<ul style="list-style-type: none"> • How did the control group come to receive the treatment?
Participant Engagement: Participant's interaction with or receptivity to a program i.e., what they think or how they feel about the intervention	<ul style="list-style-type: none"> • On a scale of 1 to 5, rate the extent to which the program met your needs 	<ul style="list-style-type: none"> • Was the program culturally appropriate and acceptable to clients?
Implementer Engagement: Subjective	<ul style="list-style-type: none"> • On a scale of 1 to 5, 	<ul style="list-style-type: none"> • How would you

staff attributes that influence program delivery i.e., what they think/ feel about the intervention and their interpersonal style.	rate your level of enthusiasm to use the practice guidelines	characterise your motivations and interests to implement the practice guidelines?
Intervention Quality: Quality of intervention materials/ resources (e.g., curriculum, training, policy).	<ul style="list-style-type: none"> On a scale of 1 – 5 rate the quality of the training 	<ul style="list-style-type: none"> Please comment on the training materials and facilitation of the training
Context: Social, built and political factors internal (e.g., partnerships) and external to the intervention environment (e.g., social norms) that shape implementation.	<ul style="list-style-type: none"> On a scale of 1 – 5, to what extent did community agencies support the intervention? 	<ul style="list-style-type: none"> In what ways did community agencies support the health service to deliver the intervention?

1. Pfadenhauer LM, Mozygemba K, Gerhardus A, Hofmann B, Booth A, Lysdahl KB, et al. Context and implementation: A concept analysis towards conceptual maturity. *Zeitschrift fur Evidenz, Fortbildung und Qualitat im Gesundheitswesen*. 2015;109(2):103-14.
2. Rossi PH, Lipsey, M.W., Freeman, H.E. *Evaluation. A Systematic Approach*. Seventh ed. Thousand Oaks: Sage Publications; 2004.
3. Patton MQ. *Qualitative Research & Evaluation Methods: Integrating Theory and Practice*. Los Angeles: Sage; 2015. 805 p.
4. Harris J, Booth, A, Cargo, M, Hannes K, Harden A, Flemming K, Garside R, Pantoja T, Thomas J, Noyes J. Cochrane Qualitative and Implementation Methods Group Guidance Paper 1: Methods for question formulation, identifying and processing evidence on intervention. *Journal of Clinical Epidemiology*. forthcoming.
5. Noyes J, Booth A, Flemming K., Garside R, Lewin S, Harden A, Pantoja T, Hannes K, Cargo M, Thomas J. Cochrane Qualitative and Implementation Methods Group Guidance Paper 2: Methods for assessing methodological limitations, data extraction and synthesis, and confidence in synthesized qualitative findings. *Journal of Clinical Epidemiology*. forthcoming.
6. Harden A, Thomas, J, Cargo, M, Harris J, Pantoja, T, Flemming K, Booth A, Garside R, Hannes K, Noyes J. Cochrane Qualitative and Implementation Methods Group Guidance Paper 4: Methods for integrating findings from syntheses of qualitative and process evaluation evidence within intervention effectiveness reviews. *Journal of Clinical Epidemiology*. forthcoming.
7. Higgins JP, Altman DG, Gotzsche PC, Juni P, Moher D, Oxman AD, et al. The Cochrane Collaboration's tool for assessing risk of bias in randomised trials. *BMJ*. 2011;343:d5928.
8. Dane AV, Schneider BH. Program integrity in primary and early secondary prevention: Are implementation effects out of control? *Clinical Psychology Review*. 1998 18(1):23-45.
9. Weiss CH. *Evaluation Research. Methods of Assessing Program Effectiveness*. Smelser HCN, editor. Englewood Cliffs, New Jersey: Prentice-Hall; 1972.
10. Moore G, Audrey S, Barker M, Lyndal B, Bonell C, Hardeman W, Moore L, O'Cathain A, Tinati T, Wight D, Baird J. *Process Evaluation of Complex Interventions*. UK Medical Research Council (MRC) Guidance.; 2015.
11. Milat A, Newson R, King L, Rissel C, Wolfenden L, Bauman A, Redman S, Giffin M. A guide to scaling up population health interventions. *Public Health Research & Practice*. 2016;26(1).
12. Wilson SJ, Lipsey MW. The effects of school-based social information processing interventions on aggressive behavior: Part I: Universal programs. *Campbell Systematic Reviews*2006.
13. Schillinger D. An introduction to effectiveness, dissemination and implementation research. A resource manual for communitiy-engaged research. University of California San Francisco Clinical and Translational Science Institute (CTSI) Community Engagement Program; 2010.
14. Noyes J, Hendry M, Lewin S, Glenton C, Chandler J, Rashidian A. Qualitative "trial-sibling" studies and "unrelated" qualitative studies contributed to complex intervention reviews. *J Clin Epidemiol*. 2016.
15. Moore G, Audrey S, Barker M, Bond L, Bonell C, Cooper C, et al. Process evaluation in complex public health intervention studies: the need for guidance. *Journal of Epidemiology and Community Health*. 2013.
16. Carroll C, Patterson M, Wood S, Booth A, Rick J, Balain S. A conceptual framework for implementation fidelity. *Implementation Science*. 2007;2:40.
17. Steckler A, Linnan, L. (Eds) *Process Evaluation for Public Health Interventions and Research*. San Francisco: Jossey-Bass; 2002.
18. Waters E, de Silva-Sanigorski A, Hall B, Brow T, Campbell K, Gao Y, Armstrong R, Prosser L, & Summerbell C. Interventions for preventing obesity in children. *Cochrane Database of Systematic Reviews*. 2011;12(No.: CD001871, p. 10.1002/14651858.CD14001871.pub14651853.).
19. Creswell JW, Klassen AC, Plano Clark VL, Smith KC. for The Office of Behavioral and Social Sciences Research. *Best Practices for Mixed Methods Research in the Health Sciences*. National Institutes of Health; 2011.

20. Chen H-T. Practical Program Evaluation. Assessing and Improving Planning, Implementation and Effectiveness. Thousand Oaks, CA: Sage Publications; 2005.
21. Farrington D, Ttofi M. School-Based Programs to Reduce Bullying and Victimization. *Campbell Systematic Reviews* 2009.
22. Noyes J, Pearson A, Hannes K, Booth A on behalf of the Cochrane Qualitative Research Methods Group. Qualitative Research and Cochrane Reviews. In: J. Higgins & S Green (Eds). *Cochrane Handbook for the Systematic Review of Interventions: Cochrane Book Series*. UK: John Wiley & Sons Ltd; 2008. p. 571-92.
23. Anderson LM, Petticrew M, Rehfues E, Armstrong R, Ueffing E, Baker P, et al. Using logic models to capture complexity in systematic reviews. *Research Synthesis Methods*. 2011;2(1):33-42.
24. Booth A, Noyes J, Flemming K, Gerhardus A, Wahlster P, Van der Wilt GJ, Mozygemba K, Refolo P, Sacchini D, Tummers M, Rehfues E. Guidance on choosing qualitative evidence synthesis methods for use in health technology assessments of complex interventions [Online]. Available from: <http://www.integrate-hta.eu/downloads/> 2016.
25. Grant MJ, Booth A. A typology of reviews: an analysis of 14 review types and associated methodologies. *Health information and libraries journal*. 2009;26(2):91-108.
26. Barnett-Page E, Thomas J. Methods for the synthesis of qualitative research: a critical review. *BMC Med Res Methodol*. 2009;9:59.
27. Funnell SC, and Rogers, PJ. *Purposeful Program Theory: Effective Use of Theories of Change and Logic Models*: John Wiley/Jossey-Bass; 2011.
28. Hoffmann T, Glasziou P, Boutron I, Milne R, Perera R, Moher D. Better reporting of interventions: template for intervention description and replication (TIDieR) checklist and guide. *BMJ*. 2014;348.
29. Walker LO, Avant, KC. *Strategies for theory construction in nursing*. Upper Saddle River, NJ: Pearson Prentice Hall; 2005.
30. Carroll C, Booth A, Leaviss J, Rick J. "Best fit" framework synthesis: refining the method. *BMC Med Res Methodol*. 2013;13:37.
31. Oliver K, Rees R, Brady LM, Kavanagh J, Oliver S, Thomas J Broadening public participation in systematic reviews: a case example involving young people in two configurative reviews. *Research Synthesis Methods* 2015;6(2):206-17.
32. Jamal F, Langford R, Daniels P, Thomas J, Harden A, Bonell C. Consulting with young people to inform systematic reviews: an example from a review on the effects of schools on health. *Health Expectations: an international journal of public participation in health care and health policy*. 2014.
33. Lewin S, Glenton C, Oxman AD. Use of qualitative methods alongside randomised controlled trials of complex healthcare interventions: methodological study. *BMJ*. 2009;339:b3496.
34. Adams RJ, Huff AS. *Shades of Grey: Guidelines for Working with the Grey Literature in Systematic Reviews for Management and Organizational Studies*. *International Journal of Management Reviews*. 2016; April 1.
35. Booth A. Identifying evidence on process and implementation Unpublished report. 2016.
36. Harden A, Oakley, A, & Weston, R. *A review of the effectiveness and appropriateness of peer-delivered health promotion for young people.*: Institute of Education, University of London; 1999.
37. Lefebvre CME, Glanville J. Chapter 6: Searching for studies. In: J. Higgins & S Green (Eds). *Cochrane Handbook for Systematic Reviews of Interventions* Version 5.10 (updated March 2011) The Cochrane Collaboration. Available from www.cochrane-handbook.org 2011.
38. Cooper Robbins SC, Ward K, Skinner SR. School-based vaccination: a systematic review of process evaluations. *Vaccine*. 2011;29(52):9588-99.
39. Booth A, Harris J, Croot E, Springett J, Campbell F, Wilkins E. Towards a methodology for cluster searching to provide conceptual and contextual "richness" for systematic reviews of complex interventions: case study (CLUSTER). *BMC Medical Research Methodology*. 2013;13:118.
40. Bonell C, Farah J, Harden A, Wells H, Parry W, Fletcher A, Murphy S. Systematic review of the effects of schools and school environment interventions on health: evidence mapping and synthesis. *Public Health Research*. 2013;1(1).
41. Lewin S, Noyes J, Chandler J, Hendry M et al. Guidance for using the iCAT-SR: Intervention Complexity Assessment Tool for Systematic Reviews, version 1. Cochrane Collaboration. forthcoming.

42. Cargo M, Stankov I, Thomas J, Saini M, Rogers P, Mayo-Wilson E, et al. Development, inter-rater reliability and feasibility of a checklist to assess implementation (Ch-IMP) in systematic reviews: the case of provider-based prevention and treatment programs targeting children and youth. *BMC Medical Research Methodology* 2015;15(1):73.
43. Salmon J, Ball K, Crawford D, Booth M, Telford A, Hume C, et al. Reducing sedentary behaviour and increasing physical activity among 10-year-old children: overview and process evaluation of the 'Switch-Play' intervention. *Health Promotion International* 2005;20(1):7-17.
44. Sutcliffe K, Thomas J, Stokes G, Hinds K, Bangpan M. Intervention Component Analysis (ICA): a pragmatic approach for identifying the critical features of complex interventions. *Systematic Reviews*. 2015;4(1):1-13.
45. Montgomery P, Underhill K, Gardner F, Operario D, Mayo-Wilson E. The Oxford Implementation Index: a new tool for incorporating implementation data into systematic reviews and meta-analyses. *Journal of Clinical Epidemiology* 2013;66(8):874-82.
46. Armstrong R WE, Jackson N, Oliver S, Popay J, Shepherd J, Petticrew M, Anderson L, Bailie RBG, Hawe P, Kristjansson E, Naccarel la L, Norris S, Pienaar E, Roberts H, Rogers W SA, Thomas H. Guidelines for Systematic reviews of health promotion and public health interventions. Version 2. Melbourne University: Australia; 2007
47. Cargo M. Tools for critically appraising process and implementation in systematic reviews. Paper presented at The Joanna Briggs Institute Biennial International Convention Ripples to Revolution: From Bench to Bedside; Adelaide, Australia.2009.
48. Rees R, Oliver K, Woodman J, Thomas J. Children's views about obesity, body size, shape and weight. A systematic review.: Social Science Research Unit, Institute of Education, University of London; 2009.
49. Shepherd J, Kavanagh J, Picot J, Cooper K, Harden A, Barnett-Page E, et al. The effectiveness and cost-effectiveness of behavioural interventions for the prevention of sexually transmitted infections in young people aged 13-19: a systematic review and economic evaluation. *Health Technology Assessment*. 2010;14(7):1-206, iii-iv.
50. Health Care Practice Research and Development Unit. Evaluation Tool for Qualitative Research. Retrieved from http://usirsalfordacuk/12970/1/Evaluation_Tool_for_Qualitative_Studiespdf. 2009.
51. Hannes K, Lockwood C, Pearson A. A comparative analysis of three online appraisal instruments' ability to assess validity in qualitative research. *Qual Health Res*. 2010;20(12):1736-43.
52. Lewin S, Glenton C, Munthe-Kaas H, Carlsen B, Colvin CJ, Gulmezoglu M, et al. Using qualitative evidence in decision making for health and social interventions: an approach to assess confidence in findings from qualitative evidence syntheses (GRADE-CERQual). *PLoS Med*. 2015;12(10):e1001895.
53. Effective Public Health Practice Project Quality Assessment Tool. Quality Assessment Tool for Quantitative Studies. 2009.
54. Petrosino A, Turpin-Petrosino C, Hollis-Peel ME, Lavenberg JG. 'Scared Straight' and other juvenile awareness programs for preventing juvenile delinquency. *Cochrane Database of Systematic Reviews*. 2013(4).