

BMJ Evidence-Based Medicine**Evidence synthesis software**

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Abstract

It can be challenging to decide which evidence synthesis software to choose when doing a systematic review. This article discusses some important questions to consider in relation to the researcher's chosen evidence synthesis approach. Software can support researchers in a range of ways. Here, the example of EPPI-Reviewer is used to explore a range of conditions and software solutions. Some review teams, for example, value collaboration across time and geographical space; in-built bias assessment tools; and line-by-line coding for qualitative textual analysis. EPPI-Reviewer has text mining automation technologies. Version 5 supports data sharing and re-use across the systematic review community. Open source software will soon be released. EPPI-Centre will continue to offer the software as a cloud-based service. The software is offered via a subscription with a one-month (extendible) trial available and volume discounts for 'site licences'. It is free to use for Cochrane and Campbell reviews. The next EPPI-Reviewer version is being built in collaboration with NICE using 'surveillance' of newly published research to support 'living' iterative reviews. This is achieved using a combination of machine learning and traditional information retrieval technologies to identify the type of research each new publication describes and determine its relevance for a particular review, domain or guideline. While the amount of available knowledge and research is constantly increasing, the ways in which software can support the focus and relevance of data identification are also fast developing. Software advances are maximising the opportunities for the production of relevant and timely reviews.

Evidence synthesis software: how to choose? A worked example using EPPI-Reviewer

Introduction: purpose of software?

There are an increasing number of ways available to manage data for reviews. So which one should you opt for when conducting a systematic review? This article highlights a number of factors useful to consider. EPPI-Reviewer is used as an example to illustrate some of these considerations in relation to the type of review and chosen approach.

Questions you might consider include:

- How many people are doing the review?
- Where are you doing the review?
- What sort of data are you interested in?
- Over what time period are you interested in collecting data, and will this continue during the review process?
- Are you planning to conduct some form of synthesis within the platform?
- What is your budget and how much does the software cost?

Requirements for review software can vary depending upon how many individuals are involved in the review. A review team may be based in the same institution, or include a collaboration across disperse geographical areas, or even time-zones. The team will need to consider how they organise

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3 the workload of e.g. screening, and whether a static repository-type function is sufficient, or requires
4 an up-to-date and iterative platform. Some reviews use a set of searches conducted at one moment
5 in time, whereas others are iterative, on-going or 'live', requiring a more dynamic form of software.
6 Researchers might choose to use a software system for screening only, while others prefer to
7 continue use of the same software for synthesis. Systematic review approaches vary from
8 descriptive mapping, to in-depth analysis. Some researchers may therefore simply wish to upload,
9 collate and categorise references. Others, however, may need to conduct complex analyses of
10 relationships between various elements of documents, within the software program.
11

12 **User experience: EPPI-Reviewer**

14 This next section describes some of the features of one software example: EPPI-Reviewer. This has a
15 number of features, which a range of needs when conducting reviews. EPPI-Reviewer is a cloud-
16 based systematic review platform which supports a range of reviews from quantitative meta-
17 analysis, to qualitative meta-ethnography. It contains features to categorise data and enable
18 reviewers to keep track of decision-making pathways throughout the systematic review process. Like
19 Covidence, it is widely used internationally and is used by both Cochrane and Campbell
20 Collaborations. EPPI-Reviewer has been used for thousands of reviews across numerous topics
21 including health, social care, education, criminology, international development and climate change.
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24 Reviewers can begin by uploading text files containing bibliographic records and by searching
25 PubMed directly from within the software. They can then screen the records for eligibility based on
26 their titles and abstracts, and later, on full texts (which can be uploaded into the system too). The
27 user-interface is clear and enables contemporaneous collaboration across institutions (e.g. during
28 double screening). Researchers can choose from a number of pre-built risk of bias and data
29 extraction tools, or create their own templates for data extraction and synthesis. Qualitative
30 synthesis can be assisted by 'line-by-line' coding of pdf files and the ability to create reports of text
31 in customised formats. A range of options for statistical meta-analysis are also available from
32 integration with the 'R' statistical software which supports standard meta-analysis with a range of
33 models and extensions including meta-regression and network meta-analysis.
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36 The EPPI-Reviewer system includes automation technologies – including text mining and machine
37 learning – to make the reviewing process more efficient. These include 'active learning' for citation
38 screening, where the software 'learns' to apply your inclusion / exclusion criteria as you screen,
39 which can make the process of study identification much more efficient (Shemilt, 2016). It also has
40 machine learning classifiers for identifying RCTs, systematic reviews, and economic evaluations, and
41 allows reviewers to build their own classifiers from their own data.
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43 EPPI-Reviewer has been adopted by NICE as its core evidence synthesis platform and the EPPI-
44 Centre and NICE are currently collaborating on developing the next version of EPPI-Reviewer which
45 is focused on streamlining workflows in a new web-based user interface and aims to support 'living'
46 reviews and guidelines through the 'surveillance' of new research as it is published (Thomas 2017).
47 With this in mind, it carries out daily updates of new and updated material on PubMed. Then, using
48 a mixture of machine learning and traditional information retrieval technologies it identifies the type
49 of research each new publication describes and seeks to identify which review / domain / guideline
50 it might be relevant for.
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53 EPPI-Reviewer in its current form already supports collaboration during a single review, but will
54 contribute further to the evidence curation process with the new Version 5. This supports data
55 sharing and re-use, aiming to reduce the considerable duplication of effort across the global
56 systematic review community. Version 5 will also be released as open source software, again to
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3 foster collaborative efforts, though the EPPI-Centre will continue to offer the software as a cloud-
4 based service. The software is offered via a subscription with a one-month (extendible) trial available
5 and volume discounts for 'site licences'. It is free to use for Cochrane and Campbell reviews.
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7 **Conclusion**

8 Evidence synthesis is central to the integration of evidence and practice. While the amount of
9 available knowledge and research is constantly increasing, the ways in which software can support
10 the focus and relevance of data identification are also fast developing. Software advances are
11 maximising the opportunities for the production of relevant and timely reviews. There will never be
12 a 'one size fits all' approach and it is important to consider what functions you require of a software
13 platform before starting your systematic review. Evidence synthesis approaches are evolving fast
14 and as the relationships between evidence and practice strengthen, the demand for more iterative
15 and 'live' approaches is likely to grow. The rigor and complexity of synthesis methods is also
16 expanding, with an increasing range of mixed methods and in-depth approaches used. EPPI-
17 Reviewer is one example of a platform which has evolved with these increasing challenges and
18 provides a wide range of user-friendly and adaptable features to support researchers in this field.
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