



EPPI-Centre methods for conducting systematic reviews

Version 1.0

Last updated September 2006

© 2006 EPPI-Centre

This document can be downloaded as a pdf or viewed as html webpages at <http://eppi.ioe.ac.uk/>

This document should be cited as:

EPPI-Centre (September 2006) *EPPI-Centre methods for conducting systematic reviews*. London: EPPI-Centre, Social Science Research Unit, Institute of Education, University of London.

This document may be reproduced free of charge, on condition that it is reproduced in its entirety without alteration and with due acknowledgement.

The EPPI-Centre is part of the Social Science Research Unit, Institute of Education, University of London.



Leading education
and social research
Institute of Education
University of London

Introduction

This section provides a brief description of the methods used in a systematic review. They are described in the order that they would happen in a review. Further description about methods can be found in the Review Companion. The EPPI-Centre Review Companion is a tool aimed at groups undertaking a review in the field of education, but will be of use to all those interested in systematic review methods. It provides a description of the processes in a systematic review and the way in which these processes are carried out in practice, along with tools and templates to facilitate this process; it is an aid to planning the work at the outset and a document which can be used throughout the review itself. Please contact the EPPI-Centre if you would like a copy.

Below is a list of the various stages that a systematic review would usually go through. Click on the relevant part to take you to some further information regarding this stage of the review and a link to the relevant part of the review companion.

1. Getting started

- User involvement
- Setting up support for the review
- Setting the scope of the review and protocol development

2. Gathering and describing research in the field

- Searching for studies and setting up a system to manage reports
- Searching electronic databases
- Applying explicit criteria to include and exclude studies
- Keywording and descriptive mapping
- Refining the scope of the review (not always done)

3. Analysing and synthesising the data

- Extracting data for in-depth review
- Quality assessment and Weight of Evidence for in-depth review
- Synthesising the findings and quality of studies reviewed in-depth

4. Writing the report

- Drawing up recommendations
- Developing the final report

5. Making use of the report

- The communication, interpretation, and application of the final report
- Reflection and contribution to methodological development
- Updating the review

1. Getting started

User involvement

Involving representatives of all those who might have a vested interest in a particular systematic review helps to ensure that it is a relevant and useful piece of research.

Everyone has a vested interest in public policy issues such as health and education. Consequently everyone, whether they wish to be actively engaged or not, has a vested interest in what research is undertaken in these fields and how research findings are shared and put to use.

In terms of potential users of research, experience in health sector research suggests that users of health services may play a role throughout the process of conducting and managing systematic reviews (Oliver, 1997 also see the home page of the [Cochrane Consumer Network](#)).

Service users have participated in debates about the purpose of reviews, in co-ordinating Review Groups, identifying review topics, prioritising reviews, identifying salient outcomes, refining review questions, conducting reviews, editing review protocols and final reports, disseminating review findings and getting findings into practice.

In considering ‘user’ involvement we have in mind a broad definition of users. The list below provides an example of some specified groups that reviews in the field of education would need to involve:

- users of services (e.g. students, parents);
- teachers, lecturers, school governors;
- education managers and policy makers in local and central government;
- education researchers;
- employers;
- members of the public.

All these people bring different kinds of expertise: understanding education as a lived experience; understanding education practices; understanding education needs; and a familiarity with research in education. This range of expertise is a vital complement to the EPPI-Centre’s experience of systematically reviewing research literature. In order to meet the needs of all potential users of research, the Initiative has to involve a broad range of users in the development, not only of systematic reviews, but also its working practices.

Setting up support for the review

Those responsible for undertaking the review can be supported by advisory groups and 'link people' to ensure a wide range of methodological and subject area expertise.

Reviews are likely to be more relevant and of a higher quality if they are informed by advice from people with a range of experiences, in terms of both the topic and methodology.

The members of the Review Group are responsible for conducting a review or series of reviews, and may come from a range of backgrounds, some with methodological and some with subject area expertise.

We recommend that Review Groups convene small advisory groups to support reviews as they progress. Advisory groups need to include methodological and subject area expertise, and include potential review users, e.g. teachers, pupils, employers. An international perspective may also be useful.

People outside the review can also play a more practical role: keeping an eye on the review's progress. For many of the Review Groups that we support we provide an EPPI 'link person' to advise on methodological issues, monitor the progress of the review and ensure that review methods and training and support progress synergistically and that EPPI-Centre materials and procedures can be developed further to fit Review Group needs. Advisory groups can also help reviewers make necessary but difficult decisions, for example, on refining a review's scope once the size of the relevant literature becomes known. Such decisions can benefit from input from a variety of perspectives. People new to reviewing can benefit from working alongside more experienced reviewers during the review's key stages.

Setting the scope of the review and protocol development

Setting the scope

As with any piece of research, the stage of defining the research question to be addressed with a systematic review is fundamental. It provides the framework for all the other stages.

The type of question being asked by a review will affect the kind of studies that need to be reviewed, in terms of study topic, population and setting and, of course, study design. Time and effort spent on this stage is likely to save time and trouble later. A poorly conceptualised research question will lead to difficulties making decisions at later stages of the review, for example when designing search strategies, or when deciding how relevant studies should be summarised. A clearly defined review question is also vital at the protocol or final report stage of a review, when readers need help in deciding whether or not a review is likely to contain information of relevance to them.

Protocol development

A protocol helps reviewers describe and explain their methods for answering the review question in an explicit and approachable way.

As is the case for any good research, the methods for a systematic review are made explicit in a 'protocol' before it starts. A protocol is an essential component of an open, consultative approach to undertaking reviews. It is also argued that if the review's methods are defined explicitly at the start of the review, reviewers are

less likely to be influenced by, for example, their knowledge of study authors or by study findings as these become apparent. Publication of accessible details of planned reviews can encourage constructive criticism from other researchers and research users at the stage at which it is most likely to help improve the final review.

The review question(s) and conceptual framework will form a large part of the protocol, but reviewers will also be required to specify the methods they will use in undertaking the review in advance. If changes are needed to the protocol as the review progresses these needed to be noted in the review's final report and the rationale for making changes made clear. The protocol is developed by the review group, with involvement of users, and is sent out to be peer refereed by individuals interested in policy, practice or methodological aspects of the review.

2. Gathering and describing research in the field

Searching for studies and setting up a system to manage reports

Searching for studies

To reduce the risk of bias (e.g. only reviewing the most accessible research) systematic research synthesis requires searches for literature to be both comprehensive and systematic.

The search aims to produce a comprehensive and unbiased set of research relevant to the review question. This requires a comprehensive search strategy that will uncover both published and unpublished, easily accessible and harder to find reports of research studies. Bias can creep in if the search is not exhaustive in this way as, for example, statistically significant positive results are more likely to be published and cited by others.

One very effective component of a comprehensive search strategy is electronic database searching. When carrying out the process of identifying relevant terms with which to search electronic databases, it is necessary to strike a balance between sensitivity (e.g. finding all articles in a topic area) and specificity (e.g. finding only relevant articles). Some terms may locate tens of thousands of articles.

However, searching of databases will not locate all research reports, as some may not be referenced in databases, and others may be missed in the searches. It is important therefore to combine systematic database searching with hand searching of journals, searching of specialist websites, and personal contacts. There is no one systematic search that can be carried out for every review; searches need to be developed, and will vary depending on the nature of the research question, and the nature of the topic area.

It is recommended that reviewers keep a 'search log' to record the detail of which databases were searched and when along with the list of search terms used and the combinations in which they were applied to the databases. Keeping a record of all this information will facilitate the process of making the review methods explicit and transparent in the final report, so that readers can make a judgement about the quality of the reviews findings. An example of a search log can be found in the Review Companion

Setting up a system to manage reports

Since systematic reviews aim to be comprehensive syntheses of research literature, it is vital that reviewers keep track of the reports they find and are able to present a full account of how each report is dealt with as the review progresses.

Reviewers can expect to deal with several hundreds, if not thousands, of references and keeping track therefore needs to be an efficient process. To update a review, reviewers need to be able to see which reports were dealt with in the review's previous versions.

Once searches have been carried out, electronic records of the results can be downloaded from databases and imported into reference management software such as EndNote or Reference Manager. The results from all databases searched can be downloaded into one place and can be supplemented by the manual inputting of the details of literature identified through hand searching, to produce a single complete list of all reports found in the search. Notes on the location and availability of research reports can be recorded here for each reference along with details of the results of screening for inclusion or exclusion.

Searching electronic databases

Systematic searching uses free text and thesaurus terms (also known as controlled terms, MESH terms, descriptor terms), to help identify all articles in a database that may be relevant to a review. Systematic searching of databases will not locate all articles, as some articles may not be referenced in databases, and others may be missed in the searches. It is important therefore to combine systematic database searching with hand searching of journals, searching of specialist websites, personal contacts and citation tracking (checking the reference lists in relevant reports). There is no one systematic search that can be carried out for every review; searches need to be developed, and will vary depending on the nature of the research question, and the nature of the topic area.

This document provides a few suggestions on how to start thinking about searches. Each of the stages in developing a search is outlined; identification of topic areas (1) and databases (2), development of free text and thesaurus terms (3-5), use of truncation and wild cards (6), building up searches (7-8) and importing searches into reference software (9)), as well as what the EPPI-Centre expects. A simple example of a search strategy and a completed EPPI-Centre search log are given at the end of this document.

Stages in a systematic search

1. A well-defined review question and inclusion/exclusion criteria will enable more successful searches. If we consider a review asking 'what are the effects of secondary school size?', two broad areas can be identified that all relevant articles should consider: *secondary age* and *school size*; if the question is more focused, e.g. 'what is the effect of secondary school size on student achievement?' then there is also a third area that all relevant articles need to consider: *student achievement*. It is these broad areas (often relating to the population, intervention and outcomes) that need to be captured in your search strategy.
2. Having identified the topic areas, the next stage is to identify the databases that you need to search and decide how these will be supplemented with other searchable sources. For example, think about the different disciplines that are involved in the area (e.g. ERIC contains educational research, but some educational research will only be found in psychological or sociological databases). Find out which databases index papers from key journals in the area. If key journals are not captured by the databases available, you may need to search them by hand.
3. Searches are built up using a combination of free text and thesaurus terms. Free text searches look for terms across a record (so will find papers where a term appears in the title for example). Therefore to guide free text (sometimes called keyword) searching, develop a list of terms that might be used in the titles or abstracts of relevant articles. The types of terms used

will be words synonymous or related to the broad areas identified in stage 1. Practitioners/ academics looking at the topic from different perspectives can offer suggestions; also useful are specialist dictionaries or thesauri for that broad topic, or the indexes of standard texts. Bear in mind that language varies from culture to culture, and American terminology may be quite different from British. This type of search will also find papers where terms have been used in passing (think of abstracts you've seen that finish by saying 'work is now needed on x' where x is the thing you're really interested in).

4. Papers in databases are classified using thesaurus terms. Trained indexers attach these terms to papers by deciding on the main foci of a paper and following explicit rules. Looking through the subject/thesaurus term indexes can help you work out which thesaurus terms might identify papers of interest. This is one of the best ways of making a search more specific to your needs (see below). A good way of identifying possible terms is to take one or more papers that you know meet your inclusion criteria and find the thesaurus terms that have been used to classify them in the database. These terms can then be built into your search (a technique called 'pearl growing'). Note that databases need to be instructed to treat thesaurus terms as such. If not instructed in this way, databases will treat the terms as a free text terms, and look for the general occurrence of the term in the record.
5. When carrying out the process of identifying relevant terms it is necessary to strike a balance between sensitivity (i.e. finding all articles in a topic area) and specificity (i.e. finding only relevant articles). Some free text terms may locate tens of thousands of articles, as can very broad thesaurus terms. For example, school size is one aspect of school organisation, but a large number of other topic areas are also included under the term school organisation, which would not be relevant to a review of the effects of school size. It is suggested that preliminary searches are used to identify those terms most relevant to the review. For example if you enter the term school organisation, screen a proportion of the citations and find that all relevant articles have also been coded school size, then it may be prudent not to use the term school organisation in the final searches. Similarly a free text search of the word 'inclusion' will not just identify articles about inclusion in education, but also any articles that mention inclusion criteria or inclusion of fruit in school dinners. It is important to remember that different databases are classified in different ways, so thesaurus terms will need to be adapted to suit each database you use.
6. Most online databases do not automatically search for all variations of a word, so if you carry out a free text search for 'inclusion', you will not retrieve 'inclusive education'. To achieve this, it is necessary to use a truncation symbol (* in the example at the end). This instructs the search engine to look for all words with the specified beginning. Truncation should be used with care, preferably using a meaningful root (e.g. educ* will find all words related to education, but mon* will find not only money and monetarism, but monkeys and monotheism). It is also possible to look for variant spellings by inserting a wild character (e.g. behavio?r or wom?n), which indicates any character or none. These characters will vary according to the database you use and the host on which you search it. Different databases will also have different ways of searching for phrases and numbers. It is therefore essential to read the Help file carefully before you start searching on any new database, and to do some test searches to ensure that you are getting the type of results you expected.

7. Once relevant terms have been identified, searches can begin. To be efficient it is necessary to build up the searches initially using OR before using AND. OR enables you to add extra terms to increase the size of your results set (I want anything about cats OR dogs - either will do). AND requires both terms to be present (or one term from each set if you are combining sets), i.e. I want something about cats AND dogs - it must include both. To take the example of the searches regarding school size, initially all the school size terms (thesaurus, and free text) were entered into the database and combined using OR. This identified all the articles in the database considering school size. Then all the terms regarding secondary age were entered, and again combined using OR. This identified all the articles in the database considering secondary age students. The two lists were then combined using AND, which identified all the articles considering both school size and secondary age (this is illustrated in the search strategy at the end of this document).
8. When undertaking a systematic review, it is tempting to include search statements relating to research methodology - at its simplest, the requirement that the report describes research rather than, for example, administrative guidance. However, previous studies and the experience of other systematic review groups is that this is unwise. Apart from Medline, which has a policy of careful description of research methodology, indexing tends to be patchy and imprecise. It is better therefore, not to search for methodological terms, even though this substantially increases the number of irrelevant results.
9. Having identified all the articles classified as both secondary school age and school size, the final list is saved and then imported into reference management software (e.g. Endnote, Procite, Reference Manager), and the process completed for the other databases. It is wise to import each search initially into a separate database - it is quite normal for the import to fail or be incomplete on the first attempt, and this allows several attempts to be made without corrupting your previous data. It may be necessary to modify the import filters to match your data, or to modify your data to match the filters. Once a good database has been established for your new reference set, you can use the reference management software to enter the name of the database searched into a user-defined field, for future reference, and then the data can be copied and pasted into your main database. Once all databases have been searched and citations downloaded, the reference management software can be used to highlight duplicates; it is good practice to select one copy of each record, then transfer any relevant information from the others (the database searched field, for example, and any missing data, such as issue number or abstract). Then the screening can start. Each of the references is screened against the inclusion criteria and where an item is rejected, a note is made of the first criterion in the list which caused it to fail. This means that each of the studies identified in the database searches can be accounted for.

In some instances it may be necessary to further reduce the number of citations identified through the searches. This can be done in a number of ways, but please contact EPPI-Centre staff to discuss the most appropriate way of doing this, if there are any difficulties:

- Using NOT: It is generally not advisable to limit searches using NOT. There are only two safe reasons for using NOT - 1) to exclude references already seen (e.g. you have already searched for School AND Size; now you decide to search for School AND Number of pupils. You can exclude Size with NOT, because you

have already seen the results; 2) to exclude terms which are totally inappropriate to the search in hand e.g. Pupils AND Records NOT Gramophone, or Nurseries NOT Agriculture.

- Using only thesaurus terms: If free text terms lead to large numbers of articles that are irrelevant for the purposes of the review, maybe because the terms have a range of meanings (e.g. inclusion, integration), it may be necessary to use thesaurus terms without using free text terms. Searches only using thesaurus terms are dependent on the indexing of the databases; since this may not be comprehensive and is prone to human error and interpretation, it is important to remember that there is a risk that relevant studies will not be identified. It is wise to test this strategy by doing small searches with free text and thesaurus terms and with thesaurus terms only, and comparing the results - if using thesaurus terms only results in a significant loss of relevant records, then a different strategy to reduce numbers would be advisable. Some databases produce better results from thesaurus-only searches than others.
- Scanning a selection of the records retrieved and noting descriptors (thesaurus terms) which are linked to totally irrelevant records; creating a search set of these descriptors and excluding them using NOT. Note: these should be terms which definitively exclude the records, not just ones which are not relevant. For example the descriptor 'Teaching of reading' would appear to be irrelevant, but the article could possibly be about the effects of school size on the teaching of reading; however, 'Porpoises' as a descriptor would indicate the size of a very different kind of school and could safely be excluded.

EPPI-Centre expectations regarding systematic searching

- A list of databases, journals to be hand searched and other sources should be defined initially, with reasons for the selection.
- A list of search terms and the way they will be combined should be established before formal searching begins; if the experience of searching results in any significant changes in this, they should be recorded.
- The actual terms used and their combination for each database search should be recorded, along with the date upon which the search was run (databases get updated) and the host that provided access to the database (e.g. Cambridge Scientific Abstracts, WebOfScience). Databases usually allow you to save a copy of the actual search run.
- Where records are retrieved and subsequently excluded, the reason should be recorded for each one (though not necessarily in the database - for the abstract screening, a marked-up printout is sufficient). This level of detail is required for the completion of Figure 3.1 in the final report of a review.

An example of a search strategy

The following is a systematic search carried out to identify articles that considered the impact of secondary school size. Initially 'descriptor' (thesaurus terms (marked de)) and free text (keyword) terms (marked KW) for (i) secondary age and then (ii) school size were combined using OR. The two groups (#27 (for secondary age terms) and #57 (for school size terms)) were then combined with AND (#58) and the resulting 2500 hits downloaded into reference software and then screened against the inclusion criteria.

ERIC

ERIC 1980-2003

Searched: Mon Sep 15 14:35:58 2003

Cambridge Scientific Abstracts

#1: KW=((year* 10) OR (year* 11) OR (year* 12))

#2: KW=((year* 7) OR (year* 8) OR (year* 9))

#3: KW=((grade* 7) OR (grade* 8) OR (grade* 9))

#4: KW=((grade* 10) OR (grade* 11) OR (grade* 12))

#5: KW=((secondary modern) OR (grammar school*))

#6: KW=((middle school*) OR (six* form*) OR (comprehensive school*))

#7: KW=((secondary educat*) OR (secondary school*) OR (high school*))

#8: #1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7

#9: (de=(middle school students))

#10: (de=(secondary education))

#11: (de=(high school freshmen))

#12: (de=(high school seniors))

#13: (de=(high schools))

#14: (de=(high school students))

#15: (de=(junior high school students))

#16: (de=(secondary school teachers))

#17: (de=(middle schools))

#18: (de=(middle school teachers))

#19: (de=(secondary school teachers))

#20: (de=(secondary education))

#21: (de=(secondary schools))

#22: (de=(secondary school students))

#23: (de=(elementary secondary education))

#24: (de=(junior high schools))

#25: (de=((grade 7) or (grade 8) or (grade 9) or (grade 10) or (grade 11) or (grade 12))

#26: #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20 OR #21 OR #22 OR #23 OR #24 OR #25

#27: #8 OR #26

#28: KW=(facility expansion)

#29: KW=(develop* institution*)

#30: KW=(transition* school*)

#31: KW=(one teacher school*)

#32: KW=(school expansion)

#33: KW=(house plan)

#34: KW=(consolidated school*)

#35: KW=(multiunit school*)

#36: KW=(school with a special*)

#37: KW=(minischool*)

#38: KW=(subschool*)

#39: KW=(small scale school*)

#40: KW=(school downsiz*)

#41: KW=(autonomous unit)

#42: KW=(school size)

#43: KW=(small school)

#44: #28 OR #29 OR #30 OR #31 OR #32 OR #33 OR #34 OR #35 OR #36 OR #37 OR #38 OR #39 OR #40 OR #41 OR #42 OR #43

#45: (de=(multiunit schools))

#46: (de=(transitional schools))

#47: (de=(facility expansion))

#48: (de=(comprehensive school reform))

#49: (de=(small schools))

#50: (de=(school size))
 #51: (de=(house plan))
 #52: (de=(school expansion))
 #53: (de=(consolidated schools))
 #54: (de=(one teacher schools))
 #55: (de=(developing institutions))
 #56: #45 OR #46 OR #47 OR #48 OR #49 OR #50 OR #51 OR #52 OR #53 OR #54 OR #55
 #57: #44 OR #56
 #58: #27 AND #57

An example of a search log

The search log is designed to help to keep an explicit record of searches.

Electronic databases

Database searched	Date & person searching	Search strategy	Time period of search	No. of hits	Downloaded file saved as	Config (filter) file used	Imported into which database
ERIC	15.09.03 Zoe Garrett	Saved in document ERIC1.txt	1976 - June 2003	2563	ERIC1.txt ERIC2.txt ERIC3.txt	ERIC Cambridge Scientific Abstracts	1. School size 2. ERIC
PsycInfo	19.09.03 Mark Newman	Saved in document psycinfo1.txt	1872-2003/09 wk3	623	Psycinfo1.txt	OVID(OHLINE)	1. School size 2. PsycInfo
Social science citation index	10.09.03 Zoe Garrett	Printed from web	1981-2003	126	Search history SSCI.wos	Imported from website	1. School size 2. SSCI

Applying explicit criteria to include and exclude studies

A set of criteria are developed to provide a clear and explicit way of identifying relevant research to be included in the review.

A large number of references (study titles and abstracts) will have been found at the searching stage of the review. A proportion of these will look as though they are possibly of relevance to the review's research questions. These studies need to be assessed, in a way that is efficient in terms of time but that also avoids bias wherever possible, to see if they really do have potential to answer the review's specific research questions.

Explicit inclusion and exclusion criteria for selecting studies that help answer the review's research question will already have been determined at the stage of defining the review's scope. Each study now needs to be compared against these criteria. To be included in the review, a study needs to meet all inclusion criteria and not meet any exclusion criteria. 'Excluded' studies may have a very useful contribution to make elsewhere, even though they are not considered relevant to the current review.

Since useful information about a study can often be obtained from its abstract, this stage is usually two-fold. First, studies are assessed using study titles and abstracts only. Since key information may not be contained in abstracts, it is important to be

over-inclusive and not to exclude studies if there is any doubt over their content. Full reports are then obtained for all studies passing this first stage of assessment. It is important to appreciate that this process is quite labour-intensive and studies ordered through interlibrary loan can take a long time to arrive.

As full copies of requested studies passing this first stage of assessment are received, they then need to be checked again against the review's inclusion and exclusion criteria.

Keywording and descriptive mapping

A map of the research literature in a specific topic area is produced by applying a set of 'keywords' to describe the main characteristics of printed materials.

Keywording

The studies included in a review are coded using a standard keywording strategy such as the *EPPI-Centre Education keywording strategy* designed to capture information on generic variables such as the country in which a study took place, the population focus and study design. Standard keywording strategies are often supplemented with additional keywords defined to capture information on the topic area of an individual review.

A standard and well-defined set of keywords is vital whenever classifying reports. Deciding which of a set of keywords to assign to a study helps reviewers seek out key aspects of the study in a systematic way. Furthermore, once the keywords are entered on to EPPI-Reviewer, subsequent keyword searches can retrieve them for further study.

Descriptive mapping

Most systematic reviews describe in some way the range of literature encountered during the review as a whole. That is, readers are usually provided not only with in-depth detail and quality assessment of studies that meet all of the review's inclusion criteria and are reviewed in-depth, but also with some kind of description of the different categories of reports that did not reach this stage of the review. Classification and description that aims primarily to illustrate the kinds of report that exist has been termed a 'descriptive mapping' by the EPPI-Centre. A clear distinction needs to be made between this aim and the aims of the in-depth stages of a review, which are to describe in-depth the characteristics and findings of studies that meet a far more restricted range of criteria and to assess the validity of these studies' findings.

Descriptive maps can serve various purposes, depending on the stage of the review at which studies are classified for the mapping (and thus the set of studies that are described) and the degree of detail with which these studies are classified. Mapping is achieved by an analysis of the keywording results in terms of variables such as language, topic, population focus, study design and any review-specific keywords. A map provides: (i) a resource in its own right, providing a systematic description of research activity in a topic area; (ii) a basis for any narrowing of inclusion criteria for the more detailed and quality-assessed research synthesis and also a basis for addressing issues of relevance in the later quality assessment process; (iii) a context for interpreting the results of the synthesis, including the nature of any need for further primary research.

Refining the scope of the review (not always done)

Once the descriptive map is complete, reviewers may have developed further ideas about the literature that is available and can therefore develop a more refined or specific question. Furthermore, if the review group doesn't have the capacity to review in-depth a very large number of studies, time and effort may be better invested focusing down on one area of the topic in question.

It is important to note that this stage may not necessarily be required. It may be a necessary stage if the review's research question was initially very broad in order to produce a descriptive map or if an unmanageable number of studies meet the review's inclusion criteria.

If a review's scope needs to be refined, it is important that this is done, as is the case for the initial definition of scope, with the help of potential users of the final systematic review. A full justification for any modifications will need to be made in the review's final report, under the heading of 'modifications to the review's initial protocol'.

A further set of inclusion and exclusion criteria will need to be developed to identify studies for in-depth review in a systematic and explicit way. See the section on applying inclusion and exclusion criteria for further information.

3. Analysing and synthesising the data

Extracting data for in-depth review

At this stage the reviewer uses a set of standard questions to interrogate and record the detail of studies in a systematic and structured way.

A systematic review synthesises the details and results of a group of studies. The data extraction stage is the point at which these results and details are captured from within individual studies and stored in one place. Each study is scrutinised systematically, using the same set of pre-determined questions and answers. Additional, descriptive information can be recorded. Once these extracted data are ordered in one place it becomes easier to synthesise the whole. This collection of questions and extracted data also acts as a record of what reviewers have done. If it is made accessible, it can also be analysed further, or differently, by future reviewers. Accessible storage of data extracted from individual studies can also make individual study findings more available: people interested in the detail of any individual study have a structured summary of that study to call upon, as well as the original report.

Quality assessment and Weight of Evidence for in-depth review

As a very important part of the data extraction process, systematic reviewers extract information to enable them to assess the quality and relevance of the studies they have found. They can then use this assessment to assign different weights to study findings.

Poor quality studies are sometimes downgraded in importance or excluded from the review. The ultimate effect of this is that research can influence a review's conclusions only when that research is sound. Studies are also assessed for their relevance for answering the review question, and again less relevant studies can be downgraded in importance.

The assessment is made on four criteria. The first three (Criteria A-C) distinguish between the different types of judgement that need to be made to assess how much weight can be given to a particular study's evidence in the review. The fourth Criterion (D) is an overarching criterion which takes into account the results of the assessment under criteria A-C.

Criteria A and B are used to assess the methodology of the study. Criterion A relates to the soundness of the study's methodology, regardless of its appropriateness to the requirements of the systematic review. Criterion B relates to whether the methodology used was appropriate for answering the review question. Criterion C is used to assess how relevant the focus of the study is (e.g. topic, population, setting etc.) for answering the review question. Criteria B and C are review-specific and can lead to a qualification of the extent that a study contributes to the conclusions of a systematic review, notwithstanding the soundness of their research methodology.

A = The **trustworthiness of the results** judged by the quality of the study within the accepted norms for undertaking the **particular type of research design** used in the study (methodological quality)

B = The **appropriateness of the use of that study design** for addressing the systematic review's **research question** (methodological relevance)

C = The **appropriateness of focus** of the research for answering the **review question**. (topic relevance)

D = Judgement of **overall weight of evidence** (WoE) based on the assessments made for each of the criteria A-C.

Synthesising the findings and quality of studies reviewed in-depth

A synthesis brings together the findings of the studies reviewed in-depth so that conclusions of the review are based upon the studies as a whole.

An important characteristic of a systematic review is that it includes a synthesis of its results, which in this case are results from previous research. It also brings together information on the content and methods of those studies, for example, describing the range of different settings in which studies were conducted or the range of sample sizes.

Like other stages in the review, the synthesis needs to be presented systematically. It is valuable to be explicit about how studies are singled out for description in a review and to be systematic when presenting detail of different studies so that each study is given standard treatment at write up. It is even more valuable if the rationale for presenting certain studies and their results includes a measure of the validity of the studies producing those results. The synthesis is usually presented in the form of a structured narrative, summary tables or a statistical combination (meta-analysis).

This synthesis is then used to formulate conclusions and recommendations. The aim is to make the links between the detail of the studies found and the reviewers' conclusions clear.

4. Writing the report

Drawing up recommendations

Being able to make recommendations for the development of policy and practice is the reason the review was carried out in the first place. These recommendations will help people take action or see what can be done.

If recommendations are linked clearly to the review's findings then readers can see the basis on which the recommendation is made. This helps to reduce bias in decision making and does making explicit strengths and limitations of the review.

Look to the synthesis to find the basis for the recommendations.

Make it explicit how judgements are being made.

Be very specific about the potential limitations in the generalisability or transferability of findings.

Developing the final report

While the results of a review are communicated in a variety of ways, the production of a written report is usually an essential part of doing a systematic review. As can be seen in our [Evidence Library](#), the final report takes a number of different forms. First, we have a one-page summary which leads on the findings of the review; second, we have a short report which, again, concentrates on the findings and context of the review. Finally, we have a full 'technical report' which provides transparency and enables readers to see in detail how the review was conducted.

The standard structure followed by technical reports provides guidance on the requirements for reporting the methods and results of a systematic review. Transparency is a key feature of systematic research synthesis that allows readers to be sure how the studies that go in to the synthesis were found, coded and assessed, so there are crucial elements of the process that readers will need to have information on. Furthermore, the standardised structure allows users of our reviews to become familiar with the style of the reports, therefore helping different types of report users to access the information they require, be it aspects of methodology or results or mapping or in-depth review.

It maybe helpful to look at existing review reports which are available online within our [Evidence Library](#).

5. Making use of the report

The communication, interpretation, and application of the final report

An important part of the process is the communication, use, and interpretation of the report in order to reach everybody who may have a stake in the review findings.

Communicating the findings of research is often described as ‘dissemination’. However, since many reviews aim to aid practical decision-making in practice, systematic reviewers must consider broader issues, such as the way a report’s findings are communicated, interpreted and ultimately applied. Clarity over whom the report is intended for at the very start of the review will make this stage easier. It can be helpful to look at this process from a variety of perspectives: those who will use it for policy development; those who will use it to lobby for change or improved resourcing in an area; those with an academic interest who might wish to carry out research to fill gaps identified by the review; those such as research funders who are trying to identify research priorities; practitioners, who may want to apply some of the findings to their own work; users of services that have come under scrutiny in a review, who want to know what practices are available and/or suitable; and politicians.

As can be seen in the [Evidence Library](#) part of our website, the EPPI-Centre has a 3-level structure for presenting the results of systematic reviews: a 1 page summary; a 15-20 page report; and a 100 page technical report.

Reflection and contribution to methodological development

Like any research project, a systematic review does not necessarily finish with the publication of the final report. Additional papers and other publications usually follow, and researchers often also reflect on the methods they used to complete the review. Since the methods for conducting many types of review are still in their infancy, reviewers often innovate during the course of conducting a review. Descriptions of new methodological innovations assist others facing similar problems in new reviews.

Updating the review

A systematic review can only be as good as the research it contains and they can become out of date when new relevant research is published. They are often updated periodically to take account of this. Updating a review usually involves re-running the original search strategy, limited to the time period after the original review, and updating its findings accordingly.