

The Campbell Collaboration

Economics Methods Policy Brief

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Executive Summary

The overall aim of this Brief is to provide an initial source of guidance for authors of Campbell Collaboration Reviews on key issues concerning the use of economics methods.

The core objective of The Campbell Collaboration (C2) is preparation, maintenance and dissemination of systematic reviews in order to help people make well-informed decisions about the effects of criminal justice, education and social welfare interventions. In the face of scarce resources, decision-makers often need to consider not only whether an intervention works, but also whether its adoption will lead to a more efficient use of resources. Provision of evidence on economics aspects of interventions can therefore enhance the usefulness and applicability of C2 Reviews as a component of the basis for decision-making.

In the Brief we attempt to:

1. Outline the rationale for including coverage of economics aspects of interventions in C2 Reviews.
2. Outline the key elements of a methodological framework for incorporating evidence on economic aspects of interventions into C2 Reviews.
3. Propose methodological standards for the economics components of C2 Reviews.

We address three key issues concerning the use of economics methods in C2 Reviews and make a series of proposals regarding each issue. A summary of key issues and our main proposals follows:

Key Issue 1: When is it appropriate for C2 Reviews to include coverage of economics aspects of interventions?

Proposal 1a

C2 Review authors considering a decision to include coverage of economics aspects of interventions in a review should consult an economist from the outset of the review production process and in advance of finalising a protocol for the review.

Proposal 1b

C2 Methods Groups should routinely seek peer review for economics components of C2 Reviews and protocols from an economist with relevant expertise.

Key Issue 2: Which economics methods are appropriate for use in C2 Reviews?

Proposal 2a

C2 Review authors should consider economics aspects of interventions from an early stage of protocol development. This exercise can usefully be converted into commentary on economics aspects of interventions, to be included in the published C2 Review and protocol.

Proposal 2b

C2 Reviews that include items of resource use, cost, or measures of cost-effectiveness as primary or secondary outcome measures should seek to identify and retrieve relevant economics studies containing these data for potential inclusion in a critical review of such studies.

Proposal 2c

The scope of a critical review of economics studies may be limited to economic evaluations based upon single empirical studies meeting inclusion criteria for the review of intervention effectiveness, or may be expanded to also include economic evaluations based in part upon syntheses of several single empirical studies meeting inclusion criteria for the review of intervention effectiveness, or further to encompass all relevant economics studies. The scope should be made explicit for end-users of the review.

Proposal 2d

Studies encountered during a C2 Review which include data relevant to the economics component of the review should be identified in 'characteristics of studies' tables and/ or in an annotated bibliography.

Proposal 2e

C2 Reviews incorporating a critical review of economics studies should, where appropriate, use a recognised checklist to inform a rigorous critical appraisal of the methodological quality of included economics studies.

Proposal 2f

Data extraction requirements for the economics component of a C2 Review will need to be specified on a review-by-review basis. In general, two types of data will need to be extracted: details of the characteristics of included studies and details of their results. For results, both resource use and unit cost data should be extracted, where possible.

Proposal 2g

C2 Reviews should emphasise use of tables to present the key characteristics and results of each included economics study, supplemented by a narrative summary to discuss and compare their principal findings. Meta-analysis of resource use, cost and/or benefit valuation data should be undertaken with caution. Development of economic models is not recommended as a routine part of the C2 Review process, but collaboration is encouraged between C2 Review authors and economic modellers to facilitate development of models for specific jurisdictions.

Proposal 2h

C2 Review authors should avoid attempting to draw definitive conclusions regarding the cost-effectiveness of interventions on the basis of a critical review of economics studies.

Key Issue 3: What are the priorities for methodological research to support further development of economics methods for use in C2 Reviews?

Proposal 3a

A structured programme of methodological research is required to support development of economics methods for systematic reviews of crime and justice, education and social welfare interventions. This will need to be accompanied by efforts to promote use of best-practice economic evaluation methods in primary research studies in these applied fields, and to develop collaboration between economists and the research synthesis community.

Further details on these issues and more detailed proposals are described in the text of this Brief.

Preface

The overall aim of this Campbell Collaboration Methods Policy Brief on Economics Methods is to provide an initial source of guidance for authors of Campbell Collaboration (C2) Reviews on key issues concerning the use of economics methods in the development of C2 Reviews. The primary focus of the Brief is therefore on methods for systematic reviews of economics studies and, secondarily, the role of systematic reviews in economic evaluation modelling studies.

As such, the authors do not attempt to provide exhaustive coverage of the full range of economics methods issues that may arise in this context. For example, we do not specifically cover methods for systematic reviews of ‘economic interventions’ (e.g. a review of different approaches to funding day-care facilities); nor do we address the use of econometric methods in synthesis of efficacy data in systematic reviews (this does not detract from the important contributions of econometricians to the development of economic evaluation and research synthesis methods). Consequently we intend this to be an evolving document with periodic updates anticipated as the methods continue to develop, and as experience of C2 Reviews including coverage of economics aspects of interventions accumulates.

The authors have developed the material contained in this Brief in parallel to a new chapter on ‘Incorporating economics evidence’, published in the updated *Cochrane Handbook for Systematic Reviews of Interventions* (Version 5.0.0, Part 3, Chapter 15. Updated February 2008. Available from www.cochrane-handbook.org).

Process

The C2 Methods Policy Brief on Economics Methods was initiated by the C2 Methods Coordinating Group following a suggestion by co-convenors of the joint Campbell & Cochrane Economics Methods Group, who were assigned the task of developing the Brief.

The Campbell & Cochrane Economics Methods Group (CCEMG) was formally registered as a Methods Group of The Cochrane Collaboration in 1998 and has been jointly registered as a C2 Methods Group since 2003. CCEMG aims are:

- To promote and support the consideration of economic issues within the research synthesis community, within systematic reviews and across the wider research community;
- To develop economic methods to be used by reviewers and those involved with research synthesis which are: relevant to the reviews and to consumers of reviews, appropriate in terms of their application and unbiased and objective in their application;
- To undertake empirical research in the development and application of economic methods for studies which develop the evidence base;
- To link reviewers and economists who can help with reviews or provide specialist advice;
- To review the validity and quality of application of economic methods;
- To disseminate valid methods and good practice; and
- To relate to other Campbell Collaboration and Cochrane Collaboration Methods Groups to ensure appropriate collaboration and avoidance of duplication.

A panel of CCEMG co-convenors developed an initial draft of the Brief at a two-day workshop hosted by The Matrix Knowledge Group in London, November 2005. This was circulated to five outside experts for independent peer review and early feedback was sought from the C2 Steering Committee. Modifications were made on the basis of comments received. An intermediate draft was discussed at an open breakout session held at the Sixth Annual C2 Colloquium in Los Angeles (February 22nd - 24th 2006). A final draft was submitted to the C2 Steering Committee for approval in November 2007 and final revisions have been made based on their feedback.

As a result of this process, CCEMG has arrived at a consensus of initial advice to the C2 Steering Group on how C2 Reviews can incorporate coverage of economics aspects of interventions. The latest guidance is detailed in the current version of the Brief (v1.0), which is presented for further criticism and comment by a wider audience.

Introduction

Economics has been defined as the study of optimal allocation of limited resources for the production of benefit to society (e.g. Samuelson 2005). Resources are human time and skills, raw materials, energy and other inputs required to implement and sustain a given course of action (e.g. an intervention, programme or policy). Resources are sometimes, but not exclusively, traded in markets where there is a price for each unit of resource.

Whilst in theory markets can, under certain specific conditions, provide an optimal allocation of resources from the viewpoint of society, in practice unregulated markets do not necessarily achieve this. This is characteristic of the markets for criminal justice, education, social care, and health services. As monetary markets often fail to provide optimal social solutions, governments intervene on behalf of society and, with such intervention, the markets in which services might have been traded are either eroded or simply do not exist (McGuire 2000). In these circumstances, other ways than maximising money gains or minimising losses are needed for determining how resources should be allocated. To this end, the discipline of welfare economics has proposed a cost-benefit approach to appraising alternative interventions in terms of the degree to which the value of benefits foregone as a result of choosing to implement one intervention instead of another (the 'opportunity cost') are outweighed by the value of benefits gained. This cost-benefit approach has become widely used and is often applied in government appraisals of public projects.

The core objective of The Campbell Collaboration (C2) is preparation, maintenance and dissemination of systematic reviews in order to help people make well-informed decisions about the effects of criminal justice, education and social welfare interventions. A central issue for Campbell (and Cochrane) systematic reviews is that they should aim to produce findings that are relevant and useful for an international audience of decision-makers. Systematic reviews of effectiveness have become a valued source of information to help support decision-making and evidence-based policy and practice. They can provide robust and comparatively inexpensive evidence (when compared to the collection of new individual-level data) on intervention effectiveness, which may be more likely to convince decision-makers than evidence from single studies (Mugford 2005, Jefferson 1999). However, in the face of scarce resources, decision-makers often need to consider not only whether an intervention works, but also whether its adoption will lead to a more efficient use of resources.

The topics of C2 Reviews cover a wide range of questions whose answers are important for the improvement of individual and social well-being in environments where resources are limited. Provision of evidence on economics aspects of

interventions can therefore enhance the usefulness and applicability of C2 Reviews as a component of the basis for decision-making (Petticrew 2006, Lavis 2005).

Given that economics issues are important to many end-users of C2 Reviews, in this C2 Methods Policy Brief on Economics Methods we attempt to:

1. Outline the rationale for including coverage of economics aspects of interventions in C2 Reviews.
2. Outline the key elements of a methodological framework for incorporating evidence on economic aspects of interventions into C2 Reviews.
3. Propose methodological standards for the economics components of C2 Reviews.

Key Issues

In consultation with the C2 Steering Committee, CCEMG co-convenors have identified three key issues to be addressed in the C2 Methods Policy Brief on Economics Methods:

1. When is it appropriate for C2 Reviews to include coverage of economics aspects of interventions?
2. Which economics methods are appropriate for use in C2 Reviews?
3. What are the priorities for methodological research to support further development of economics methods for use in C2 Reviews?

1. When is it appropriate for C2 Reviews to include coverage of economics aspects of interventions?

In order to judge how to act on effectiveness evidence in the face of scarce resources, decision-makers need to consider further evidence. This is because most interventions impact not only on criminal justice, education or social welfare outcomes (effects), but also on the resources used in their production (costs).

In criminal justice, education, social welfare or health care systems, there are never enough resources to meet all potential uses. As a result, decisions need to be made about which interventions will be funded, and to what levels, and which will not. Since resources have alternative beneficial uses, to allocate resources with *efficiency* (i.e. to derive maximum total benefit from the resources that are available), information is needed on both the levels and value of the benefits resulting from an intervention and the impact of the intervention on levels (and value) of resource use (costs).

There is currently no formal requirement for C2 Reviews to include coverage of economic aspects of the interventions they compare (where the list of ‘comparators’ may include a ‘do-nothing’ alternative, or ‘standard practice’). However, coverage of economic aspects of interventions is likely to add value to C2 Reviews whenever there are likely to be important differences between the interventions being compared in terms of:

- the quantities of resources required to implement and sustain them (resource inputs);
- the value of resource inputs (costs) required to implement and sustain them;
- their impact on subsequent use of resources and costs (i.e. downstream costs and/ or downstream cost savings);
- the value of intermediate and/ or final outcomes; and/ or

- their impact on overall levels of economic welfare in society.

In other words, coverage of economic aspects of interventions is warranted in a C2 Review when decision-makers in different national, sub-national or international jurisdictions are likely to need to take into account significant resource or cost implications of a decision to *implement* a given intervention (versus alternatives), and to weigh evidence on the relative resource use and costs associated with alternative interventions against evidence on their relative effectiveness in order to arrive at a decision. It is also clear that issues of ‘cost’ and ‘resource use’ are closely aligned with issues of *implementation*; evidence regarding costs and resource use presented in a C2 Review can in this sense be seen as providing an important component of the ‘implementation context’ for evidence on intervention effectiveness.

Figure 1 shows a decision matrix for costs and effectiveness, which is intended to provide a simple illustration of how implementation decisions may be influenced as a result of considering evidence on the costs (resource use) associated with alternative interventions alongside evidence on their effectiveness. Assume that a rational decision-maker would choose to maximise the benefits gained from the investment of available resources. The third column of the matrix (Cells A3, B3 and C3) illustrates three hypothetical scenarios in which a new intervention is found to be more effective than some comparator intervention. If the new intervention is found to be more effective and less costly than its comparator (as in Cell C3), then it is clear that a rational decision would be to adopt the new intervention.

Figure 1 Decision matrix for costs and effectiveness

		Effectiveness			
		1	2	3	
Costs	More costly	A	X	X	JR
		B	X	✓X	✓
	Less costly	C	JR	✓	✓

The same is true in a scenario where the new intervention is again more effective but this time costs the same as its comparator (Cell B3). However, if the new intervention

is both more effective and more costly than its comparator (Cell A3), then a further judgement is required (JR) as to whether the additional effectiveness gained is worth the additional costs (i.e. which intervention is the most cost-effective?).

The second column of the matrix (Cells A2, B2 and C2) illustrates three hypothetical scenarios in which a new intervention is found to be as effective as some comparator intervention. If the new intervention is found to be as effective but less costly than its comparator (Cell C2), then it is again clear that the rational decision would be to adopt the new intervention. Conversely, if the new intervention is found to be as effective but more costly than its comparator (Cell A2), then it is clear that the rational decision would be to reject the new intervention. However, if the new intervention is as effective and costs the same as its comparator (Cell B2), then it would be equally rational to choose either intervention.

The first column of the matrix (Cells A1, B1 and C1) illustrates three further hypothetical scenarios in which a new intervention is found to be less effective than some comparator intervention. If the new intervention is found to be less effective and more costly than its comparator (Cell A1), then it is clear that a rational decision would be to reject the new intervention. The same is true in a scenario where the new intervention is found to be less effective and costs the same as its comparator (Cell B1). However, if the new intervention is both less effective and less costly than its comparator (Cell C3), then a further judgement is required as to whether the reduction in effectiveness is worth the reduction in costs (i.e. which intervention is the most cost-effective?).

Finally, a further scenario is possible in which there is insufficient evidence available to judge whether the new intervention is more, less, or as effective as some comparator (this scenario is not shown in Figure 1). In these circumstances, a decision-maker may still be faced with a choice about which of the alternative interventions to implement. As such, the decision will need to be made on the basis of types of evidence other than evidence of intervention effectiveness, and so in these circumstances evidence regarding the costs (resource use) associated each alternative remains a relevant component of the basis for decision-making.

It is important to state at the outset that a decision to include coverage of economic aspects of interventions in a C2 Review is likely to require consultation with economist researchers willing to provide specialist advice and peer review. This input is best obtained from the outset of the C2 Review production process, in advance of finalising a protocol for the review. The Campbell & Cochrane Economics Methods Group (CCEMG) will, within available resources, seek to provide advisory and peer

review support 'on request' to individual reviews from amongst our active membership, or to help review authors identify a 'local' economist with relevant expertise and experience. Please contact the CCEMG Research Coordinator in the first instance, via e-mail: research@c-cemg.org.

Proposal 1a

C2 Review authors considering a decision to include coverage of economics aspects of interventions in a review should consult an economist willing to provide specialist advice to the review. This support is best obtained from the outset of the review production process and in advance of finalising a protocol for a review.

Proposal 1b

C2 Methods Groups should routinely seek peer review for economics components of C2 Reviews and protocols from an economist with expertise in methods for incorporating economics evidence into systematic reviews. Peer review can be sought from economists linked into C2 Methods Groups via membership of the Campbell and Cochrane Economics Methods Group. Please contact the CCEMG Research Coordinator via e-mail: research@c-cemg.org

2. Which economics methods are appropriate for use in C2 Reviews?

This section of the Brief describes the key stages in an optional methods framework for incorporating coverage of economics aspects of interventions into the C2 Review production process. The central component of this framework is conceptualised as a critical review of economics studies. Each stage of research can be undertaken as a fully integrated component of a C2 Review, in consultation with economist advisors. Initial guidance on methods underpinning each stage of research is presented below.

An economics study is defined here as a full or partial economic evaluation study (see below), or any (other) primary study that includes description, measurement or valuation of resource use (costs) associated with an intervention (see also section 2.3). Although a critical review of economics studies may rarely produce results that are on their own sufficient for policy-making, the results of such a review can serve both to highlight economics issues relevant to potential decisions between alternative interventions, to identify methodological strengths and weaknesses of existing studies and to clarify economics research questions that any subsequent economic evaluation may need to address. The main aim of incorporating a critical review of economics studies in a C2 Review, therefore, is to provide the international context within which

evidence on economics aspects of interventions can be interpreted and assessed as a preliminary to full economic evaluation (Jefferson 1999 *ibid*).

2.1 Starting points and economic commentary

Following a decision to include coverage of economics aspects of interventions in a C2 Review, the first stage of research is to consider, broadly, the role and relevance of economics issues to the overall review topic. The questions below are intended to provide useful starting points in helping C2 Review authors to conceptualise the role and relevance of economics issues:

- ‘What is the economic burden placed on society (e.g. individuals, groups, service providers) by the social problem(s), circumstances or conditions which the alternative courses of action under consideration (i.e. intervention and comparators) are seeking to address?’
- ‘What types of resource *inputs* (e.g. staff, equipment, premises) are likely to be required in order to implement and sustain the alternative courses of action under consideration?’
- ‘What are the potential resource *consequences* of implementing the alternative courses of action under consideration?’ Or ‘How might the alternative courses of action under consideration impact on the subsequent (downstream) use of resources?’
- ‘What is the economic value associated with changes in outcomes that may result from one course of action compared with another (i.e. intervention versus comparators)?’
- Who bears the costs (resource inputs, resource consequences), who receives the benefits and when do costs and benefits occur?
- What are the potential trade-offs between costs (resource use) and beneficial or adverse effects that may need to be considered in a decision to adopt or reject a given course of action?

The answers to these questions can, first, inform a commentary on economics aspects of the interventions under consideration. Whether or not a C2 Review proceeds to the further optional stages of identifying, appraising, extracting and presenting evidence relating to these economics aspects of interventions, extracted from economics studies, it is still useful to include this type of commentary in the ‘Background’ section of the published review. The aim of the commentary is to highlight, for the end-user, economics issues likely to be of relevance to potential decisions regarding the adoption or rejection of the interventions under consideration.

Proposal 2a

C2 Review authors should consider economics aspects of the interventions being studied from the early stages of developing C2 Reviews and their protocols. This exercise can usefully be converted into a commentary on economics aspects of interventions, to be included as an integral component of the published C2 Review and protocol.

2.2 Event pathway descriptions

Event pathways provide a systematic, explicit method of representing different criminal justice, education, social care or health outcomes and processes. Description of the main event pathways associated with the interventions being compared can help to clarify the important items of resource use (costs) and outcomes (beneficial and adverse effects) relevant to a choice between alternative interventions, who incurs the costs, who receives the benefits and when these costs and benefits occur. Event pathway descriptions are therefore useful to inform both a commentary of the type described in ‘Proposal 2a’, and also to help identify key items of resource use (costs), and outcomes (effects) that may be included as primary or secondary outcome measures in a critical review of economics studies.

Figure 2 Event pathways example - A Treatment Foster Care programme

Event pathway	Example
Event	Children or young people who, for reasons of severe medical, psychological, social and/ or behavioural problems, are placed out-of-home.
↓	↓
Event management and subsequent events	Treatment Foster Care (vs. other forms of residential placement), therapy and specialised services + sequelae and complications of treatment.
↓	↓
Resources used to manage events and outcomes of events	Length and stability of placement; structure, intensity and duration of therapy + services; staff requirements; management of sequelae and complications (e.g. secondary diagnoses; episodes of self-harm); individual-level psychological, social, educational, behavioural, health and social care outcomes associated with each stage.
↓	↓
Cost of resources used and values of outcomes	Valuation of resources using social care (and other) pay and prices and (where possible) valuation of outcomes (e.g. using willingness to pay, utilities, other valuation methods.)

The method involves describing pathways of events that have distinct resource implications or outcome values associated with them, from the point of introduction of the interventions, through subsequent changes in management of participants, to final outcomes (see also Donaldson 2002, Chapter 2). This includes identification and description of the resources required to implement the interventions being compared.

In developing an event pathway description, it is important to consider the following issues:

- *Magnitude*: What is the likely order of magnitude of different items of resource use and costs arising as a result of the interventions studied? In other words, which items of resource use (resource inputs and resource consequences) and which costs are likely to be important when making choices between alternative interventions?
- *Analytic viewpoint*: What analytic viewpoint, or perspective, should be adopted for a critical review of economics evidence (e.g. that of intervention subjects/ participants, the service provider, the social care/ education/ criminal justice system, government, society)? For example, the indirect costs of violent crime to victims may be relevant from a societal viewpoint, but may be excluded when a narrower perspective is selected, such as the perspective of an agency or legislature providing a correctional intervention. Given the range of end-users of C2 Reviews, a pragmatic approach may be to adopt a broad, societal viewpoint for the critical review of economics evidence, and then to report not only measures of resource use and cost, but also who bears the cost/ incurs the resource use.
- *Time horizon*: What is the time horizon over which important costs and effects are likely to accrue? C2 Reviews and other systematic reviews of intervention effectiveness implicitly establish a time horizon for effects by specifying intermediate and/ or final endpoint measures of effectiveness as target outcome measures. There is a need to consider whether the same time horizon is applicable when all relevant costs (resource use) and effects are considered together (within the scope of the specified analytic viewpoint).
- *Beneficial and adverse effects (outcomes)*: The set of beneficial and adverse effects to be included in a critical review of economics evidence (e.g. individual-level psychological, social, educational, behavioural, health or social care outcomes) can be obtained directly from the set of outcomes specified for the main review of intervention effectiveness.

2.3 *Identifying relevant economic evaluation studies*

In this section, we describe methods for identifying studies to be included in a critical review of economics studies. Economics studies are those which include description, measurement (e.g. point estimate and statistical distribution), or valuation of:

- the resource inputs required to implement and sustain interventions being compared in the review;
- the value of resource inputs (i.e. costs) required to implement and sustain interventions being compared in the review;
- the resources used as a consequence of the (beneficial and adverse) effects of interventions being compared in the review;
- the value of resources used as a consequence of the (beneficial and adverse) effects of interventions being compared in the review (i.e. downstream cost savings or downstream costs);
- the value of intermediate and/ or final outcomes (beneficial and adverse effects) of interventions being compared in the review; and
- the incremental cost-effectiveness, cost-utility or cost-benefit of interventions being compared in the review.

Economics studies can be classified into three broad categories: **full economic evaluations** (e.g. cost-effectiveness analyses, cost-utility analyses, cost-benefit analyses), **partial economic evaluations** (e.g. cost analyses, cost-comparison studies, cost-outcome descriptions), and **effectiveness studies** containing more limited information on the resource use and/ or costs associated with interventions. The first two categories of studies are described in more detail below:

1. **Full economic evaluations**

Full economic evaluation has been defined as the comparative analysis of alternative courses of action in terms of both their costs (resource use) and consequences (effectiveness) (Drummond 2005a). Full economic evaluation studies aim to clarify, quantify and value the resource inputs and consequences of all relevant alternative courses of action (e.g. intervention 'x' versus comparator 'y'). Cost-benefit analysis (CBA) falls into this category (see Box A). Some approaches fall short of full valuation of consequences, but are still considered to be full economic evaluations, including cost-effectiveness analysis (CEA) and cost-utility analysis (CUA). An important general point is that it is primarily the nature of a specific decision problem which drives the appropriate choice of

type(s) of full economic evaluation, so that no type is inherently superior or inferior to another. See Box A for descriptions of CEA, CUA and CBA¹.

2. Partial economic evaluation studies

Partial economic evaluations are economic analyses which either focus solely on costs and/ or resource use but do not relate costs to consequences, or which focus on both costs and consequences but do not involve a comparison between alternative interventions. Types of studies considered to be partial economic evaluations include: cost analyses, cost-comparison studies, cost-consequences analyses and cost-outcome descriptions. Partial economic evaluations can provide elements of information required for full economic evaluation, since they all attempt to identify, measure and value costs and resource use resulting from interventions. Indeed, in some cases, partial economic evaluations may provide the most detailed and highest quality descriptions and measurements of the resources used to implement and sustain an intervention that are currently available.

Box A Types of full economic evaluation

All types of full economic evaluation compare the inputs or resources necessary to carry out one (or more) alternative interventions (e.g. intervention 'x' versus comparator 'y') with their consequences, or effects. All the types value resource use in the same way (i.e. by applying unit costs to measured units of resource use). The various types differ primarily in the way they itemise and value effects. Differences between the types reflect the different aims and viewpoints of different decision problems (or economic questions).

Cost-effectiveness analysis (CEA): the effects of alternative interventions (and its comparators) are measured in identical units of outcome (e.g. recidivism rate, graduation rate). Alternative interventions are compared in terms of 'cost per unit of effect'.

Cost-utility analysis (CUA): when alternative healthcare interventions produce different levels of effect in terms of both quantity and quality of life (or different effects), the effects may be expressed in utilities. Utilities are measures which comprise both length of life and subjective levels of well-being. The best known utility measure is the quality-adjusted life year, or QALY. Alternative interventions are compared in terms of cost per unit of utility gained (e.g. cost per QALY).

Cost-benefit analysis (CBA): both resource inputs and effects of alternative interventions are expressed in monetary units, so that they compare directly and across programmes within a given system (e.g. social care system), or with programmes outside social care (e.g. social care intervention vs. educational intervention).

¹ Drummond 2005a *ibid* (Chapters 2, 5, 6 and 7), Jefferson 2000 (Chapter 2) and Levin & McEwan 2001 (Chapter 1) include introductions to the theoretical basis for these different types of full economic evaluation, including illustrative examples. CRD Report 4 (Khan 2001) includes an introduction to types of economic evaluation studies that may be encountered when conducting a systematic review.

All types of full and partial economic evaluations can be conducted alongside single, empirical studies that may be included in the effectiveness component of a C2 Review, such as randomised trials, group randomised trials, or observational study designs. Such studies may include commentary on economics aspects of the interventions under consideration, as described in 'Proposal 2a'. Studies containing this type of information can inform a similar commentary in a C2 Review, but should only be considered for formal inclusion in a critical review of economics evidence if they also include some level of economic analysis that is relevant to target economic outcomes (e.g. quantitative estimates of resource use, costs, benefit valuation and/ or cost-effectiveness).

All types of full economic evaluation can also be based upon systematic review methods, including use of a decision-analysis approach which involves pooling or *modelling* the available evidence on intervention costs and effects (Briggs 2006). Economic models use data collected from a variety of sources to evaluate the incremental cost-effectiveness (cost-effectiveness, cost-utility or cost-benefit) of an intervention versus relevant comparators. They provide a useful structure to model the processes associated with implementation of interventions and are often applied in order to extrapolate primary data on costs and effects beyond the endpoint of a trial (i.e. to follow human subjects for a sufficiently long time for all important cost and effect differences to be captured), or to make comparisons between interventions for which no 'head-to-head' trials exist.

C2 Reviews can provide a useful source of evidence to inform development of a subsequent (or parallel) full economic evaluation model. This is true whether or not the review incorporates coverage of economic aspects of interventions, since a well-conducted meta-analysis of data on effect-size and adverse effects collected using a systematic review of randomised controlled trials has been proposed as the least-biased source of data to inform effect-size and adverse effects parameters in an economic model (Coyle 2002, Cooper 2005). This needs to be supplemented by additional systematic searches of data to inform ranges of values for the other key parameters in the economic model (Phillips 2004, Cooper 2005). Economic evaluation models can therefore be seen as a further layer of evidence synthesis building on the systematic review process.

Furthermore, economic models that have already been produced can, in principle, be included in a critical review of economics studies being conducted as part of a C2 Review. However, economic evaluation models and economic evaluations based on single empirical study designs are generally recognised to be distinct and specialised forms of economic evaluation (Craig 2006), so that in reviews that will consider both

forms, we suggest that each form is reviewed separately, in order to retain comparability amongst reviewed studies.

Overall, it is clear that there are several interfaces between economic evaluation and systematic review methods, and this implies *at least* three options when defining the scope of a critical review of economics evidence that may be undertaken as part of a C2 Review, in terms of the economic evaluation studies that will be considered for inclusion:

1. Only those full and partial economic evaluations based on single empirical studies meeting inclusion criteria for the effectiveness component of the review (e.g. economic evaluations based on randomised controlled trials).
2. Full and partial economic evaluations based on single empirical studies meeting inclusion criteria for the effectiveness component of the review (e.g. economic evaluations based on randomised controlled trials *plus* economic evaluation models based in part on systematic reviews and meta-analyses of several single empirical studies meeting inclusion criteria for the effectiveness component of the review).
3. All relevant full and partial economic evaluations, irrespective of the source of the effectiveness data they utilise (if applicable).

To date, there has been little empirical research to assess the impact of decisions regarding the scope of included studies on the results of a critical review of economics evidence. However, it is plausible that such decisions have at least the potential to impact on results, since the different options may involve reviewing different sets of studies. Leaving aside likely variations in the breadth and depth of economics literature relevant to specific review topics, it is clear that ‘Option 1’ is less broad in scope than either ‘Option 2’ or ‘Option 3’, and that ‘Option 2’ is less broad than ‘Option 3’. For example, in a C2 Review that includes only randomised controlled trials in the effectiveness component of the review, both ‘Option 2’ and ‘Option 3’ would allow for inclusion of economic modelling studies based on a meta-analysis of data collected using a systematic review of randomised controlled trials, whilst ‘Option 1’ would not. In the same review, ‘Option 3’ would additionally allow for economics studies based on observational study designs or analysis of large administrative datasets, whilst ‘Option 1’ and ‘Option 2’ would not.

Cochrane Reviews that incorporate coverage of economics literature typically include only those economic analyses based upon effectiveness studies meeting inclusion criteria for the effectiveness review (Shemilt 2007). This in effect (and often implicitly) imposes the same inclusion criteria applied to effectiveness studies on to

economic evaluation studies. In some cases this relatively narrow strategy may exclude a proportion of the relevant economics literature.

We therefore recommend that C2 Review authors adopt as broad an approach as is feasible, within available resources, to the issue of ‘scope’ in order to allow as much relevant economics literature as possible to be considered for inclusion in a review. Whichever option is pursued, identification of economics studies will need to be followed-up with a rigorous critical appraisal of their methodological quality, which will include (but is not limited to) grading studies according to the source and quality of effectiveness data on which they are based, if applicable (see section 2.4).

It is also important that the choice of ‘scope’ highlighted above is made explicit to ensure that search strategies and inclusion criteria are transparent for end-users of a C2 Review. All studies encountered during the review which include data relevant to the economics component (e.g. full and partial economic evaluations) should be identified either in ‘characteristics of included studies tables’ or in ‘characteristics of excluded studies tables’. This can usefully be supplemented by an annotated bibliography of papers containing such data.

Proposal 2b

C2 Reviews that include items of resource use and/ or cost and/ or measures of cost-effectiveness as primary or secondary outcome measures should seek to identify and retrieve relevant economics studies containing these outcome data for potential inclusion in a critical review of such studies

Proposal 2c

The scope of a critical review of economics studies may be limited to economic evaluations based upon single empirical studies meeting inclusion criteria for the review of intervention effectiveness, or may be expanded to also include economic evaluations based in part upon syntheses of several single empirical studies meeting inclusion criteria for the review of intervention effectiveness, or further to encompass all relevant economics studies. The scope should be made explicit for end-users of the review.

Proposal 2d

Studies encountered during a C2 Review which include data relevant to the economics component of the review should be identified in ‘characteristics of studies’ tables and/ or an annotated bibliography.

Alongside screening of titles, abstracts, full-texts and reference lists of studies encountered during the review for references to relevant economic analyses that may have been conducted, search strategies for the review can also be extended to include relevant economics search terms. Extended search strategies will need to be configured on a review-by-review basis and take into account variations across electronic literature databases in the indexing or classification of full and partial economic evaluation studies. This task should be undertaken in consultation with an economist advisor or a search specialist with experience in undertaking searches for economics studies.

There are also some specialist electronic literature databases containing details of economic evaluation studies that may be relevant to C2 Reviews. **Econlit** is the American Economic Association's electronic bibliography of international economics literature. The database includes references, abstracts and links to full-text articles in over 750 indexed economics titles, including many peer-reviewed journals covering social science topics likely to be of interest to C2 reviewers. EconLit is available as a free-access resource through many libraries and universities. See <http://www.econlit.org/index.html> for further information.

The **NHS Economic Evaluation Database** (NHS EED) is published as part of The Cochrane Library (see <http://www.theCochraneLibrary.com>) and is also available free online from the website of the Centre for Reviews and Dissemination, University of York (see <http://www.york.ac.uk/inst/crd/crddatabases.htm>). NHS EED is a key source of economic evaluation studies covering health and related fields in all languages. The database contains structured abstracts of full economic evaluation studies (including critical appraisal) written by independent economist reviewers, as well as references to partial economic evaluations (e.g. cost analyses), methodology studies and reviews (including systematic reviews of economics studies). C2 Review authors may find searching NHS EED particularly fruitful where interventions involve potential health outcomes (e.g. public health, mental health or social interventions), or are implemented in and across policy domains including health (e.g. school breakfast clubs, day-care centres, treatment foster care). The desire to extend the principles of the UK-based NHS EED database to other European countries has led to the establishment of the **European Network of Health Economic Evaluation Databases** (EURONHEED), which is also freely available online (see <http://infodoc.inserm.fr/euronheed/>). There are currently no equivalent databases to NHS EED which specifically cover economics literature in the education, criminal justice and/ or social welfare fields. CCEMG will aim to undertake research to establish coverage of economics literature by electronic social sciences literature databases likely to be of interest to C2 Review authors.

2.4 Assessment of methodological quality

For the economics component of a C2 Review, full-text papers reporting potentially relevant full and partial economic evaluation studies will need to be obtained and screened in order to exclude those studies not meeting inclusion criteria relating to interventions, participants and outcomes. Reasons for excluding full and partial economic evaluations at this stage should be reported in ‘characteristics of excluded studies’ tables in the published C2 Review. The next stage of research is to undertake critical appraisal of the methodological quality of these studies.

Critical appraisal of full economic evaluation studies should consist of two elements. First, since the reliability of a full economic evaluation study is in part predicated on the use of reliable effectiveness data, C2 Review authors should consider sources of potential bias that may apply to the study (or studies) utilised as the source of effectiveness data (see Shadish 2002, pages 12-13, Key Issue 8 for guidance on this issue). Second, authors should assess the overall methodological quality of the full economic evaluation study.

Figure 3 is an established, peer reviewed checklist developed to assess risk of bias in economic evaluation studies in healthcare (Drummond 1996), which we have adapted (very slightly) for use to inform critical appraisal of full economic evaluations of crime and justice, education and social welfare interventions that are based on single empirical studies. The same checklist can be used to inform critical appraisal of partial economic evaluations, using the subset of applicable checklist items.

It is important to highlight that there are, as yet, no widely validated minimum methodological criteria to be applied to screening economic evaluation studies for inclusion in systematic reviews (nor research on the impact of excluding studies which meet some criteria, but not others, on results) and so ultimately, decisions to include or exclude such studies will need to be made on the basis of an overall judgement of the methodological quality of studies (based on aspects of their internal and external validity). We also recommend that where a checklist is used for the purpose of informing a critical appraisal of methodological quality, the published C2 Review includes an additional table in appendices which summarises included economic evaluation studies by checklist items (with economic evaluations listed in columns, and checklist items listed in rows), as well as highlighting aspects of methodological quality as part of a narrative summary of the characteristics and results of included studies (see section 2.7).

Figure 3 Checklist for assessment of methodological quality in economic evaluation studies

Item	Yes	No	Not clear	Not appropriate
Study design				
1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
6	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
7	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Data collection				
8	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
9	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
12	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
17	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
18	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
19	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
20	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Analysis and interpretation of results				
22	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
23	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
32	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
33	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
34	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
35	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Source: Adapted from Drummond 1996.

The checklist shown in Figure 3 is not sufficient to inform critical appraisal of economic evaluation modelling studies. Whilst a number of established checklists are available to inform assessment of the methodological quality of health economic models (e.g. Phillips 2004, Weinstein 2003) these have not specifically been adapted for use in C2 policy domains. As such, C2 Review authors wishing to undertake critical appraisal of economic models should consult an economist advisor.

Proposal 2e

C2 Reviews incorporating a critical review of economics studies should, where appropriate, use a recognised checklist to inform a rigorous critical appraisal of the methodological quality of included economics studies.

2.5 Data extraction

Precise requirements for extraction of data from included economic evaluation and/ or effectiveness studies will need to be specified on a review-by-review basis. However, in general terms, two types of data will need to be extracted: details of the characteristics of included studies and details of their results. The potential to extract data as suggested below will be constrained by the quality of reporting in economics studies (where information is missing, a further option is to contact study authors to request additional details).

Useful data to be extracted regarding the characteristics of each economics study include: details of intervention and comparators; study design/ method of economic evaluation; year of study; decision-making jurisdiction and/ or geographical and organisational setting; analytic perspective adopted (e.g. societal; national/ sub-national criminal justice/ educational/ social care system; third party payer; institution; individual service user; service users' families); time horizon for both costs (resource use) and effects (beneficial and adverse effects); and sources of resource use, unit costs and (if applicable) effects and benefit valuation data.

A potential difficulty in classifying the different types of full and partial economic evaluation studies that may be encountered during a systematic review is that studies reported as being one type of study design (e.g. cost-benefit analysis) may, on closer inspection, turn out to be another (e.g. a cost-effectiveness analysis). This means that care is required when classifying economics studies encountered during a review (Zarnke 1997).

For results, both resource use and unit cost data should be extracted, wherever possible. Both a point estimate and measure of uncertainty should be extracted, if

reported. Resource use data should be extracted in natural units (e.g. hours of psychologists' time; number of reading books; number of school meals; kilowatt hours of electricity) and, where possible, recorded either as resource inputs (which may occur pre-intervention, e.g. training, or during intervention delivery, e.g. staff/ personnel, equipment, premises, overheads) or resource consequences/ downstream resource use (i.e. post-intervention or 'downstream' changes in resources used as a result of the intervention). Also, where possible, we recommend extracting both resource use and unit cost data per participant and/ or per session (as well as the number of sessions, or 'dosage', to allow calculations of the total amounts of resources used and/ or total costs). For unit cost data, it is important to extract data on price year and currency. Additionally, it is useful to extract details of any sensitivity analyses that have been undertaken, including the impact of varying assumptions on results.

CRD Report 6 (Craig 2006) includes a template for producing structured abstracts of economic evaluations, together with notes to guide data extraction and critical appraisal. These materials can provide a useful template to inform the design of data extraction forms for use in the economics components of C2 Reviews.

Proposal 2f

Data extraction requirements for the economics component of a C2 Review will need to be specified on a review-by-review basis. In general, two types of data will need to be extracted: details of the characteristics of included studies and details of their results. For results, both resource use and unit cost data should be extracted, where possible.

2.6 *Analysing and presenting results*

The emphasis of our recommendations regarding analytic methods for use in the economics components of C2 Reviews is placed upon tabulation of the characteristics and results of individual economics studies. This can be supplemented by a narrative summary which focuses on critical appraisal of included economics studies and discussion and comparison of their principal findings. Additionally, in some circumstances, a meta-analysis of resource use, cost or benefit valuation data, and/ or development of an economic model, may be considered. These options are described in more detail below. Further options for analysing economics studies and presenting the results of these analyses need to be evaluated through further methodological research.

Use of tables

Tables can be used to present details of the characteristics of each included economics study and details of their results. Details of the characteristics of economics studies include: details of intervention and comparators; study design/ method of economic evaluation; year of study; decision-making jurisdiction and geographical and organisational setting; analytic perspective; time horizon for both costs (resource use) and effects (beneficial and adverse effects); and sources of resource use, unit costs and (if applicable) effects and benefit valuation data (see also section 2.5). Authors should also consider including an additional table to summarise checklists that have been completed to inform assessments of the methodological quality of included economics studies (with economic evaluations listed in columns, and checklist items listed in rows - see also section 2.4).

For tabulation of results, point estimates of measures of resource use, costs or benefit valuations should be presented with associated measures of uncertainty for both the target intervention and each comparator, as well as point estimates and associated measures of uncertainty for measures of incremental resource use, costs, benefit valuation and/ or cost effectiveness. Details and results of sensitivity analyses should also be tabulated (if conducted and reported). It is also important to state currency and price year alongside estimates of costs and/ or incremental costs (if reported).

It may be possible to convert cost estimates to a common currency and price year, in order to facilitate comparison of estimates collected from different studies. The GDP deflator (or 'implicit price deflator for GDP') can be used to convert each cost estimate to a common target price year and then an international exchange rate based on Purchasing Power Parities (PPPs) can be used to convert this estimate to a common target currency (see <http://www.oecd.org/std/ppp>). However, use of PPPs is only possible where the original cost estimate is expressed in one of several specific currencies for which a PPP conversion weight is available. CCEMG will aim to issue further guidance on this topic in due course.

Narrative summary

C2 Reviews may include a narrative summary of the main characteristics and results of included economics studies in order to supplement and provide a commentary on tabulated characteristics and results. Including this type of narrative summary is particularly useful when quantitative synthesis of economic data is not judged appropriate (see below in this section under 'Meta-analysis'). However, it is also important to avoid misusing the narrative summary as a form of analysis that can lead to recommendations regarding cost-effectiveness.

The central aim of a narrative summary is to make explicit, for the end user, the extent to which estimates of (incremental) resource use, costs, benefit valuation and cost-effectiveness collected from multiple studies are homogeneous between studies. This can be accomplished by describing differences in the methods underpinning description, measurement and valuation, and differences in patterns of, incremental resource-use, costs and cost-effectiveness across studies.

Economics studies are constructed differently and for different purposes, leading to heterogeneity in the detailed methods used, which is one potential source of heterogeneity in results between studies (e.g. in terms of identification of key cost items, estimates of resource use, costs, method of benefit valuation and/ or cost-effectiveness). For example, one study may evaluate resource use and costs from a service provider perspective, and therefore take into account only resource use and costs incurred by the service provider (e.g. amounts and levels of personnel, equipment, premises, overheads etc) whilst another study may additionally take into account resource use and costs incurred by the service-user (e.g. time-off work, travel costs, other out-of-pocket expenses). Similarly, studies may differ in the time-horizon adopted for resource use/ costs, so that one study may consider only resource use (costs) incurred only during the period of intervention (e.g. amounts and levels of personnel, equipment, premises, overheads etc) whilst another may additionally consider downstream resource use/ costs resulting from the effects of interventions (e.g. reduced number of incarcerations due to decreases in recidivism).

Alternatively, inconsistencies in results across economics studies may be in part attributable to 'real' differences in the levels and combinations of particular resources used to provide the interventions or programmes (e.g. personnel, equipment etc.), or different service settings (e.g. school or community centre). Results may also vary across studies where units of resource are valued using different unit costs (e.g. due to differences between settings in local prices, economies of scale, exchange rates or financial incentives, or due to changes in unit costs over time attributable to inflation), across studies. Drawing attention to all these potential sources of statistical heterogeneity in a narrative summary of the characteristics and results of included economics studies (i.e. by offering potential explanations for inconsistencies in results between studies) can help to summarise the international economics literature in a way that is likely to be useful to the end-users of C2 Reviews.

Features of good practice in a narrative summary of economics studies include:

- Reporting the overall number of economics studies selected for inclusion in the review by study design;

- Describing the economics questions addressed within included economics studies;
- Reporting the analytic perspectives and time-horizons adopted within included economics studies;
- Discussion of principal results across included economics studies, in terms of measures of incremental resource use, costs and/ or cost-effectiveness;
- Reporting measures of uncertainty alongside measures of incremental resource use, costs and/ or cost-effectiveness extracted from included economics studies;
- Reporting currency and price year alongside estimates of costs, or if possible adjusting cost estimates to a common currency and fixed price year;
- Highlighting key features of sensitivity analyses undertaken and the consistency in the direction and magnitude of results, both within and across included economics studies;
- Discussion of the overall quality, strengths and limitations of methods underpinning included economics studies;
- Discussion of the relevance and generalisability of the results of included economics studies to jurisdictions and settings other than those considered within each study;
- Where applicable, discussion of the quality of sources of (beneficial and adverse) effects data utilised within included economics studies and the relationship between effect-size estimates within included economics studies and those estimated within the parallel effectiveness component of the review.

Meta-analysis

In principal, quantitative estimates of the amounts and values of individual items of resource use or costs, or values of benefits (intervention versus comparator), extracted from two or more studies, can be pooled using a meta-analysis, providing some measure of uncertainty is available. However, we advise caution when considering whether to undertake a meta-analysis of resource use, cost or benefit valuation data.

Meta-analysis requires that a common metric and measures of uncertainty are available across two or more studies. This means that the metric in question should have equivalent meaning across studies. In the case of items of resource use and cost, particular attention should be given to whether the item has equivalent meaning across studies, prior to any decision to pool estimates from multiple studies. One implication here is that cost estimates collected from multiple studies will need to be adjusted to a common currency and price year before these data are pooled.

More generally, resource use, costs and (if available) measures of preferences for outcomes/ benefit valuations (e.g. estimates of willingness to pay, utility measures) are sensitive to variability across settings, both *within* country and *between* countries, in features of the local context such as local prices, aspects of service organisation and delivery, and the strength of people's preferences for outcomes (Manca 2006, Drummond 2005b, Sculpher 2004, Bryan 1998, Phelps 1997). This may limit the generalisability and transferability of estimates of cost, resource use and, by implication, estimates of cost-effectiveness, across settings. It is also the main reason that resource use and cost data relating to the specific populations and jurisdictions of interest are regarded as the best available source of data for use in economic evaluations (Coyle 2002 *ibid*, Cooper 2005 *ibid*). These concerns have generated debate on whether meta-analysis of resource use, cost or benefit valuation data is likely to generate results that are meaningful, what additional value the results of such a meta-analysis may have for end-users of C2 Reviews and how results should be interpreted.

On the other hand, whether specific estimates of resource use or costs are generalisable or transferable across settings may be regarded as an empirical question. In circumstances where there is evidence of little variation in resource use or adjusted cost estimates between studies, it may be regarded as legitimate to present a pooled estimate, alongside a measure of uncertainty surrounding the pooled estimate. If meta-analyses of resource use and/ or cost data are undertaken in a C2 Review, this should always be supported by thorough critical appraisal of the methods used to derive such estimates in primary studies, alongside use of methods to investigate and incorporate between-study heterogeneity (e.g. chi-squared, I^2 , Q-stat tests, random-effects models)..

Authors should also consult the Campbell Collaboration Statistical Analysis Policy Brief (Becker 2002) for full guidance on meta-analysis and related statistical methods for use in C2 Reviews, before considering meta-analysis of resource use, cost or benefit valuation data. Any meta-analysis of such data should always be accompanied by a narrative summary in the 'Results' section of the review, which comments on the direction and magnitude of results and their precision. Finally, it is important to highlight here that there are currently no agreed-upon methods for combining cost-effectiveness, cost-utility or cost-benefit ratios collected from multiple full economic evaluation studies using a meta-analysis, or other quantitative synthesis methods.

Economic models

C2 Reviews can contribute key components of the evidence required to develop a subsequent or parallel full economic evaluation model (see also section 2.3). The

economic modelling approach usually involves estimation of the point estimate, and description of the joint distribution of incremental costs and effects resulting from an intervention (in terms of cost-effectiveness, cost-utility or cost-benefit), compared to a relevant alternative, within a defined population and setting, and with costs and outcomes included to be relevant from a specific, stated viewpoint (such as service provider, purchaser, government, service-user/ family, or societal) over a specified time horizon. A well-conducted meta-analysis of randomised controlled trials with direct comparison between alternative interventions has been proposed as the least-biased source of data for the main clinical effectiveness parameter in an economic evaluation modelling exercise (Coyle 2002 *ibid*, Cooper 2005 *ibid*).

C2 Review authors wishing to pursue the ‘in-depth’ economics of the interventions under consideration are encouraged to collaborate with researchers who have expertise in developing economic models. Notwithstanding issues already raised regarding the generalisability and transferability of the results of economic evaluations across jurisdictions/ settings, it may sometimes be considered worthwhile (although time, resource and expertise intensive) to develop one or more example economic models for publication in a C2 Review. For example, one motivation for developing an economic model as part of a C2 Review may be to inform the design of future research that will incorporate an economic evaluation component, by helping to clarify the structural assumptions and parameters that may need to be considered and the data that will need to be collected. If an economic model is published in a C2 Review, it needs to be made clear that the model provides only an illustrative assessment of the cost-effectiveness (cost-benefit/ cost-utility) of the interventions being compared in an example (e.g. national) jurisdiction at a given point in time. However, economic modelling methods are not emphasised in this Brief, since we are not recommending their routine use as part of the C2 Review process.

Economic modellers are also encouraged to consider utilising C2 Reviews to inform development of such models in different jurisdictions and settings. Efforts to incorporate economics evidence using the methods outlined in this Brief should increase the relevance and applicability of C2 Reviews for use in subsequent or parallel full economic evaluation modelling exercises.

Proposal 2g

C2 Reviews should emphasise use of tables to present the key characteristics and results of each included economics studies, supplemented by a narrative summary to discuss and compare their principal findings. Meta-analysis of resource use, cost and/ or benefit valuation data should be undertaken with caution. Development of economic models is not recommended as a routine part of the C2 Review production process, but closer collaboration is encouraged between C2 Review authors and economic modellers to facilitate development of economic evaluation models to inform decision-making in specific jurisdictions.

2.7 Interpretation of results

Interpretation of the results of a review of economics studies is dependent on the specific question and context of relevance to a given decision about the provision of education, criminal justice or social care programmes and services. In C2 Reviews - intended for an international audience - there are clearly a large number of potential economics questions and contextual factors that different decision-making constituencies may need to take into account. Given this global context, it is not recommended (and is unlikely to prove possible) to draw definitive conclusions on the basis of existing literature regarding the adoption or rejection of a programme or service. In other words, it is unlikely to prove possible to interpret the results of a review of economics studies undertaken as part of a C2 Review to provide definitive answers to questions about ‘which intervention is the most cost-effective?’ of those being compared, or ‘which intervention is the least costly’. However, whilst in these circumstances a review of economics evidence is unlikely to provide the central aspect of a policy evaluation, it can help decision-makers to understand the structure of the resource allocation problem they are addressing, the main parameters that need to be considered, variation between settings in terms of resource use, costs and cost-effectiveness and potential reasons for these variations, thus helping to refine an economic discussion and to set this in an international context.

In a review topic with few or no relevant, high quality economic evaluation studies, the C2 Review can serve to highlight a lack of evidence on economics aspects of interventions that future research may need to address. In this case, review authors should also consider that since a full economic evaluation is in part predicated on the availability of reliable data on the effects of interventions, a lack of reliable effects data would clearly impact on the feasibility and availability of full economic evaluation studies.

Proposal 2h

C2 Review authors should avoid attempting to draw definitive conclusions regarding the cost-effectiveness of interventions on the basis of a critical review of economics studies.

3. What are the priorities for methodological research to support the further development of economics methods for use in C2 Reviews?

The assembly of material for this Brief has confirmed the need for closer collaboration between C2 Review authors and applied economists to take forward the development of relevant, appropriate and unbiased economics methods for use in C2 and other systematic reviews of crime and justice, education and social welfare interventions.

In parallel, the Brief has highlighted the need for a structured programme of methodological research to evaluate the use of best-practice economics methods for systematic reviews conducted in these applied fields. It is envisaged that findings from this research will provide the basis for development of further proposals regarding the use of economics methods in C2 Reviews. Some priorities for methodological research to support these activities are:

- Research to establish a more detailed understanding of patterns of economic evaluations of crime and justice, education and social welfare interventions.
- Research to establish patterns of coverage of economics literature in social sciences journals and electronic literature databases likely to be used in C2 Reviews.
- Research to establish a more detailed understanding of current patterns of use of economics methods in systematic reviews of crime and justice, education and social welfare interventions in general, and in C2 Reviews in particular.
- Investigation of the impact on results of use of quality thresholds to determine inclusion/ exclusion of economics studies on grounds of methodological quality.
- Development and evaluation of a checklist to assist in the identification and classification of economic analyses of crime and justice, education and social welfare interventions.
- Development of specialist database(s) of economic evaluation studies conducted in crime and justice, education and social welfare fields.

- Development of sources of unit cost data for use in crime and justice, education and social welfare research.
- Development and testing of economic models based on systematic reviews of crime and justice, education and social welfare interventions.

The list above is not intended to be exhaustive and priorities for research are not fixed, since new issues are likely to emerge as the methods are applied. Methodological research will need to be accompanied by renewed efforts to promote more routine collection of ‘implementation data’ on resource use and costs, as well as the use of best-practice economic evaluation methods, in primary studies of criminal justice, education and social welfare interventions and to develop increased dialogue and close collaboration between economists and the research synthesis community. The Campbell & Cochrane Economics Methods Group is engaged in ongoing efforts to build capacity amongst its active membership both to participate in methodological research and to provide advisory and peer review support to C2 Review authors seeking to include coverage of economics evidence.

The authors welcome further discussion and constructive critical comment on the issues and guidance presented in this document from both colleagues within The Campbell Collaboration and other interested parties. Please address all correspondence to the CCEMG Research Coordinator via e-mail to: research@c-cemg.org

Proposal 3a

A structured programme of methodological research is required to support the further development of economics methods for systematic reviews of crime and justice, education and social welfare interventions. This will need to be accompanied by efforts to promote use of best-practice economic evaluation methods in primary research studies in these applied fields, and to develop collaboration between economists and the research synthesis community.

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