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The Science of Using Science

Researching the Use of Research Evidence in Decision-Making

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1. The Final Report by Langer, Tripney, and Gough (available at http://eppi.ioe.ac.uk/cms/Default.aspx?tabid=3504);
2. The Technical Report by Langer, Tripney, and Gough (the current document);
1. A discussion document based on the Final Report and a case study analysis of decision-makers' use of evidence by Breckon and Dodson (available at http://www.alliance4usefulevidence.org/publication/);
3. A conference to disseminate the findings, held on 12 April 2016 at the Wellcome Trust.

The Technical Report is an extended version of the Final Report and provides additional detail on research methods and findings.

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Executive summary

Introduction

Research evidence is just one factor that can influence decision-making at a policy and practice level. While various interventions have been developed to enhance and support the use of research evidence by decision-makers, it is unclear which interventions are effective. This research project set out to review the efficacy of interventions applied to increase decision-makers' use of research in various decision arenas. The project also examined whether there is additional knowledge in the broader social science literature that is relevant to evidence-informed decision-making (EIDM) and could be applied to help support future interventions in this area.

Review methods

Two reviews of reviews were conducted: first, a systematic review of reviews of the EIDM literature (Review 1); and, second, a scoping review of the research reported in reviews in the broader social science literature (Review 2). Both reviews applied an explicit review methodology following a structured and transparent process to synthesise the findings reported in both bodies of literature. An overall conceptual research framework was developed to structure the two reviews in a comparable manner and to allow for the integration of the results from both reviews. This framework was used to group interventions according to six mechanisms of change (i.e. the processes by which EIDM might be achieved). Each of the six mechanisms (M1-M6) were also examined in terms of intermediary behavioural outcomes consisting of the capability, motivation, and opportunity (CMO) to act in a way that may increase EIDM.

Review 1 results: what works to increase research use by decision-makers?

The systematic review of reviews (Review 1) identified 36 existing reviews assessing what interventions work to increase research use. Synthesising the findings of 23 reviews rated moderate to high trustworthiness and relevance, we found:

Evidence of effects (evidence use outcome)

Interventions facilitating access to research evidence, for example through communication strategies and evidence repositories, conditional on the intervention design simultaneously trying to enhance decision-makers' opportunity and motivation to use evidence (reliable evidence).[1]

Interventions building decision-makers' skills to access and make sense of evidence (such as critical appraisal training programmes), conditional on the intervention design simultaneously trying to enhance both capability and motivation to use research evidence (reliable evidence).

Interventions that foster changes to decision-making structures and processes by formalising and embedding one or more of the other mechanisms of change within existing structures and processes

[1] 'Reliable' refers to evidence based on reviews rated high trustworthiness and relevance in the weight of evidence assessment. For details of the weight of evidence assessment, see Section 2.1 below and Chapters 2, 3 and Appendix I in the Technical Report.

(such as evidence-on-demand services integrating push, user-pull and exchange approaches) (cautious evidence).[2]

There is reliable evidence that some individual interventions characterised by a highly intense and complex programme design lead to an increase in evidence use. Overall, however, and based solely on observation, simpler and more defined interventions appear to have a better likelihood of success.

Evidence of no effects (evidence use outcome)

- Interventions that take a passive approach to communicating evidence that only provide opportunities to use evidence (such as simple dissemination tools) (reliable evidence).
- Multi-component interventions that take a passive approach to building EIDM skills (such as seminars and 'communities of practice' without active educational components) (cautious evidence).
- Skill-building interventions applied at a low intensity (such as a once-off, half a day capacity-building programme) (cautious evidence).
- Overall, unstructured interaction and collaboration between decision-makers and researchers tended to have a lower likelihood of success. However, clearly defined, light-touch approaches to facilitating interaction between researchers and decision-makers, engagement in particular, were effective to increase intermediate CMO outcomes (cautious evidence).

Absence of evidence

- Interventions building awareness of, and positive attitudes towards, EIDM.
- Interventions building agreement on policy-relevant questions and what constitutes fit-for-purpose evidence.

Review 2 results: insights from social science knowledge to support research use

The scoping review of the broader social science literature (Review 2) identified 67 interventions of potential relevance to EIDM. Configuring the insights and, in some cases, the reported effects of these interventions generate a number of contributions that the reviewed social science literature suggests. These contributions illustrate examples of potential applications of social science knowledge to support EIDM interventions and mechanisms.

Promote and market behavioural norms

- Social science knowledge on the creation of behavioural norms could be used in EIDM to support the formation of social or professional *evidence use norms*. Effective social science interventions to build such norms included social marketing, social incentives, and identity cues, for example.

[2] 'Cautious' refers to evidence based on reviews rated moderate trustworthiness and relevance. As above.

Engage in advocacy and awareness raising for the concept of EIDM

- Social science research suggests that advocacy and awareness-raising campaigns are effective in supporting behavioural change. These strategies could be applied to communicate and *popularise the concept of EIDM* to increase awareness for the benefits of using evidence during decision-making as well as the risks of not doing so.

Effectively frame and formulate communicated messages

- Social science literature on effective communication suggested many techniques and strategies that can be used to enhance the communication of research evidence. *Framing* of messages, *tailoring* communication including *audience segmentation*, and regular use of *reminders* are examples of communication techniques reported as effective in the social sciences that could contribute insights to EIDM interventions as well.

Design appealing and user-friendly access platforms and resources

- The social science literature features a rapidly growing body of knowledge on *information design*. Interventions aiming to improve decision-makers' access to evidence could directly draw from this knowledge to enhance the design of evidence repositories and other resources, as well as to investigate the programming of *EIDM apps.*

Build a professional identity with common practices and standards of conduct

- Social science insights on social influence, collaboration, relationship building, and group interaction could be used to improve the design and outcomes of interaction interventions. The literature suggests that interaction among professionals can build a *professional identity* with *common practices and standards of conduct* (through, for example, communities of practice, mentoring, and inter-professional education). Making the building of a professional identity relating to evidence use a key objective of future interaction interventions would, in turn, entail a greater emphasis on facilitating interactions between different decision-makers to fully harness the power of social influence and peer-to-peer interaction.

Foster adult learning

- Social science knowledge on *adult learning theories and principles* is of direct use and relevance to EIDM capacity-building. Integrating this body of knowledge more closely with EIDM is likely to enhance the long-term performance of interventions supporting decision-makers' EIDM skills.

Build organisational capacities and support organisational change

- A large body of knowledge on *organisational structures* could be transferred to support the design of EIDM interventions. Social science research on organisational learning and cultures, management and leadership techniques, and other changes to organisational processes and structures (for example, facilitation), is of direct benefit to interventions aiming to increase the receptivity of decision-making processes and structure to evidence use. A closer integration of

this body of knowledge could enhance the appetite and readiness of organisations to use evidence.

Use behavioural techniques, including nudges

- A developing body of social science knowledge, one which is currently not integrated within the EIDM literature, investigates the influence of behavioural factors (such as cognitive loads) on individual decision-making processes. It has also developed effective techniques to reduce cognitive biases and enhance decision-makers' choice architectures. Supporting the use of evidence during decision-making similarly could be subject to these techniques and the design of *evidence use nudges* could provide a valuable tool in the repertoire of EIDM interventions. Behavioural sciences stress the importance of *salience* in the design of interventions, which could directly be applied to support the practice of EIDM.

Exploit the potential of online and mobile technologies

- The application of online and mobile technologies is suggested in the social science literature to increase the reach, convenience, and appeal of interventions. A range of EIDM interventions (e.g. communication, capacity-building, decision aids) could benefit from the integration and regular use of online and mobile technologies.

Institutional frameworks and mechanisms

- Institutional frameworks and mechanisms can advocate and nurture structural changes at all levels of decision-making. In the context of EIDM, effective examples include accreditation processes, clearinghouses such as the National Institute for Health and Care Excellence (NICE), and government ministries. Overall, however, not enough rigorous evaluation in this area is taking place.

Implications from Review 1 and Review 2:

The findings from Review 1 and Review 2 suggest a number of implications for EIDM practice and research. We discuss these for each review in turn below, before concluding with some final suggestions based on combined insights from both reviews.

Interventions that support the communication of and access to research evidence were only effective to increase evidence use if the intervention design simultaneously tried to enhance decision-makers' *opportunity* and *motivation* to use evidence. It is therefore advisable that future research and practice focus on how to design and tailor interventions that better feature these CMO configurations. In this, social science offers a great deal of knowledge that can be drawn upon.

Similarly, interventions building decision-makers' skills were only effective to increase evidence use if the intervention design simultaneously tried to enhance both *capability* and *motivation* to use research evidence. Again, attention should be paid to CMO configurations when designing or tailoring such interventions.

Changes to decision-making structures and processes may be an effective mechanism to increase evidence use, but this currently lacks an extensive evidence-base. The results of this review suggest increasing the use of this mechanism in practice, as well as urging future research studies to explore the mechanism's impact and theory of change more carefully.

The majority of the reviewed interventions that focus on unstructured interactions between decision-makers and researchers appear ineffective at improving decision-makers' evidence use, a finding that may be explained by a lack of conceptual clarity (i.e. what constitutes interaction, relationships, trust) and casual clarity (i.e. purpose of the interaction, theory of change of how interaction supports evidence use). Future research therefore requires an in-depth engagement with the theory of change underlying interaction interventions, and current practice is advised to focus on light-touch and well-defined intervention designs, such as decision-maker engagement, which command a more positive evidence-base.

Given the current evidence gap, increased research and practice efforts are required to gain an understanding of interventions promoting the concept of EIDM, as well as those working towards mutual understanding of policy-relevant questions and agreement on what constitutes fit-for-purpose evidence needed to answer them.

Unfortunately, the evidence on the relative effectiveness of single and multi-mechanism interventions is limited to observational patterns at this stage. Based on this, however, there is some suggestion that simpler and more defined interventions have an increased likelihood of success. Therefore, it seems sensible to both increase and substantiate research knowledge on simpler interventions, and develop the necessary theory before conducting large studies of multi-mechanism interventions whose casual chain is difficult to disentangle at this early stage of research knowledge.

The scoping review identified many areas of social science knowledge that are currently not well-integrated and drawn from in EIDM. This leaves two main implications from Review 2 for future research and practice: first, a closer investigation of the integration of the social science interventions and knowledge suggested as of relevance to EIDM in this scoping review; and second, the creation of a closer link between EIDM and the social science literature. Future research should explore mechanisms to better connect both bodies of knowledge. Thereby, EIDM would be better positioned to benefit from the most up-to-date knowledge base and run less risk of being out of sync with other areas of the social sciences.

Finally, in this project we have used levels of intervention, mechanisms of change, and capability, motivation and opportunity to change behaviour as a framework to help understand (a) what interventions are trying to achieve, and (b) the processes they use to try to achieve this (in other words, the 'theory of change' of how the intervention is meant to have its effect). We hope that this framework can help others to plan a theory of change when they develop or evaluate interventions to enable EIDM, and we offer guidance on how to develop such a theory of change.

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Chapter 1. Introduction

1.1 Aim

The results of research studies can be one important component in decision-making by policymakers, professionals, and members of the public. However, such research evidence is not always considered in decision-making, even when relevant research is available. The aim of this research project is to review the evidence-base relevant to increasing the use of research evidence by decision-makers; in other words, to review one aspect of the science of using scientific knowledge.

1.2 Background

Over the last twenty years there has been an increasing concern, both in the UK and internationally, to make better use of the evidence produced by research in policy and practice decision-making. This has led to the rapid growth of systematic reviews to bring together, in a rigorous and transparent way, the available research evidence. There have also been a number of initiatives developed to improve the communication, interpretation, and uptake of research with the aim of helping decision-makers of different types make better use of research. In addition, a new area of research activity has developed to study how research interacts with policy and practice, with the intention of enabling such interactions to become more frequent and useful (Nutley et al. 2007). While much of this research has focused on processes of research use and/or the barriers and facilitators to the use of research (for example, Oliver et al. 2014), there is also now a considerable body of research evaluating the effectiveness of strategies promoting evidence-informed decision-making (EIDM).

To address the aim of this project, we conducted two separate reviews of the literature. First, we first systematically reviewed existing reviews of the specialist EIDM literature which has evaluated evidence use interventions. Second, as there are also many other aspects of social science research that may be relevant to the study of research use, we undertook a scoping review of the broader social science literature to identify evidence of the effectiveness of additional interventions and any further insights that could be relevant in an EIDM context[3]. Our research therefore brings together the findings reported in two related bodies of literature: Review 1 (review of EIDM literature) and Review 2 (review of the broader social science literature).

Definitions

For the purpose of this project, EIDM is defined as a process whereby multiple sources of information, including the best available research evidence, are consulted before making a decision to plan, implement, and (where relevant) alter policies, programmes and other services.

Our concern is limited to the use of a particular type of evidence in decision-making: that is, research-based evidence. Research may be defined as a systematic investigative process employed to increase or revise current knowledge. For the purposes of this review, we employed a broad conceptualisation of research that included not only scientifically-based research, but also

[3] In this context, 'broader' indicates the research use literature too, as it is also part of the social science literature.

administrative data and statistics collected in the course of service and benefit provision (such as school-level datasets).

Research use is understood as a multidimensional construct (Weiss 1979). Two kinds of research use are relevant to this study: instrumental and conceptual.

- *Instrumental research use* is a direct use of research knowledge. It refers to the concrete application of research, such as in the taking of specific policy decisions or implementation of practice interventions.

- *Conceptual research use* highlights its enlightenment function. This is when research influences how policymakers and practitioners think about issues, problems, or potential solutions. Research findings may change their opinion but not necessarily a particular action.

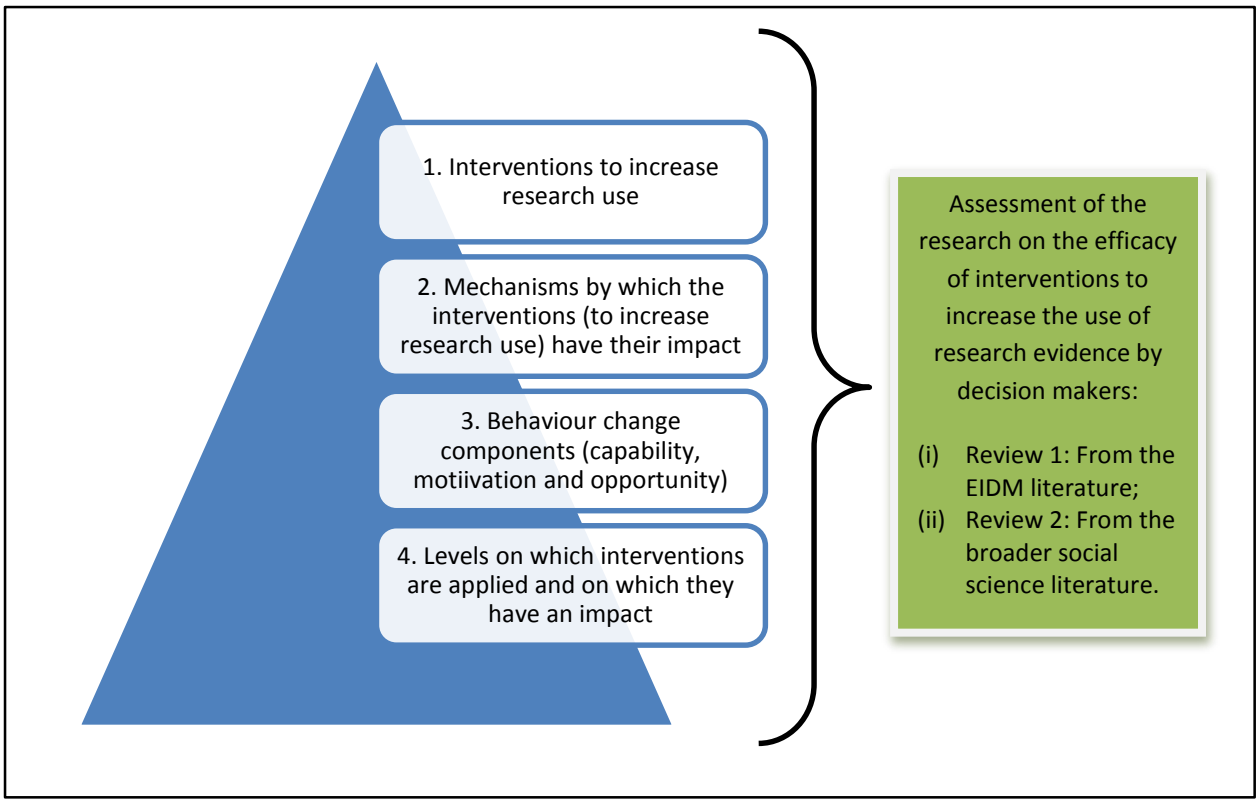
The phrase 'research use' therefore implies that the research user has engaged with the research and acted upon it in some way. Acting upon it may not necessarily mean that the research has been used to inform policy or practice developments. It could simply mean that the findings have been considered during policy discussions.

Throughout the report we use the terms EIDM, evidence use, and research use interchangeably to denote the use of research evidence by decision-makers.

1.3 Approach taken by this project

The research project was concerned with interventions able to enhance and support the use of evidence in decision-making. In the absence of an agreed over-arching theory of how EIDM occurs, we developed a conceptual framework to structure both reviews in a comparable manner and to allow for the integration of the results from both reviews. This framework consisted of two different types of intervention, which were grouped according to six identified mechanisms of change (i.e. the processes by which EIDM might be achieved). In addition to the primary outcome behaviour of EIDM, each of the six mechanisms were also examined in terms of intermediary behavioural components consisting of capability, motivation, and opportunity (CMO) to act in a way that may increase EIDM. We are aware that these interventions could occur at different levels, such as targeting behaviour change by individuals or in organisations. Together these four elements of intervention types, the mechanisms, behavioural CMOs, and levels of intervention, provided the overall conceptual framework for examining both the EIDM and broader social science literature, as illustrated in Figure 1.1 (and described in greater detail below).

Figure 1.1. Overall conceptual framework for the project



(1) Specific interventions from the EIDM and the broader social science literatures

The project focused on two main types of interventions. First were those interventions designed to directly impact on the consideration of research evidence in decision-making (for example, continuing professional development activities to increase policymakers' awareness of and capacity to use research in developing policy). The second type of intervention were those from the broader social science literature (for example, psychology, management, and behavioural sciences) that could potentially be relevant to increasing EIDM (even if such research has not yet been applied directly to EIDM). So, for example, there may be research on interventions to increase the effectiveness of communication strategies, but not specifically about communicating research evidence or the need to use such evidence. Other examples may include approaches to changing organisational behaviour and the use of marketing in individual behavioural change.

As our focus was on interventions to improve consideration of research evidence in the decision-making process, supply-side interventions to improve the research enterprise itself (such as through funding channels) or researchers' behaviour were not considered. In addition, interventions to support implementation and/or adherence of agreed evidence-based policies, practices or programmes (for example, clinical practice guidelines) were also outside the scope of the project.

(2) Mechanisms of evidence use

We used the underlying mechanisms driving interventions that have been proposed in the EIDM literature to categorise evidence use interventions. We identified six such intervention mechanisms based on previous studies of mechanisms (for example, Gough et al. 2011; Nutley et al. 2007),

research on barriers and facilitators to decision-makers' use of evidence (for example, Oliver et al. 2014), and existing empirical frameworks for intervention effectiveness (for example Moore et al. 2011). Interventions aiming to increase EIDM were assumed to work through either individual mechanisms or through a combination of mechanisms. Table 1.1 outlines these six evidence use mechanisms.

Table 1.1. Identified evidence use mechanisms

Evidence use mechanisms	*Applied example of the mechanism*
AWARENESS (M1) Building awareness for, and positive attitudes toward, evidence-informed decision-making (EIDM). *This mechanism emphasises the importance of decision-makers' valuing the concept of EIDM.*	• Presenting information on cost-effectiveness of evidence use. • Asking decision-makers to suggest a policy or practice problem that can be informed by evidence.
AGREE (M2) Building mutual understanding and agreement on policy-relevant questions and the kind of evidence needed to answer them. *This mechanism emphasises the importance of building mutual understanding and agreement on policy questions and what constitutes fit-for-purpose evidence.*	• Decision-maker engagement in research production. • Decision-maker feedback on the relevance of received evidence.
COMMUNICATION & ACCESS (M3) Providing communication of, and access to, evidence. *This mechanism emphasises the importance of decision-makers receiving effective communication of evidence and convenient access to evidence.*	• Dissemination of research studies. • Evidence repertories accessible to decision-makers.
INTERACT (M4) Interaction between decision-makers and researchers.[4] *This mechanism emphasises the importance of decision-makers interacting with researchers in order to build trusted relationships, collaborate, and gain exposure to a different type of social influence.*	• Organisation of joint events (e.g. seminars, workshops, conferences). • Communities of practice. • Knowledge brokering.
SKILLS (M5) Supporting decision-makers to develop skills in accessing and making sense of evidence.	• Professional development. • Critical appraisal training.

[4] Use of the term researcher denotes anyone conducting research and is not confined to appointed individuals in official research positions.

This mechanism emphasises the importance of decision-makers' having the necessary skills to locate, appraise, synthesise evidence, and integrate it with other information and political needs etc.	
STRUCTURE & PROCESS (M6) Influencing decision-making structures and processes. *This mechanism emphasises the importance of decision-makers' p*sychological, *social, and environmental structures and processes (e.g. mental models, professional norms, habits, organisational and institutional rules) in providing means and barriers to action.*	• Organisational incentives (e.g. committee/promotion structures) • Organisational protocols.

To enhance accessibility we have structured the mechanisms using a numerical list and abbreviation (M1–M6). However, this does not reflect a hierarchical order of the mechanisms and we assume each mechanism to be of equal importance in supporting decision-makers' use of evidence.

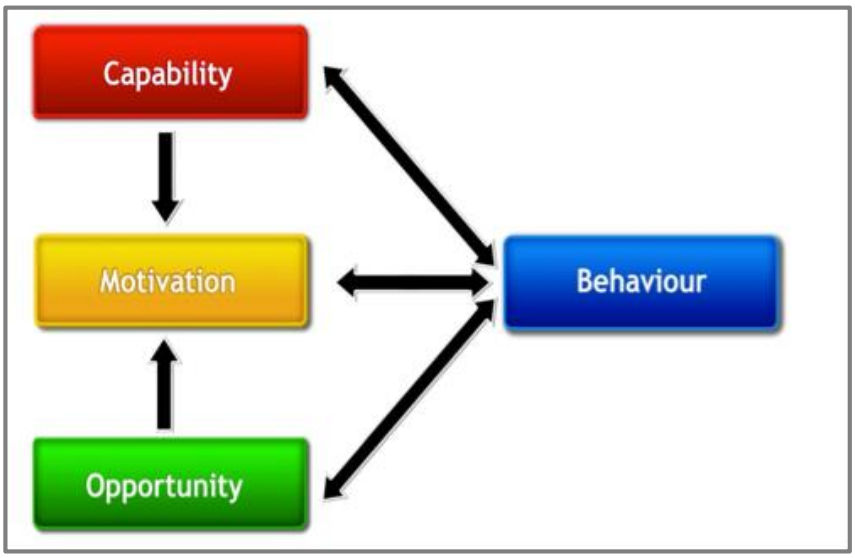
(3) Components of behaviour change

Increasing the use of research evidence by decision-makers depends on behaviour change: in this instance, the use of such evidence to influence policy debates, the resulting policy choices, and the practical implementation of those choices. The components of such behaviour change provide us with intermediary outcomes, in addition to the primary outcome behaviour of EIDM.

Based on a review of existing frameworks for understanding behaviour change, Michie and colleagues (2011) developed a method for characterising interventions and linking them to an analysis of the targeted behaviour. In this 'behaviour system', three essential conditions—capability, motivation, and opportunity (CMO)—interact to generate behaviour that in turn influences these components. Any given intervention might change one or more components in this 'behaviour system' (see Figure 1.2). Our review has retained Michie's definition of capability, motivation, and opportunity.[5]

[5] **Capability** is defined as the individual's psychological and physical capacity to engage in the activity concerned. It includes having the necessary knowledge and skills. **Motivation** is defined as all those brain processes that energise and direct behaviour, not just goals and conscious decision-making. It includes habitual processes, emotional responding, as well as analytical decision-making. **Opportunity** is defined as all the factors that lie outside the individual that make the behaviour possible or prompt it (Michie et al. 2011).

Figure 1.2 Components of behaviour change (source: Michie et al 2011)



(4) Level of intervention

The change in behaviour may be in organisations or by individuals, and organisations can vary in terms of their scope and responsibilities. For the purposes of this review, behaviour has been organised into four levels consisting of:

- individual behaviour;
- immediate organisational context (such as where people live or work);
- broader organisational context (such as local government);
- national and international organisations.

Logic model

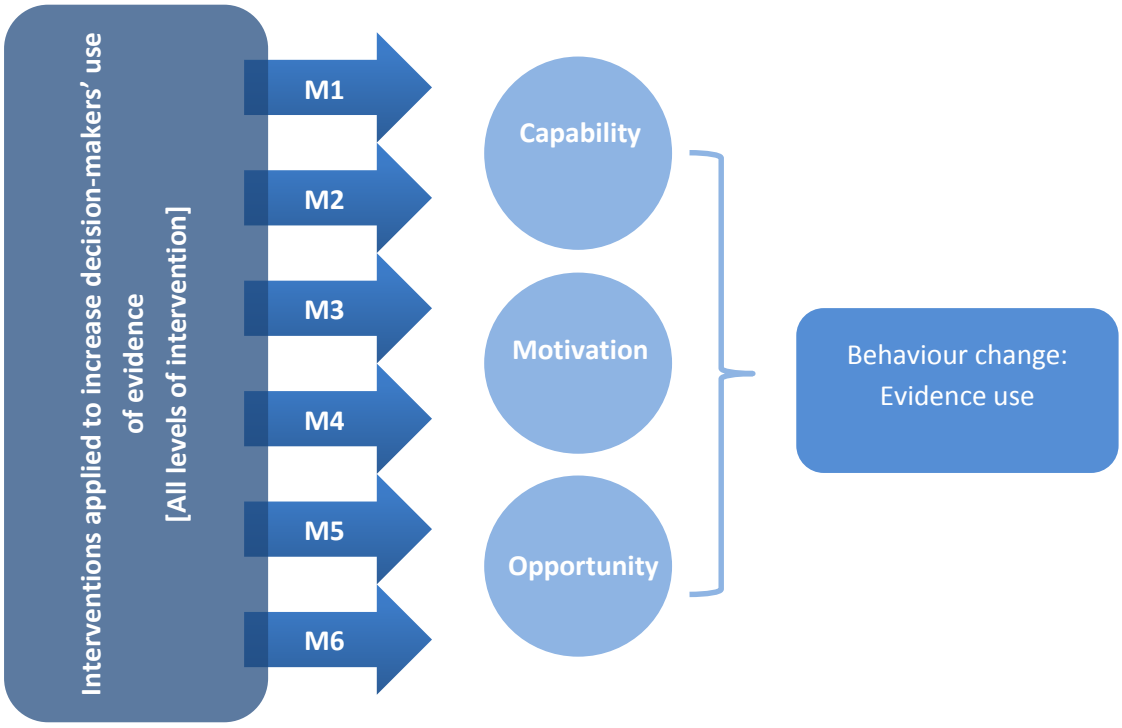
As noted above, there is no agreed theory of how interventions can effectively influence decision-makers' use of evidence. We therefore brought together the individual components of our conceptual framework to create a basic logic model that sets out how evidence use interventions are assumed to influence decision-makers' consideration of research evidence (Figure 1.3).

The model illustrates how interventions may influence evidence use, either through a single mechanism or through multi-mechanism combinations. Applying these mechanisms allows interventions to influence one or more components of behaviour change, i.e. capability, motivation, and/or opportunity to use evidence. These CMOs then facilitate the final outcome of evidence use. A CMO component can therefore be understood as an intermediate outcome on the causal pathway to the final outcome. CMOs can work either in isolation or in combination.

The logic model allowed us to structure the interventions according to the applied intervention mechanisms (outlined in Table 1.1). We could then unpack the impact of these interventions on evidence use through a CMO configuration as an intermediate outcome. Structuring interventions

according to mechanisms, and outcomes according to behaviour change components, allowed us to create a structure that equally applied to the EIDM and broader social science literature.

Figure 1.3: Intervention logic model – for each level of intervention



1.4 Research questions

To review the evidence-base relevant to increasing the use of research evidence by decision-makers in a systematic and transparent manner, we constructed the following research questions for this project.

Review 1:

(RQ1) What is the quantity and type of studies that have been undertaken on the efficacy of interventions used to increase the use of research evidence by decision makers?

(RQ2) What evidence is there for the efficacy of interventions used to increase the use of research evidence by decision makers?

Review 2:

(RQ3) What interventions are suggested in the social science literature that might be relevant to the evidence use mechanisms mapped in Review 1?

(RQ4) What evidence is there for the efficacy of these broader social science interventions and how might they be relevant to EIDM?

Chapter 2. Review methods

Introduction

This project, through a review of reviews, brings together relevant literatures using the logic and methods of systematic review (Gough et al 2012). Bibliographic management software (EPPI-Reviewer 4) was used to manage the review process, which was conducted in two phases (hereafter Review 1 and Review 2).

The review of reviews consisted of two connected reviews of the literature. First, a systematic review of reviews of evidence of the efficacy of strategies to increase the use of research evidence by decision-makers. This research on research use is a relatively new field of enquiry and we hypothesized that although this literature was informed by studies in the rest of social science, there might be some aspects of social science that were relevant for developing strategies to increase the use of research evidence but that had been missed by the systematic reviews in the EIDM literature. The broader[6] social science literature (for example, psychology; management; behavioural sciences) might hold a body of knowledge on areas such as behaviour change, organisational change, learning and motivation, that could be of high relevance to efforts to encourage decision-makers to use evidence. We therefore undertook a scoping review of this broader social science literature to find such research of potential relevance to EIDM.

In the absence of an agreed logic model of how interventions can effectively influence decision-makers' use of evidence, we required a conceptual framework to structure our project's review of reviews. For this purpose we used the underlying mechanisms driving interventions as a structure to categorise evidence use interventions that had been proposed in the EIDM literature. We identified six such intervention mechanisms (see section 1.3; table 1.1). In addition, we distinguished increased evidence use as an outcome measure and the potential intermediate steps of the capability, motivation, and opportunity to use evidence (CMO configuration), which allowed us to present a more nuanced analysis of interventions' effects. This conceptual framework of six mechanisms, CMOs, and evidence use outcomes was used to structure both the systematic review of reviews of the EIDM literature and the scoping review of potentially relevant research in the broader social science literature. The framework allowed us to integrate the findings of both reviews in a transparent and structured manner.

Review 1 is a systematic map and synthesis of existing research on the impact of interventions used to increase research use. As this is a broad area of study with many existing systematic reviews, we undertook a systematic review of reviews. Evidence use interventions were grouped according to the six intervention mechanisms. Intervention outcomes were broken down into capability, motivation, and opportunity to use evidence (i.e. intermediate outcomes) and final outcomes of the use of evidence by decision-makers. We used narrative synthesis based on a structured inventory of the included reviews (see Table 4.1; Appendix A) to answer the question of what works to increase decision-makers' use of evidence.

Review 2 is a more exploratory synthesis of research that may be relevant to EIDM. As social science is so vast, our strategy was to start with the six mechanisms for research use identified in Review 1

[6] Broader, in this context indicates the research use literature, too, is part of the social science literature.

and use these to iteratively identify and map key relevant concepts and interventions. Having identified relevant social science interventions, we then collected existing reviews on the impact of these interventions to present a descriptive overview of the interventions' likely effects and contribution if applied in the context of EIDM. As this is an exploratory process, where systematic reviews were not available then other, less systematic, reviews were used to state what is known in an area, with appropriate caveats as to the trustworthiness of the evidence being used. Review 2 can therefore best be regarded as a scoping review of the social science literature on research results relevant to the study of EIDM.

2.1 Review perspectives

The perspectives and knowledge of founders, authors, and an advisory board drove the interest and chosen project approach. In detail, this includes NESTA, the Wellcome Trust, the UCL EPPI-centre, the What Works Centre for Well Being, and the Alliance for Useful Evidence.

2.2 Selection criteria

Explicit criteria were developed to enable the identification of relevant literature. Differences in the boundaries of Review 1 and Review 2 are reflected in the selection criteria developed for each review (see below). Only English language publications were considered. No language restrictions were applied. All forms of publication were eligible, including grey literature such as working papers and dissertations.

Review 1: Studies from the EIDM literature

For the map and synthesis of research on the efficacy of interventions used to increase the use of research evidence by decision makers, the following criteria were used to assess study eligibility.

Type of study: Only systematic reviews were considered for inclusion. A minimum requirement was an explicit review methodology, including search strategy, criteria for including studies, and the process of synthesis. Rapid and scoping reviews were eligible for inclusion, but protocols for systematic reviews were not considered.

Methods (of included primary studies)*:* Systematic reviews were only included if they reviewed primary studies that used a research design that evaluated the effects of the applied interventions on evidence use outcomes minimising possible biases in the attribution of the effects to interventions. Such designs included for example RCTs, Quasi-experimental studies, before/after evaluations, and the ability of research designs to minimise biases in attribution further influenced the weight of evidence rating of each review. Reviews that focused exclusively on decision-maker surveys and facilitators and barriers to research use, and did not synthesise the effects of primary studies that evaluated an applied evidence use intervention were excluded.

Intervention: To be included, reviews must evaluate the effectiveness of interventions (either single or multi-component) used to increase evidence-informed decision-making. Reviews were excluded if they were limited to evaluating the implementation and/or following of agreed evidence-based policies or programmes, or supply-side interventions, such as financial incentives to produce better

quality research. While supply-side interventions are an important tool to enhance EIDM, for example, by increasing the policy-relevance of research, the focus of this project was on the direct use of evidence by decision-makers (the science of using science). Supply-side interventions in this context were outside the scope of this project as they did not directly target decision-makers and rather aimed to change researcher behaviour. It is beyond the project's ability to assess the lengths of the causal chain from this change in researcher behaviour to decision-makers' use of evidence in the long-run. Interventions such as co-production and engagement were, however, of relevance to this project in case they targeted decision-makers' demand for evidence and were not narrowly focused on enhancing the supply of research.

Level of analysis: Focus could be on any level as set out in Chapter 1, section 1.3.

Outcomes: Eligibility extended to measures of changes (at individual or organisational level) in attitudes, knowledge, skills, or behaviour related to:

(a*) Intermediate CMO outcomes related to mechanisms of research use* (relevant indicators included, but were not limited to: test scores evaluating respondents' knowledge of EIDM concepts; ability to locate best available evidence within appropriate databases; critical appraisal skills; attitudes towards evidence; intended use of evidence or actions related to the use of evidence, e.g. accessing a database)

(b) *Final outcome of research use by decision-makers* (relevant indicators included, but were not limited to: research evidence being referenced in policy documents, or utilised in programme or guideline development; EIDM indicators, e.g. Global EIDM index (Dobbins et al 2009); evidence of decision-makers' behaviour change, e.g. accessing, appraising, considering' evidence as part of a decision-maker's daily practice, as distinguished from the once-off measurement of these sorts of outcomes as part of a training programme).

Our core concern is with the use of research-based evidence in decision-making. Eligibility extended to studies concerned with the use of evidence from research using a scientific methodology, or administrative data and statistics collected in the course of service and benefit provision (such as school-level datasets). At this stage we therefore excluded reviews that focused on the use of information more generally.

The conceptualisation of research use presented a challenge to the application of outcomes inclusion criteria. There is a large amount of reviews synthesising the results of interventions in which evidence use is understood as the adoption of an evidence-based practice. The targeted behaviour change in this case is the implementation of a new practice, which happens to be evidence-based and the positive outcomes of the new practice are therefore framed as a result of research uptake. Gray and colleagues (2013) term this type of research use interventions as fostering the uptake of 'empirically supported interventions (EIS)', as opposed to interventions aiming to increase EIDM.

Many evaluations of interventions aiming to increase research use only investigate the implementation of evidence in practice as well as the outcome of the practice (e.g. re-offending

rates). In essence, though, this approach is synonymous with evaluating a common adoption of a new practice and its performance. If studies aim to evaluate an intervention to increase research use, outcomes must be structured to capture changes in research use that is the practice of EIDM (Thompson 2007). The targeted behaviour change is the use of research evidence rather than the adoption of individual evidence-based practices. Unfortunately, this distinction is rarely made explicit in the wider evidence-base. In this systematic review of reviews, we resorted to analysing the outcome measures reported in the included reviews in order to ensure that the outcome of evidence use in fact referred to EIDM. Some reviews, however, included studies featuring different conceptualisations of evidence use under the same outcome constructs, and we subsequently only drew from review findings that were based on studies that fit our outcome definition of EIDM.

Review 2: Studies from the broader social science literature

For the overview and synthesis of social science research potentially relevant to support the application of evidence use interventions the following criteria were used to assess study eligibility.

Type of study: Any type of literature was eligible to inform our identification of relevant concepts and interventions reported in the broader social sciences. Eligible sources of information for example referred to introductory textbooks, primary studies, theory papers, literature reviews, excluded reviews in Review 1.

To inform our assessment of the impacts of these identified concepts and interventions, only reviews that synthesised the findings of empirical evaluations of these interventions were eligible for inclusion. This included both systematic reviews and when these were not available other, less systematic, reviews. Regardless of applied methodologies, reviews, however, had to combine the findings of empirical evaluations of interventions. Conceptual literature reviews as well as systematic reviews that did not focus on the impact of interventions were excluded.

Type of intervention: We did not define eligible interventions a priori. In order to identify a range of social science interventions as broad as possible, the only inclusion criteria referred to conceptual relevance. Identified interventions were required to be able to make a sensible contribution to the evidence use literature. Conceptual relevance could refer to: (i) suggesting a different intervention or technique commonly not applied in EIDM but of potential to increase the impact of evidence use interventions (e.g. commitment devices); (ii) suggesting a change to the application of existing evidence use interventions (e.g. framing of research findings in line with decision-makers' professional norms); (iii) suggesting a more regular application of interventions based on their evidence-base in the social sciences (e.g. reminders); (iv) enhancing the evidence-base of the EIDM intervention (e.g. no evidence of intervention impact in research use literature, but evidence of effects in the social science literature).

Level of analysis: Focus could be on any level as set out in Chapter 1, section 1.3.

Outcomes: We did not define eligible outcomes a priori. The only inclusion criteria referred to the conceptual relevance outcomes to EIDM. We used the CMO and behaviour change outcome classification to assess conceptual relevance. For example, in the marketing literature a review of

how to increase customer identification with a brand would be eligible for inclusion (outcome: identification—CMO: motivation) while a review of marketing's impact on product sales did not appear of conceptual relevance (outcome: sales/consumption).

2.3 Search methods for identification of studies

The two phases of the review each have their own search strategy for identifying relevant studies and additional mechanisms.

We assumed that there are two bodies of literature that contribute insights on interventions supporting decision-makers' use of evidence: the specialised EIDM literature and the broader social science literature. To identify EIDM intervention studies we used standard systematic review methodology. However, to identify other social science intervention studies it was necessary to adopt a broader strategy on the grounds that that most of these studies would not have been picked up by the more systematised approach.

Review 1: Studies from the EIDM literature

As this is a broad area of study with many existing systematic reviews, we undertook a systematic review of reviews. A comprehensive and diverse search strategy was used to locate all qualifying published and unpublished studies for the time period 1990 through 2015 (September).

The search for systematic reviews of research involved:

(a) the use of 'research use' related keywords to electronically search bibliographic databases,
(b) hand searching key journals (e.g. *Evidence and Policy* and *Implementation Science*), websites, and publications (e.g. Boaz et al 2011),
(c) checking reference lists of included studies,
(d) forward citation checking exercises using Web of Science and Google Scholar.

Additional details of the databases and other sources searched, including an example search query used in the electronic search, are presented in Appendix B.

Review 2: Studies from the broader social science literature

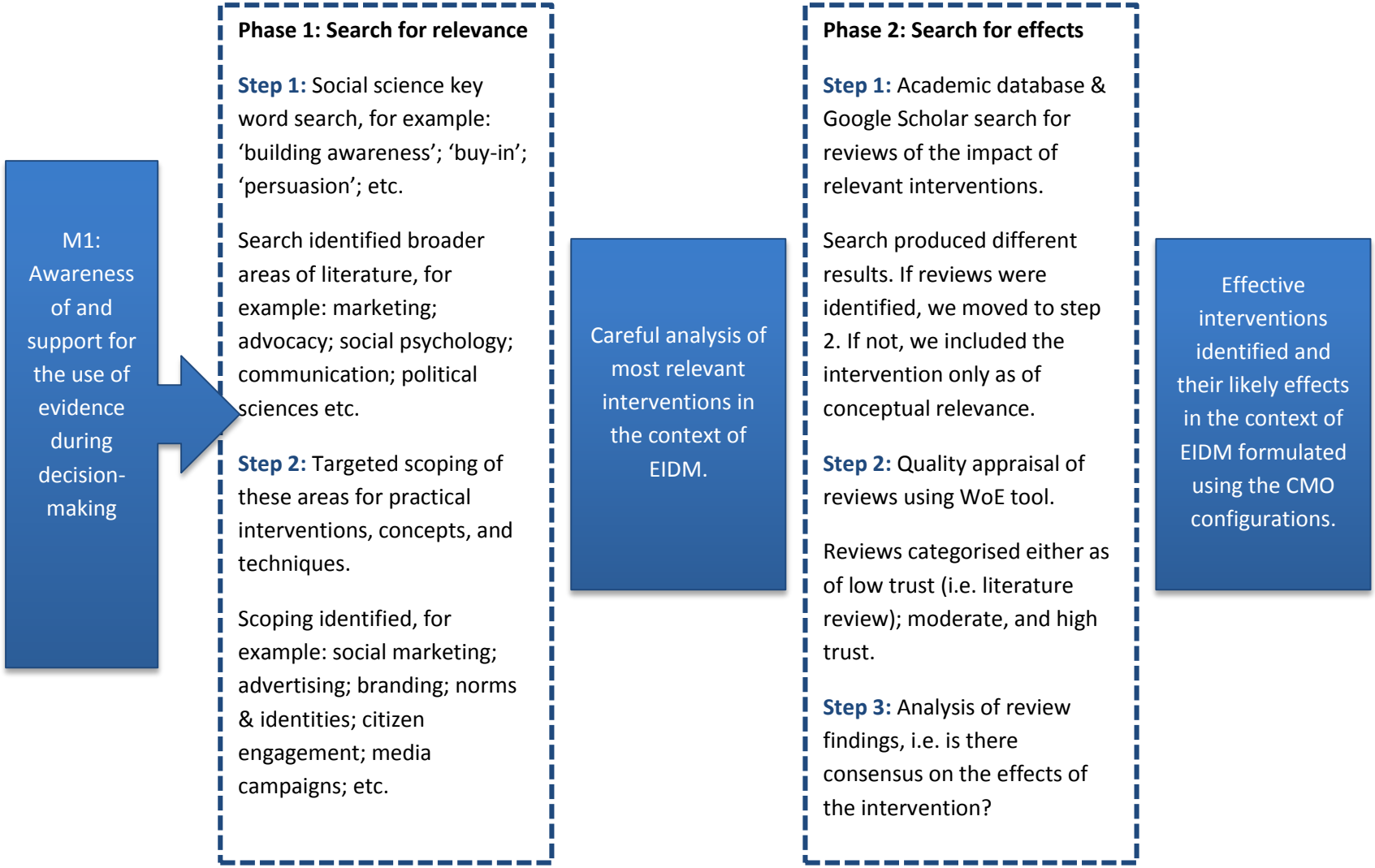
As Review 2 was an exploratory process, our overall strategy differed to that of Review 1. It involved a targeted search for relevant concepts and interventions reported in the social science literature (phase 1) and having identified these, a search for reviews of the effects of these interventions (phase 2). An applied example of this search strategy is provided in figure 2.1. Given this vast body of knowledge, we applied our mechanism framework to target and structure our search. We designed initial key words as search terms related to each mechanism and identified broader areas of literature to commence the search (step 1 in figure 2.1). For example, related to M6 (processes and structures), we searched for 'barriers' AND 'decision-making' in databases collecting industrial psychology, management, and social group literature, to name a few. From this broad initial scoping search, we then collected further concepts and interventions to generate new key words and refine the search. This led to the development of an iterative search strategy for each mechanism (step 2). Sources and methods constituting this iterative strategy included:

- keyword searches of academic databases;

- hand-searches of academic journals;
- keyword search of Google Scholar, and Google;
- snowballing searches, including forward citation searches
- backward citation searches (i.e. screening reference lists)
- introductory text-books
- consultation of excluded reviews and other search hits (e.g. theory papers and primary studies) during Review 1.

Having explored different bodies of literature through this iterative process, we then collected reported interventions or concepts and techniques that could inform the design of interventions, which were of high conceptual relevance to the evidence use mechanisms. Our search then engaged in a second phase in which we searched explicitly for reviews on the effects of these identified social science interventions. This search followed a more linear process and key words related to the interventions were combined using the AND Boolean with search terms related to 'review'. This basic search string was then applied in academic databases and Google Scholar (step 3). Additional information is provided in Appendix C.

Figure 2.1 Example of search strategy



2.4 Study selection

For both Review 1 and Review 2, selection of studies was based on the pre-developed selection criteria described above.

Review 1: Studies from the EIDM literature

Study selection was conducted in two stages: an initial screening of titles and abstracts against the inclusion criteria to identify potentially relevant papers followed by screening of the full papers identified as possibly relevant in the initial screening. One reviewer screened all titles and abstracts identified during the bibliographic search. Two reviewers examined all papers that were subjected to full-text review. Any disagreements about study eligibility were resolved by discussion, further review of the study reports, and consultation with a third reviewer where necessary. Studies included in Review 1 are listed in Appendix D. Studies excluded during this phase are listed in Appendix E. Excluded studies that appeared potentially relevant to Review 2 were tagged for later consideration.

Review 2: Studies from the broader social science literature

Study selection was conducted in two stages: an iterative screening of literature to identify relevant concepts and interventions reported in the social sciences. We did not 'include' individual research studies and rather aimed to generate a list of concepts and interventions relevant to each evidence use mechanism. This list was then screened by two reviewers and relevant interventions worthy of further exploration were agreed on. Any disagreements about interventions' relevance to the mechanisms were resolved by discussion among the review team. A full list of interventions considered is provided in Appendix F. Regarding the inclusion of social science reviews, one reviewer screened all titles and abstracts identified during the bibliographic search. A second reviewer confirmed inclusion of reviews based on title and abstract for a subset of studies. Social science reviews included in Review 2 are listed in Appendix G.

2.5 Data extraction and critical appraisal

For Review 1, a data extraction form was designed to allow for the systematic recording of information about the retrieved studies (Appendix H). Review 2 presents a scoping review of the literature to generate an overview of research. It therefore did not require a detailed data extraction form as the only information of relevance referred to critical appraisal rating and direction of the identified effects.

Review 1: Studies from the EIDM literature

Data extraction

Data relevant to our review were abstracted from each included study report. Studies were coded according to different variables of interest relating to the study, intervention, outcome measures and results. Information was also collected on the methods to enable an appraisal of the trustworthiness and relevance of each included review (see below). The data abstraction form is detailed in Appendix H. One reviewer extracted data, with a sample of reviews checked by a second

reviewer to ensure the reliability of the abstracted information. Any uncertainties and discrepancies in coding were resolved by discussion, further review of the study reports, and consultation with a third reviewer where necessary.

Mechanisms were coded based on the authors' description of the intervention and/or the outcomes measured in the reviews. Interventions further often applied multiple mechanisms. Coding of interventions and mechanisms followed a systematic and transparent method and the individual codes for each intervention are presented in Appendix A. Notwithstanding, the coding process entails a degree of interpretation. Interventions were also linked to components of the behaviour change system based on the description of the intervention (targeted CMOs) and the reported outcome measures (assessed CMOs).. The same disclaimer applies for the coding of the CMOs.

Critical appraisal

The included reviews were appraised using a 'weight of evidence' framework (Gough 2007) which examined the relevance and trustworthiness of the evidence. The specific questions used to assess these components are detailed in Appendix I. Reviews could either be allocated a high, moderate, or low trustworthiness and relevance rating. Reviews judged as of low trustworthiness or relevance were excluded from the synthesis. Findings drawn from reviews of high trustworthiness and relevance were classified as reliable evidence; while findings drawn from reviews of moderate trustworthiness and relevance were classified as cautious evidence.

Review 2: Studies from the broader social science literature

Data extraction

Review 2 presents a scoping review of the literature to generate an overview of research. It therefore did not require a detailed data extraction form as the only information of relevance referred to critical appraisal rating and direction of the identified effects.

Critical appraisal

The included reviews were appraised using on the trustworthiness assessment criteria of the above 'weight of evidence' framework (Gough 2007). The specific questions used to assess these components are detailed in Appendix G. As in Review 1, reviews could either be allocated a high, moderate, or low trustworthiness rating. Review 2, however, did not exclude reviews of low trustworthiness given the different research traditions in the social sciences. Social science reviews judged as of low trustworthiness were included an indicated as literature reviews.

2.6 Synthesis

Review 1: Studies from the EIDM literature

We applied a narrative synthesis of the included systematic reviews to provide an overall finding of the effectiveness of research use interventions. Combining studies using meta-analysis techniques

was not possible as there were insufficient statistical findings in the included reviews. Our narrative synthesis is based on detailed summary tables of the included systematic reviews (Appendix A). Review findings were then aggregated and structured according to the applied intervention mechanisms (Table 4.1). This allowed us to investigate the effects of intervention mechanisms on CMOs and decision-makers' use of evidence. The results of this analysis are then presented in narrative and summary boxes in Chapter 4.

Review 2: Studies from the broader social science literature

We conducted a narrative overview of the identified social science concepts and interventions relevant to each mechanism. Based on summary tables (e.g. Table 6.1) we assess interventions for their conceptual relevance (i.e. what can be gained for the application in an EIDM context) and their evidence of effects in the social science. Having identified relevant interventions and established an overview of the findings of existing social science reviews on their impact, we then used the CMO structure to integrate interventions' likely effects if applied in the context of EIDM. This integration synthesises Review 2 findings with findings of Review 1 to propose different interventions and changes to existing interventions that are suggested in the social science as of potential benefit to EIDM.

The synthesis of Review 2 does not claim to be exhaustive. We were, for example, unable to search extensively for social science reviews and can only provide an overview of reviews findings rather than a formal synthesis. In addition, our synthesis neither claims that the relevance of the suggested social science interventions is a unique discovery to this review. Some of the identified concepts and interventions, for example, might have been suggested to be of relevance to support EIDM in theoretical papers, primary studies, and practice reports, each of which was outside the scope of the Review 1[7].

[7] In chapter 6, we provide a list of suggestions based on our project's findings and point the reader to some examples of primary EIDM literature that raise similar points.

Chapter 3. Results review 1: Map of the literature

Introduction

This chapter presents the results of our systematic search for systematic reviews assessing the effects of interventions aiming to increase decision-makers' use of evidence. It maps out the identified evidence to provide a descriptive account of the consulted evidence-base. This descriptive account aims to characterise the evidence-base commenting on its overall relevance and trustworthiness. Information on the search for evidence, number of included reviews, methodological characteristics, review settings, interventions and outcomes are provided.

3.1 Search results Review 1

We conducted an exhaustive search of the literature to identify relevant systematic reviews between August and October 2015. We searched for literature published from 1980 onwards applying the search strategy presented in section 2.3 (Appendix B). In total, 18 different search sources were consulted, of which seven presented academic databases covering health, psychology, education and broader social science literature. Eleven sources were accessed to search the Grey literature, i.e. organisational websites, sector-specific repositories, and *Google/Google Scholar*. This was complemented by hand-searches of key journal publications covering research on EIDM, e.g. *Evidence & Policy*, as we all as by forward and backward citation searches of the included systematic reviews.

Our systematic search yielded 6786 unique citations, which were screened on title and abstract against our inclusion criteria (Figure 3.1). As shown below, the majority of the identified citations was not relevant to our research question and was therefore excluded (n=6645). This removal left 141 reviews, which we accessed and screened on full-text to assess whether they met our inclusion criteria. Full-text reviews were stored and managed using EPPI-Reviewer version 4 software (V.4.5.1.0). The full-text screening led to an exclusion of a further 105 reviews.

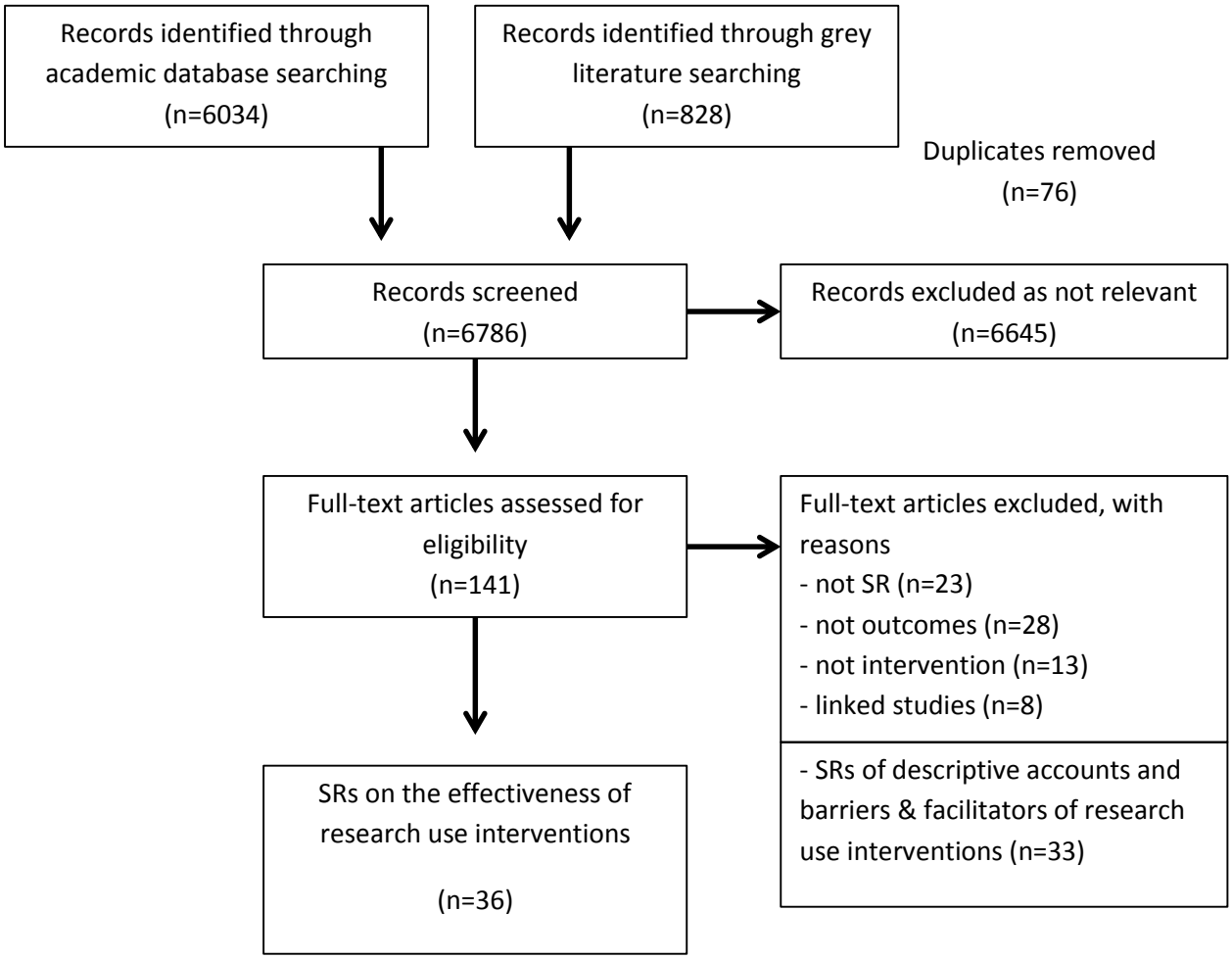
The main reason for reviews being excluded from our systematic review of reviews came as a result of reviews not examining the effectiveness of the applied interventions (n=33). Rather, these reviews provided a descriptive account of facilitators and barriers to evidence use, characteristics of interventions, and decision-makers' perceptions and attitudes. While highly relevant to the conceptual understanding of the evidence ecosystem, the synthesised findings of these reviews were based on primary studies that did not measure the impact of research use interventions. For example, a survey of decision-makers, which finds that they would prefer to receive policy briefs as a form of evidence dissemination, cannot measure whether providing decision-makers with a policy brief does in fact lead to an increase in their use of evidence. The 33 excluded non-effectiveness evidence use reviews were, however, studied carefully to verify and enhance our six mechanisms of evidence use and further guided our search for promising new interventions and programmes in Review 2. A full list of these reviews is provided in appendix E.

The second main cause for exclusion referred to review outcomes not capturing evidence use as defined in this review (n=28) (see section 3.2). These reviews did assess the impact of interventions, but then measured outcomes and indicators that could not be regarded as reflecting evidence use as

understood by the concept of EIDM. For example, changes of clinical practice to adopt a practice that so happened to be evidence-based would have not met this review's definition of EIDM. The remaining reasons for exclusion referred to reviews not meeting the required methodological criteria to classify as a systematic review of evidence (n=23) as well as reviews not assessing an intervention or strategy applied to increase evidence use (n=13). Annotated examples of excluded reviews are presented in section 3.5.

As a result, we included 36 systematic reviews that investigate the impact of interventions aiming to improve decision-makers' use of evidence. To answer the question of evidence use interventions' effectiveness—the objective of this systematic review of reviews—we only drew from the synthesised effects of applied research use interventions reported in these 36 included reviews.

Figure 3.1: PRISMA flow diagram of search results and study inclusion



3.2 Description of the included reviews

The 36 included reviews[8] assessing the effectiveness of interventions aiming to improve decision-makers' use of evidence were reported in 44 published papers (Appendix D). All 36 reviews were then subject to in-depth coding and critical appraisal. The in-depth coding extracted data on pre-defined key characteristics allowing us to systematically map the identified evidence-base. The applied coding tool is illustrated in appendix H.

Review characteristics

All included reviews were published post 2000 with the large majority of reviews (n=28) being published since 2010. While most reviews have been published in the last five years, it should be cautioned that there is only a single review that searched for studies being published in 2014. It is therefore more accurate to state that this systematic review of reviews is investigating the characteristics of the evidence-base as of 2013. All but two reviews were published as academic articles and the included evidence featured two Cochrane systematic review reports too. Twenty-six reviews described themselves as systematic reviews and six reviews as 'scoping systematic reviews'. The latter differed from the former by providing less emphasis on a structured synthesis. Scoping systematic reviews followed systematic review methodology to search for, include, identify and appraise studies; but did not conduct a full synthesis on the included evidence merely providing a vote count or narrative table of the included primary studies. This was complemented by two cross-sector reviews, one rapid evidence assessment, and a realist synthesis. The cross-sector reviews each conducted rapid evidence assessments of different bodies of literature potentially relevant to EIDM, e.g. management literature and synthesised the results of these. Rapid evidence assessments present an adapted version of systematic review methodology in which a review question is assessed in a considerable shorter time frame (between 3 to 6 months) while attempting to uphold the methodology's principles of rigour and transparency. The realist synthesis followed Pawson's (2006) guidelines for conducting systematic reviews with a particular focus on programmes theories, contexts, and mechanisms underlying the intervention.

The number of primary studies included in the reviews ranged between two and eighteen. In total, 129 primary studies were included in all the identified reviews, but there was a duplication of four studies that featured in multiple reviews. Two reviews did not identify any evidence eligible for inclusion and thus presented 'empty' reviews.

We also categorised reviews according to their targeted scope of evidence use (Table 3.2). Half of the reviews (n=18) applied no restriction to the scope of evidence use. These reviews included any intervention in a given sector that might increase decision-makers' use of evidence, that is reviews had no specification on what programmes or mechanisms might be included as long as they targeted evidence use. This was the broadest and most common scope across the included reviews. Ten reviews were concerned with specific intervention categories, whose effects on evidence use were synthesised. This could, for example, include knowledge brokering or capacity building. This category of reviews had limited their scope to some extent but still included different types of interventions, e.g. formal education courses and educational visits by opinion leaders under the umbrella of

[8] We are aware of an additional systematic review fitting our inclusion criteria that has been published online on 20 November 2015 after our systematic search was conducted: Bornbaum et al (2015) and hope to include this study when updating the existing review.

capacity building. In contrast, the third category of reviews was limited to either a single intervention or, at an even lower level of aggregation, to a single evidence use mechanism. These reviews included syntheses on journal clubs (i.e. single intervention) and syntheses of the effects of supporting research literacy or change agency (i.e. concepts related to evidence use mechanisms). This last group of reviews comprised eight reviews.

Table 3.2 Review scope

Broadest review scope	*Medium review scope*	*Narrowest review scope*
No restrictions on relevant evidence use interventions.	Restricted to specific categories of evidence use interventions (e.g. capacity building).	Restricted to specific evidence use interventions or mechanisms (e.g. journal clubs/change agency).
n=18	n=10	n=8

Research context

We further coded the setting of evidence use reported in the included reviews. In this, it should be cautioned that the reviews themselves aggregated the settings of the individual primary studies and that a further aggregation necessarily is rather reductionist. A majority of reviews included evidence from a variety of regional settings (n=21). We coded these reviews as 'Global setting'. Thirteen reviews were exclusive focused on evidence use in High-Income Countries and a marginal number of reviews (n=2) assessed evidence use strategies in Low- and Middle-Income Countries.

The vast majority of included reviews were conducted in a health care setting (n=30). Three reviews assessed evidence use across sectors and a single review each targeted the education sector, psychology, and social work. Seeing that the concept of EIDM emerged in the health care sector, this finding was somewhat expected. However, the strength of the results in health care or, in other words, the paucity of research on EIDM in sectors other than health care, may not reflect the size of the available primary evidence.

In terms of what type of decision-makers the interventions included in the reviews targeted, we differentiated between decision-makers in a policymaking context and decision-makers in a practice context. Yet, due to limited reporting, the coding of this variable should be treated with caution. Where reliable information could be identified, most reviews focused on decision-makers in a practice context (n=19), e.g. nurses or teachers. Ten reviews targeted decision-makers with policymaking authority, e.g. public health managers. In seven reviews the type of included decision-makers was either mixed or unclear.

Interventions

The 36 included reviews reported on 91 interventions and intervention categories[9]. The highest number of intervention categories assessed within a single review was seven categories. The two largest single interventions categories were education/training, explicitly featured in 25 reviews and

[9] While reviews with few included studies resorted to an individual narrative of each intervention, reviews with a larger number of studies reported on the effects of intervention categories, i.e. similar interventions grouped together to derive an overall effect.

dissemination of evidence included in 18 reviews. Five reviews alone assessed the effects of interventions aiming to improve the uptake of systematic reviews. Evaluating the teaching of critical appraisal skills to decision-makers' was the sole focus of three reviews. Reviews of single intervention categories presented a third of the total sample (n=12), leaving the majority of reviews investigating multiple interventions (n=24). All but three interventions were applied at an individual level. The three exceptions referred to a clustering of the allocation of the intervention to different public health departments, different units within a health care organisation, as well as different 'teams' of employees within one organisation.

Intervention mechanisms

Table 3.3 below provides an overview of the applied intervention mechanisms in the 36 included reviews[10]. It shows how often each evidence use mechanism was applied in isolation and how often it was applied in combination with other mechanisms in a combined intervention.

Table 3.3 Overview of intervention mechanisms in map

Interventions mechanism	*Sole intervention mechanism*	*Applied in combination*	***Total***
M1: Awareness & attitudes	2	12	**14**
M2: Consensus on ffp evidence	0	3	**3**
M3: Communication & access	11	32	**43**
M4: Interaction & relationships	2	25	**27**
M5: EDIM Skills	12	31	**43**
M6: Structures & processes	2	20	**22**

From Table 3.3 it emerges that M3 (communication and access) and M5 (skills in accessing and making sense) are the most applied intervention mechanisms. This is followed by M4 (interaction & relationships) and M6 (structures & processes). M1 (awareness & attitudes) is only featured in 15 per cent of the interventions, and M2 (consensus on fit-for-purpose evidence) was only explicitly applied in three interventions.

M3 (communication & access) and M5 (skills) were the only evidence use mechanisms repeatedly applied in isolation in the reviewed interventions. The remaining four mechanisms were mainly part of interventions that featured multiple mechanisms through which to increase decision-makers' use of evidence. M3 (communication & access) and M5 (skills) can therefore be regarded as the most prominent mechanisms reported in the literature and a majority of the identified interventions applied these two in their programme design. M3 (communication & access) was the sole evidence use mechanism in eleven interventions and was incorporated into an additional 32 programmes. Equally prominent, M5 (skills) was the sole mechanisms in twelve interventions, while being built

[10] Reviews included multiple interventions and mechanisms therefore can exceed the number of reviews.

into a further 31 multi-mechanism interventions. Of the remaining evidence use mechanisms, which are only applied in combination with other mechanisms in the identified interventions, M4 (interact) and M6 (structures & processes) emerge as the most often-used mechanisms in the reviewed evidence. In the included sample of reviews, M4 (interact) is applied in combination with other mechanisms in 25 interventions, while M6 (structures & processes) features in twenty programmes aiming to increase evidence use. M1 (awareness) and M2 (agree) only present a small group within the six mechanisms, being part of only twelve and three multi-mechanism interventions respectively.

As a majority of the interventions included in the reviews applied multiple evidence use mechanisms, we aimed to investigate possible patterns of how mechanisms are combined with each other, which is presented in the matrix in Table 3.4. The matrix provides numerical information on how often a mechanism was combined with each of the other mechanisms. We identified a strong cluster of mechanism relations between M3 (communication & access), M4 (interact), and M5 (skills) in the interventions reported in the included reviews. This seems to reflect an assumption in the identified literature that the most promising approach to foster evidence use is to design an intervention that combines an increased access to and communication of evidence (M3) and/or with supporting interaction (M4) and/or with an increase in decision-makers' practical skills to use evidence (M5). Changing the processes and structures in which decision-making is embedded (M6), was mainly used in multi-mechanism interventions in combination with M1 (awareness), M3 (communication & access), and M5 (skills). This combination aimed to formalise (M6) the access to research evidence or EIDM skills (M3/M5) and to enhance efforts to highlight the importance of using evidence during decision-making. This conceptual support for EIDM (M1) was to a lesser degree also combined with interaction and capacity-building interventions (M4/M5). There was insufficient evidence to comment on the combination of M2 (agree) intervention combinations.

Table 3.4 Overview of intervention mechanism combinations

	M1	**M2**	**M3**	**M4**	**M5**	**M6**
M1	**2**					
M2	1	**0**				
M3	3	1	**11**			
M4	8	2	15	**2**		
M5	9	2	18	19	**9**	
M6	11	1	12	8	14	**2**

Intervention mechanisms and CMO components

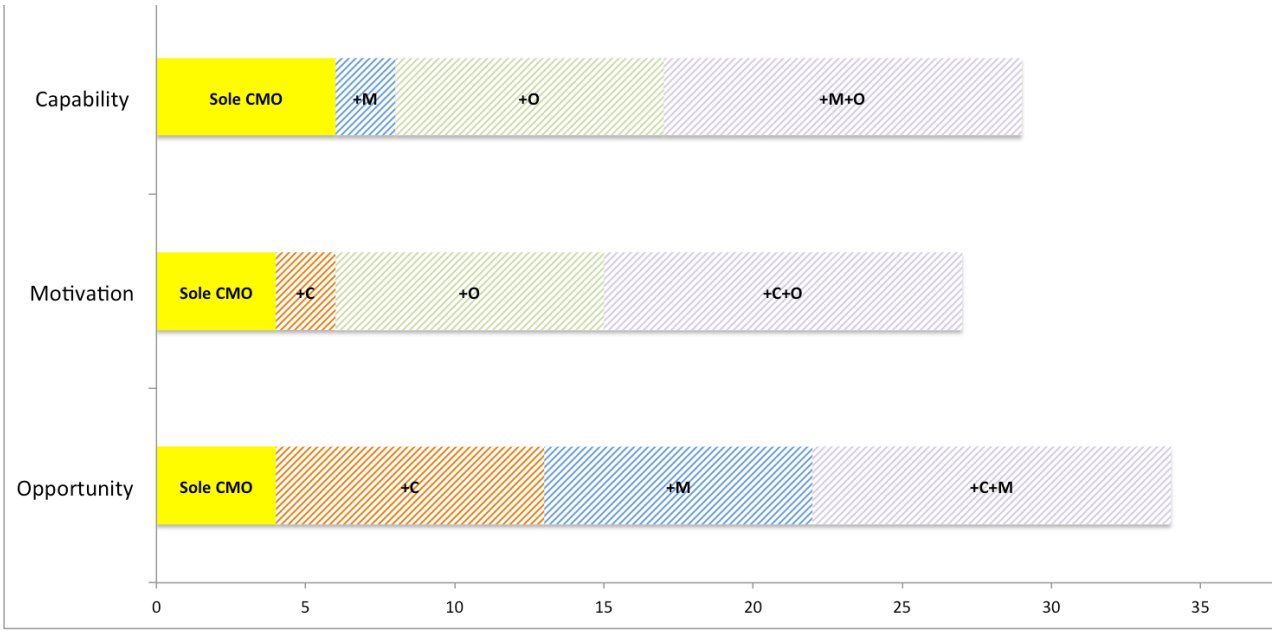
We next assessed the relationship between the mechanisms of evidence use applied in the reviewed interventions and components of behaviour change (Appendix J). This analysis aimed to examine whether different intervention mechanisms might target different approaches towards supporting

decision-makers to change their behaviour and make an increased use of evidence. It should be noted though, that, in multi-mechanisms interventions, there is some confounding as to which mechanism is aiming to trigger what aspect of behaviour change. M3 (communication and access) is strongly associated with aiming to improve decision-makers' opportunity and motivation to use evidence, which are targeted in 95 per cent and 74 per cent of interventions applying M3 respectively. M5 (skills), in contrast, mainly targets the capability as well as opportunity to incorporate evidence into the decision-making process (capability in all interventions and opportunity in 63% of interventions). The remaining intervention mechanisms are evenly distributed in relation to the three targeted CMO outcomes.

CMO combinations

Table 3.5 presents an overview of the targeted CMOs in the reviewed interventions and mechanisms. Regarding the overall use of different components of behaviour change, opportunity to use evidence was the most-often targeted component (n=34). This was followed closely by capability to use evidence targeted in 30 interventions and motivation to use evidence in 27 interventions[11]. In general, most interventions targeted a combination of CMOs rather than focusing on a single component of behaviour change. Twelve interventions aimed to facilitate all three components at once. This was followed by interventions combining capability and opportunity to use evidence as well as motivation and opportunity; both combinations were applied in nine interventions respectively. The pairing of capability and motivation was only explicitly targeted in a two interventions. Lastly, only a small number of interventions were designed to affect a single component of behaviour change. Six interventions exclusively aimed at increasing decision-makers' capability to use evidence, and four interventions each focused exclusively on motivation and opportunity to use evidence. In sum, in the interventions included in the reviews, there was a clear pattern to research multiple components of behaviour change at once.

Table 3.5 Overview of CMO configurations



[11] A single included review was 'empty', i.e. no eligible impact evaluations of interventions were identified and there is thus no CMO configuration associated with the reviewed intervention (Stacey et al 2010).

Definition of evidence in EIDM

During the coding of reviews, we also aimed to assess the nature of the evidence that was positioned to be used by decision-makers. For this purpose, we investigated whether (i) the evidence positioned to be used in fact presents research evidence, and, if so, (ii) whether it is of reliable quality, and (iii) whether the available evidence was objectively represented during the process of encouraging evidence use. Unfortunately, only a minority of reviews (n=5) explicitly stated what type of evidence decision-makers were encouraged to draw from. In each of the five cases, decision-makers were pointed towards systematic review evidence as the most reliable source of knowledge. However, in general, there was surprising little information on what presents reliable and relevant evidence in the reviews of interventions aiming to increase the use of such evidence.

Outcomes

We included reviews that targeted both final and intermediate outcomes of evidence use as well as outcomes and outcome measures related to the mechanisms that were assumed to foster decision-makers' use of evidence. The 36 included reviews reported on 66 outcome constructs; however, in only eight reviews, the final outcomes of evidence use were assessed. The remainder of reviews only commented on intermediate outcomes. This tendency to focus on intermediate outcomes as a proxy for evidence use presented a major challenge in the evidence-base. Assessing decision-makers' attitudes toward evidence use or increases in critical appraisal skills cannot be regarded as a final outcome of evidence use.

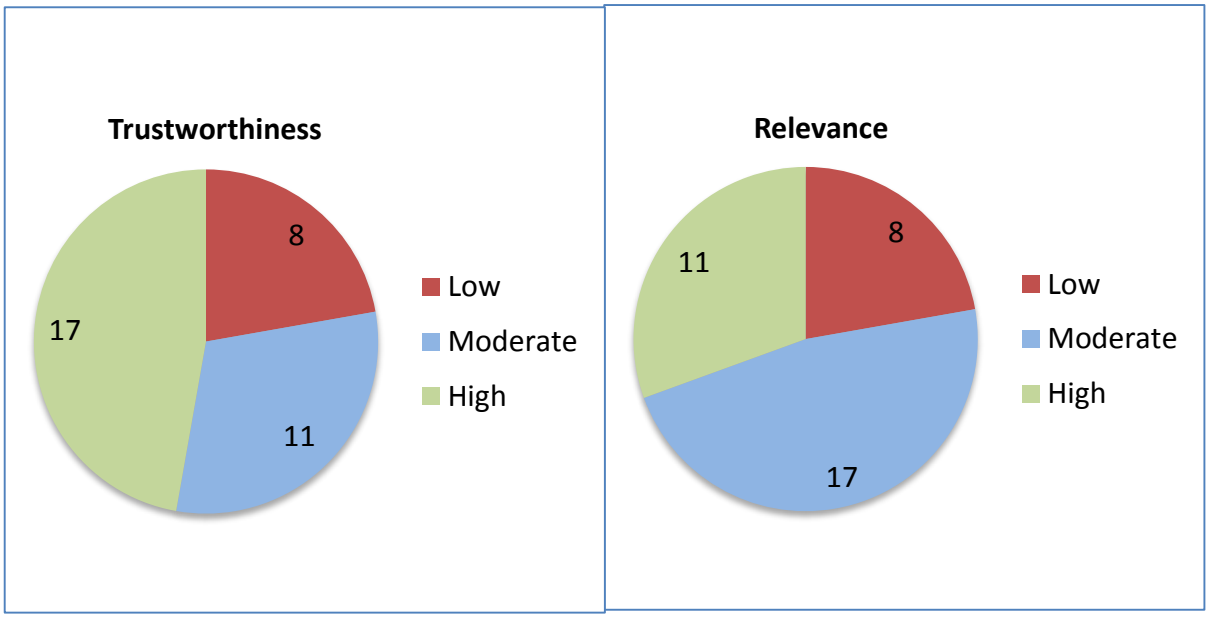
In addition to the challenging tendency to focus on intermediate outcomes, there is further a lack of agreed and tested indicators to measure EIDM outcomes objectively. Individual studies therefore highly varied in their attempts to measure evidence use and often applied subjective outcomes measures such as self-reports. The few reliable objective indicators for the final outcomes of evidence use identified in this review included the reference of evidence in policy documents, programme funding being determined by the evidence-base, and the 'Global EIDM Index' developed by Dobbin et al (2009). Regarding intermediate outcomes, outcome measures related to practical skills and knowledge to use evidence (e.g. appraising research) were measured objectively (e.g. assessment tests). Less tangible outcomes such as access to evidence, on the other hand, were assessed using more subjective outcome measures (e.g. self-reports, future intentions).

There also was a lack of reporting within the reviews at what level of analysis outcomes were measured and we are therefore unable to systematically map this dimension of outcomes. It appeared that throughout the reviews, changes in individual decision-makers' use of evidence were the applied level of analysis. In five reviews, though, outcome constructs were assessed that referred to what could be loosely regarded as a change in organisational use of evidence.

3.3 Weight of evidence appraisal results

As explained above, we applied a detailed weight of evidence appraisal to investigate the trustworthiness and relevance of the included reviews. Reviews that were found to be of either low relevance or low trust were excluded from the synthesis. Figure 3.2 below presents the results of our weight of evidence appraisal. We can see that in a majority of the included reviews we were confident that application of the review methods and the thereby generated synthesised effects were trustworthy (n=28 [17 high trust/11 moderate trust]). Only eight reviews were judged to be of low trustworthiness. The main criteria for low-trust weightings came as a result to doubts regarding: the fitness for purpose and adequacy of the methods of synthesis and synthesis findings (n=7); the application of the critical appraisal tool (n=6); and the scope and implementation of the review's search (n=5).

Figure 3.2: Overview of weight of evidence appraisal



A similar picture emerges in regard to the relevance of the findings of the included reviews to our research question. Again, 25 reviews were found to be of acceptable relevance with a slightly less strong composition (11 high relevance/17 moderate relevance). The findings of eight reviews were excluded from our synthesis due to being of low relevance. These results were driven largely by a misfit between the reviews' definition of evidence use and the empirical outcomes assessed that attempted to denote this use (n=8). Reviews receiving a low weighting for this criterion had stated

to assess the effects of strategies to support EIDM but then included primary evidence that only referred to implementation of evidence-based practices. Therefore, the reviews essentially analysed how to foster practice change, which by co-incidence happened to be an evidence-based practice. This, however, does not explain how decision-makers' general behaviour can be changed to make sustained use of evidence during decision-making processes.

All in all, after the application of the weight of evidence tool, the findings from 23 reviews were included in the synthesis. The findings of 13 reviews were excluded as of low trustworthiness, low relevance, or both. Of the 23 reviews feeding empirical data into the synthesis, eight reviews were rated as of high relevance and high trust. These eight reviews therefore presented the most reliable and relevant evidence of what works to increase decision-makers' use of evidence. For the remainder of this report, we will refer to these reviews as of a 'high weight of evidence (WoE)' and findings of these reviews will be classified as reliable evidence. The remaining 15 reviews were of a moderate weight of evidence rating in at least one domain (trust or relevance). For the remainder of this report, we will refer to these reviews as of a 'moderate WoE' and findings of these reviews will be classified as cautious evidence. An overview of each reviews individual WoE rating is provided in Appendix A.

3.4 Summary of the evidence-base

In sum, a number of key characteristics of the evidence-base emerge:

- A total of 36 systematic reviews investigating the effects of interventions aiming to increase decision-makers' use of evidence were included in the systematic review of reviews.
- Most reviews have been published post 2012 (n=28).
- A large majority of reviews (n=30) are conducted in a healthcare setting and focus on decision-makers at the practice level (n=19) and at the policy level (n=10).
- Twenty-six reviews described themselves as systematic reviews, six as scoping systematic reviews. This was complemented by two cross-sector reviews, one rapid review, and a realist synthesis. The number of primary studies included in the reviews ranged between two and fifty-two.
- The outcomes of evidence use are underdefined and few common indicators are applied across studies. Most outcomes present intermediate evidence use outcomes. The conceptualisation of evidence use in the literature presents a challenge as implementation of evidence-based practices are often framed as research uptake, resulting in outcomes rarely being structured to capture changes in evidence use *per se*.
- What constitutes evidence in evidence-informed decision-making is often not made explicit.
- In total, the findings of 23 reviews were eligible to feed into the synthesis (8 high WoE; 15 moderate WoE). The findings reported in 13 reviews were excluded as of low relevance or low trustworthiness.

In sum, the map of the evidence-base of what works in increasing the use of evidence by decision-makers established that there is a large body of published evidence. However, the applied interventions and assessed outcomes are heterogeneous and conceptual challenges remain

regarding the definition of reliable outcome constructs able to capture changes in EIDM as well as what constitutes evidence in EIDM and rigorous processes of adequately presenting this evidence. Most reviews of interventions aiming to increase decision-makers' use of evidence are conducted in the health professions and include primary studies published from the mid-2000s onwards. The methodological quality of the included reviews was, by and large, satisfactory and we are therefore able to draw from a robust body of evidence (n=23 reviews) in the synthesis.

3.5 Further information on the excluded reviews

This section briefly discusses examples of excluded reviews to highlight the application of our inclusion criteria.

Reviews not examining the effectiveness of the applied evidence use interventions:

Oliver and peers (2014) 'A systematic review of barriers to and facilitators of the use of evidence by policymakers' presents an example of a systematic review that did not meet our inclusion criteria as it did not review the empirical impact of applied interventions. Instead of synthesising knowledge on the results of interventions that have attempted to increase decision-makers' use of evidence, the review combines the findings of surveys, case studies, observational studies, semi-structured interviews, and existing reviews, which comment broadly on the use of evidence during decision-making. The majority of included studies reported perceptions or experiences of decision-makers' on barriers and facilitators to their evidence use. The review therefore does not aim to measure the empirical outcome of evidence use interventions and a large majority of included studies in fact do not report on the application of an active intervention to increase EIDM.

Review outcomes not capturing an evidence use outcome as defined in Review 1:

Boaz and peers (2011) 'Effective implementation of research into practice: an overview of systematic reviews of the health literature' presents an example of a systematic review that did not meet our outcome inclusion criteria because the study focused on the implementation of evidence-based practices and guidelines rather than the systematic consideration of evidence during decision-making process which constitutes the definition of EIDM in this project. The literature on implementation science primarily aims to understand how professional behaviour can be changed to adopt new practices and tools, which may or may not be evidence-based based (Boaz 2011: 212). The uptake of a practice that happens to be evidence-based though is not synonymous with evidence-informed decision-making and therefore did not fit our outcome inclusion criteria. The same applied to practice outcomes such as changes to prescriptions and clinical outcomes, and we therefore excluded this review and related studies.

Reviews not meeting the required methodological criteria to classify as a systematic review:

DRUSSA (2015) 'A literature review on knowledge utilisation' presents an example of a study not meeting our methods inclusion criteria. The literature review neither applies or reports a structured

search of the literature, nor defines what type of evidence will be included in the review or how this evidence will be appraised. The study can therefore not be regarded to present a transparent and structured review of the literature and it is unclear to an outside audience how the review's findings were arrived at and whether they could be reproduced.

Reviews not assessing an intervention or strategy applied to increase evidence use:

Liverani and peers (2013) 'Political and institutional influences on the use of evidence in public health policy. A systematic review' present an example of a review in which the applied interventions did not refer to a practical programme. Rather, the 'intervention' referred to contextual factors and their impact on EIDM. Other examples of reviews excluded for this reason are: transfers of information during staff transition; evaluating tools that evaluate research use; supply side interventions that increase the relevance of research.

Chapter 4. Results review 1: Synthesis of the evidence of impact

Introduction

After the application of the WoE tool, the data reported in 23 reviews were eligible for inclusion in the synthesis of this systematic review of reviews. We used a narrative approach to synthesis based on detailed summary tables of the included reviews and extracted data (Appendix A) in order to aggregate and configure the findings of the reviews on the effectiveness of interventions increasing the evidence use of decision-makers. Narrative synthesis was adopted as only a single review presented statistical effects as a measure of interventions' impacts on evidence use (Yost et al 2015). In addition, the review question was formulated broadly and allowed for the inclusion of a heterogonous body of evidence.

The synthesis is structured around the mechanisms applied by interventions aiming to increase evidence use, i.e. in order to synthesise the effects of heterogeneous interventions, we structure evidence use interventions according to the applied intervention mechanisms. Using this mechanism structure, we can then aggregate and configure the evidence on intervention's impact to provide synthesised findings on what interventions using which mechanisms are effective to increase evidence use. In order to generate a more nuanced understanding of the effectiveness of interventions and mechanisms, we further unpack their effects on evidence use based on the discussed three components of behaviour change (capability, motivation, and opportunity to use evidence). Reviews cited in the synthesis are referred to by the name of the first author.

4.1 Synthesis of the effects of evidence use interventions, mechanisms and related CMOs

The following section presents the synthesis of the empirical data identified in this systematic review of reviews on the effects of interventions applying the six mechanisms to facilitate a change in decision-makers' use of evidence. Apart from this change in behaviour to engage in EIDM, the synthesis also investigates interventions and mechanisms effects on decision-makers' capability, opportunity, and motivation to use evidence. The synthesis is based on Table 4.1, which lists for each included review the applied interventions, the mechanisms of evidence use within these interventions, the considered CMOs for each intervention as well as the assessed CMOs and the final outcome of evidence use. The distinction between considered and assessed CMOs refers to the intervention's intentions to support certain CMOs (considered CMOs) and the empirically measure of the intervention's success in this regard (assessed CMOs). Often, interventions aimed to affect a number of different CMOs, but were restricted in the evaluation to final outcomes of evidence use and/or only a sub-set of the considered CMOs.

Overall, 16 interventions identified in the included reviews empirically assessed the final outcome of decision-makers' use of evidence. These 16 interventions reflect mixed results as seven see an increase in evidence use whereas nine fail to identify a change in behaviour. Regarding evidence CMOs, there was strong evidence that interventions were able to improve decision-makers' capability to use evidence. Results indicated that 15 interventions were associated with increased capability, and only two instances of ineffective capability outcomes were reported. A similar picture

emerges with regard to decision-makers' motivation to use evidence, which was found to have increased in 18 interventions, with ineffective results being reported in only three interventions. Lastly, opportunity to use evidence found to have increased in all of the twelve interventions that assessed this outcome.

The main reason for this large difference between measuring final outcomes of evidence and CMO outcomes is that a majority of reviews were limited to reporting intermediate outcomes such as increased critical appraisal skills as an indicator for evidence use. However, having the skill or the intention to use evidence, in itself, cannot be regarded as a reliable indicator of behaviour change in practice. Therefore, in this systematic review of reviews, we have a larger body of evidence when commenting on CMOs as potential contributors to evidence use as compared to when commenting on final evidence use outcomes.

While this descriptive overview of results leaves a fairly positive impression on the effectiveness of interventions to improve different CMOs, it tells us little about how these interventions work. As stated above, this synthesis assumes that the evidence use mechanisms applied within these interventions presents a helpful structure to synthesise evidence of intervention's effects.

To answer this project's research question of what works in improving the use of science evidence, we therefore will next present the results of our narrative synthesis on the effectiveness of different evidence use mechanisms applied in the reviewed interventions. This section is organised by number of mechanism. However, the identified evidence-base for each mechanism differs in size and richness. For two mechanisms, M1 (awareness) and M2 (agree) in particular we identified an evidence-gap regarding the effects of interventions applying these mechanisms. The first two sections of the below narrative synthesis are therefore only descriptive and readers interested in synthesised review findings only might want to start at the third section of the synthesis, the effects of M3 (communication & access) interventions.

Table 4.1 Summary table of interventions, mechanisms, and CMOs, and outcomes

OVERALL HIGH WEIGHT OF EVIDENCE

High trustworthiness /high relevance reviews

Review	Intervention	Mechanism	Outcomes				
				Capability	Motivation	Opportunity	Evidence Use
Bunn (2012) n=4	$I1_1$: access to online DB of SRs (Dep of Health programme directors)	M3	C	☐	☐	☒	
			A	☐	☐	☐	■
	$I1_2$: online DB of SRs + weekly targeted messages (same as above)	M3	C	☐	☒	☒	
			A	☐	☐	☐	■
	$I1_3$: online DB of SRs + weekly targeted messages + KB (same as above)	M3 + M4 + M5	C	☒	☒	☒	
			A	☐	☐	☐	■
	I2: personalised dissemination of SRs (public health policymakers)	M3	C	☐	☒	☒	
			A	■	■	■	■
Hyde (2000)	I1: Different types of CA courses	M5	C	☒	☐	☐	

n=16	(mostly medical doctors)		A	■	■	☐	■
Ilic (2014)	I1: Formal EBM teaching	M5	C	☒	☐	☐	
n=9	(undergraduate medical students)		A	■	■	☐	■
La Rocca	I1: Communities of practice	M3 + M4 + M5	C	☒	☐	☒	
(2012)	Mental health practitioners		A	■	☐	☐	■
n=4	I2: Tailored, convenient dissemination	M3	C	☐	☒	☒	
	(social workers and policymakers)		A	■	■	■	☐
	I3: DB access + training workshop + PSS	M3 + M5 + M6	C	☒	☐	☒	
	(public health physicians)		A	■	☐	☐	■
	$I4_1$: access to online DB of SRs	M3	C	☐	☐	☐	
	(Dep of Health programme directors)		A	☐	☐	☐	☐
	$I4_2$: online DB of SRs + weekly targeted	M3	C	☐	☐	☐	
	messages (same as above)		A	☐	☐	☐	☐
	$I4_3$: online DB of SRs + weekly targeted	M3 + M4 + M5	C	☐	☐	☐	

	messages + KB (same as above)		A	☐	☐	☐	☐
Moore (2011) n=5	$I1_1$: access to online DB of SRs (Dep of Health programme directors)	M3	C	☐	☐	☐	
			A	☐	☐	☐	☐
	$I1_2$: online DB of SRs + weekly targeted messages (same as above)	M3	C	☐	☐	☐	
			A	☐	☐	☐	☐
	$I1_3$: online DB of SRs + weekly targeted messages + KB (same as above)	M3 + M4 + M5	C	☐	☐	☐	
			A	☐	☐	☐	☐
	I2: user engagement of public health unit teams in the research production (units)	M3 + M4	C	☒	☒	☒	
			A	■	■	■	■
	$I3_1$: teaching CA (health practitioners & policymakers)	M5	C	☒	☐	☐	
			A	■	■	☐	■
	$I3_2$: teaching CA + organisational change (senior health service execs, organisations)	M5 + M6	C	☒	☐	☒	
			A	■	■	■	☐
	I4: personalised dissemination of SRs (public health policymakers)	M3	C	☐	☐	☐	
			A	☐	☐	☐	☐

Perrier	I1: personalised dissemination of SRs	M3	C	☐	☐	☐	
(2011)	(public health policymakers)		A	☐	☐	☐	☐
n=4	$I2_1$: access to online DB of SRs	M3	C	☐	☐	☐	
	(Dep of Health programme directors)		A	☐	☐	☐	☐
	$I2_2$: online DB of SRs + weekly targeted	M3	C	☐	☐	☐	
	messages (same as above)		A	☐	☐	☐	☐
	$I2_3$: online DB of SRs + weekly targeted	M3 + M4 + M5	C	☐	☐	☐	
	messages + KB (same as above)		A	☐	☐	☐	☐
Thompson	I1: practitioner/research collaboration +	M1+M2+M3+M4+M5+M6	C	☒	☒	☒	
(2007)	marketing and education (nurses)		A	☐	☐	☐	☐
n=3	I2: Educational meetings + user engagement	M1 + M5 + M6	C	☒	☒	☒	
	(nurses)		A	☐	☐	☐	☐
Yost (2015)	I1: educational meetings + mentorship	M4 + M5	C	☒	☒	☒	
n=4	(nurses)		A	☐	☐	☐	☐

OVERALL MODERATE WEIGHT OF EVIDENCE

Moderate trustworthiness / high relevance

Review	Intervention	Mechanism	Outcomes			
			Capability	Motivation	Opportunity	Evidence Use
Chambers (2011) n=5	I1: User-friendly, valued added summaries of SR + PSS (health policymakers)	M3 + M6	C ☐	☒	☒	
			A ☐	■	■	■
	I2: policy briefs of SRs (health policymakers)	M3	C ☐	☒	☒	
			A Not publicly available			
Mitton (2007) n=4	I1: user engagement of public health unit teams in the research production (units)	M3 + M4	C ☐	☐	☐	
			A ☐	☐	☐	☐
	I2: personalised dissemination of SRs (public health policymakers)	M3	C ☐	☐	☐	
			A ☐	☐	☐	☐
	$I3_1$: access to online DB of SRs (Dep of Health programme directors)	M3	C ☐	☐	☐	
			A ☐	☐	☐	☐

$I3_2$: online DB of SRs + weekly targeted messages (same as above)	M3	C	☐	☐	☐	
		A	☐	☐	☐	☐
$I1_3$: online DB of SRs + weekly targeted messages + KB (same as above)	M3 + M4 + M5	C	☐	☐	☐	
		A	☐	☐	☐	☐

High trustworthiness/moderate relevance

Review	Intervention	Mechanism	Outcomes				
				Capability	Motivation	Opportunity	Evidence Use
Abdullah (2014) n=3	I1: mentoring as part of multifaceted KT interventions (health practitioners)	M4 + M5 + M6	C	☒	☒	☒	
			A	■	■	■	☐
Hines (2015) n=10	I1: Workplace Learning for Nurses' Research Literacy (nurses)	M5	C	☒	☐	☒	
			A	■	■	☐	☐
	I2: Formal university courses for improving research knowledge and CA skills (nurses)	M5	C	☒	☐	☒	
			A	■	☐	☐	☐

Horsley (2011) n=3	I1: Teaching critical appraisal skills (health care practitioners and managers)	M5	C A	☒ ■	☐ ☐	☐ ☐	 ☐
Murthy (2012) n=3	$I1_1$: access to online DB of SRs (Dep of Health programme directors)	M3	C A	☐ ☐	☐ ☐	☐ ☐	 ☐
	$I1_2$: online DB of SRs + weekly targeted messages (same as above)	M3	C A	☐ ☐	☐ ☐	☐ ☐	 ☐
	$I1_3$: online DB of SRs + weekly targeted messages + KB (same as above)	M3 + M4 + M5	C A	☐ ☐	☐ ☐	☐ ☐	 ☐
	I2: educational visits and access to SRs DB (health practitioners)	M3 + M5	C A	☒ ■	☒ ☐	☒ ☐	 ☐
	I3: user-friendly packaging of SRs (health care professionals)	M3	C A	☐ ☐	☒ ■	☐ ☐	 ☐
Quinn (2014) n=6	I1: knowledge exchange portals (DB) (targeted health care practitioners and policymakers)	M3	C A	☐ ☐	☐ ☐	☒ ■	 ☐

Stacey (2010)	I1: *empty review*	*empty review*	C	*empty review*			
			A	*empty review*			
Wallace (2014) n=7	I1: clinically integrated EBM eLearning courses (medical students & healthcare practitioners)	M3 + M5	C	☒	☐	☒	
			A	■	■	☐	☐
	$I2_1$: access to online DB of SRs (Dep of Health programme directors)	M3	C	☐	☐	☐	
			A	☐	☐	☐	☐
	$I2_2$: online DB of SRs + weekly targeted messages (same as above)	M3	C	☐	☐	☐	
			A	☐	☐	☐	☐
	$I2_3$: online DB of SRs + weekly targeted messages + KB (same as above)	M3 + M4 + M5	C	☐	☐	☐	
			A	☐	☐	☐	☐
	I3: user-friendly packaging and dissemination of SRs (healthcare professionals)	M3	C	☐	☒	☒	
			A	☐	■	☐	☐

Moderate trustworthiness /moderate relevance

Review	Intervention	Mechanism	Outcomes			
			Capability	Motivation	Opportunity	Evidence Use

Gray (2013) n=11	I1: Training to increase supervision of EBM and CA skills (child welfare supervisors)	M3 + M5 + M6	C	☒	☒	☒	
			A	■	☐	■	■
	I2: audio recordings of research summaries for health practitioners to listen to while driving	M3	C	☐	☐	☒	
			A	☐	☐	☐	■
	I3: research/practitioner collaboration, workshops, on-demand research summaries	M1+M3+M4+M6	C	☐	☒	☒	
			A	☐	■	■	☐
Harris (2011) n=18	I1: journal clubs (healthcare practitioners)	M2+M3+M4+M5	C	☒	☒	☒	
			A	■	■	■	☐
Li (2009)	I1: Communities of practice	M1 + M4 +M5 + M6	C	☒	☒	☒	
			A	*empty review*			
Mairs (2013) n=9	I1: online knowledge management strategies (targeted at healthcare managers and policymakers)	M3 + M4 + M6	C	☐	☒	☒	
			A	☐	■	■	☐
	I2: Virtual community of practice (targeted at healthcare managers and policymakers)	M3 + M4 + M5	C	☒	☒	☒	
			A	☐	■	■	☐

Menon (2009) n=3	I1: multifaceted knowledge translation strategies (rehabilitation professionals)	M3 + M4 + M5	C	☒	☒	☒	
			A	☐	☒	☐	☐
	I2: journal clubs (occupational therapists)	M3 + M4 + M5	C	☒	☐	☒	
			A	☐	☒	☐	☐
	I3: opinion leaders to facilitate educational sessions	M5	C	☒	☒	☐	
	(physical therapists)		A	☐	☒	☐	☐

DB=database; KB=knowledge broker; EBM=Evidence-based medicine; CA=critical appraisal; PSS=professional support services (eg QA service, on-demand support; evidence hotlines, etc)

Legend:
C=Considered
A=Assessed
☒ Assessed & found effective
☒ Assessed & found not effective
☐ Not considered/assessed
☒ Considered

Interventions providing 'Awareness for and attitudes toward EIDM' (M1) – Evidence of effects

Definition: M1 refers to the importance of decision-makers valuing the concept of EIDM. It is assumed that a conceptual understanding and normative support of EIDM as a principle of decision-making is of benefit to foster actual evidence use.

Application: In our systematic review of reviews, we only identified three reviews that included interventions employing M1 (awareness) (Thompson 2007; Gray 2013; Li 2009). In these interventions, M1 (awareness) was combined with M6 (structures & processes) (n=4), M5 (skills) (n=3), and M4 (interact) (n=3). Only a single intervention featured M1 (awareness) in combination with M3 (communication & access) and M2 (agree). All but one of the multi-mechanism interventions featuring M1 (awareness) targeted all three CMOs (n=3). A single intervention focused only on motivation and opportunity to use evidence.

Summary box 1

Interventions applying M1, i.e. awareness and attitudes towards EIDM were found to:

- present a **marginal number of interventions** included in the identified reviews leaving a knowledge gap regarding the mechanism's role and contribution;
- where applied, **focus on strengthening motivation** to use evidence through illustrating the value of evidence to inform solutions to decision-makers' professional challenges;
- be applied in particular in **combination with M6**.

Effectiveness of M1 (awareness) interventions on evidence use: In all the reviewed interventions employing multiple mechanisms we were unable to attribute observed outcomes to the application of M1 (awareness) in the interventions. We therefore cannot comment on the role and contribution of M1 as an evidence use mechanism neither in isolation nor in combination with other mechanisms. Below, we briefly provide descriptive information on the intended role of M1 (awareness) in the reviewed interventions.

Thompson (2007) reviews two multi-mechanism interventions with a focus on education and collaboration. The first intervention aims to raise conceptual awareness of the need for evidence to inform decision-making through the conduct of a needs assessment by decision-makers. This assessment is assumed to help decision-makers' identify professional challenges and to then realise the value of evidence to help them formulate answers to these challenges. This process is assumed to lead to an increased motivation to use evidence. In the second intervention decision-makers are involved in the design and conduction of a policy-relevant research study. This direct engagement, likewise, is assumed to lead to an appreciation of the value of research translating into an increased

motivation to use evidence. The multi-mechanism intervention reviewed by Gray (2013) also aims to support decision-makers' motivation to use evidence by means of highlighting the value of research evidence. As part of the intervention, a knowledge broker works directly with practitioners to identify practice questions where research evidence could be helpful. Lastly, the review by Li (2009) aimed to synthesise evidence on the effects of communities of practice to support evidence use. Interactions within the communities of practices were assumed to share the importance of using evidence thereby supporting the development of evidence use as a professional norm. Unfortunately, the review did not find any studies eligible for inclusion that evaluated the effects of communities of practice.

Interventions providing 'Agreement to what constitutes fit-for-purpose evidence' (M2) – Evidence of effects

Definition: M2 (agree) emphasises the importance of a consensus between decision-makers' and researchers as to what evidence is fit-for-purpose to inform the decision-making process. It is assumed that decision-makers will benefit from co-shaping the nature of the evidence supplied to them in order to ensure it fits their needs.

Summary box 2

Interventions applying M2, i.e. agreement to what constitutes fitness-for-purpose were found to:

- present a **marginal number of interventions** included in the identified reviews leaving a knowledge gap regarding the mechanism's role and contribution;
- where applied, **focus on strengthening motivation** to use evidence through increasing the relevance of evidence to decision-makers' professional needs.

Application: In this systematic review of reviews, we only identified two reviews that included an intervention employing M2 (agree) (Harris 2011; Thompson 2007). Both interventions combine multiple mechanisms, with M4 (interact) and M5 (skills) featuring in both, and M1 (awareness), M3 (communication & access), and M6 (structures & processes) featuring in a single intervention each. The two interventions both aimed to address all CMOs of evidence use.

Effectiveness of M2 (agree) interventions on evidence use: Both interventions employ multiple evidence use mechanisms and we were unable to attribute the assessed CMOs and evidence use outcomes to M2 (agree). The current evidence base therefore does not allow us to comment on the role and contribution of M2 (agree) as an intervention component. Below, we briefly describe the intended function of M2 (agree) in both included interventions.

In the intervention reviewed by Harris (2011) researchers and decision-makers worked collaboratively in order to agree on the clinical applicability and utility of evidence. This discussion and resulting joint agreement was used to inform the future production of evidence. It was assumed that the then produced evidence would be more relevant to decision-makers' needs increasing their motivation to use evidence. Thompson (2007) identified an intervention subscribing to a similar approach. As part of a multi-mechanism training and collaboration intervention, decision-makers were asked to evaluate the relevance of the current evidence to their professional needs, organisational values, standards and policies, as well as to comment on potential cost and benefit of using the research. The outcomes of this evaluation were then fed back to the researchers in order to inform the design of a new study. In line with Harris (2011), the underlying objective of M2(agree) seems to have been to increase decision-makers' motivation to use evidence.

Interventions providing 'Communication and access' (M3) – Evidence of effects

Definition: M3 (communication & access) emphasises the importance of decision-makers' being subject to an effective communication of evidence to ensure that they are aware of the available evidence that could inform their decisions. It also refers to effective access to evidence to accompany the communication and dissemination of evidence.

Application: M3 (communication & access) was the sole evidence use mechanism in nine interventions and was incorporated into an additional 14 programmes. Where M3 (communication & access) was used in combination with other mechanisms, this was mainly in conjunction of applying M5 (skills) (n=10), M4 (interact) (n=9) and M6 (structures & processes) (n=6). In relation to CMOs of evidence use, M3 (communication & access) was predominantly applied in interventions aiming to affect decision-makers' opportunity to use evidence (n=22), e.g. through online evidence portals. This was followed by attempts to improve motivation to use evidence (n=17), e.g. through personalised communication techniques. Increasing capability to use evidence through M3 (communication & access), was, in comparison, a less popular approach, being applied in only 11 interventions.

Summary box 3

Interventions applying M3, i.e. communication of, and access to, evidence were found to:

- be **effective** to increase evidence use when **M** and **O** where applied in **combination**;
- **not** be **effective** to increase evidence use if **only O** was targeted;
- **effective** to increase **M** using personalised and targeted communication, audience segmentation, and user-friendly design techniques;
- **effective** to increase **O** through user-engagement, multiple means of access and online repositories.

Effectiveness of M3 (communication & access) interventions on evidence use: In four of the nine reviewed interventions in which M3 (communication & access) was applied as the single evidence use mechanism, the final outcome of evidence use was assessed. In two of these, applying M3 (communication & access) was found to be an effective intervention approach to encourage behaviour change (Bunn 2012). In both interventions, M3 (communication & access) was used to simultaneously increase decision-makers' motivation and opportunity to use evidence. Motivation to use evidence was created through a more personalised and targeted manner of evidence communication. This entailed approaching decision-makers prior to the conduct of the research to seek their permission for a future dissemination as well as sending weekly, targeted messages that advised decision-makers of articles in a registry relevant to their programme area. These motivation-building components were then coupled with an opportunity to use evidence. This opportunity included providing decision-makers' with access to an evidence portal and systematic review summaries as well as the dissemination of evidence exclusively to decision-makers who had initially expressed an interest in it. The combination of building motivation and opportunity to use evidence succeeded in encouraging decision-makers' use of evidence as measured by the number of actual evidence-based strategies, policies, and interventions being implemented as well as the reported use of systematic reviews to inform a policy decision in a two-year period.

The two reviewed interventions (Bunn 2012; Gray 2013) that did not identify a positive effect of applying M3 (communication & access) on evidence use both only attempted to create an opportunity to use evidence through M3 (communication & access). This entailed merely providing access to the above-mentioned evidence portal as well as providing audio recordings of research summaries for decision-makers to listen to while driving. In both cases, this intervention approach was found to not increase evidence use. This therefore suggests that the effective incorporation of M3 (communication & access) in evidence use interventions requires at least the combination of motivation and opportunity in order to encourage evidence use. This assumption is further strengthened by the observation that one intervention compared these two scenarios directly with each other. The intervention reviewed in Bunn (2012) finds that access to an evidence portal led to no changes in decision-makers' evidence use unless personalised and targeted messages were sent to decision-makers. We therefore conclude that including M3 (communication & access) applied to foster motivation and opportunity to use evidence seems to be a promising intervention approach, a finding which is robust to WoE ratings.

Effectiveness of M3 (communication & access) interventions on CMOs: In addition to investigating effects on the final outcomes of evidence use, we also found further evidence on the effectiveness of interventions applying M3 (communication & access) to affect different CMO outcomes in five reviews. The above identified motivation and opportunity configuration was unpacked in more detail in two interventions reported in La Rocca (2012) and Wallace (2014). La Rocca confirms Bunn's (2012) findings that a combination of motivation and opportunity can translate into positive outcomes for each behaviour change component. The reviewed interventions focused on adapting dissemination techniques to decision-makers' preferences as well as tailoring the content and presentation of the evidence to the different audiences. This was found to be effective to not only increase motivation and opportunity to use evidence but also to increase the capability to do so. Participants who had the option to chose their preferred methods of dissemination (motivation) and

accessed the dissemination materials at their own convenience (opportunity and motivation) were also found to be more knowledgeable regarding where to locate relevant evidence materials in general (capability). The intervention included in the moderate WoE Wallace (2014) review, too, applied M3 (communication & access) to foster motivation and opportunity to use evidence. The intervention designed more user-friendly summaries of systematic reviews and disseminated these together with a review user manual to evidence users. The review attested this approach to result in a greater awareness of systematic reviews, which could indicates an increased opportunity to use evidence.

Additional explanatory evidence on the effectiveness of designing evidence products in a more user-friendly manner is provided in the Murthy (2012) review. The reviewed interventions, as Wallace (2014) above, focused on making systematic reviews more user-friendly by, for example, adding a summary of findings table and plain language summaries. The review only synthesises evidence on motivation to use the designed products and found motivation to have increased significantly compared to conventional review designs. Lastly, there is also evidence from a moderate-rated review (Quinn 2014) that interventions applying M3 (communication & access) focused only on providing opportunities to use evidence—which were found ineffective above regarding evidence use—might at least result in a greater access to evidence. The interventions of interest are knowledge exchange platforms in this review. While in itself not sufficient to encourage evidence use, the review did suggest that evidence databases *per se* are consulted by decision-makers. However, as this systematic review of reviews shows, the opportunity to use evidence needs to be complemented with motivation in order to encourage behaviour change.

Overview of M3 (communication & access) interventions and CMOs: There is evidence that interventions applying M3 (communication & access) are effective to improve motivation to use evidence. Promising applied techniques include personalised and targeted communication, audience segmentation in dissemination, and more accessible and user-friendly packaging of evidence. This does, however, only present a small number of possible communication techniques that might be able to improve motivation. Prominent examples of techniques found effective in different contexts include reminders, incentives, framing and anchoring. There is also evidence that M3 (communication & access) does increase decision-makers' opportunity to use evidence. Promising tools, which have shown impact on increased opportunities, include online repositories, engagement prior to providing the opportunity, as well as offering multiple means of access. Providing opportunity to use evidence, however, is only effective if applied in combination with efforts to improve decision-makers' motivation as well. The knowledge gap therefore is to identify which motivational techniques seem to match most effectively with what type of opportunities. There is currently insufficient evidence to comment on the potential of interventions applying M3 (communication & access) to change capabilities to use evidence. While there are individual interventions in which capabilities have increased, by and large, M3's educational potential appears to be limited.

Role and contribution of M3 (communication & access) in multi-mechanism interventions: M3 (communication & access) was also applied in 14 multi-mechanism interventions. Below, we discuss the evidence of M3's effects in these interventions only in programmes in which outcomes can be attributed to M3 (communication & access).

The Moore (2011) review reported on a multi-mechanism intervention that combined the dissemination of evidence (M3) with the engagement of the intended evidence users in the packaging of the evidence (M4). The intervention succeeded in building all three components of behaviour change and evidence users reported an increased value and understanding of as well as practical access to the evidence. In line with Bunn's (2012) and La Rocca's (2012) reviews above, this suggests that being consulted about or involved in the process of packaging evidence is an effective approach to increase at least motivation and opportunity to use evidence.

Moore (2011) further provided an interesting example of how M3 (communication & access) can be applied in interventions to more systematically affect the way in which decision-makers gain access to evidence—being formally involved in the packaging of the evidence product. A number of interventions in the moderately rated Chambers (2011) review developed this idea further generating formal programmes to provide decision-makers with permanent access to tailored and policy-relevant evidence (M6). The interventions combined designing systematic review reports in a more user-friendly manner (see above for related evidence on this) with on-demand service hotlines that decision-makers can consult when in need of evidence. The on-demand services aimed to alter the process of how decision-makers access evidence in order to embed the consultation of evidence more conveniently in their daily work processes. The review reported effective outcomes of these interventions regarding motivation and opportunity to use evidence. One of the reviewed on-demand services, the *Aggressive Research Intelligence Facility*, has reportedly led to policy and programme decisions being explicitly based on the consulted evidence (Chambers, 2011). However, the review also cited an example of an ineffective on-demand service in South Africa, which failed to increase the opportunity to use evidence receiving a single request for evidence in a whole year. All in all, there seems to be some cautious support to the assumption that applying M3 (communication & access) and M6 (structures & processes) in combination might be a promising intervention approach to increase evidence use.

Two interventions reported in Murthy (2012) and Wallace (2014) reviews, reported on the combination of M3 (communication & access) and M5 (skills), that is the combination of access to evidence, e.g. systematic review databases, and training courses on skills related to EIDM. In each of these, M3 (communication & access) was supposed to provide an opportunity to use evidence in addition to the capability to do so supported by the training component of the intervention. None of the studies assessed though whether the M3 (communication & access) component was effective in increasing the opportunity to use evidence. In Murthy (2012) the combined intervention failed to have any effect on capability to use evidence, but it should be cautioned that the intervention dose was very modest, lasting a single day. In the Wallace (2014) review, a positive effect of an intervention combining M3 (communication & access) and M5 (skills) was claimed on capability and motivation to use evidence following clinically integrated EBM eLearning courses, which featured access to online libraries of systematic reviews. The overall effectiveness of combining M3 (communication & access) and M5 (skills) in interventions to support CMOs of evidence use is unclear.

Lastly, there is evidence from a moderate-rated review that online platforms might have become a promising approach to increase decision-makers' access to evidence (Mairs 2013). Mairs' (2013)

review investigated the feasibility and performance of online knowledge management platforms as well as virtual communities of practice. The interventions applied M3 (communication & access) as a tool to increase opportunity to use evidence as well as motivation. The latter was believed to result from the fact that the online platforms are experienced as a less threatening professional environment and as more efficient and rapid tools to provide feedback and advice on the use of evidence. The review found some cautious evidence that these claims reflected some of the users' experiences, but the evidence remains tentative at best.

Discussion of the evidence on M3 (communication & access) interventions' effectiveness: The above results on the use of M3 (communication & access) to support CMO outcomes as well final outcomes of evidence use suggest a number of implications for interventions aiming to employ some form of communication and access component to facilitate evidence use. Most of the reviewed interventions applying M3 (communication & access) follow a linear approach of producing evidence to then package and disseminate it. For example, a systematic review report is produced, then summarised, and shared with decision-makers interested in it (Murthy 2012; Wallace 2014). Based on this systematic review of reviews, this intervention approach is feasible to encourage evidence use if it combines motivation with opportunity to use evidence. However, there are also indications that it is worth consulting with the intended recipients before the conduction of the research (Bunn 2012) or to involve them and seek their feedback during the packaging of the evidence (La Rocca 2012). This hints at benefits of engaging decision-makers in the production and design of research evidence, which we discuss in more detail in relation to M4 (interact) below. The tailoring of the proposed way of packaging and means of disseminating the evidence to the intended audience seem to be key to improve their motivation to use evidence. At this stage, only a limited number of options have been tried to increase motivation. This includes targeting the content to decision-makers' areas of expertise, personalising messages, and online communication. We therefore currently can say less about which specific approaches are most effective to build motivation through interventions applying M3 (communication & access) than we can say about the general principle of incorporating motivation-building components into evidence communication programmes, which seems promising.

A similar picture emerges regarding the design of interventions aiming to increase decision-makers' access to evidence. Currently, online libraries of systematic reviews and other knowledge repositories as well as direct dissemination of evidence present the majority of these interventions. The reviewed evidence finds that, on its own, this intervention approach is insufficient to increase evidence use. To increase the opportunity to use evidence, interventions aiming to solely improve access seem to benefit from convenient and hassle-free means of access, ideally with the user being able to choose between different methods of access. This has important implications for the design of online platforms in particular, which currently seem to have focused on functionality of the repository rather than the visual design and user-friendly layout of the platform.

Finally, it is currently unclear what might be the most effective combination of M3 (communication & access) with other evidence use mechanisms in interventions. There is some tentative evidence that formalising and embedding decision-makers' access to evidence in their existing work processes might hold some promise. Evidence on-demand services have been found as highly effective in individual reviews but the overall picture is less clear.

Interventions providing 'Interaction and relationships' (M4) – Evidence of effects

Definition: M4 (interact) focuses on the interactions between decision-makers and researchers. The mechanism assumes that interactions between the two groups might support the creation of trusted relationships, collaboration, and exposure to a different type of social influence, each of which could be conducive to decision-makers' use of evidence.

Application: Our systematic review of reviews did not identify any review that incorporated an intervention that applied M4 (interact) as the sole evidence use mechanism. M4 was thus only applied in multi-mechanism interventions. The most popular mechanism combinations entailed the use of M4 (interact) in interventions together with M5 (n=10), M3 (n=9), and M6 (n=5). As M4 (interact) was not applied in isolation, the intended CMOs associated with the mechanism's usage need to be treated with caution. Minding the caveat of possible confounding and correlations in multi-mechanism interventions, it seems that M4 (interact) was fairly equally associated with each CMO. Twelve multi-mechanism interventions employing M4 (interact) intended to affect decision-makers' opportunity to use of evidence, while eleven interventions each focused on changing capability and motivation to use evidence.

Summary box 4

Interventions applying M4, i.e. decision-maker / researcher interactions and relationships were found to:

- affect evidence use and CMO **only as part of multi-mechanism interventions**, **denying conclusions** on any direct associations between M4 and the evidence use outcomes and CMOs of interest in this systematic review of reviews;
- **not seem to change** decision-makers' behaviour to **use evidence** as part of multi-mechanism interventions;
- **not** be **effective** in **combination with M5** to share EIDM knowledge & skills;
- feature **some promise** to affect evidence use CMOs, if interventions are well-defined focusing on light-touch interaction approaches such as user-engagement;
- suffer from a **lack of conceptual and casual clarity**, impeding overall effectiveness.

Effectiveness of M4 (interact) interventions on evidence use: None of the included reviews reported on an intervention that employed M4 (interact) as the sole evidence use mechanism. As a result, we are unable to comment on the effectiveness of M4 (interact) as an individual intervention

component to support the use of evidence by decision-makers. This finding seems to suggest that, on its own, the support of interactions between decision-makers and researchers is not a viable intervention approach to improve EIDM. M4 (interact) is, however, incorporated in 13 multi-mechanism interventions. The following narrative synthesis is based only on interventions in which outcomes can be attributed to the interaction component of the intervention.

Role and contribution of M4 (interact) in multi-mechanism interventions that assess evidence use: M4 is applied in five interventions for which the final outcomes of evidence use have been assessed. Only a single review (Thompson 2007) identified a multi-mechanism intervention that includes M4 (interact) and is found to be effective in increasing decision-makers' use of research evidence. However, the intervention consists of five mechanisms of evidence use and it is therefore not possible to assess to what extent the interaction component (collaboration between researchers and practitioners) contributed to the intervention's effectiveness.

In four reviews, multi-component interventions that feature M4 (interact) fail to achieve an impact on evidence use (Bunn 2012; La Rocca 2012; Moore 2011; Yost 2015). The strongest evidence between these four is provided by Bunn (2012), which reports on three different iterations of the same intervention combining different mechanisms. In the most intensive iteration of the intervention, decision-makers are provided with access to an online database of systematic reviews (M3) combined with weekly, targeted messages (M3) and a knowledge broker to present one-on-one support to the decision-makers (M4/M5). This combined intervention approach is found to have no impact on evidence use and in fact was less effective than access to the database and targeted messages only. This finding is contextualised by the existing high research culture of the targeted organisation and sub-group analysis did suggest that the provision of a knowledge broker might be more effective in organisations with a low research culture as there might be more scope to benefit from a more intensive intervention.

The reviews by La Rocca (2012) and Yost (2015) both synthesise the effects of interventions that aim to combine the interaction between decision-makers and researcher (M4) with an attempt to improve EIDM skills of the decision-makers (M5). We have commented on these interventions regarding their effectiveness on M5 (skills) above already. La Rocca (2012) reviews the use of communities of practice, which aim to bring together interested decision-makers and researchers to share knowledge, learn together, and create common practices supporting knowledge exchange among decision-makers. There is no information to what extent M4 (interact) was effective to build relationships within the communities of practice and whether the participants derived valuable networking opportunities from the intervention. The review finds no evidence of increased evidence use following the community of practice interventions, which implies that any possible contribution of M4 (interact) was not sufficient to promote evidence use. A similar conclusion can be drawn from the Yost (2015) review, which aggregates the impacts of a combination of mentorship programmes with educational meetings. Again, it is unclear what exact contribution M4 (interact) makes to the pursuit of evidence use in the intervention design. The mentees might derive motivation to use evidence from interacting with a mentor, who might exert positive social influence. Likewise, the mentor/mentee interactions could lead to an increased opportunity to use evidence as the mentor can guide the mentee where and when to look for evidence. However, no information is provided on

the contribution that the mentorship relationships are assumed to make. The combined interventions, as in La Rocca (2012), failed to influence evidence use.

The last intervention employing M4 (interact) as an evidence use mechanism is identified in the Moore (2012) review. Despite not finding a significant effect of the multi-component intervention on evidence use, this review does provide some cautious evidence in favour of M4's potential contribution to interventions' effects. The reviewed intervention combined M3, M4, and M5 and targeted all CMO outcomes. Three public health teams interacted with a research organisation (M4) over a year commenting on draft research reports to be disseminated to the public health department (M3) as well as attending joint meeting to discuss the research findings (M3/M4). The evaluation of the intervention identifies—among other—that the interaction process helped to educate the interacting teams about the research process and that teams were more articulate about the value of the final report. M4 (interact) therefore seems to have played a role in the team's capability and motivation to use evidence. The teams further accessed the final reports that they had commented on increasing their opportunity to use evidence too. Yet, the evaluation found no empirical evidence of the consulted research reports influencing the team's future decision-making. In sum, there is little evidence that suggest that intervention applying M4 (interact) in different combinations with other evidence use mechanisms, are effective to improve decision-makers' use of research.

Role and contribution of M4 (interact) in multi-mechanism interventions: Investigating the use of M4 (interact) in multi-component interventions that are not evaluated for their effects on final outcomes contributes some more nuances to our understanding of interventions employing M4 (interact) and the mechanism's potential role and contribution. In contrast to the high-rated Yost (2015) review, the moderate-rated Abdullah (2014) review did identify some positive outcomes of mentoring interventions. In the latter, the mentorship relation (M4) was combined with EIDM training (M5) as well as new protocols for EIDM in practice (M6). The review found these mentoring programmes to have led to an increased motivation to use evidence (increased beliefs in EIDM). Decision-makers in the group receiving the multi-component intervention including mentoring further reported improved perceptions of organisational culture and readiness for EIDM. Both these findings seem to suggest that the application of M4 (interact) might have contributed to the interventions' effectiveness to improve CMO outcomes.

Lastly, three reviews of moderate WoE ratings identify M4 (interact) to play some role in the design of journal clubs as an intervention to increase decision-makers' use of evidence (Harris 2011; Mairs 2013; Menon 2009). Journal clubs in both reviews are defined as an interactive approach to making sense of evidence (M5), commonly defined as a group of individuals who meet regularly to discuss the clinical applicability of articles in current medical journals (M4/M3/M2)[12]. It is evident that there is interplay between the different evidence use mechanisms and it is therefore not possible to assess the specific contribution of M4 (interact) to the interventions' effectiveness. Nevertheless, all three reviews identify the journal clubs to have some positive effects on CMO outcomes and there seems to be some reason to believe that M4 (interact) presented a fertile mechanism in this regard. In particular, a positive effect on motivation to use evidence was identified in all three reviews. While

[12] Journal clubs were facilitated by researchers in a number of the reported interventions.

this observation does not allow for a rigorous attribution, this might support the hypothesis that interactions between like-minded individuals in terms of intention to use evidence (i.e. signing up for a journal club) might increase individual's motivation through social influence.

Harris (2013) claims that the 'active ingredients' of the reviewed journal clubs were—among other—mentoring as well as group discussions to consider the applicability and utility of evidence. The chance to present and discuss evidence and receive feedback was found to be a promising approach to alert decision-makers about new evidence (opportunity to use evidence) as well to improve their motivation. Discussion, for example, could highlight the applicability of evidence in certain contexts and positive feedback might sustain decision-makers' interest in evidence. In addition, the Mairs (2013) review finds that evaluations of online journal clubs report that users appreciated the trusted and non-threatening environment for discussions that the clubs facilitated. This hints at an increased opportunity to use evidence but it is unclear whether this is a particular feature of the online environment or of journal clubs in general.

***Knowledge gaps on M4 interventions**:* There is currently insufficient evidence to comment on the design of interventions aiming to employ M4. Rather, it is questionable whether fostering interaction between decision-makers and researchers, on its own, can be regarded as a viable intervention approach. Our systematic review of reviews did not identify a single review that included an intervention applying M4 (interact) as the sole evidence use mechanism. As a result, there is no particular intervention that exclusively focuses on M4 (interact). Communities of practice, mentoring, journal clubs, and knowledge brokers seem to incorporate interaction components and so do a large number of multi-component interventions that foster some form of collaboration or exchange. The specific objective and rationale for employing M4 (interact) as an evidence use mechanism, however, is unclear. There is a lack of conceptual clarity about the purpose of increasing interactions between decision-makers and researchers. Does interaction lead to an exchange of knowledge and skills providing an increased capability to use evidence as suggested by communities of practice; or does interaction lead to trusted relationships and social influence to increase motivation and opportunities to use evidence as suggested by mentoring and journal club programmes?

The little available evidence seems to suggest that M4 (interact) is not effective to improve capability use evidence. Interventions that combine M4 (interact) and M5 (skills) and assume a passive process of knowledge and skills sharing through interaction have so far failed to record an effect on capabilities. Regarding motivation to use evidence, a small number of reviews of journal clubs offer some tentative findings that M4 (interact) might be effective to increase motivation to use evidence. There is insufficient evidence to make aggregate statements regarding effects on opportunity to use evidence.

In addition to, and arguably partly caused by, the lack of conceptual clarity on the role of M4 (interact) is a lack of empirical evidence of the effectiveness of interventions aiming to increase evidence use, which employ M4—regardless of its specific objective. The little evidence identified in this systematic review of reviews provides a bleak vote count on the effectiveness of M4 (interact) interventions, which only in a single review is found to be part of an effective multi-mechanism intervention. In contrast, four reviews report ineffective evidence use outcomes for a multi-

mechanism intervention featuring an M4 intervention component. We therefore conclude that there is currently little reliable evidence which suggests that fostering interactions between decision-makers and researchers is an effective intervention approach. This is not to suggest that M4 (interact) does not play an important part in contributing to EIDM; rather it suggests that we need to be more explicit about the purpose of interactions and what constitutes an effective interaction or relationship.

An observation in this regard is that user-engagement and consultation—rather than full-blown interaction—seems to hold some promise to affect evidence use CMOs. The synthesis of M3 (communication & access) interventions' effects did reveal that applying a light-touch user-engagement (e.g. seeking permission to disseminate evidence; feedback on communication techniques) was of benefit to support the interventions' impact. Undemanding types of co-production and research involvement (e.g. supporting the setting of research questions; input on research reports) were also presented as a promising intervention approach. In combination with considering issues of voice and power in engagement and co-production, the adequate targeting of the degree and required commitment in engagement is of benefit to interventions' effects. In sum, user-engagement with clearly defined, light-touch demands on users, therefore might provide a hunch to guide a closer definition of M4 (interact), unpacking the current black box of what interaction aims to contribute to the pursuit of EIDM.

Interventions providing 'Skills to access & make sense of evidence' (M5) – Evidence of effects

Definition: M5 refers to decision-makers having the necessary skills associated with EIDM. This includes skills to locate, appraise, synthesise and integrate evidence.

Application: M5 (skills) was the sole evidence use mechanism in seven interventions while being built into a further 15 multi-mechanism interventions. In cases where M5 (skills) was applied in combination with other mechanisms, this included M3 (communication & access) and M5 (skills) in ten interventions each as well as M6 (structures & processes) in six interventions. Regarding considered CMOs of evidence use, interventions applying M5—somewhat unsurprisingly—were mainly associated with capability to use evidence (n=22), but also intended to support decision-makers' opportunity to use evidence (n=19). Changing motivation to use evidence was less prominent as a programme objective, featuring in only twelve interventions that applied M5 (skills).

Summary box 5

Interventions applying M5, i.e. skills to access and make sense of evidence were found to:

- be **effective** to increase evidence use if **both C and M** improved;
- **reliable builds C** in particular if embedded in an educational programme focused on teaching **critical appraisal skills**;
- **increase M** even without explicitly targeting it;
- **not work in multi-mechanism interventions** (M3 and M4) if the educational component is **diluted** and **only passively affected** in the combined programme;
- be **effective** in **combination with M6** to embed EIDM skills into organisational processes resulting in increased motivation and opportunity to use evidence.

Effectiveness of M5 (skills) interventions on evidence use: In three of the seven reviewed interventions in which M5 (skills) was applied as the single evidence use mechanism, the final outcome of evidence use was assessed. M5 (skills) interventions were found to have a positive effect on evidence use in two reviews (Hyde 2000; Ilic 2014). In both reviews, applying M5 (skills) was an effective interventions approach to nurture the capability as well as motivation to use evidence, which then translated into the targeted decision-makers illustrating an increased use of evidence. In the interventions assessed in the Hyde (2000) review, decision-makers' evidence use was measured—among other—by the number of evidence sources cited in the write-ups of patient consultations. The interventions included in Ilic (2014) assessed self-reported accounts of evidence use as well as the number of searches run on Medline by decision-makers. Hyde (2000) evaluated the effects of teaching critical appraisal skills to decision-makers as a way to promote their capability to use evidence, while Ilic (2014) investigated educational programmes aiming to teach the principles of evidence-based medicine for the same purpose. Interventions in both reviews did not explicitly target to build decision-makers' motivation to use evidence and rather focused on the transfer of skills and knowledge. However, in each case the reviews of the interventions did not only find evidence of positive effects on capability to use evidence but also found evidence on decision-makers having a more positive attitude towards the use of evidence, that is an increased motivation to use evidence. The reviews do not provide explanatory evidence on this finding.

In contrast, the intervention applying M5 (skills) assessed in the Moore (2012) review did not find any statistical effects on decision-makers' use of evidence. While M5 (skills) in this intervention too did translate into an increased capability to use evidence, this did not lead to an increased use of evidence. Likewise, albeit not being targeted explicitly, as in the above interventions, the intervention did not have an effect on motivation to use evidence either. In comparison to the positive effects before, this observation therefore suggests that the effectiveness of interventions employing M5 (skills) support evidence use requires a combination of capability and motivation to change behaviour. It should be noted, however, that the intervention reported in Moore (2012) is significantly less intensive than the interventions reported in Hyde (2000) and Ilic (2014). The applied critical appraisal programme consisted of a once-off, half a day workshop only.

***Effectiveness of M5 (skills) interventions on CMOs*:** In addition to investigating effects on the final outcomes of evidence use, we also found further evidence on M5 (skills) interventions' effectiveness to affect different CMO outcomes in four reviews. Following up on the observation that a combination of capability and motivation to use evidence might increase interventions' impact, we identified a single moderate-rated review (Menon 2009) that features interventions applying M5 (skills) to support capability as well as motivation to use evidence. The reviewed interventions used local opinion leaders to facilitate training workshops on EIDM, assuming that the opinion leader might increase participants' motivation to use evidence. The review of the interventions did not find evidence that the use of the opinion leaders increased decision-makers' attitudes towards EIDM. No other CMO or evidence use outcomes are assessed, limiting the implications we can draw from this review.

The two remaining reviews featuring interventions that solely focused on M5 (skills) as an evidence use mechanism mainly confirm the already established evidence of M5 (skills) interventions' effectiveness to increase decision-makers' capability to use evidence. The Horsley (2011) review illustrates this finding in the context of teaching critical appraisal programmes, but is limited in its analysis to changes in capability only. The two interventions applying M5 (skills) in the Hines (2015) review focus on increasing decision-makers' capability to use evidence through teaching research literacy either as part of a professional development course or during tertiary education. In both interventions, M5 (skills) is combined with the provision of a practical opportunity to use evidence during the teaching courses, that is getting involved in an ongoing research programme. The effect of this opportunity to use evidence, for example decision-makers' sustained interest to be involved with primary research, was not assessed. As per above, interventions employing M5 (skills), however, were effective to increase decision-makers' capability to use evidence and the professional development course further enhanced motivation to use evidence too.

Overview of M5 (skills) interventions and CMOs: There is consistent evidence that M5 (skills) interventions applied in a variety of educational programmes are effective to build decision-makers' capability and motivation to use evidence. Interventions featuring M5 (skills) as the sole evidence use mechanism considering only capability to change behaviour have been found effective to facilitate evidence use. This establishes M5 (skills) firmly as an effective evidence use mechanism and current knowledge gaps relate to how best to embed M5 (skills) into interventions, not whether to do so at all. The link between M5 (skills) and motivation to use evidence is less clear. Following EIDM skill-focused educational interventions, decision-makers' tend to report an improvement in attitudes toward EIDM too. As this might be associated with evidence use outcomes, increased research efforts and programme experimentation to more formally incorporate motivational aspects within M5 (skills) interventions would be of benefit. Currently, there is no evidence that interventions applying M5 (skills) are effective to increase opportunities to use research evidence. It is questionable whether this does present a knowledge gap or whether this behaviour change component is difficult to integrate within M5 (skills) interventions *per se*.

Role and contribution of M5 (skills) in multi-mechanism interventions: M5 (skills) was also applied in 16 multi-mechanism interventions. Below, we discuss the evidence of M5's effects only in interventions in which outcomes can be attributed to the M5 (skills) programme component. The

relationship between M5 (skills) and M3 (communication & access) has already been discussed above and there is no evidence that suggests that the combination of these two mechanisms in interventions is particularly effective. This finding does not come as a surprise as the rationale for combining M5 (skills) and M3 (communication & access) was for the latter to improve decision-makers' opportunity to use evidence in addition to the capability to do so. Evidence on the effectiveness of M5 (skills) as a sole intervention mechanism has already refuted the assumption that the mechanism is particularly well suited to strengthen decision-makers' opportunity to use evidence.

There is little evidence to suggest that the effectiveness of M5 (skills) components is enhanced when the educational intervention is embedded within a wider intervention not primarily focused on increasing decision-makers' EIDM skills. Four reviews feature interventions that apply M5 (skills) in combination with M4 (interact), twice as part of a community of practice and twice as part of a mentoring programme. In both the community of practice interventions, the assumption that bringing like-mined individuals together (M4) would incite a process of knowledge and skills sharing between them (M5), which would then increase evidence use, is not supported. The reviews neither find an increase in capability to use evidence nor in evidence use in general (Moore 2012; Mairs 2013). The evidence of the reviews assessing M5 (skills) as part of a mentoring programme (Abdullah 2014; Yost 2015) is also not supportive of the combination of M4 (interact) and M5. In the Yost (2015) review educational meetings followed by access to a mentor fail to increase decision-makers' capability to use evidence. The moderate-rated Abdullah (2014) review does report an increase in capabilities to use evidence following a mentorship programme focused on supporting evidence-based practice. Though, it is unclear what and how skills were assessed. To conclude, attempts of embedding M5 (skills) in an intervention not primarily targeted at increasing decision-makers' EDIM skills seems to dilute the effectiveness of the M5 (skills) programme component to build capability to use evidence. From the reviewed evidence, it appears that using M5 (skills) effectively in interventions requires an explicit skill transfer component. The assumption that EIDM skills and knowledge can be shared passively as by-product of increased interaction is not supported by the empirical evidence identified in this systematic review of reviews.

Our systematic review of reviews identified a relationship between M5 (skills) and M6 (structures & processes), that is changing processes and structures of decision-making. Two reviews (Moore 2012; Gray 2013) identify interventions that use a training programme (M5) to not only change decision-makers' skills to use evidence, but likewise to support their role to encourage the evidence use of their staff too. Moore (2012) reports on an executive training for research application program that aimed to build receptor capacity for research among senior health service executives as well as the organisations in which they work. The training therefore did not only focus on EIDM skills, but also incorporated components on how to supervise staff to use evidence and how to build learning networks within one's organisation. Combining M5 (skills) and M6 (structures & processes), the intervention was highly effective and improved all CMO outcomes simultaneously. Participants were not only confident to use research evidence in future themselves but also reported that following the training they were aware of opportunities to learn more about research at work.

These findings are supported by the intervention reported in Gray's (2012) moderate-rated review, which combined teaching of critical appraisal skills for supervisors and middle managers (M5) with

an opportunity to learn about the use of an EIDM tool in supervision (M6). Again, an intervention component aimed to change existing work processes to become more conducive to the use of evidence is incorporated into a training programme targeting EIDM skills. In agreement with the Moore (2012) review, the combination of M5 (skills) and M6 (structures & processes) is highly effective leading not only to a change in capability to use evidence but further to an improvement in the perceived opportunity to incentivise the use of evidence through supervision. The review states that this improved supervisor support did translate into an increased application of evidence by supervisees, but this outcome measure needs to be treated with caution. In sum, both reviews provide evidence that the combination of M5 (skills) and M6 (structures & processes) is an effective intervention approach to embed gained EIDM skills into organisational processes thereby including both capability and motivation to use evidence.

Discussion of the evidence on M5 (skills) interventions' effectiveness: The above results on the use of M5 (skills) to support CMO outcomes as well final outcomes of evidence use suggest a number of implications for interventions aiming to employ some form of training and education component to facilitate evidence use. M5 (skills) is the only intervention mechanism identified in this systematic review of reviews for which there is evidence of affecting decision-makers' use of evidence through a single component of behaviour change—the capability to use evidence (Hyde 2000). This underlines the strength of M5 (skills) interventions and suggests that in certain cases decision-makers merely require some extra support in terms of EIDM knowledge and skills. On the one hand, this is certainly not a universal finding and in different contexts an increase in capabilities to use evidence is not sufficient to encourage evidence use (Moore 2011). On the other hand, there is also evidence that diluting the skill-building emphasis of M5 (skills) interventions when applying the mechanism in combination with more interaction- or access-focused intervention components decreases its effect. Interventions incorporating M5 (skills) should therefore be precise about their educational objective, and, given the right context, could pool their recourses to focus on building capability to use evidence only.

M5 (skills) applied in a range of educational interventions featured in the included reviews. These interventions vary in terms of setting (e.g. tertiary education; educational meetings; professional development courses) as well as pedagogical approach (e.g. small-groups; interactive teaching; online learning) and content (e.g. critical appraisal skills; EIDM supervision skills; research literacy). There is no reliable evidence at this stage as to which educational techniques or settings might be most effective. Content-wise, reviews[13] of teaching critical appraisal skills consistently identify this to be an effective approach, whereas there is not enough evidence to aggregate other content categories. Lastly, evidence seems to be forthcoming that interventions applying M5 (skills) might benefit from targeting senior decision-makers in order to simultaneous built their skills to supervise their staff's use of evidence. This intervention approach might result in wider organisational changes that embed the benefits of the educational programme into routine decision-making processes and thereby create new opportunities to use evidence.

[13] Including a Cochrane review (Horsley 2011)

Interventions providing 'Structures and processes of decision-making' (M6) – Evidence of effects

Definition: M6 (structures & processes) refers to efforts to change the structures and processes of how individuals, teams, and organisations make decisions. It emphasises decision-makers' psychological, social, and environmental structures and processes that shape their decision-making and intends to make these more susceptible to evidence use.

Application: In our systematic review of reviews, we identified nine reviews that included interventions that employed M6 (structures & processes). In none of these interventions did M6 (structures & processes)present the sole evidence use mechanism. Changes in structures and processes were always implemented in combination with additional evidence use mechanisms. The most common combinations featured M3 (communication & access) and M5 (skills), which were each part of six multi-component interventions that also employed M6 (structures & processes). This was followed by M4 (interact) in four interventions and a surprisingly high correlation with M1 (awareness), which, too, was part of four joint multi-mechanism interventions. In terms of considered CMOs, M6 (structures & processes) interventions were fairly evenly distributed. Ten multi-component interventions employing M6 intended to support decision-makers' opportunity to use evidence, while eight interventions each focused on capability and motivation to use evidence.

Summary box 6

Interventions applying M6, i.e. structures and processes of decision-making were found to:

- affect evidence use and CMO only as part of **multi-mechanism interventions**, **denying conclusions** on any direct associations between M6 and the evidence use outcomes and CMOs of interest in this systematic review of reviews;
- be associated with decision-makers' **use of evidence** in **combination** with other mechanisms, in particular **M5 and M3**.
- **support O** through formalising and embedding access to evidence;
- **support M** through setting organisational incentives.

Effectiveness of M6 (structures & processes) interventions on evidence use: As our systematic review of reviews did not identify any intervention that applies M6 (structures & processes) as the sole evidence use mechanism, we are unable to comment on the effectiveness of the M6 (structures & processes) intervention component as an individual mechanism to support the use of evidence by decision-makers. M6 (structures & processes) is, however, incorporated in ten multi-mechanism interventions. The following narrative synthesis is therefore based only on interventions in which outcomes can be attributed to the application of the M6 (structures & processes) component in the identified multi-mechanism interventions allowing us to reliable comment on the component's contribution to the intervention's effects.

Role and contribution of M6 (structures & processes) in multi-mechanism interventions that assess evidence use: Changes in structures and processes are part of five multi-mechanism interventions for which the final outcome of evidence use has been assessed. In two of these the combined intervention is not found to be effective to increase evidence use, while in the remaining three interventions a positive evidence use outcome is established. La Rocca's (2012) review includes an intervention that combines access to an evidence database (M3) with an 11-week EIDM skill course (M5) and further information services inclusive of a question and answer service (M6/M3). The latter could be seen as a structural change to how decision-makers access evidence, being provided with a customised on-demand support when looking for evidence. However, little information is provided on this programme component and we can therefore not comment on the effectiveness of M6 (structures & processes) in this intervention. The combined programme was found to increase decision-makers' capability to increase evidence use, but this did not translate into behaviour change. The second multi-mechanism intervention including M6 (structures & processes) and found not be effective to support evidence use similarly combined an EIDM trainings course (M5) with an intended change to decision-makers' exposure to evidence (Thompson 2007). Decision-makers' were offered the opportunity to design and partake in a research study focused on a clinical problem that the decision-makers' faced in their professional context. The involvement in the research project intended to present a change in decision-makers' working structures thereby aiming to provide an increased scope for research findings to inform decision-making, that is an increased opportunity and motivation to use evidence. Unfortunately, the review does not report on individual CMO outcomes and only assesses the overall impact of the combined intervention on evidence use, which is found to be insignificant.

In three reviews, an intervention applying M6 (structures & processes) in combination with other mechanisms is found to be effective to increase research use. Thompson (2007) reports on a 6-months programme that aims to change decision-makers' working processes to be more susceptible to evidence use. Decision-makers are trained to follow a six-step protocol that is hoped to ensure their ongoing evidence use. However, the intervention also provides more general EIDM training (M5), provides opportunities for collaboration (M4) as well as building awareness for EIDM in general (M1). While the combined intervention is found to be effective, it is not possible to attribute this identified behaviour change to any individual mechanism.

In contrast, the interventions included in Chambers (2012) seem to allow for an attribution of M6's positive effects on decision-makers' use of evidence. The reviewed interventions aim to embed access to evidence (M3) more formally into decision-makers' routine work processes (M6). For this purpose, on-demand service hotlines and platforms are created which decision-makers can access at their own convenience to receive rapid access to policy-relevant evidence. The provision of these services is assumed to improve decision-makers' routine use of evidence (opportunity to use evidence). The moderate-rated review provides evidence that decision-makers access and value these on-demand services and cites instances in which the evidence provided has informed policy and programme decisions.

The remaining intervention establishing a direct link between M6 (structures & processes) and decision-makers' use of evidence is included in the Gray (2013) review. The intervention has already

been discussed as part of M5 (skills) above and embedded training on how to supervise staff's use of evidence into a wider EIDM skills training programme for senior decision-makers, who hold a management role in their organisations. The moderate-rated review identifies this combination of M5 (skills) and M6 (structures & processes) to be effective to not only increase decision-makers' EIDM skills but to further allow them to incentivise their staff through the supervision of their EIDM behaviours. This seems to have contributed to an increased motivation and opportunity to use evidence, which is claimed to have translated into an established practice of evidence use. This link between M5 (skills) and M6 (structures & processes) is also supported by the reviewed executive training for research application presented in Moore (2012). The intervention similarly incorporates a programme component aiming to build managerial skills related to the supervision of staff's practice of EIDM into a wider EIDM skills training. While evidence use as an outcome is not assessed, the intervention did lead to an increase in all CMO outcomes, with decision-makers indicating that they felt confident to be able to create more opportunities to use evidence in their organisations.

Taken together, and minding the risk of confounding in multi-mechanism interventions, there seems to be cautions evidence that M6 (structures & processes) has positive effects on decision-makers' use of evidence. The evidence base further suggests that M6 paired with M3 to formalise access to evidence into routine working processes is effective to improve opportunities to use evidence; and that M6 paired with M5 (skills) can increase motivation to use evidence by means of setting effective incentives through EIDM-related supervision.

Role and contribution of M6 (structures & processes) in multi-mechanism interventions: We identified three further reviews rated of moderate WoE that included M6 (structures & processes) as part of multi-mechanism interventions (Abdullah 2012; Gray 2013; Mairs 2013). In each of these, the link between the applied M6 (structures & processes) intervention component and the reported CMOs is not clear. The combined intervention reported by Gray (2013) did feature an on-demand service, comparable to what Chambers (2012) reports as an effective approach to change decision-making processes and structures. Policy teams were provided with an implementation officer, who—among other—prepared on-demand research summaries in response to the questions identified by the team. The multi-component intervention did not assess final outcomes, but reported an improvement in decision-makers' motivation and opportunity to use evidence. This seems to confirm the findings reported above.

Abdullah (2012) reviews the effects of mentorship programmes as part of multi-component knowledge translation strategies. The review claims that this intervention approach led to decision-makers reporting improved perceptions of organisational culture and readiness for EIDM. However, it is not clear what intervention component triggered this assumed effect on organisational change. The review explains that mentorship relations in which the mentor is a senior to the mentee and both are based at the same organisation might have contributed to these organisational outcomes. However, this hypothesis does not seem to be based on empirical evidence.

Finally, Mairs (2013) reviews the evidence on the effects of online knowledge management strategies. While primarily targeting an improved access to evidence (M3), the review reports that some online knowledge management strategies targeted a wider organisational change. For example, the access to these online platforms was formally included during staff discussions and

team building efforts. The reported evidence base in this regard is rather thin and claims made by the review that such platforms provide a non-threatening environment for staff to share views and inform decision-making should be treated with caution.

Knowledge gaps on M6 (structures & processes): Unfortunately, only a small number of interventions have applied M6 (structures & processes) so far and no intervention has exclusively focused on M6. It is therefore challenging to comment on the implication of our findings on the design of future interventions. Currently, two effective intervention approaches employing M6 (structures & processes) have been identified:

The first approach refers to the provision of on-demand services, such as evidence hotlines and rapid response systems. The interventions formally embedded the access of evidence into decision-makers' routine work processes. They are specifically designed to meet decision-makers' professional needs so that the process of accessing evidence becomes a fluent and routine procedure. The second approach refers to the integration of training on how to supervise staff's use of evidence into a wider training for senior decision-makers' EIDM skills (M5 + M6). This approach aims to alter organisational processes through the top-down provision of adequate incentives to use evidence by means of supervision. A common denominator through the application of M6 (structures & processes) in interventions seems to be that the changes to processes and structures should not require a high up-front investment on part of the decision-makers (e.g. time, skills, resources). The opportunity cost for the decision-makers to change her existing structure and processes should be minimal as in the case of on-demand services. M6 (structures & processes) intervention components further seems to be work most effectively where integrated into existing systems and structures (e.g. into wider EIDM training) rather than creating new structures. An intervention in the Bunn (2012) review, for example, found that providing the services of a knowledge broker in an organisational setting in which evidence use is already high (i.e. adding a new structure) is not effective.

In sum, there is evidence that suggests that changing the process and structures in which decision-making is embedded is a promising approach to encourage evidence use. While not clear-cut, the majority of the identified evidence supports this findings and there are reliable cases in which an increase in decision-makers' use of evidence can be attributed to changes in structures and processes. M6 (structures & processes) therefore emerges as a promising evidence use mechanism. However, the mechanism is currently underemployed in the interventions included in the identified literature. Given the identified evidence of effects, there seem to be many additional intervention approaches that could apply M6 (structures & processes). Suggestions in the literature that have not been evaluated for their effectiveness yet include, for example, organisational leadership (other than supervision), computer-generated policy simulations, the provision of social incentives, formal decision-making support tools, as well as a range of behavioural micro-level interventions such as reminders and mental frames. Lastly, the relationship between M6 (structures & processes) and M1 (awareness) remains unclear despite a high correlation of the two mechanisms within the applied interventions.

Multi-mechanism interventions – Evidence of effects

Description: Above, we have discussed the evidence of effects of interventions employing single mechanisms as well as combinations of mechanisms in which identified effects could be attributed to individual mechanisms. In addition to these, our systematic review of reviews identified a number of interventions that applied multiple mechanisms and did not allow us to break down the outcome effects to individual mechanisms. To assess whether there might be patterns and evidence of effects for certain mechanism combinations, we grouped interventions with similar mechanism combinations together to compare their CMOs and evidence use outcomes. This assessment focused only on multi-mechanism interventions that included at least three different mechanisms. All double-mechanism interventions were already discussed as part of the synthesis on individual mechanisms above, as it was possible to attribute effects to individual mechanism components.

Overview of multi-mechanism interventions: We only identified two mechanism combinations that were applied repeatedly in the interventions reported in the included reviews: first, a simultaneous effort to improve communication and access (M3), interactions (M4), and EIDM skills (M5), which was applied in five interventions; second, a simultaneous effort to improve communication and access (M3), EIDM skills (M5), and decision-making structures and processes (M6), which was applied in two interventions. Due to the diversity of the different interventions in which these mechanism combinations were applied, as well as the difference between the two combinations themselves, it does not seem sensible to report their intended effects on CMOs.

Summary box 7

Effects of multi-mechanism interventions, i.e. interventions applying plus three evidence use mechanisms:

- The intervention combination of **M3+M4+M5** was **not effective** to improve evidence use or CMOs; in particular when multiple mechanisms are associated with multiple intervention components.
- The intervention combination of **M3+M5+M6** produces **mixed results**; if M5 and M6 are the main drivers of the intervention, evidence use might increase, which is in line with results reported in the single mechanism synthesis.
- Two innovative interventions apply **high-intensity, complex interventions** that are **effective** to increase evidence use and CMOs respectively.
- Effective multi-mechanism interventions present **an exception rather than the norm**; therefore, applying clearly defined and focused combinations seems to be a more appropriate default option for future interventions.

Effects of interventions combining M3+M4+M5: Four reviews reported five interventions combining evidence use mechanisms M3 (communication & access), M4 (interact), and M5 (skills) (Bunn 2012; La Rocca 2012; Mairs 2013; Menon 2009). Two of the reviewed interventions were found to be ineffective to increase evidence use (Bunn 2012; La Rocca); two interventions were ineffective in improving CMO outcomes (Menon 2009); and a single intervention reported positive effects on CMO

outcomes (Mairs 2013). The interventions in which these three mechanisms were combined varied however.

Bunn (2012) reports on an intervention combining a knowledge broker (M4/M5), an evidence portal (M3), and weekly, targeted messages (M3) to improve evidence use. The combination of these three mechanisms potentially affects all CMOs, but does not translate into changes of decision-makers' use of evidence. This is in contrast to a single-mechanism iteration of the same programme that only provides access to the database and targeted messages (M3), which is found to be effective in supporting evidence use. The review explains this phenomenon with differences in organisational cultures. If the targeted organisation already displays a strong use of evidence, a less intensive intervention approach (i.e. using only M3) seems to be effective, while an intensive approach (i.e. M3, M4, M5) is not. The same holds true in reverse and sub-group analysis showed that organisations with a low baseline culture of evidence use might have benefited from the more intensive multi-component intervention.

Menon's (2009) review similarly failed to identify positive effects following the application of interventions combining M3 (communication & access), M4 (interact), and M5 (skills). The review identified no evidence that multifaceted knowledge translation strategies featuring interactive educational sessions (M5), opinion leaders (M4/M5), dissemination (M3), as well as outreach visits (M3/M4) were effective to improve evidence use CMOs or final outcomes. Despite the potential of the mechanism combination to affect all three CMOs, decision-makers' attitude towards evidence use did not change and no occurrence of behaviour change was identified. The second intervention included in Menon (2009) employed the M3, M4, M5 mechanism combination as part of journal club interventions. The journal club aimed to foster decision-makers' access to evidence through the regular discussion of relevant evidence (M3). Decision-makers attended joint meetings for this purpose (M4) and supported each other to understand and assess the presented evidence in the context of their professional experiences (M5). The review found cautious evidence that this intervention approach is effective to increase decision-makers' motivation to use evidence. Evidence use outcomes are not assessed. This finding is in contrast to the previous two multi-mechanism interventions. A possible explanation for this divergence might be that the application of multiple mechanisms (i.e. M3, M4, M5) within a single-component intervention, such as a journal club, is more effective than the application of multiple mechanisms within interventions that combines multiple programme components too (e.g. opinion leaders, dissemination, and outreach visits).

There is mixed evidence to support this assumption. Mairs (2013) reviewed the effectiveness of online communities of practice—a single component intervention providing opportunities for decision-makers to interact (M4) and to share knowledge and learn from on another (M3/M5)—and found this combination of multiple mechanisms to be effective to improve motivation and opportunity to use evidence. La Rocca's (2012) review, which is of a higher WoE rating, however, reviewed the effectiveness of 'common' communities of practice and reaches a contrary conclusion. In this review, communities of practice following the same evidence use mechanism combinations did not change CMO outcomes or decision-makers' use of evidence. The overall picture on the effectiveness of interventions applying M3, M4, and M5 in combination therefore suggests that this is not a promising approach to encourage evidence use. This finding is particularly rigorous when multiple mechanisms are associated with multiple programme components.

Effects of combining M3+M5+M6: Two interventions identified in two reviews combined evidence use mechanisms M3 (communication and access), M5 (EIDM skills), and M6 (structures and processes) (La Rocca 2012; Gray 2013). There is conflicting evidence as to whether this mechanism combination is effective to increase decision-makers' use of evidence. While the intervention reviewed in La Rocca (2012) does not increase evidence use, Gray's (2013) review, which is of a lower WoE rating, established a positive effect of combining M3, M5, and M6 on evidence use. The programme approach as well as potential effects of the mechanism combination on CMOs differ between the two interventions. Both interventions employ an EIDM training component, but differ in their objective to change decision-making processes as well as participants' access to evidence. The intervention included in La Rocca (2012) implements a detailed 11-course skill-building workshop on EIDM and combines the training with the provision of a web-based on-demand evidence service. Decision-makers are assumed to use this service on a regular basis to request policy-relevant evidence, which is then provided by researchers. This is assumed to change decision-makers' habits of accessing evidence leading to an increased opportunity to use evidence. The opportunity to use evidence is then complemented by the capability to use evidence facilitated by the training. The latter seems to have been successful and decision-makers showed improved EIDM skills following the intervention. Alas, the review did not identify a change in the use of research in reports compiled by decision-makers after the intervention, and evidence use thus seems to not have improved.

The multi-mechanism intervention reported in Gray (2013) combines EIDM skills training for senior decision-makers in a managerial position (M5) with advice and tools on how to supervise their staff's use of evidence (M6). Access to an online library of evidence is also provided (M3). As reported above, this intervention approach is assumed to not only build decision-makers' capability to use evidence but to further improve their staff's motivation and opportunities to use evidence through the provision of adequate incentives and supervision. In this intervention approach, the combination of M3 (communication & access), M5 (skills), and M6 (structures & processes) is found to be effective to increase evidence use. In comparison, we therefore identify mixed evidence on the effectiveness of this mechanism combination and its impact seems to depend on the intervention approach rather than the interplay between the different mechanisms.

Other multi-mechanism combinations: Lastly, there are three evidence use mechanism combinations that are each only applied in a single intervention (Abdullah 2014; Mairs 2013; Thompson 2007). As none of the mechanism combinations is found to improve decision-makers' evidence use and all interventions have been discussed as part of the single mechanism synthesis already, we will here just provide a brief description of the applied combinations.

The intervention included in Abdullah (2014) combined a training programme with the establishment of mentoring relationships between. Training is aimed at decision-makers' EIDM skills (M5) and the mentoring aims to support the mentees through ongoing interactions (M4) to retain the skills and to find opportunities to apply them in their professional context (M6)—with the latter not being described in detail. The review reports that the combination of M4 (interact), M5 (skills), and M6 (structures & processes) in this intervention was effective to improve all CMO outcomes. Evidence use was not assessed. An educational objective was also the focus of the intervention

identified by Thompson (2007). The included programme combined training on EIDM skills (M5), with an opportunity for decision-makers to reflect on a practice problem and actively seek evidence to inform a response to this problem (M1). The intervention then attempted to formalise this evidence-seeking behaviour through an opportunity for decision-makers to become involved in conducting research as part of their professional practice (M6). The combination of M1 (awareness), M5 (skills), and M6 (structures & processes), too, was assumed to affect all CMOs. CMO outcomes, however, were not empirically assessed and the review did not find a positive effect on evidence use outcomes. Lastly, Mairs' (2013) review investigated the effects of online management strategies such as online listservs and virtual journal clubs. As outlined above, these interventions assumed that the online tools could increase access to evidence (M3) and create engagement between users to discuss the accessed evidence (M4). The review cited that some of these online tools have been formally embedded into staff discussion and team building efforts (M6). There is cautious evidence that decision-makers valued the convenience and non-threating character of these tools and accessed them regularly. No information was provided on whether this increased motivation and opportunity to use evidence translated into behaviour change.

Complex and intensive multi-mechanism interventions: To conclude our discussion of the effects of combining multiple evidence use mechanisms, we lastly identified a small number of highly complex and intensive interventions. These interventions presented special cases and invested a larger than usual effort into improving decision-makers' use of evidence. This large amount of investment arguably challenges the replicability of the identified interventions, but at the same time might be an effective approach to produce sustainable effects in the long term. Notwithstanding, we summarise these high dose, multi-mechanism interventions and their effects below. Two interventions of this kind were identified in our systematic review of reviews.

The first intervention is included in the Thompson (2007) review and covers all evidence use mechanisms. The intervention extends over half-a-year and combines educational and marketing components within a collaborative setting that aims to bring practitioners and researchers together. Multi-disciplinary teams of practitioners and researchers are created aimed at solving a clinical problem through the use of research findings. The intervention was divided into six sequential stages: (1) problem identification and assessment of research bases; (2) evaluation of research relevancy to problem selection, departmental values, standards and policies, and potential cost and benefit; (3) innovation design to meet the needs of the problem within the scope of the research base; (4) actual or construct replication and evaluation of the innovation; (5) decision to adopt, alter or reject the innovation; (6) development of means to extend the innovation within and outside the setting.

In summary, this intervention allowed decision-makers to find answers to a practice problem through the use of evidence. Decision-makers were assisted and trained by researchers in this process of accessing and appraising the rigour and relevance of the evidence. Having identified and contextualised the evidence, the decision-makers then tested the feasibility of the evidence findings in their own settings and made an informed decision whether to adopt the suggested practice. Through this process, decision-makers gained capabilities to use evidence, had various opportunities to access and generate evidence, and learned about the value of applying evidence to find a solution to a practice problem (i.e. motivation to use evidence). At various stages, different forms of evidence

were accessed (e.g. primary and secondary research) and decision-makers carefully judged and tested the applicability of the suggested findings in the evidence to their professional contexts. Outcomes were assessed using Kim's research utilisation scale and showed a significant effect on evidence use post-intervention.

It is unclear what evidence use mechanisms drove the identified behaviour change in the applied intervention. It is also unclear to what extent this intervention approach can be replicated. The tasking of decision-makers to become involved in first reviewing secondary research to identify promising practice solutions and to then conduct primary research on these solutions might be somewhat overburdening in most contexts. Having said that, the principle of encouraging decision-makers to critically reflect on the solutions suggested in the literature and to carefully pilot, feedback, and iterate the applied solutions seems to be feasible in other contexts too. Rather than merely critically appraising evidence and then adopting its recommendations, the review findings seem to present critical reflection and iteration as principles along the entire decision-making and implementation process. Interventions aiming to support EIDM therefore could benefit from adopting ideas and tools emphasised in the literature on complex systems such as rapid feedback loops and programme iteration.

The second outlier intervention, included in the Moore (2011) review, stood out in terms of its intensity. The intervention was implemented within a context in which the value of EIDM seems to present a professional norm and designed a training programme to improve receptor capacity for research among senior health service executives and the organisations in which they work. The intervention thus deliberately targeted organisational change rather than increasing individual decision-makers' use of evidence. The two-year training program is structured around residency sessions and includes guidance on the development and implementation of an intervention project, an information management component, and learning networks. Decision-makers therefore gain the relevant skills to create the conditions and put in place tools to support their staff's use of evidence. Both, the dosage of the intervention and its packaging is highly intense as large-scale organisational changes are facilitated through a single training course.

The evaluation of the intervention finds the programme to be successful in increasing all CMO outcomes. Decision-makers' saw significant improvements in their receptor capacity for research and gained capabilities to create more opportunities for their staff to use research too. Evidence use, unfortunately, is only assessed using self-reported intentions and we can therefore only regard this as an increase in motivation to use evidence. The replicability of this intervention is, however, low due to the intensity of the programme and the context in which it is applied. Arguably, in a context in which there is little awareness of the need for evidence to inform decision-making, a top-down organisational change to use more evidence might not be as effective. It is also questionable whether senior executives might be as open to the training itself. In relation to the interventions reported in our systematic review of reviews, we would therefore position this intervention approach as a promising way to complement EIDM interventions that initially established a basic understanding of, and exposure to, the use of evidence among staff.

Comparing the effects of single mechanism and multi-mechanism interventions on evidence use: Above, we concluded that multi-mechanism interventions, by and large, were rarely effective in

increasing decision-makers' use of evidence. Following up on this, we were interested how the effectiveness of single mechanism interventions compared to the effectiveness of multi-mechanism interventions. For this purpose, we only analysed single[14] or multi-mechanism interventions that were effective in increasing evidence use outcomes, not CMO outcomes. A descriptive pattern in favour of single-mechanism interventions, in which the role of the mechanism was clearly defined, emerged. The application of a single evidence use mechanism was effective to increase evidence use in four interventions and a double mechanism combination was effective in one intervention. Multi-mechanism interventions were only found to be effective in two interventions, one presenting an outlier within the review.[15] This breakdown established that over half of all mechanism combinations that were effective to increase evidence use within the reviewed interventions comprised a single evidence use mechanism.

Given that this pattern emerged through a descriptive analysis we are cautious to present this as rigorous evidence that 'simpler' or more focused mechanism combinations and intervention approaches might be more effective. There is, however, a single review that empirically compares the effectiveness of an intervention applying a single evidence use mechanism with multi-mechanism combinations (Bunn 2012): and it identifies single-mechanism interventions as more effective. We have described the mechanism combination in detail above and the review explained the contrasting relative effectiveness with difference in the organisational culture to use evidence. Rather than dismiss multi-mechanism combinations, we would agree with Bunn's (2012) analysis that contextual factors might be central to the decision whether to apply a complex, high-dose multi-mechanism intervention or to opt for a more focused intervention approach featuring a targeted application of evidence use mechanisms. Yet, all in all, the reviewed evidence presents effective multi-mechanism interventions as an exception rather than the norm. We therefore suggest that future interventions assume a clearly defined and focused combination of evidence use mechanisms as their default option.

Organisational outcomes:

Lastly, we identified a number of reviews that included interventions that commented on organisational factors and investigated outcomes at a level of analysis that might be linked to organisational changes. These interventions thus aimed to influence organisational outcomes, unlike the above-presented interventions that aimed to influence outcomes at an individual level (i.e. individual decision-makers at a policy and practice level). It should be noted that all of the interventions also targeted evidence use outcomes and therefore have been discussed in relation to these outcomes above already. However, this section reflects on intervention's effects on organisational outcomes across all six evidence use mechanisms. It therefore goes beyond individual studies and mechanisms to present an overview of the different approaches to investigate and influence organisational EIDM outcomes.

Two interventions (Bunn 2012; Moore 2011) were clustered at an organisational level: the intervention reported in Bunn (2012) randomised different health departments while the

[14] This includes two-mechanism interventions, as these were more comparable to singe-mechanism interventions in terms of programme approach and scale.

[15] Calculating relative effectiveness per mechanism group confirms this finding: Single mechanism (4/15); double-mechanism (1/6); multi-mechanism (2/11).

intervention included in Moore was allocated to different public health units. In both interventions, however, outcomes were measured at an individual level and we can therefore not comment on whether individual's increases in evidence use or CMOs reflected a wider organisational change. Bunn (2012) attempts to generate some insights on organisational outcomes by reporting a correlation analysis of the culture of evidence use prevailing at baseline in the clustered health departments with the identified effects of individual's use of evidence at endline. Thereby, the review established that organisational culture is indeed affecting the impact of evidence use mechanisms. Organisations with an existing culture of evidence use were found to not benefit from intensive, multi-mechanism interventions, while a more targeted, single-mechanism intervention was found to be effective. In reverse, intensive, multi-mechanism interventions seemed to be of value to organisations with a low baseline value of evidence use.

Three reviews (Abdullah 2014; Gray 2013; Moore 2011) include interventions in which decision-makers' provide their perceptions of how the applied intervention might affect the future use of evidence within the wider organisation. Organisational change is therefore not measured empirically and these outcomes need to be treated with caution. In the Gray (2013) and Moore (2011) reviews, the combination of M5 (skills) and M6 (structures & processes) was applied in interventions to train senior decision-makers to improve the supervision of their staff's use of evidence. Decision-makers reported that the training increased their perceived ability to create more opportunities and motivation to use evidence in their respective departments. Adequate supervision of staff's EIDM and a top-down promotion of evidence use as a professional norm was assumed to provide effective incentives and opportunities for staff to apply evidence in their decision-making processes. Abdullah (2014), too, reported perceived positive effects on organisational changes. Following a multi-mechanism intervention, combining M4 (interact), M5 (skills), and M6 (structures & processes), decision-makers rated their organisation's readiness for EIDM significantly higher than at baseline. The reason for this change, however, is unclear.

Lastly, there is a single intervention in which the reputation of an organisation was used as an incentive to encourage decision-maker's evidence use (Murthy 2012). To motivate the use of a systematic review library (M3), decision-makers' were given the results of an audit of their unit's activities against guidelines developed by the unit, which stipulated the intended use of systematic reviews. The overall intervention was ineffective to change CMOs, but was applied at a very low dose (single visit and training on database).

4.2 Overview of synthesis findings of Review 1

Above, we have presented a synthesis of the effects of individual evidence use interventions and mechanisms on decision-makers' use of evidence and related CMOs. We aim to summarise the main findings of this synthesis in the following:

What mechanism / mechanism combinations are currently known unknowns?

- There is an evidence gap on the effects of applying M1 (awareness) in interventions.
- There is an evidence gap on the effects of applying M2 (agree) in interventions.
- M4 (interact) is currently under-defined in terms of conceptual and casual clarity, which impeded its overall effectiveness and application in interventions.
- The reason for and the effects of the correlation between M1 (awareness) and M6 (structures & processes) jointly applied in interventions.

What interventions and mechanisms are effective to improve CMOs?

- There is reliable evidence that interventions applying M3 (communication & access) can improve motivation and opportunity to use evidence. For example, an intervention combining user-friendly packaging of evidence and audience segmentation during dissemination.
- There is reliable evidence that interventions applying M5 (skills) can improve capability and motivation to use evidence. For example, educational interventions such formal, taught EIDM university or professional development courses.
- There is reliable evidence that interventions applying M6 (structures & processes) can improve motivation and opportunity to use evidence. For example, an intervention providing professional incentives through supervision to increase motivation as well as formalised routine access to evidence sources to increase motivation.

What interventions and mechanism hold little promise to improve evidence use?

- There is no evidence to suggest that interventions applying M3 (communication & access) focusing only on opportunity to use evidence are effective to increase evidence use. For example, an intervention that merely creates an evidence exchange platform without further mechanisms/CMOs.
- There is little evidence to suggest that interventions applying M5 (skills) as part of multi-mechanism interventions that feature M3 (communication & access) and M4 (interact) are effective to increase evidence use. For example, an intervention assuming that skills transfer (M5) can result from increased interaction and evidence exchange in communities of practice (M3 and M4).
- There is no evidence to suggest that M4 (interact) is effective to increase evidence use as part of multi-mechanism interventions.

- There is no evidence to suggest that the combination of M3 (communication & access), M4 (interact), and M5 (skills) in any type of intervention is effective to improve evidence use. For example, interactive educational outreach visits (M4/M5) by an opinion leader (M4/M5) in addition to dissemination of evidence (M3).

What interventions and mechanisms are effective to improve evidence use?

- There is reliable (i.e. high WoE) evidence that interventions applying M3 (communication & access), when providing both opportunity and motivation to use evidence, increase decision-makers' use of evidence. For example, an intervention combining an online database of systematic reviews with personalised and targeted messages to decision-makers.

- There is reliable evidence that interventions applying M5 (skills), when providing both capability and motivation to use evidence, increase decision-makers' use of evidence. For example, an intervention providing a critical appraisal training, which targets appraisal skills as well as attitudes toward evidence use.

- There is reliable evidence that interventions applying M5 (skills) in combination with M6 (structures & processes) are effective to improve capability and opportunity to use evidence, with cautious evidence (i.e. moderate WoE) establishing a positive effect on evidence use. For example, an intervention providing an executive training course on evidence use in combination with training and tools on how to supervise staff's use of evidence.

- There is reliable evidence that interventions applying M6 (structures & processes) in combination with M3 (communication & access) are effective to improve motivation and opportunity to use evidence, with cautious evidence establishing a positive effect on evidence use. For example, an intervention providing an on-demand evidence service offering a formalised means of access to evidence embedded in decision-makers' day-to-day work processes.

- There is reliable evidence that individual outlier interventions characterised by a highly intense and complex programme design increased decision-makers' use of evidence.

- There is cautious evidence that interventions applying clearly defined and focused evidence use mechanism combinations (in particular single mechanism interventions) are associated with an increased probability for success.

The results of our synthesis construct a surprisingly clear picture of the effectiveness of interventions applying the six evidence use mechanisms. M3 (communication & access) and M5 (skills) emerge as the most effective mechanisms and interventions applying these mechanisms featured the strongest evidence of impact. The effects of interventions applying M3 (communication & access) or M5 (skills) can be broken down into different effective CMOs and there is some evidence on promising combinations with other mechanism too. M6 (structures & processes) also emerges as a promising intervention mechanism to foster evidence use. Despite a relatively low number of interventions making use of this mechanism, this systematic review of reviews was able to attribute effective CMOs to the application of the mechanism in interventions, as well as nascent effects on evidence use outcomes. M4 (interact), on the other side, is currently lacking evidence of effectiveness, and interventions featuring this mechanism were not associated with an increased use of evidence. Impeded by a lack of conceptual and casual clarity, there is little evidence to suggest that M4

(interact) contributes to interventions supporting decision-makers' use of evidence. There is currently insufficient evidence to comment on the contribution of M1 (awareness) and M2 (agree) to applied interventions. Lastly, multi-mechanism interventions can also be an effective means to improve evidence use. Yet, this impact seems to come at the expense of high cost investments into intervention design and, by and large, applying clearly defined and focused evidence use mechanism combinations seems to be a more promising and loss-averse intervention approach.

Due to the limited application of single mechanisms in evidence use interventions, it is currently challenging to establish overall findings of what interventions/mechanisms are effective to affect which CMOs. There is also no clear pattern in the relation of CMOs to evidence use outcomes. At this stage, it appears that capability to use evidence is mainly supported by interventions applying M5 (skills). Opportunity to use evidence seems to be largely created through interventions featuring M3 (communication & access) and/or M6 (structures & processes). Motivation to use evidence, on the other hand, is targeted and affected by interventions applying and/or M3, M5, M6. There is too little empirical evidence of effects on CMOs regarding M4, M2, and M1 applied in interventions. In terms of considered CMOs, however, each of these targeted motivation to use evidence, and interventions including M4 (interact) further aimed to affect opportunity to use evidence too.

Chapter 5. Results: Review of social science literature

Introduction

In Review 1, we synthesised the evidence on the impact of interventions and mechanisms aiming to increase decision-makers' use of research evidence. The identified body of evidence therefore reported on interventions that are designed with an explicit purpose to change decision-makers' behaviour to make an increased use of evidence. However, there might be additional social science research relevant to the study of research use reporting on a different range of interventions, which have not yet been applied in the context of EIDM. For example, while Review 1 has identified a number of communication techniques to be effective to increase evidence use, there might be a large untapped body of literature on effective communication techniques that is not specifically about communicating research evidence or the need to use such evidence. The second phase of the current review (Review 2) therefore examines this broader social science literature to see what evidence of effectiveness of social science interventions might be relevant to contribute insight to the study of research use. In other words, Review 2 concerns interventions on which there may be evidence of effectiveness in the broader social science literature that could potentially be relevant to increasing evidence-informed decision making – even if such research has not yet been applied directly to that issue.

Methodologically, Review 2 presents a scoping review (Arksey & O'Malley 2005) of the social science literature. Given the vast extent of published social science studies, the scoping review rapidly mapped the key concepts underpinning relevant research areas to identify interventions applicable to support EIDM as well as the review evidence commenting on the effectiveness of these interventions. To guide and target our scoping review of the social sciences, we applied the same framework of evidence use mechanisms as in Review 1. The mechanism framework therefore served as a tool to search the social sciences in a structured way for concepts and interventions relevant to contribute insights on the application of these mechanisms. In the first step of the scoping review, relevant concepts and interventions were drawn from a variety of sources: primary studies, text-books, literature reviews, etc. In a second step, we then searched for systematic reviews to provide a quick summary of the effectiveness of those interventions. This process generated a list of social science interventions identified as of relevance to support the respective evidence use mechanisms. We assessed these social science interventions for their likely effects on CMOs and behaviour change outcomes if applied in an EIDM context; and also comment how their application might alter the choice and design of evidence use interventions.

This scoping review does not claim to present an exhaustive exercise and rather applies iterative, exploratory methods to present a first attempt to relate social science concepts and interventions in a structured way to the literature on research use. We also do not claim that the relevance of the suggested social science interventions is a unique discovery to this review. Some of the identified concepts and interventions, for example, might have been suggested to be of relevance to support EIDM in theoretical papers, primary studies, and practice reports, each of which was outside the

scope of this research project[16]. The generated list of potentially relevant social science interventions to support EIDM, however, might present a helpful starting point to closer integrate the vast body of social science knowledge with the research use literature.

The remainder of the chapter is structured as follows: first, we present an overview of the social science literature consulted to illustrate how the applied mechanism framework guided our search for relevant concepts and interventions. After this we present the results of our synthesis of relevant social science interventions discussing what insights might be gained from their application in an EIDM context. The synthesis is structured according to mechanisms and under each mechanism we provide an overview table of the identified social science interventions and their conceptual relevance to the evidence use mechanism as well as an indication of the intervention's evidence-base in the social sciences. This indication of the evidence-base provides information only on whether we identified evidence of effects (yes; no; mixed in the overview tables, e.g. Table 5.1) and how strong/weak this evidence is. The assessment of the strengths of evidence was made based on the number of identified reviews and their WoE trustworthiness rating.

5.1 Overview of social science literature consulted for Review 2

We conducted an explorative search of the social science literature to identify relevant concepts and interventions that might provide insights and contribute knowledge on how to enhance EIDM. Given this vast body of knowledge, we applied our mechanism framework to target and structure our search. We designed initial key words as search terms related to each mechanism and identified broader areas of literature to commence the search. For example, related to M6 (processes and structures), we searched for 'barriers' AND 'decision-making' in databases collecting industrial psychology, management, social group, literature, to name a few. From this broad initial scoping search, we then collected further concepts and interventions to generate new key words and refine the search. This led to the development of an iterative search strategy for each mechanism. Sources and methods constituting this iterative strategy included:

- keyword searches of academic databases;
- hand-searches of academic journals;
- keyword search of Google Scholar, and Google;
- snowballing searches, including forward citation searches
- backward citation searches (i.e. screening reference lists)
- introductory text-books
- consultation of excluded reviews and other search hits (e.g. theory papers and primary studies) during Review 1.

As indicated the applied search strategy was iterative and differed for each mechanism. For some mechanisms, initial scoping searches could venture into established bodies of research. For example, literature on communication, education, and organisations was relatively easy to obtain as the academic knowledge in these fields is well-defined and organised. Other searches, however, required a piecemeal, step-by-step approach. For example, identifying relevant and rigorous

[16] In chapter 6, we provide a list of suggestions based on our project's findings and point the reader to some examples of primary EIDM literature that raise similar points.

research on relationship building in a professional context required a labour-intensive dissection of overlapping bodies of literature (e.g. networking, social influence, group dynamic, etc.). Having explored different bodies of literature through this iterative process, we then collected reported interventions or concepts and techniques that could inform the design of interventions, which were of high conceptual relevance to the evidence use mechanism. Our search then engaged in a second phase in which we searched explicitly for reviews on the effects of these identified social science interventions. Figure 2.1 above was presented above to visualise this search approach.

Once we had identified relevant interventions and established an overview of the findings of existing reviews, we then used the CMO structure to integrate interventions' likely effects if applied in the context of EIDM. Using the example of social marketing (Figure 2.1), we know from the social sciences that it is an effective intervention to create social norms and support behaviour change. In the context of EIDM, social marketing therefore can be positioned to nurture professional and social evidence use norms, which might influence decision-makers' motivation and opportunity to use evidence. The CMO structure thereby allows us to integrate the findings of Review 2 with Review 1, which is presented in more detail in chapter 6.

All in all, to illustrate the breaths of research consulted in Review 2, examples of areas of literature consulted in Review 2 include:

- Media & Communication studies
- Organisational learning and management studies
- Psychology
- Behavioural Sciences
- Adult learning theories
- Development Studies
- Political Sciences
- Sociology
- Information design
- Environment & climate science

5.2 Synthesis of social science interventions of conceptual relevance to evidence use mechanisms

Our explorative, iterative search of the social science literature identified 67 interventions that were of conceptual relevance to the six evidence use mechanisms. It is important to note that this does not claim to present an exhaustive list of interventions and that some interventions relate to multiple mechanisms at once. The identified interventions varied in nature and their potential insights to EIDM. In terms of nature, an intervention could refer to individual programme components (e.g. sending reminders as a component of communication interventions); coherent interventions (e.g. social marketing as a communication intervention); and concepts from which future interventions might be derived (e.g. information design as a scientific concept). In terms of insights, social science research could suggest changes to existing EIDM practices or propose the application of different practices altogether. Some changes also referred to a more regular application of interventions based on the evidence of effects in the social sciences.

Again, we highlight that we do not claim unique discovery to the relevance of the suggested interventions in an EIDM context. Interventions might have been discussed and implemented to support research use already, but the social science literature possess additional insights on their application, which are yet to be considered in the context of EIDM. For example, while communities of practice have been used to support EIDM skills, the wider body of knowledge on their impact suggests that they might as well present an effective tool to build professional norms and identities—a feature which is less prominent in the EIDM literature. As discussed above, suggested interventions might also have been considered in the EIDM primary literature, which was outside the scope of this research project. Lastly, it is important to keep in mind that interventions found effective in Review 1 already were not explicitly repeated in Review 2 even if our search did identify them again in relation to individual mechanisms. A full list of all considered social science interventions for each evidence use mechanism is presented in Appendix F.

As the six evidence use mechanism drove the search for relevant social science interventions, the synthesis of identified interventions in Review 2 is organised according to mechanisms. For each mechanism, a list of social science interventions of conceptual relevance is provided indicating for which interventions there further is evidence of positive effects on outcomes of relevance to evidence use (e.g. behaviour change). We grouped individual interventions into higher-level intervention categories, and discuss each intervention separately thereafter. This discussion follows a similar fashion throughout: first, we elaborate on the nature of the interventions and its evidence-base in the social sciences; second, we explain the intervention's potential application in relation to the evidence use mechanism indicating the likely effects on CMOs and/or evidence use.

It is important to keep in mind that interventions were primarily assessed for conceptual relevance to support EIDM and we only investigated whether there is evidence of interventions' effectiveness in a second step. In case we cite evidence of social science interventions' effects, this is based on identified research syntheses (e.g. systematic reviews) and not on the results of primary studies. We conducted a critical appraisal of these social science reviews using the weight of evidence A (i.e. trustworthiness) criteria applied in Review 1 (Appendix I). Unlike Review 1, however, we did not exclude low-trustworthiness studies given that different research traditions in the social sciences subscribe to different methodological approaches. Review findings rated as of low trust were

considered and labelled as 'literature review' findings. A list of all identified reviews is provided in Appendix G.

M1 'Awareness for and positive attitudes toward EIDM': relevant social science interventions

M1 (awareness) assumes that interventions aiming to encourage decision-makers' use of evidence can benefit from building decision-makers' conceptual understanding of, and normative support for, EIDM. Review 1 found a paucity of evidence use interventions currently aiming to build such support for the concept of EIDM. Searching the broader social science literature in Review 2 using key words related to 'awareness building' and 'influencing attitudes', we identify nine interventions and concepts that seem conceptually relevant to EIDM. Table 5.1 provides an overview of these social science interventions and concepts relevant to M1. The interventions are listed in the left-hand column and grouped into overarching categories. The middle column illustrates briefly how the interventions might be of relevance to EIDM. This does not present an exhaustive account of conceptual relevance and rather highlights the main areas and pathways of relevance. The right-hand column provides information for which interventions we further identified evidence of positive effects. Strong evidence refers to two of more reviews of high trustworthiness identifying a positive effect of the interventions, while weak evidence refers to one high-trustworthiness or multiple moderate-trustworthiness reviews confirming such a positive effect. Following table 5.1, we present a brief narrative account of each intervention.

Table 5.1 M1 (awareness) – relevant social science interventions

Intervention	*Conceptual relevance*	*Evidence of effects**
CREATING SOCIAL & PROFESSIONAL EVIDENCE USE NORMS		
Social marketing	Potential to market social or professional evidence use norms that reinforce and motivate the use of evidence as a desirable behaviour. An established norm then anchors the concept of EIDM as a principle of decision-making.	Yes, strong evidence.
Social incentives	Potential to build the intrinsic motivation required to establish the behaviour of evidence use as a norm. Public social incentives further could popularise EIDM.	Yes, weak evidence.
Identity cues & priming	Potential to trigger and reinforce nascent evidence use norms. Reminding decision-makers about the professional norm of	Yes, weak evidence.

	using evidence to support the motivation and behaviour of evidence use.	
PROVIDING A COUNTERFACTUAL TO EVIDENCE USE		
Counter-marketing	Potential to inform decision-makers about the possible negative effects of not accessing evidence to increase motivation to use evidence.	No, evidence identified.
Social group techniques such as *redteaming* and *dogfooding*.	Potential to challenge the status quo of decision-makers' use of evidence to foster a debate on whether to apply evidence or not (i.e. motivation and opportunity to use evidence).	No evidence identified.
PC-generated policy models & other simulations	Potential to model the effects of different policy decisions allowing for a comparison of evidence-informed with opinion-based policies (i.e. motivation and opportunity).	No evidence identified.
ENGAGEMENT		
User/community engagement	Potential to increase familiarity with the research process and thereby motivation and opportunity to use evidence.	Yes, weak evidence.
ADVOCACY FOR EVIDENCE USE		
Awareness-building campaigns	Potential to increase the visibility and credibility of EIDM in order to support motivation to use evidence and support the creation of an evidence use norm.	Yes, weak evidence.

*We cannot provide a rigorous assessment of the size of the identified effects across interventions.

CREATING SOCIAL AND PROFESSIONAL EVIDENCE USE NORMS

Literature on social influence and behavioural sciences (e.g. Berkovitz 2004; Cialdini & Goldstein 2004; Nolan et al 2008) suggests the creation of social and professional norms as an effective approach to increase awareness and support for desired behaviours. Norms present an intrinsic motivation to exercise a certain behaviour, reinforced by social and professional surroundings, and

thus effective to increase awareness and support of the desired behaviour. For example, descriptive social norms such as the mere statement that 'nine out of ten people did X…' have been found effective to change citizens' behaviours in line with what they assumed the majority behaviour to be (John et al 2014). Established norms are thus reinforced through the behaviour of others and might be able to incite a virtuous circle of behaviour change: observing others displaying the norm behaviour increases awareness, while social and professional rewards and sanctions nurture behaviour to conform with the established norm (Berkovitz 2004; Cialdini & Goldstein 2004).

In the context of EIDM, presenting the behaviour of evidence use as a social or professional norm could anchors the use of evidence as the 'right thing to do' either in one's social or professional contexts. The creation of an evidence use norm might therefore provide an effective intervention approach to support decision-makers to adopt the desired behaviour of evidence use. For example, one could present decision-makers with information on how many of their colleagues have used evidence in a past assignment. The perception of evidence use could thereby change to a standardised practice, which decision-makers would regard as part of their professional identify. This perception would directly increase awareness and support for EIDM and increase the motivation to use evidence. In the case of social norms, in which the desired behaviour is framed as a socially desirable action rather than a professional desirably act, exercising the norm of evidence use would be associated with the decision-makers' social standing or the organisations' reputation and subsequently be rewarded through social reinforcement. Again, this would increase awareness of and support for EIDM as well as build motivation to use evidence. Our review identified social marketing, social incentives, and identity cues as interventions potentially being able to build new norms, which are discussed below. Using these interventions to create a norm of evidence use seems to be a promising approach applicable to be piloted in EIDM.

Social marketing refers to the systematic use of marketing concepts in programmes designed to influence specific behavioural goals of target audiences for a social or public good (McDermott et al 2005; Stead et al 2007). Social marketing interventions usually feature between six and eight benchmark criteria (McDermott et al 2005; Modi et al 2014; NSM 2014) including aspects such as a clearly defined and realistic behaviour change target; audience segmentation and tailoring of marketing techniques; exchange of benefits and opportunity costs of adopting the targeted behaviour; identifying factors competing with the targeted behaviour. Our scoping review identified three high trustworthiness[17] systematic reviews in the management, health care, and social policy literature that each found social marketing to present an effective intervention to change a range of behaviours (McDermott et al 2005; Modi et al 2014; Stead et al 2007). Behaviours targeted by the reviewed social marketing interventions were as diverse as changing retailers' product sales; creating more conducive learning environments; and using malaria bed nets. Once an adopted behaviour has been sustained and is widely adopted, one can then regard it as a new behavioural norm (Modi et al 2014).

Given the diversity of the targeted behaviours there seems to be reason to believe that social marketing presents an effective intervention to support the creation of evidence use norms, which in return facilitate M1 (awareness) and the motivation to use evidence. Social marketing in the context of EIDM could highlight the social benefits of making evidence-informed decisions. Social

[17] This is based on the methodological assessment part of the WoE tool.

marketing techniques too could be used to create recognisable 'branding' for decisions informed by evidence or rewards for individual evidence users to promote the professional norm. In the context of professional norms, the exchange component of social marketing could highlight e.g. promotional structures, while the identification of competing factors to decision-makers' use of evidence are already well-established (e.g. Oliver et al 2014). Audience segmentation and the tailoring of marketing strategies, however, would be key as professional evidence use norms and social contexts between decision-makers vary greatly. Social marketing, thus far, has rarely been positioned to increase decision-makers use of evidence and the interventions might thus contribute relevant insights to support EIDM.

Social incentives refer to the provision of non-financial incentives to encourage a desired behaviour (Bandiera et al 2010; Tonin & Vlassopoulos 2013). Instead of monetary value, the presented reward is of social value. It is argued that the provision of social incentives nurtures an intrinsic motivation associated with the desired behaviour change, which might present a more sustainable approach to motivate targeted behaviours than providing extrinsic motivation through financial rewards (Kavanagh et al 2006; Tonin & Vlassopoulos 2013). Social incentives are therefore positioned to be more conducive to the building of norms. Social incentives might be connected to individual's social concerns (fairness, reciprocity, altruism etc.) and can, for example, take the form of lotteries, vouchers, and certificates. We identified two reviews, one of high trustworthiness (Kavanagh et al 2006) and one literature review (World Bank 2015), that reported positive effects of social incentives on behaviour change.

Social incentives might present an effective approach to support the building of an evidence use norm. To nurture an intrinsic motivation to use evidence, decision-makers applying evidence could receive social rewards such as certificates or public recognition when using evidence. Such publicly visible social incentives would further increase the awareness of other decision-makers of the targeted norm behaviour of using evidence. In combination with the above-suggested social marketing interventions, social incentives that provide visible tokens or focus on peer-recognition might therefore be more relevant in the context of EIDM than voucher or lottery schemes. The application of social incentives to nurture evidence is of potential benefit to M1 (awareness) and, thus far, has rarely been applied to support the systematic use of evidence by decision-makers.

Identify cues and priming present an approach to reinforce existing norms. An identity cue highlights a person's connection to an existing social identity or norm. Identity cues and priming aim to influence behaviour by highlighting a particular identity or norm that is aligned with the targeted behaviour (Pittinsky et al 2006; Richburg-Hayes et al 2014; Steele & Aronson 1995). Our scoping review identified two literature reviews that found identity cues to be effective to reinforce existing social identities and norms (Richburg-Hayes et al 2014; World Bank 2015).

In the context of EIDM, identity priming might be effective as a complementary intervention after an evidence use norm has been established. An identity cue, which is linked to the professional identity of decision-makers that entails the use of evidence, could be presented to individuals when faced with an important practice or policy decision. This intervention could thereby trigger decision-makers' evidence use norm and increase their awareness and motivation to use evidence. Using identity cues and priming as a technique to trigger evidence use norms and motivation seems to

provide a relevant contribution to support M1 (awareness) interventions to build awareness for EIDM.

PROVIDING A COUNTERFACTUAL TO EVIDENCE USE

In social psychology, counterfactual reasoning or thinking refers to a mental process of modelling the effects of alternate decisions (Hendrickson 2008; Roese 1999; Walsh & Byrne 2007). Alternative decision can be either past or future possibilities and are often constructed using "what if" statements (Hendrickson 2009). Counterfactual thinking can have different impacts on decision-makers and has been associated with behaviour regulation and performance improvement (Epstude & Roese 2008). Decision-making entails the use downward and upward counterfactuals (i.e. how a decision could have led to better/worse outcomes) in our thinking, for example, to create behaviour intention and goal-directed activities (Epstude &. Roese 2008; 2011; Scholl &Sassenberg 2014).

To foster the awareness of the need for evidence to inform decision-making, interventions could benefit from applying psychological techniques to trigger decision-makers' counterfactual reasoning, i.e. hypothesising a situation in which evidence is not used and highlighting the consequences of this. The counter-factual of a decision not informed by evidence would aim to compare the effects of using evidence with the effects of not using evidence, with the latter assumingly being less beneficial. This comparison could directly highlight the need for applying evidence to decision-makers and motivate their subsequent use of evidence. We identified counter-marketing, social group techniques, and policy models and simulations as interventions reported in the social science literature that seemed to feature the potential to highlight the effects of not using evidence to decision-makers.

Counter-marketing is a marketing technique which aims to discourage (rather than promote) a certain behaviour. This discouragement typically involves the use of negative messages and perceptions to stop individuals from the targeted behaviour (Armstrong & Kotler 2012; Zucker et al 2000). Counter-marketing has been used to discourage, for example, unhealthy behaviours such as smoking, but is also commonly used during election and advocacy campaigns. Unfortunately, our scoping review did not identify review evidence assessing the impacts of counter-marketing on behaviour change.

Applying counter-marketing to increase awareness for the need to use evidence during decision-making, would aim to highlight how the non-use of evidence can have negative consequences. The example of the adverse impact of the Scared Straight Programme in the US (Petrosino et al 2003; 2013) would present an opportunity for countering the behaviour of not using evidence during policy and programme decisions. A counter-marketing campaign would then apply common marketing techniques to make decision-makers aware of the risk of not using evidence, e.g. popularising the results of the Scared Straight Programme. Through highlighting the negative effects of not using evidence, counter-marketing interventions might be able to improve decision-makers' perceptions of EIDM and build motivation to use evidence. We consider counter-marketing as a relevant intervention approach in the context of EIDM, which so far has rarely been suggested to change decision-makers' behaviour.

Social group techniques have also been used to expose the consequences of prevailing behaviours (World Bank 2015). Social psychology suggests that group settings motivate individuals to argue vigorously; a finding that can be channelled to improve decision-making if people in a group share a common interest but are actively tasked to disagree with each other or find flaws in each other's proposals (Baron & Kerr 2002). Two often-applied techniques to encourage like-minded individual to disagree effectively with one another are *redteaming* and *dogfooding* (Masys 2012; World Bank 2015). Alas, we did not identity review evidence commenting on the effectiveness of social group techniques to challenge existing behaviour patterns.

In the context of EIDM, *Redteaming,* for example, could be handily applied to support decision-makers' awareness of the need to access evidence. A team faced with a policy decision would be split in two groups, of which one team would be tasked to review evidence in favour of the proposed policy and another with identifying evidence opposing the decision. The purpose of this intervention is, of course, not to base the policy decision of this cherry-picking of evidence but rather to encourage the principle of having one's decision reviewed by existing evidence in order to increase awareness of the concept of EIDM. The aim of these social group techniques is thus to challenge the status quo of decision-makers' use of evidence to foster a debate on whether there is virtue in applying evidence. Ideally, this could then increase motivation to use evidence as well as providing an opportunity to use evidence in this process.

PC-generated policy models and other simulation techniques represent the most sophisticated intervention approach to provide a counterfactual to an intended action or decision. From a conceptual point of view, these interventions model the effects of a policy or programme decision. By using computer software or real life simulations, they allow decision-makers to test the hypothetical effects of their actions and decisions. The evidence-base on automated policy models and other simulation techniques is still nascent and our scoping review did not identity any reviews of evidence.

Some of these simulation techniques seem to provide room to model different scenarios of evidence-informed decision-making, either a decision in line with the evidence base or a contrary decision. Milne and colleagues (2014) report on the development of a policy advice software, which can model the likely effects of different policy decision. Ungar et al (2015) present a practical simulation exercise in which decision-makers use role-play to mirror their practice experiences. This simulation aims to identity decisions made in practice and to contextualise these with the existing evidence-base. Both these different intervention approaches potentially can affect decision-makers' motivation to use evidence (e.g. realising the positive effects of this behaviour) as well as providing an opportunity—albeit only simulated—to apply evidence during the decision-making process.

ENGAGEMENT

Why and how people engage with causes, products, and services has been widely studied in psychology, management, and communication literature (e.g. Stevenson et al 2015; Ahonen & Moore 2005; Hollebeek 2011; Schaufeli 2013) The importance of engagement, too, is cited to increase student motivation in the educational literature (Naghavi 2015; Trowler 2010). At its most basic, engagement can be defined as an 'emotional involvement and commitment' (Schaufeli 2013). Individuals who feel involved and commitment to, for example, a social cause are assumed to be

more motivated and likely to actively support it (Corning & Myers 2003). Increasing engagement thus seems to be a relevant approach to build positive perceptions and attitudes, which is directly relevant to M1. In our scoping review, we identified user engagement interventions as of most relevance in the context of EIDM.

User engagement refers to the inclusion of the perceived beneficiaries of an intervention or service in the design and implementation of the former. User engagement is a widely applied mechanism to increase the relevance of interventions and beneficiaries sense of ownership of and identification with it (O'Mara-Eves et al 2013; Yang & Pandey 2011). In the social sciences user engagement is, for example, cited in the context of increasing civic participation in government services (e.g. Head 2007), international development (e.g. Chambers 2014), and education (e.g. Butin 2010). We identified a large body of review evidence on user and community engagement (e.g. O'Mara-Eves et al 2013; Domecq et al 2014; Shippee et al 2013). This body of literature commented on individual engagement strategies' effectiveness and conceptual frameworks for engagement in general. There were positive effects of user engagement on behaviour change in a high-trustworthiness review (O'Mara-Eves et a 2013) and mixed outcomes in a similar-ranked review (Mockford et al 2012).

In the context of EIDM, user engagement, too, appears as a relevant intervention to increase decision-makers' familiarity with evidence. Engaging decision-makers in the production of evidence might increase their understanding of research and lead to a more favourable perception of evidence. Decision-makers familiar with research evidence and how it is produced might be more motivated to feed evidence into the decision-making process and display a greater demand for evidence. The evidence of user engagement's effects above lends some support to this causal chain.

In addition to this, our scoping review also identified a number of evidence-informed conceptual frameworks of effective user engagement reported in the literature (e.g. Shippee et al 2013; O'Mara-Eves et al 2013; Yang & Pandey 2011). These frameworks presented a number of design criteria that seem to be of benefit to increase the impact of user engagement in EIDM. We identified these design criteria because they seemed under-applied in the interventions aiming to engage decision-makers in the research process included in Review 1. Potentially beneficial criteria include: formulating clearly defined outcome objectives of the engagement for both parties; defining an appropriate intervention timing, frequency, and duration that cater to decision-makers' needs; tailor engagement strategies to audiences' needs, particularly considering the organisational context of the decision-makers; build reciprocal relationships, i.e. what is the benefit of the engagement to decision-makers; consider the opportunity costs of engagement for decision-makers and attempt to offset these; and lastly, reassess and feedback on the objectives of the engagement.

The involvement of decision-makers in the research process is an often-suggested intervention approach to support EIDM (e.g. Lavis 2006; Carr & Coren 2007). However, often the involvement of decision-makers in the production of evidence has been positioned as an effective supply side intervention to improve the relevance of evidence (e.g. Nutley et al 2007). As explained above, engagement could likewise be positioned to increase demand for evidence. Analysing user-engagement from this angle would highlight how a better understanding and sense of ownership of evidence benefits decision-makers' motivation for the use of evidence; and, further, nurtures positive attitudes for the concept of EIDM. The contribution of the social science literature on user-

engagement might therefore refer to a change in the current practice of engagement to place a stronger emphasis on demand-building mechanisms.

In addition, Review 1 has also established that evidence use interventions focused on providing interactions between decision-makers and researchers (M4) seem to suffer from a lack of conceptual clarity regarding the purpose and effects of the interaction. We concluded that engagement as a less-intensive and more defined approach to interaction might be more effective. Our scoping review adds to this finding through the presentation of effective components of engagement interventions. The incorporation of these might further contribute insights to the existing application of user-engagement to support decision-makers' use of evidence.

ADVOCACY FOR EVIDENCE USE

The question on how best to raise awareness for a desired behaviour change is central to social mobilisation and advocacy. Issues such as environmental protection, violence preventions, and gender equality all require a change in behaviour and have been subject to explicit awareness-building campaigns by public and private bodies (Fulu et al 2014; Joyce 2013). Lessons from these awareness-raising campaigns, too, might be relevant in order to understand how to raise awareness for EIDM among decision-makers. Below, we highlight key insights applicable to the endeavour of building awareness for EIDM, based on literature commenting on campaigns raising environmental awareness, violence preventions, and information literacy.

Awareness-building campaigns are not narrowly focused on the communion of a specific issue. Awareness-building is more encompassing and entails the promotion of an issue's visibility and credibility within a community or society (Sayers 2006). To raise awareness is to inform and educate people about an issue with the intention of influencing their attitudes, behaviours, and beliefs towards the achievement of a defined purpose or goal. Due to this link to behaviour change, awareness-raising campaign often target a change in social norms as the outcome of the campaign (e.g. Fulu et al 2014; WHO 2009), which links this interventions to the above-mentioned social marketing programmes. Our scoping review identified a large body of Grey literature commenting on the effective design of awareness-raising campaigns including two moderately rated reviews (Fulu et al 2014; WHO 2009).

Following established principles of awareness building (e.g. Joyce 2013; Sayers 2006), an EIDM awareness campaign would first focus on an issue of concern (e.g. a non-effective social programme) to then present evidence use as an attractive solution to this issue. Unless decision-makers' identify and understand with the initial issue, the proposed solution (i.e. systematic use of evidence) will remain disconnected (Joyce 2013). Campaigns therefore benefit from the use of emotions— e.g. humour, surprise, concern—to increase audiences' attention. An EIDM awareness campaign further would require a message arch, which presents a multi-message narrative to guide decision-makers, depending on their existing awareness of EIDM (e.g. informed but of neutral opinion), to the objective of the campaign. The primary objective of an EIDM awareness-building campaign would be to increase decision-makers' familiarity with the concept of EIDM, thereby increasing motivation to use evidence. The design of an explicit awareness campaign to popularise EIDM as a principle in decision-making could present an effective contribution to support the use of evidence.

Summary of social science interventions relevant to M1 (awareness)

Our scoping review of the social science literature explored concepts and interventions that might present relevant insights to contribute to the application of M1 (awareness) interventions. We identified four categories of interventions applied in the broader social sciences that present relevant insights to contribute to decision-makers' awareness of and support for the concept of EIDM (M1). These include (i) the creation of social or professional norms; (ii) the provision of a counterfactual to the use of evidence; (iii) re-focusing and designing engagement interventions; as well as (iv) advocacy for EIDM. We assessed these for their likely effects on CMOs and behaviour change outcomes as well as the nature of the insights and contribution to the application of M1 (awareness) interventions.

Evidence of effects in social sciences:

Based on our scoping review, interventions with potential to influence behaviour change referred to social marketing and awareness-building campaigns. Each of these might be able to nurture social and professional norms of decision-makers. In the context of EIDM, these interventions might be applied to foster the creation of evidence use norms. These could motivate decision-makers to comply with the social or professional norm of using evidence, thereby supporting motivation and behaviour change.

Social incentives and identity cues were identified in the social sciences as interventions effective to reinforce behavioural norms. Having created a social or professional evidence use norm, social incentives and identity cues could support the compliance with this norm and motivation to engage in the targeted behaviour, i.e. motivation to use evidence.

User-engagement, as a tool reported in the social sciences as effective to support familiarity and identification with an intervention, might be able to positively influence both, motivation and opportunity to use evidence. From a demand-side perspective, users receive an opportunity to be engaged in the production of evidence, assuming that this experience might increase their attitudes towards, and future appetite for, evidence.

Conceptually relevant social science interventions that however lacked a reliable evidence-base referred to interventions aiming to present a counter-factual to evidence use, i.e. counter-marketing, social group techniques, and PC-generated models and simulation exercises. Conceptually, these might be able to support opportunity as well as motivation to use evidence.

Social science insights for EIDM:

In addition to assessing likely effects of social science interventions on CMOs and behaviour change outcomes, our scoping review also aimed to showcase what insights could be gained from their application to support M1 (awareness) interventions.

Most of the identified interventions suggested additional practices to the status quo of interventions aiming to support EIDM. Using social marketing, social incentives, and identity cues to nurture the formation of evidence use norms seems to hold potential to change the nature of evidence use interventions, in particular programmes employing M1. Likewise, the use of awareness-building campaigns to popularise the concept of EIDM and evidence use as a behavioural norm presents an effective contribution to the research use literature. The concept of creating a counter-factual to the

use of evidence, too, appears of conceptual relevance and the proposed interventions (counter-marketing, social group techniques, automated modelling and simulations) would provide a promising addition to interventions aiming to build decision-makers' awareness of and support for EIDM (M1). Lastly, repositioning user-engagement as demand-side intervention as well as the incorporation of effective engagement principles identified in social science reviews might be able to alter the existing practices of applying user-engagement to support EIDM.

M2 'Agreement to what constitutes fit-for-purpose evidence': relevant social science interventions

M2 (agree) proposes that building consensus between decision-makers' and researchers as to what evidence is fit-for-purpose to inform the decision-making process is an effective intervention approach to increase evidence use. If decision-makers' contribute to discussions on the nature of evidence, they might perceive an increased ownership and familiarity of the produced evidence.

Review 1 found a paucity of evidence use interventions aiming to build consensus on fit-for-purpose evidence and we therefore were unable to comment on potentially effective intervention approaches. Searching the broader social science literature in Review 2 for key words related to 'consensus'; 'debate'; and 'persuasion', we identify seven interventions and concepts that seem conceptually relevant to EIDM. Table 5.2 provides an overview of these social science interventions and concepts relevant to M2 (agree) and we present a brief narrative account of each intervention below.

Table 5.2 M2 (agree) – relevant social science interventions

Intervention	*Conceptual relevance*	*Evidence of effects**
CONSENSUS-BUILDING TECHNIQUES		
Delphi-panels, nominal group techniques, etc.	Potential to provide a structured and transparent way to reach consensus on fit-for-purpose. Different types of evidence are considered in the process (opportunity) of reaching a mutually-satisfactory consensus (motivation).	Yes, weak evidence.
Discursive leadership & collaborative planning	Potential to allow more participation and multiple perspectives to emerge and lead to mutually satisfactory agreements on what constitutes fit-for-purpose (i.e. opportunity and motivation).	No evidence identified.

Feedback mechanisms	Potential to provide a channel for differing opinions to emerge and challenge existing notions of what constitutes fit-for-purpose. Feedback primarily affects motivation to use evidence providing a channel to disagree with prevailing definitions of fit-for-purpose.	Unclear, mixed evidence.
COLLABORATIVE LEARNING		
Inter-professional education	Potential for decision-makers and researchers from different contexts to study joint issues from different professional angles and epistemologies (all CMOs)	Unclear, mixed evidence.
Communities of practice	Potential for like-minded individuals to reflect on the applicability of different types of evidence in their respective contexts (i.e. motivation and opportunity)	No evidence identified (empty reviews)
Journal clubs	Potential to debate the applicability of evidence and reach consensus on profession's standard for fit-for-purpose (i.e. motivation and opportunity to use evidence)	Yes, strong evidence.
ENGAGEMENT		
User/community engagement	Potential to provide a formal channel to influence the production of evidence more in line with decision-makers' perception of fit-for-purpose (i.e. motivation and opportunity)	Yes, weak evidence.

*We cannot provide a rigorous assessment of the size of the identified effects across interventions.

CONSENSUS-BUILDING TECHNIQUES

The social science literature, in particular management, political science, and communication research, has produced a large body of work on how to reach agreement and consensus between individuals and groups (e.g. Susskind et al 1999; Briggs et al 2005; Kacprzyk et al 1992; Heitzig & Simmons 2010). This literature is concerned with practical techniques that can be applied to reach consensus on e.g. management decisions and political debates. The aim of such techniques is not to

reach a unanimous decision, but to facilitate the satisfactory inclusion of all stakeholders in the decision to be made (Susskind et al 1999). In this spirit, consensus-building techniques aims to solve logjams created by intransigent position taking, including the views of multiple stakeholders to then reach a decision of mutual gain (Innes & Booher 1999).

At the most applied level, reaching agreement on what constitutes fit-for-purpose evidence, is about building a consensus between different stakeholders (e.g. practitioners, researchers, managers). It therefore appears that M2 (agree) interventions might be able to benefit from the application of proven consensus-building techniques reported in the social sciences. This acknowledges that there is no one-size -fits all type of evidence for every decision to be made, and that in most policy and programme decisions there is room for decision-makers to draw from different types of research studies. In such situations where decision-makers actively attempt to draw on evidence, established consensus-building techniques as e.g. developed by management professionals might be of relevance to support evidence use interventions too. In our scoping review, we identified Delphi panels; discursive leadership and collaborative planning; and feedback mechanisms as potentially relevant interventions.

Delphi-panels, nominal group techniques, etc. are among the most popular formal consensus-building techniques that provide a structured and transparent way to reach agreement within a group setting (Nasser et al 2007; Diamond et al 2014). The Delphi technique is a means and method for consensus-building by using a series of questionnaires to collect data from a panel of selected subjects (Hsu & Brian 2007). Different iterations of questionnaires follow each round of data collection and analysis to develop consensus. The Delphi technique is, for example, applied in a policy setting to build consensus for public policies when different political or ideological positions hinder the political agreement (Manley 2013). Our scoping review identified a single high-trustworthiness review that provided evidence of the positive effects of Delphi-panels to build consensus (Diamond et al 2014).

In the context of research use, a Delphi panel could be formed to review the relevance of different types of evidence to a specific policy topic. It could counter biased epistemological rejections or preferences of certain types of evidence and ensure that the most relevant evidence is identified as fit-for-purpose. Delphi does not require panel members to meet in person to partake in the consultations. The technique therefore seems to be of further relevance in the context of EIDM given that decision-makers and researchers are usually not working in close physical proximity. Using Delphi to reach a consensus of what constitutes fit-for-purpose evidence could potentially influence opportunity as well as motivation to use evidence. Decision-makers would be exposed to different types of evidence during the panel rounds (i.e. opportunity) and might identify more strongly with the reached consensus on fit-for-purpose (i.e. motivation). The use of Delphi-panels to formally foster consensus on what constitutes fit-for-purpose evidence therefore seems to present a relevant contribution to M2 (agree) interventions.

Discursive leadership & collaborative planning refer to management techniques that enhance participation and incorporate multiple perspectives to build consensus (Fairhurst 2007; Innes & Boher 1999; Wodak 2011). As consensus among staff is key to ensure the joint long-term pursuit of strategic objectives, and consensus requires the development of shared understanding and common commitment, management strategies have been designed to create an organisational environment

in which consensus can be achieved. A discursive approach to leadership, e.g. applies communication strategies and social psychology to ensure consensus can be formed in meetings and the wider organisational remit. Our scoping review did not identify any review evidence on the effects of these techniques.

In the context of EIDM, applying discursive leadership techniques could ensure that multiple perspectives of what constitutes fit-for-purpose evidence are incorporated before encouraging the wider use of evidence among staff. Likewise, collaborative planning could be a tool to build consensus on what evidence to seek early on in the conception of a new policy or programme development plan. Both these techniques would allow different forms of evidence to be considered increasing the opportunity to use evidence. Being consulted and able to input into the agreement on what constitutes fit-for-purpose might further increase motivation to use evidence as stakeholder can identify closer with the final decision.

Feedback mechanisms function as channels through which decision-makers can express their support or rejection of an issue. Feedback mechanisms can comprise of what is loosely termed 'local consensus processes' in the health literature (Nasser et al 2007; Johnson et al 2015), which present formal or informal means of including the opinions of people usually not part of the decision-making group but subject to the effects of decisions. Feedback can be given as part of informal meetings, organisational reviews, dedicated feedback forms, etc. and aims to add different perspectives to the prevailing consensus. We identified two high-trustworthiness reviews assessing the effects of local consensus processes that both reported unclear impacts (Bero et al 1998; Johnson et al 2015).

In the context of EIDM, decision-makers at a practice level in particular might be able to make use of local consensus processes to report their experiences of what constitutes fit-for-purpose evidence. In the short-term this might primarily affect motivation to use evidence as decision-makers can express grievances or support of prevailing notions of fit-for-purpose. Feedback mechanisms thereby could ensure that decision-makers perceive their input to be taken into consideration. In the long term, feedback mechanisms might affect opportunities to use evidence too. Bottom-up notions of fit-for-purpose (e.g. tactic knowledge) could be communicated through feedback mechanisms changing the initial conceptualisation of fit-for-purpose. Feedback mechanisms therefore could be used to systematically gather decision-makers' perceptions on the prevailing notion of evidence. Regularly applying feedback mechanisms for this purpose might present a beneficial change to existing practices in EIDM.

COLLABORATIVE LEARNING

Professional silos and epistemological traditions often present a barrier to effective joint decision-making (Glesson 2013; Zwarenstein & Reeves 2006; Barr et al 2005). Decision-makers might be unable to reach consensus largely because they associate with different professions and research/training traditions (Margalit et al 2009). In order to overcome such structural barriers to consensus-building, education literature suggests to foster a process in which professionals from different backgrounds learn with and from another (e.g. Zwarenstein & Reeves 2006; Dillenbourg 1999; Barr 2014; Hyunkyung 2014). This is assumed to facilitate an exchange and understanding of each other's professional backgrounds and reasoning, which then might increase willingness to collaborate as well as consensus-building.

Professional silos and epistemological tradition, too, affect research use. Inciting a process by which decision-makers of different backgrounds have a chance to learn with and from another (including joint learning with researchers) might therefore present a relevant intervention approach to support consensus on what constitutes fit-for-purpose evidence. We summarised a number of educational interventions that hold the potential to enhance agreement on fit-for-purpose evidence through removing barriers to professional silos and narrow epistemological positions under the category of 'collaborative learning'. These interventions include inter-professional education; communities of practice; and journal clubs. While these interventions are also associated with EIDM capacity-building (M5) and interaction interventions (M4), the above-cited social science sources suggest that they are as well applicable to support agreement on what constitutes fit-for-purpose evidence (M2).

Inter-professional education is a concept developed to encourage joint learning between health and social care professions (Zwarenstein & Reeves 2006). It assumes that learning with and from another will enhance professionals' understanding of each other's practices and mindsets. This understanding might then motivate collaboration and support agreement on, or at least tolerance of, professional policies and practices (Zwarenstein & Reeves 2006; Reeves et al 2013). Our review of reviews identified a single review of high trustworthiness that found mixed effects of inter-professional education to encourage practice change (Reeves et al 2013).

In the context of evidence use interventions, inter-professional education might be an effective approach to introduce different decision-makers with each other's respective traditions of evidence use, or to familiarise decision-makers and researchers with the perceptions of what constitutes evidence in each profession. For example, decision-makers' formal training courses (e.g. public management and administration) could be enriched by modules and guest lectures on the principles of EIDM and, vice-versa, the training of researchers could include presentations from decision-makers on what type of research is relevant to their professional contexts. While this process primarily targets a joint agreement on fitness-for-purpose and thereby motivation to use evidence, it also entails opportunity- and capability-building components. Some professions, in particular in health care, already incorporate formal teaching of EIDM courses in degree programmes. However, these often only expose students to a theoretical review of EIDM and do not present opportunities for collaboration and exchange with professionals from different background.

Communities of practice (CoPs) present a widely used intervention to build professional consensus through exchange of practitioners' experiences and joint learning. Formally defined as "groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis" (Wenger et al 2002: 4), CoPs seem well positioned to build consensus on professional standards and practices (Barton & Tusting 2005; Amin & Roberts 2009). Unfortunately, the existing reviews of the impact of CoPs identified by our scoping review found a dearth of reliable impact evaluation evidence, leaving the question of CoP's effects unanswered (e.g. Ranmuthugala et al 2010; 2011).
This finding is in line with the result of Review 1 in which we, too, found a lack of evidence to comment on CoP's effects to increase decision-makers' use of evidence. The concept of CoP, however, seems highly relevant to foster agreement on what constitutes fit-for-purpose for different decision-makers and professions. Literature on CoPs continuously cites the intervention's potential to support an exchange of tactic knowledge with research evidence and practice guidelines (Barwick

et al 2009; Meagher-Stewart et al 2012; Kothari et al 2015; Ranmuthugala et al 2010). Review 2 therefore identified CoPs as a relevant intervention to support EIDM, in particular M2 (agree). CoPs might present an effective setting in which a healthy professional debate on the virtue of different types of evidence can take place. This might support opportunities to consider evidence as well as build motivation to use it, having reached a mutually satisfactory understanding of fit-for-purpose. Seeing that CoP's impacts on tangible learning and behaviour skills outcomes are unclear, social science insights in relation to M2 (agree) refers to a change of the current conception of CoPs as primarily an educational tool towards a more discursive tool, which aims to foster agreement on existing practices and standards of conduct.

Journal clubs are a widely applied educational intervention to discuss academic knowledge. While mainly discussed as a tool to introduce decision-makers at a primary care level to research evidence, journal clubs, too, are used to review academic knowledge in a wide array of research fields such as philosophy (e.g. *The Philosopher's Eye*), data science (e.g. *Silicon Valley Data Science Journal Club*), biology (e.g. *Harvard Phylogenetics Journal Club*). Journal clubs further can serve as an organisational tool to support internal knowledge systems to create, record, and share the organisation's own practice-relevant knowledge (e.g. Manela & Moxley 2002; Strauss et al 2009). The objectives of journal clubs differ and range from educational outcomes, to adoption of practices, and the development and popularisation of a research field (Deenadayalan et al 2008; Taylor et al 2015). A systematic review of Twitter Journal Clubs, for example, found that these clubs can mainly be regarded as an attempt to increase the visibility of research domains and to connect with other scholars contrasting the traditional educational remit of a journal club (Roberts et al 2015).

The effectiveness of journal clubs as an educational intervention to increase EIDM skills has already been discussed and our scoping review identified additional reviews of varied critical appraisal ratings attesting to the effectiveness of journal clubs on a range of knowledge outcomes (e.g. Ebbert et al 2012; Honey & Baker 2011; Deenadayalan et al 2008).

Based on the above review of the wider literature on journal clubs, however, journal clubs also seem to present a viable space in which decision-makers and practitioners can debate and reach consensus to develop their profession's practices, standards of conducts, and visibility. This presents a more encompassing concept of journal clubs and seems to position journal clubs as a relevant intervention to support M2 (agree). Decision-makers, for example, can as much use journal clubs as a platform to discuss the applicability and relevance of research evidence to their professional realities and challenges, thereby developing what constitutes fit-for-purpose evidence in their domain. .
In addition to journal clubs' objective to translate research findings and increase decision-makers' EIDM skills, it might therefore present a relevant contribution to the design of journal clubs in EIDM to more explicitly target conceptual discussions on the nature of evidence. This might add to the intervention's educational potential the ability to influence decision-makers' motivation and opportunity to use evidence. Lastly, journal clubs, so far, seem to have predominantly been applied to decision-makers at a primary care practice level (e.g. nurses and social workers), leaving room for the intervention approach to be levelled at decision-makers at a management and policy level too.

ENGAGEMENT

We have already conceptualised engagement and its relevant to EIDM in reference to M1. The concept, too, seem to be of relevance to interventions aiming to build consensus on what constitutes fit-for-purpose evidence (M2), which we explore further below.

In relation to M2 (agree), formal engagement of different groups in the decision-making process might foster debates on what evidence should be used to inform the decision. Different groups might contribute different opinions on what evidence is fit-for-purpose to inform a specific decision. Creating formal channels during the decision-making process to ensure the participation of these groups and their voices could since challenge existing habits and standards of defining fit-for-purpose. This process of engagement could thus nurture a larger effort to build consensus on what constitutes fit-for-purpose evidence. Our scoping review identified user engagement as a relevant intervention that might be able to create formal engagement channels to support consensus building.

User engagement has been discussed in relation to M1 (awareness) already. As a formal intervention to involve decision-makers into the production of evidence our scoping review identified weak positive effects of user engagement on behaviour change. We also presented a number of intervention components reported in the social science that might improve the design of user engagement programmes in EIDM.

User engagement, however, seems not only relevant to increase decision-makers' awareness for the concept of EIDM; the intervention as much might be applicable to support consensus-building of what presents fit-for-purpose evidence. Through engagement in the research process decision-makers and researchers are exposed to each other's respective understanding of and preferences for evidence. This might result into joint debates and an effort to harmonise the conception of fit-for-purpose taking into consideration each other's professional backgrounds and needs. As per above, user-engagement seems to be able to influence both opportunity and motivation to use evidence and its relevance stems from a change to the existing practice of user engagement in line with the programme components suggested in the social sciences.

Summary of social science interventions relevant to M2 (agree)

Our scoping review of the social science literature explored concepts and interventions that might present relevant insights to contribute to the application of M2 (agree) interventions. We identified three broad categories of interventions applied in the broader social sciences that present relevant insights to contribute to efforts aiming to build consensus on what constitutes fit-for-purpose evidence: consensus-building techniques; collaborative learning; and user engagement. We assessed these for their likely effects on CMOs and behaviour change outcomes as well as the nature of the insights and contribution to the application of M1 (awareness) interventions.

Evidence of effects in the social sciences:

Scoping the wider social science literature, we identified three interventions that were found effective to support consensus-building, and thus appear applicable to serve a similar function with regard to defining fit-for-purpose evidence: Delphi-panels, journal clubs, and user engagement. Delphi-panels, journal clubs, and user engagement each provided a platform in which the relevance

of different types of evidence could be discussed (i.e. opportunity to use evidence). These three interventions further appeared effective in facilitating a process that allowed for a mutually satisfactory definition of fit-for-purpose to be agreed on, increasing decision-makers' motivation to use evidence.

A majority of conceptually relevant interventions to support M2 (agree), however, lacked a reliable evidence-base. These referred to feedback mechanisms; discursive leadership & collaborative planning; communities of practice; and inter-professional education. These interventions are suggested in the social sciences as of potential to support consensus-building, but our scoping review either failed to identify existing reviews of effects or the identified reviews reported mixed effects.

Social science insights for EIDM:

In addition to assessing likely effects of social science interventions on CMOs and behaviour change outcomes, our scoping review also aimed to showcase what insights could be gained from their application to support M2 (agree) interventions.

We identified a number of interventions contributing relevant insights to support consensus-building in the context of EIDM by suggesting changes to current practices. Journal clubs, communities of practice, and user engagement all have been suggested to support EIDM. Drawing from the social science literature though it appeared that journal clubs and communities of practices, in addition to their educational remit, could serve as an effective discursive intervention approach to build common standards and practices within a profession—agreement on fit-for-purpose potentially being one such standard. User-engagement might benefit from the incorporation of a number of evidence-informed programmes components identified in social science reviews.

Delphi-panels, discursive leadership & collaborative planning, and inter-professional education, on the other side, are suggested in the social sciences as additional interventions, whose application in EIDM might yield potential benefits. So far, these interventions rarely have been positioned to be of benefit to EIDM. Lastly, a single intervention—feedback mechanisms—might contribute to the impact of M2 (agree) interventions if its usage is exercised on a more regular basis.

M3 'Communication and access of evidence': relevant social science interventions

The effective communication and access to evidence (M3) is a key objective of interventions aiming to increase decision-makers' use of evidence. Effective communication is required to make decision-makers' aware of relevant evidence and facilitating convenient access is needed to increase their motivation and opportunity to use evidence. Our findings in Review 1 indicated that communication interventions that targeted both motivation and opportunity were effective in getting evidence into use. However, only a small range of interventions was investigated and all of these focused on increasing the use of individual pieces of research evidence. No studies investigated how the principle of EIDM could be communicated. In Review 2, we therefore searched the social science literature on additional communication interventions that might be applicable in the context of research use interventions too. Table 5.3 below provides an overview of 17 identified

communication interventions and techniques, whose application seemed to be able to benefit efforts to increase evidence use.

Table 5.3 M3 (communication & access) – relevant social science interventions

Intervention	*Conceptual relevance*	*Evidence of effects**
COMMUNICATION TECHNIQUES		
Tailoring & targeting	Potential to align the communication of evidence to decision-makers' professional needs and personal preference to increase motivation to use evidence.	Yes, strong evidence.
Framing (gain/loss)	Potential to align the communication of the results of research with the cognitive characteristics of the decision or the desired behaviour (i.e. evidence use). Framing increases the likelihood that information will be considered and taken into account potentially affecting opportunity and motivation to use evidence.	Yes, strong evidence.
Framing (norms / identities); identify cues & priming	Potential to align the communication of evidence or the concept of EIDM with the decision-makers' existing norms and identity. Identity cues and frames can increase motivation to use evidence.	Yes, weak evidence.
Explaining uncertainty	Potential to use communication techniques to explain uncertainty in the results of research to increase decision-makers' engagement with research (i.e. motivation).	Yes, strong evidence.
Narratives	Potential to increase the relevance and accessibility of research evidence or the concept of EIDM through emotional connections and identification.	Yes, strong evidence.
DISSEMINATION TECHNIQUES		
Audience segmentation	Potential to ensure that the communicated evidence is adapted to	Unclear, no independent evidence.

	each target audience to increase reception and motivation.	
Online and social media	Potential to increase the reach and convenience of access to evidence communication or the concept of EIDM (i.e. motivation and opportunity).	Yes, strong evidence.
Branding	Potential to increase the credibility, visibility, and emotional connection of the concept of EIDM. Branding could support motivation to use but also affect behavioural intentions and change.	Yes, strong evidence.
Reminders	Potential to reinforce communicated research results, triggered frames, and targeted behaviour of accessing evidence. Reminders can affect instant motivation but also provide an opportunity to reinforce intended accessing of evidence.	Yes, strong evidence.
Timing	Potential to increase the timing of evidence communication to receptive periods of decision-makers / the decision-making process (i.e. opportunity).	Yes, weak evidence.
Information design	Potential to increase the accessibility as well as visual appeal of evidence to increase motivation to use evidence.	Yes, weak evidence.

STRATEGIC COMMUNICATION

Social marketing / branding	Potential to establish the targeted behaviour of evidence use as a social or professional norm. An evidence use norm could foster motivation to use evidence as well as directly affect behaviour change.	Yes, strong evidence.
Awareness-building campaigns	Potential to increase the awareness of decision-makers for EIDM as a principle and norm of decision-making. Increased awareness for the need to use evidence	Yes, weak evidence.

	reinforces motivation and behavioural intention.	
Multicomponent strategies (components: reach, ability, motivation)	Potential to combine the communication of evidence with practical opportunities or skills to use evidence.	Yes, weak evidence.
Science communication	Potential to ensure that the profession of science communication applies information design and is aligned to wider attempts of establishing a norm of evidence use (all CMOs).	No evidence identified.
ACCESS OPTIONS		
Online repositories	Potential to create more effective online platforms if IT-design principles are emphasised in addition to functionality. This might increase users motivation to use the repositories and thus increase opportunity to use evidence.	No evidence identified.
Apps	Potential to create more convenient access options and tools on mobile devices. Evidence use apps might not present the standard type of access but might be able to provide an appealing and personalised first encounter with EIDM (motivation and opportunity).	No evidence identified.

*We cannot provide a rigorous assessment of the size of the identified effects across interventions.

COMMUNICATION TECHNIQUES

Our scoping review of the social sciences literature identified a number of communication techniques that increase the impact and persuasiveness of a communicated message. These techniques are routinely applied to effectively formulate messages for different audiences to support desired behaviour change or the diffusion of ideas. In the context of EIDM, the incorporation of such communication techniques might be of benefit to either communicate the results of research more effectively to decision-makers or to increase awareness for the concept of EIDM in general. The below presented techniques are not limited to certain communication formats (e.g. print media, emails, videos) and rather present principles applicable to any evidence use communication intervention. We do not claim the presented techniques to be completely novel to support the use of evidence (e.g. tailoring). However, unlike other professions, none of the below

currently seems to be applied on a regular basis as a communication practice to support the communication of evidence.

Tailoring & targeting refers to the co-ordination of the communicated messages to the intended audience in order to increase its relevance and likelihood of uptake (Kreuter & Wray 2003; Noar et al 2007). For any form or tailoring and targeting, knowledge of the composition and preferences of the intended audience is required. Our scoping review identified a large evidence-base on the effectiveness of targeted and tailored messages to encourage behaviour change using different communication channels. A high-trustworthiness review e.g. found that tailored print messages were effective to change a range of behaviours (Noar et al 2007) while a similarly ranked review (Lustria et al 2013) came to the same conclusion regarding web-delivered, tailored communication.

Tailoring the communication of evidence to decision-makers' characteristics might therefore be of potential to increase the uptake of evidence. This will, however, require a more in-depth knowledge of decision-makers' preferences and backgrounds for those who communicate the results of research evidence as well as a willingness to communicate research results differently to different audiences. The same applies to the communication of the concept of EIDM, which might benefit from a more tailored approach to decision-makers that are likely to be receptive for it. Tailoring and targeting is of high conceptual relevance to evidence use communication and access interventions. There have been successful attempts to use the technique to support evidence use (e.g. Bunn et al 2012) and its contribution might refer to the regular application of the technique when communicating evidence. The intervention's main effect seems to be an increase in the motivation to use evidence.

Framing as a communication technique is based on the insight that the way information is presented to the audience (i.e. how it is framed) influences the manner in which the information is processed and thus affects attitudes and behaviours (Fairhurst & Sarr 1996; Ledgerwood & Boydstun 2014). The most common form of framing refers to gain and loss frames, which either highlight the benefits of a change in behaviour (i.e. gain) or the cost of doing so/not doing so (i.e. loss) (Rothman et al 2006). Depending on the situational setting and the targeted behaviour different types of frames are more effective. For example, if individuals are already well-informed about the targeted behaviour, loss-framed messages are more effective with the reverse being true for a less-informed audience (Wansink & Pope 2014). Our scoping review identified a large number of reviews of different critical appraisal ratings attesting to the positive impacts of framing on behaviour change (e.g. Rothman et al 2006; Cornelissen & Werner 2014).

Framing seems to be of high conceptual relevance to support interventions aiming to increase decision-makers use of research. Depending on the context of decision-making, the use of evidence could be either framed as a 'gain' behaviour (e.g. more effective programme outcomes) or as a loss-averting behaviour (e.g. less waste of resources). Such gain and loss frames would similarly apply to the communication of research results. Most decision-makers in a development policy context, e.g. have been found to be loss-averse (World Bank 2015). Given this insights, development research findings or research use would benefit from being framed as averting losses.

The technique of framing is not limited to gain/loss frames. Information can also be framed in line with audiences' identities and norms (World Bank 2015). Often referred to as identity cues and priming (see M1), the information or targeted behaviour is framed according to decision-makers'

self-perception. An identify frame could e.g. emphasise the values of the civil service profession as a frame for the use of evidence. A norm frame, on the other side, could exploit the power of social influence as discussed in M1(awareness) and M4 (interact), by providing information on the norm behaviours of others. There might be scope to increase the use of framing techniques when communicating research findings or when promoting evidence use. As framing increases the likelihood that information will be considered and taken into account, it could potentially affect decision-makers' opportunity and motivation to use evidence.

Communication of **uncertainties** is closely related to the framing of messages. Uncertainty around the outcome of an action or decision inhibits decision-making, behaviour change, and identification with the action or decision (Budescu et al 2009; Patt & Weber 2013; Klopprogge et al 2007). The manner in which uncertainty is explained and presented (e.g. framed) is therefore central to negate its negative effects on decision-making and behaviour change (Budescu et al 2009; Klopprogge et al 2007). How to effectively communicate uncertainty is, for example, extensively discussed in the management literature (e.g. Brashers 2006) and in relation to the body of science on climate change (e.g. Patt & Weber 2013). Budescu and peers (2009) for instance investigate how the communication of uncertainty in the reports of the Intergovernmental Panel on Climate Change can be improved.

The uncertainty in research results is often cited as a reason for decision-makers' distaste of evidence (Oliver et al 2014). This leaves the effective communication and explanation of uncertainty as a promising technique to increase the uptake of research findings (i.e. motivation). A large number of concepts have been proposed to explain uncertainty in the context of EIDM, e.g. risk of bias, strengths of evidence, net benefit, but these terminologies might not necessarily resonate with decision-makers. A high-trustworthiness systematic review of communicating uncertainties drawing from both the health and communication literature (McCormack et al 2014), for example, found that communicating precision and net benefit as well as the terminology of 'strength of recommendations' might be more effective approaches to explain uncertainty. A related review of high-trustworthiness adds to this that research results might gain from the presentation of absolute rather than relative effects (Zipkin et al 2014). The importance of communicating uncertainty effectively seems to have been realised more strongly in some research sectors (e.g. health care) than others. While the conceptual relevance of explaining uncertainty in the context of EIDM is high, its likely effects thus depend on the existing communication practices in different research domains.

Narrative as a communication technique refers to the use of stories, metaphors, and comparisons to enhance the emotional connection of the audience to the communicated information or targeted behaviour (McCormack et al 2014). The technique assumes that the narrative increases the audience's engagement and identification with the communicated message (i.e. motivation). Oxfam's 2015 communication of wealth inequality using the example of a double-dekker bus that can host the amount of people owing half of the planet's wealth (Oxfam 2015) presents an effective example of communicating the results of research using narratives. Our scoping review identified two high-trustworthiness reviews presenting evidence that narrative communication techniques are effective to encourage behaviour change (McCormack et al 2014; Winterbottom et al 2008).

Packaging the results of research evidence in form of narratives might therefore be a relevant and effective approach to increase decision-makers' engagement with the research and motivation to use it. Shepherd (2014), for example, uses an industrial analogy (the petrochemical industry) to

conceptualise the evidence ecosystem adopting a language around evidence pipelines, leaks, etc. Results from primary studies, too, lend themselves to the use of narrative as a communication technique as the example of Oxfam above shows. Narratives might therefore be applied more regularly in the context of EIDM.

DISSEMINATION TECHNIQUES

Dissemination techniques refer to the underlying principles of the communication intervention. They are distinct from communication techniques, which referred to the formulation of effective messages. As the above communication techniques, dissemination techniques are equally applicable to support interventions aiming to influence the uptake of individual research studies or the uptake of the concept of EIDM; and, too, not bound to any particular communication format. Our review of reviews identified six dissemination techniques that might be of potential to benefit the communication of evidence and research use.

Audience segmentation refers to the process of dividing one's audience into smaller groups, who are homogenous with regard to critical attributes (e.g. demographics, behaviour, ideology) mitigating or reinforcing the uptake of the communicated message or behaviour change (Maibach et al 2011; Slater 2010). While tailoring and targeting refers to the adaptation of the communicated message to the intended decision-makers, audience segmentation ensures that the different tailored messages are received by homogenous groups of recipients. Unfortunately, our scoping review did not identify any reviews assessing the independent impact of audience segmentation on behaviour change. Existing reviews that did include communication interventions applying audience segmentation were unable to disaggregate interventions' effects to investigate the contribution of audience segmentation to the overall effect (e.g. Noar et al 2014; Kubacki et al 2015; Bertrand et al 2006).

To ensure an effective dissemination of research evidence, it seems relevant to segment different group of recipients and tailor the results of the research accordingly. Such a process might be able to increase motivation to access and consider the presented research. Similarly, when aiming to communicate the concept of EIDM, audiences could be divided into decision-makers with agenda-setting authority, preference for innovation, little familiarity with research etc. to then formulate different communication strategies and messages for each group. Given the lack of evidence, however, we can only present audience segmentation as of conceptual relevance to interventions communicating evidence. There have been some successful and effective attempts to incorporate audience segmentation strategies into evidence communication interventions (e.g. La Rocca et al 2012), but these results come from individual studies. An increased experimentation with the technique might present a promising contribution to the repertoire of interventions aiming to effectively communicate evidence to decision-makers.

Online and social media tools are changing the way humans communicate and interact (Wood & Smith 2004). As a medium for communication, using online and social media has the potential to increase the reach of dissemination programme and their messages. Social network sites such as *Facebook*, *Twitter*, and *LinkedIn* each count user numbers past 100 millions (Statistica 2015). Our scoping review further found reliable evidence from a large number of reviews of moderate to high appraisal ratings (e.g. Hi-Res 2013; Lustria et al 2013; Moorhead et al 2014) identifying online and

social media communication to be as effective in transmitting information and encouraging behaviour change as traditional communication channels. It remains unclear however which online communication channels are most effective and the mix of tools might since depend on the targeted audience (Colliander & Dahlen 2011; Freeman et al 2015)

Given the above user numbers, communicating evidence via online and social media is likely to reach the largest audience in terms of absolute numbers. It, too, could present a more convenient way of accessing evidence as these tools allow decision-makers to access evidence anywhere, anytime. As a dissemination technique, online and social medial tools have become indispensible and interventions aiming to communicate research evidence seem to be well-advised to move towards the use of online and social media tools as a standard practice. As outlined above, this is likely to increase decision-makers' opportunity as well as motivation to access evidence.

Branding is a potent part of dissemination to create a positive and recognisable image associated with the received communication (Armstrong & Kotler 2012). Branding can thereby enhance the effects of communication interventions (Evans et al 2008; Keller 2009). Branding can, for example, be incorporated into dissemination programmes through the design of recognisable logos and slogans as well as through the distribution of promotional material (Keller 2009). Our scoping review identified branding as an effective dissemination techniques as part of the above-cited reviews on social marketing (e.g. Evans et al 2008; Noar et al 2007).

In the context of EIDM, branding seems to be more relevant to communication interventions that aim to inform decision-makers about the concept of evidence use than to the communication of individual research studies. Policy and service institutions could, for example, introduce recognisable seals of approval for programmes that have consulted the existing evidence in their design. Branding thereby might be able to increase decision-makers' motivation to use evidence if such logos and seals would be associated with a positive image of the organisation. There is currently little application of branding in the context of increasing decision-makers' use of evidence. Individual organisations such as the *Cochrane Collaboration* have created nascent evidence brands. By and large, however, the branding of EIDM as, for example, an organisational quality, seems to present a relevant contribution to inform the future design of evidence communication interventions.

Reminders refer to the simple dissemination technique of systematically following-up on an initial communication or intervention to remind the recipient about the information or targeted behaviour. Reminders are widely applied in marketing, management, and health care and their effectiveness on behaviour change has been confirmed in multiple reviews (e.g. Boaz et al 2012) as well as high-trustworthiness overviews of systematic reviews (Cheung et al 2012; Johnson et al 2015).

There is since good reason to believe that applying reminders to follow-up on the dissemination of research studies is an effective approach to support decision-makers' use of this evidence. Review 1 also identified a review featuring an RCT that found positive effects of sending weekly reminders to decision-makers alerting them about new, relevant evidence added to an online repository (Bunn et al 2012). Reminders are further a cost-effective intervention (Cheung et al 2012) and can be combined with other communication techniques such as targeting and framing. Given their high conceptual relevance and strong evidence-base, a more regular application of reminders seems to be a justified change to the design of interventions providing communication of and access to

evidence. This more regular application of reminders seems likely to be able to improve both motivation and opportunity to use evidence.

Timing influences the effectiveness of interventions communicating evidence (Lavis et al 2003). Insights from behavioural sciences e.g. show the existence of windows of opportunities in which behaviour change communication is effective (Richburg-Hayes 2014; Shepherd 2014). So called 'life moments' such as taking up a new job or moving properties often allow for the establishment of new behaviours. Alas, our scoping review only identified the two above-cited literature reviews (Richburg-Hayes 2014; Shepherd 2014) summarising the effectiveness of timing behaviour change interventions.

These 'life moments' might add to the already established knowledge that the decision-making process, too, is more receptive towards the use of evidence at different stages (e.g. Nutley et al 2007). In addition to targeting the communication of evidence early on in the decision-making process or when external events have created a window of opportunity (e.g. media coverage), one could also target the communication of EIDM principles when decision-makers start a new position and have not yet developed work routines. Likewise, the revision or formulation of organisational protocols might present an effective opportunity to communicate the virtue of EIDM. Lastly, the increasing use of online and social media communication also allows for a tracking of one's audience' receptive hours. Disseminating research results via such channels could benefit from a use of online applications to schedule posting when one's audience is active on social networks too. Incorporating these behavioural insights on windows of opportunity for behaviour change seems a relevant addition to the already suggested practice of timing the communication of evidence in line with the policymaking circle. Both approaches might be likely to increase opportunity to consider evidence.

Information design refers to the attempt to apply design principles to the presentation of scientific information. Information design aims to facilitate collaboration between scientists and designers 'to turn complex information into meaningful narratives, beautiful visions and understandable messages' (Morelli 2015). Information designers, for example, work with the *Norwegian Knowledge Centre for Health Services* to design more appealing and user-friendly summaries of findings tables in Cochrane reviews (InfoDesginLab 2016). The concept includes techniques such as data visualisation for which we identified a moderately-rated review outlining evidence on the performance of different tools (West et al 2014).

Review 1 also provided some evidence that making the presentation of data in systematic reviews more user-friendly is an effective approach to increase decision-makers' motivation to use evidence. The reviewed interventions, however, were not based on explicit design principles, leaving room for the concept of information design to further support the presentation and accessibility of evidence. Information design might find many different applications in EIDM ranging from the design of research reports and data visualisation to the outline of evidence repositories and social marketing materials.

STRATEGIC COMMUNICATION

Strategic communication refers to coherent approaches that combine communication and

dissemination techniques in a formal programme over a sustained period of time. Such explicit strategic communication has the potential to influence decision-makers' use of evidence more systematically and is thus not targeting the communication of individual research studies. Strategic communication interventions might be able to change decision-makers' habits of accessing evidence or their perceptions of research. We identified four potential strategies that seemed to be of particular relevance in the context of research use.

Social marketing has already been discussed in relation to M1 (awareness) including references to its effectiveness to influence behaviour change in the wider social sciences. The intervention is using mainly communication components to inform about and market the targeted behaviour change. Marketing messages are framed depending on decision-makers' needs and tailored to different audiences.

We presented social marketing as a potent communication strategy to influence the behavioural norm of using evidence during the decision-making process. As indicated in the discussion of social marketing in relation to M1, the intervention is vested in an established evidence-base of its positive impact on behaviour change. Its ability to support the creation of behavioural norms lends itself to target decision-makers' motivation to use evidence as well as the actual behaviour of evidence use. Social marketing, thus far, has rarely been suggested as an approach to increase decision-makers' use of evidence and an increased application of the intervention is therefore promising to generate new insights on supporting EIDM.

Awareness-building campaigns have already been discussed in relation to M1 (awareness) including references to effective components of campaigns and their potential application to EIDM. Awareness-building campaigns might use communication tools such as mass media in combination to social marketing to educate about and propose a solution to a specific issue. From a communication perspective, there is an established body of literature commenting on the impact of mass media campaigns as a tool in awareness-building campaigns. Our scoping review identified a number of reviews as well as review of reviews evaluating the effectiveness of mass media campaigns to change behaviours and practices. Among these, a high-trustworthiness overview of reviews (Johnson et al 2015) and a similar-rated Cochrane review (Bala et al 2013) present rigorous evidence of mass medias potential to influence behaviours and practices.

Some research, in particular in health care (Noar et al 2009), might be of such importance that an awareness-building campaign is warranted to communicate the research findings (e.g. protection from HIV infections). In general though, awareness-building campaigns might be more relevant to communicate the concept of EIDM to decision-makers. While its convincing evidence-base suggests mass media to be an effective communication tool within awareness-building campaigns its conceptual relevance to the promotion of EIDM seems somewhat limited. It is not clear whether the use of mass media would be able to target the relevant audiences and its use could be criticised as a slight displacement of scope. We would therefore position the wider literature on awareness-building campaigns (e.g. Joyce 2013; Sayers 2006) to present a more relevant entry point to inform strategic communication to promotion EIDM.

Multicomponent communication strategies refer to communication interventions that combine multiple components to support the communication of the targeted message or behaviour. These components can, for example, include an opportunity to apply the communicated information or to

practice the intended behaviour. Based on a systematic review of communication interventions, McCormack and colleagues (2014) categorise the underlying strategy components as (i) increase reach (of information) to a variety of audiences; (ii) increase motivation to use and apply such information; and (iii) increase ability to use and apply information. The author's high-trustworthiness review, which is the only review identified in our scoping review, finds that there is cautious evidence that a combination of components is more effective than the application of single component interventions.

This finding seems to confirm the results of Review 1, which attested evidence use interventions effective impacts only if they targeted opportunity and motivation simultaneously. There is thus an even stronger conceptual rationale for the packaging of communication interventions to be combined with access to online repositories or motivation-building components such as reminders. Given the small number of interventions identified in Review 1 that applied multi-component communication strategies, this practice might present a relevant contribution to existing intervention approaches. McCormack and peers (2014) suggested framework seems of particular relevance as it is directly correlated with the CMOs of evidence use: reach – opportunity; motivation; ability to use – capability. This framework could also be used to combine different evidence use mechanisms with the communication strategy.

Science communication refers to the profession of communicating the findings of science to decision-makers and the general public[18]. It covers scientists' own efforts to communicate the results of their studies through outreach strategies as well as science journalism. Unfortunately, our scoping review did not identify any evidence on the impact of science communication platforms and initiatives.

Reviewing the above communication interventions, it appears that there might be room for science communication to target decision-makers more explicitly as potential evidence users, and for the profession to be closer aligned with efforts to build awareness for the concept of EIDM (Hart & Niesbet 2012; Dahlstrom 2014). Science communication, for example, could focus less on communicating the results of individual studies and more on the systematic application of scientific knowledge and mode of inquiry. This would allow science communication outlets to not just inform about science findings but further to serve as a tool for social marketing. Science commination might also benefit from identifying a more defined audience. In some context, it might be worthwhile to target communication more at a decision-maker level than to the general public. Science communication further might be able to learn from the recent growth of *vox.com*, and popularity of its remit to 'explain the news' through blending journalism, research, and innovative design. A similar concept might be applicable to the targeted communication of research to decision-makers. The World Bank, for example, has initiated a shared learning event between the Development Impact Evaluation group and *Vox* to discuss the Bank's efforts to popularise research evidence (World Bank 2015). Using science communication to promote the concept of EIDM or blending it with information design principles might present a relevant contribution to increase science communication's impact on decision-makers motivation and opportunity to use evidence.

[18] In the context of this review, we are only concerned with decision-makers as a relevant population.

ACCESS OPTIONS

Our scoping review did not identify a coherent body of research in the social sciences that would indicate what type of access to information decision-makers prefer. We can therefore not discuss whether face-to-face, print, online, or audio/video options of accessing information and research are more promising than others. While individual primary studies have been conducted on e.g. the most effective design of policy briefs as a communication tool (3ie 2010), the results of these studies are heterogeneous and again do not point towards any communication tool in particular. Throughout the literature, there is, however, a trend to highlight the importance of online platforms and mobile technologies as the future main means of accessing information (Castels 2014; NESTA 2014; Maloney et al 2015; Freeman et al 2015). We therefore discuss below two such access options that seem to be of particular relevance to guide the future means of accessing evidence for decision-makers.

Online repositories refer to online tools that allow the collection, structure, and maintenance of information in a central space (Galitz 2007; Wood 2014). In other words, online repositories thereby provide an organized body of related information that is accessible via online technologies. Given that these databases exist in the online space, their impact on usability depends on the design of the user interface to foster engaging human-computer interaction (Galitz 2007; Chang et al 1997; Horsky et al 2012). Our scoping review identified a vase body of knowledge on effective strategies for human-computer interface design (Sutcliffe 2013; Backer et al 1995; Helander et al 2014; Schneiderman et al 1992). This body of literature also includes a number of reviews of high and moderate trustworthiness (e.g. Kelders et al 2012; Horsky et al 2012; Kohl et al 2013; Vandelanotte et al 2014). A number of evidence-based features of online platforms that have been suggested to change health-related behaviour include tailored reminders and feedback to log-on; multiple means of access (phone, tablet, PC); level of interactivity; connection to social networks; and an appealing and easy to navigate interface (Kohl et al 2013; Vandelanotte et al 2014; Webb et al 2010). However, all in all, the body of literature was too vast and heterogeneous to reliable single out an overall effective type of interface design. The main insights from the social science thus refer to highlighting the importance of considering user interface design features when creating online repositories.

In the context of EIDM, online repositories are a widely applied tool to support decision-makers' use of evidence. Often termed knowledge translation platforms (e.g. Moat & Lavis 2014; Berman et al 2015) these tools consist of online libraries of evidence complimented be a range of services to motivate decision-makers to access evidence such as discussion boards, networks, and training opportunities. Yet, as the results of Review 1 showed, there is currently little evidence to suggest that these platforms, on their own, increase decision-makers' use of evidence. Based on the scoping review of the wider social sciences, this lack of impact might be explained by an insufficient consideration of user interface design principles that could facilitate human-computer interaction. Arguably, a tool to promote evidence-informed decision-making should be designed according to the best available evidence on effective design features (Vandelanotte et al 2014). EIDM online repositories therefore could benefit from a closer consideration of user interface design features. A promising approach in this regard might be to improve the design of online repositories to balance the trade-off between functionalities and design principles more effectively (David & Glore 2010). To improve decision-makers' motivation to use online repositories, these might not require the most sophisticated search algorithm or advanced discussion board; an appealing visual design and user-friendly interface might yield higher returns on motivation. Online repositories that aim to motivate

decision-makers' use of evidence instead of merely providing an opportunity to do so might, for example, benefit from the incorporation of some of the above cited evidence-based design features. In sum, online repositories remain a relevant intervention approach to support evidence use. To increase their impact on EIDM, it might be beneficial to enhance their design drawing from IT and information design principles on effective human-computer interaction.

Apps are different types of software that perform specific tasks and services on computers and mobile technologies. Given the ubiquity of mobile devices in particular, human beings access an increasing amount of their information via apps (Arthur 2014; Free et al 2013). Communication literature therefore presents the use of apps as an increasingly integral approach to disseminate information and motivate behaviour change (Curtis & Eleni 2014). Our scoping review, however, did not identify rigorous reviews[19] that formally assessed the potential of apps to communicate information and encourage behaviour change. Conceptual studies on the design of apps to affect the uptake of information and behaviour, however, suggest that their design itself requires the incorporation of evidence-based behaviour change components into the app (Direito et al 2014; Curtis & Eleni 2014).

An evidence use app might provide a relevant tool to familiarise decision-makers with the concept of EIDM. Apps might present a more appealing first encounter with the use of evidence due to the personalised and convenient access on one's mobile. An evidence use app could perform simple functions such as providing a checklist and feature to appraise evidence; rating the relevance and usefulness to feedback on an accessed studies; or allow for the calculation and synthesis of effect sizes. The concept of an evidence use app would not replace or present an alternative to any of these tasks and merely aim to build familiarity with these tasks in a more informal and convenient manner. This could then lead to an increased opportunity and motivation to use evidence.

Summary of social science interventions relevant to M3 (communication & access=)

Our scoping review of the social science literature explored concepts and interventions that might present relevant insights to contribute to the application of M3 (communication & access) interventions. We identified a number communication and dissemination techniques, communication strategies, and access options that might be of relevance to support decision-makers' reception of evidence and motivation to apply it. We assessed these for their likely effects on CMOs and behaviour change outcomes as well as the nature of the insights and contribution to the application of M3 (communication & access) interventions.

Evidence of effects in the social sciences:

Communication techniques found effective in the social science literature and thus likely to be effective to increase motivation to use evidence include: tailoring, framing, explaining uncertainty, and narratives. Applying these techniques could enhance the way research findings are communicated and might improve decision-makers' reception of and attitude towards the communicated evidence and its findings (motivation). As a secondary outcome, they also might enhance the likelihood that a communicated message will be remembered, thereby potentially increasing opportunities and capabilities to use evidence as decision-makers might better recall the

[19] There is a large body of evidence on the effectiveness of mHealth interventions but this literature does not include reviews on the effects of apps relevant to EIDM.

key findings of research studies (opportunity) and display a better understanding of them (capabilities).

Effective dissemination techniques included in our scoping review were online and social media, branding, reminders, timing, and information design. Branding and information design could be of benefit to affect decision-makers' motivation to use evidence. To enhance decision-makers' opportunity to use evidence, by increasing the reach of evidence and the personal convenience of receiving it, online and social media, reminders, and timing appeared as promising interventions. In addition, we identified three coherent communication strategies that were identified as effective in the social science literature and could combine these techniques into a formal and planned effort to encourage behaviour change (in our case evidence use), namely social marketing, awareness-building campaigns, and multi-component communication strategies. Social marking and awareness-building campaigns hold potential to communicate social and professional evidence use norms, while multi-component communication strategies encompass all three components of behaviour change.

Lastly, conceptually relevant interventions for which we identified insufficient evidence of effects referred to: science communication; design of online repositories; and evidence use apps.

Social science insights for EIDM:

In addition to assessing likely effects of social science interventions on CMOs and behaviour change outcomes, our scoping review also aimed to showcase what insights could be gained from their application to support M3 (communication & access) interventions.

Interventions suggested in the social sciences that might contribute different approaches to support EIDM refer to social marketing, information design, awareness-building campaigns, branding, evidence use apps. A re-occurring feature among these seems to be the focus on the communication and promotion of the concept of EIDM—rather than of individual research studies—to encourage behaviour change (i.e. use of evidence).

In a second category of interventions, the evidence-base in the social sciences proposed a more regular application of the interventions. Targeting/tailoring, reminders, timing, online and social media, and explaining uncertainty all refer to interventions that are not systematically applied to support the use of evidence, even through literature in the social sciences suggest this might be of benefit.

Lastly, a number of interventions reported in the social sciences seemed to be able support EIDM by changing the way current interventions are applied. The design of online repositories and science communication outlets to incorporate information design principles, the use of CMOs to design multi-component strategies, and the application of narratives throughout all communication channels seem to fall into this category.

M4 'Interaction & relationships': relevant social science interventions

M4 (interact) reflects the assumption in the research use literature that decision-makers are more likely to access and make use of evidence if there is an interaction with research producers, ideally in

the form of trusted relationships. Many evidence use interventions have taken up this objective aiming to bring decision-makers and researches together to facilitate interactions, e.g. through joint events and assignments. However, Review 1 did not identify M4 (interact) interventions to have a significant impact on decision-makers' use of evidence. The unguided facilitation of interaction, i.e. the bringing together of decision-makers and researchers without a clear purpose or agenda of the shape and outcome of interaction, does not seem to be a particularly effective intervention approach. To understand how the effectiveness of interaction interventions might be improved, in Review 2, we therefore searched the social science literature for concepts related to interaction and relationships. The identified eleven concepts and interventions are listed below in table 5.4 and might be applicable to improve the design and performance of M4 (interact) interventions in order to increase decision-makers' use of evidence.

Table 5.4 M4 (interact) – relevant social science interventions

Intervention	*Conceptual relevance*	*Evidence of effects**
COMPONENTS IN INTERACTION INTERVENTIONS		
Social influence	Potential to provide information on other decision-makers' behaviour to influence the use of evidence and behavioral norms (i.e. motivation and behaviour change).	Yes, strong evidence.
Collaboration	Potential to learn about and support the practice of evidence use through joint assignments (i.e. opportunity and motivation)	Mixed, unclear evidence.
Relationships & trust	Potential to formalise the objective of interaction to increase decision-makers' familiarity, exposure, and perception of research (i.e. opportunity and motivation)	No evidence identified.
Online interaction	Potential to increase the reach, convenience and cost-effectiveness of interaction (i.e. opportunity).	Yes, weak evidence.
INTERACTION TO BUILD PROFESSIONAL NORMS & STANDARDS		
Communities of practice	Potential to negotiate and standardise practices and standards of conduct. This could include establishing evidence use as a standard practice (opportunity) and	No evidence identified.

	increased identification with one's profession (motivation).	
Joint practice development	Formal mechanism to develop a new multi-disciplinary practice, in the context of EIDM the practice of using evidence. Evidence might be considered in the process of developing the practice (opportunity) and involvement in the development might increase motivation too.	Yes, weak evidence.
Mentoring	Potential to change the professional norms and standards of conducts to be more conducive to evidence use (motivation & opportunity)	Yes, weak evidence.
Inter-professional education	Potential for decision-makers and researchers from different contexts to study joint issues from different professional angles and epistemologies aiming to create common professional norms and standards (all CMOs).	Unclear, mixed evidence.

CREATION OF NETWORKS

Formal networks	Potential to organize a group of decision-makers and/or researchers interested in EIDM into a formal body.	No effectiveness reviews identified.
Online networks	Potential to organize a group of decision-makers and/or researchers interested in EIDM into an more informal body using online technologies.	Yes, weak evidence.
Network analysis	Potential to understand the networks of decision-makers' to target interaction interventions and the introduction of evidence use into an existing network of professional relations (opportunity).	No evidence identified.

*We cannot provide a rigorous assessment of the size of the identified effects across interventions.

COMPONENTS IN INTERACTION INTERVENTIONS

The nature of social interaction and networks to support the flow of information and ideas are widely discussed in the social science literature (e.g. Rogers 1995; Valente 1996; Greenghalg et al 2005). Social psychology, constructivist theories of learning, sociology, and management and organisation each contribute the literature on social interactions and networks (Greenghalg et al 2005). This diverse body of literature challenges the identification of specific interventions that could be described as 'interaction interventions' whose conceptual relevance to the research use literature then could be assessed. As a result, our scoping review, in a first step, investigated common components within the diverse body of interventions facilitating some form of interaction to encourage the uptake of information or behaviours. The most relevant components regarding EIDM interventions were identified as social influence; collaboration; building relationships & trust; and online interaction. These are presented below.

Social influence refers to the ability to spread information and behaviour through personal ties and networks (Kim et al 2015; Nutley et al 2007). As a principle of interaction interventions, it assumes that decision-makers can be influenced by the behaviour and information provided by other decision-makers (Cialdini & Goldstein 2004). There is a large body of research including reviews of moderate trustworthiness that confirms that social influence can have positive effects on innovation and behaviour change (e.g. Pittaway 2004; Greenhalgh et al 2005; Walter et al 2005).

The potential of social influence to support EIDM has been raised before (e.g. Nutley et al 2007). In the context of EIDM, social influence is usually positioned to foster a process of peer-to-peer learning between decision-makers and targets the alteration of decision-makers' values and norms regarding research use (Nutley et al 2007). A range of different interventions has been designed to make use of the power of social influence including role models, local opinion leaders, evidence champions etc. Alas, in Review 1, we did not identify review evidence assessing the impact of these interventions on EIDM.

In our scoping review, we, however, found evidence of these interventions' effects to support the uptake of evidence-based practice from a number of high-trustworthiness reviews (e.g. Flodgren et al 2011; Johnson et al 2015). Research use interventions therefore might be well-advised to continue the exploration of the applicability of social influence as an effective component of interaction interventions. Interventions could further target the degree of such social influence to the prevailing extent of research use in practice. Ploderer and peers (2014), for example, differentiate between applying (i) social traces, a passive form of social influence in which decision-makers encounter traces and patterns of other users behaviour (e.g. website usage statistics); (ii) social support, an active form of social influence in which decision-makers receive tangible support through the direct exchange with others (e.g. advice; joint problem solving); and (iii) collective use and learning, in which systems or platforms are designed to introduce a collective body of decision-makers to new social norms and behaviours. This framework might be of relevance to guide the adequate targeting of the most appropriate degree of social influence applied. In sum, social influence remains a relevant interventions approach to foster decision-makes' motivation to use evidence and behaviour change. Incorporating social science insights into the application of social influence in M4 (interact) interventions, such as targeting the degree of influence, might be able to increase the interventions' effectiveness.

Collaboration refers to the underlying objective of interaction interventions to facilitate a process in which a group(s) of people can work together for a joint purpose. Collaboration can take many forms ranging from formal partnerships to informal support and advice; open and closed collaboration; online collaboration, strategic collaboration, etc. (e.g. Daugherty 2006; Pisano & Verganti 2009). Reviewing the social science literature on the performance and application of collaboration techniques, the high amount of investment in terms of time, commitment, finances etc. (e.g. Huberman 1993; Cross et al 2016) as well as organisational obstacles (e.g. Goering et al 2003; Guerkay et al 2015) are cited as a challenge to effective collaboration. Even in cases where these factors can be overcome, there is research to show that collaboration can be harmful to effective decision-making (e.g. Branson et al 2010; Kerr & Tindale 2004). Recently, dubbed the 'collaborative overload' (Cross et al 2016), unstructured collaboration is claimed to decrease the value of interactions by overburdening collaborators within organisations. Our scoping review, though, was unable to identified rigorous review evidence on the overall effectiveness of collaboration to confirm or refute this claim, and there, too, is positive primary evidence positioning collaboration as an effective approach to support decision-making (e.g. Guerkay et al 2015; Palinkas et al 2011). Taken together, this leaves the question to collaboration's impact unanswered.

Collaboration, too, is an underlying component driving interaction interventions in the context of EIDM (e.g. Nutley 2007). It is assumed that joint work between researchers and decision-makers can strengthen the link between the two groups. This collaboration might then lead to a greater familiarity between both groups allowing for practical opportunities to exchange research findings and identify decision-makers' needs. This exchange might also foster motivation to use evidence through the established joint working relationships. Review 1, however, did not identify evidence of the effectiveness of this interaction approach concluding that a lack of clarity on the purpose and nature of the interaction impedes the interventions' impact. These findings from Review 1 seem to resonate with the consensus in the wider literature indicating that collaboration interventions benefit from a more focused programme design featuring tangible benefits to decision-makers and minimal investment of their time (e.g. Ross et al 2003; Varda et al 2012). In sum, the literature does caution against an uncritical embrace of collaboration to foster interaction. The design of collaboration intervention requires a careful and precise programme approach and insights from the social sciences seems to be able to offer a number of contributions in this regard.

Building relationships and trust is a major component through which interaction interventions are assumed to exert their influence (Nutley et al 2007; Palmatier et al 2006). However, interaction interventions rarely specify what constitutes an effective relationship or how the interaction between groups and individuals is assumed to build trust between the two groups. While research in diverse sectors such as political science, marketing, and management identified relationships and trust to be of importance, they did not specify how interventions could actively build the former (Bachman & Inkpen 2011; Borgatti & Cross 2003; Moorman et al 1992). There are some insights in the marketing literature on how to build effective customer/product relationships but these do not seem to be of relevance to guide the design of EIDM interventions (e.g. Palmatier et al 2006). All in all, our scoping review is therefore unable to comment on effective approaches to build relationships and trust between individuals or groups. A potentially relevant framework to understand what type of characteristics might influence whether a relationship between two people leads to an exchange of information is, however, provided by Borgattie & Cross (2003). The authors identify four effective characteristics: (i) knowing what that person knows; (ii) valuing what that

person knows; (iii) being able to gain timely access to that person's thinking; and (iv) perceiving that seeking information from that person would not be too costly.

In the context of EIDM, trusted relationships between decision-makers and researchers are similarly presented as an effective approach to foster interaction (e.g. Orton et al 2011; Oliver et al 2014). Review 1, however, echoes the findings from our scoping review of the social science literature identifying a black box of what constitutes or how to build effective relationships and trust between decision-makers and researchers. We can therefore currently only position relationship-building as a relevant intervention approach to foster interaction without being able to unpack how this might translate into an effective programme design. EIDM interventions aiming to build effective relationships to encourage an exchange of information might benefit from attempting to influence the factors suggested by Borgatti and Cross (2003). Concerning interaction to build trusted relationships increasing decision-makers' motivation and opportunity to use evidence, little is currently known.

Online interaction, i.e. interacting using online and mobile technologies, is sometimes presented as a less-effective form of interaction given a divide between virtual realities and 'real world' behaviour (Bond et al 2012; Centola 2010). Our scoping review of the wider social sciences literature, however, identified no evidence that online interaction is systematically less effective than other interaction channels, a finding based on a number of moderately-rated reviews (Balatsoukas et al 2015; Bond et al 2012; Centola 2010; Maher et al 2014).

Online interaction is therefore as relevant a programme approach to support EIDM as more traditional interventions, such as face-to-face interaction. Online interaction further might benefit interventions to reach larger audiences as well as being more cost-effective in certain contexts (Balatsoukas et al 2015; Maher et al 2014). Online interaction can, for example, take place on discussion boards/fora, social networks and media, mailing lists, webinars, etc. In addition to increasing the reach of interaction (i.e. opportunity), the use of online and mobile technologies could also improve the convenience of interaction as decision-makers and researchers have greater control and more personalised access to the interaction channels. This might translate in an increased motivation to interact and potentially to use evidence.

INTERACTION TO BUILD PROFESSIONAL NORMS & STANDARDS

Combining the insights of the above components, it appears that interaction interventions might be less-well suited to passively disseminate knowledge or behaviours. The role of relationships similarly is not clear either. Social influence, on the other hand, appeared to be a promising intervention component as did the formulation of explicit rationales for and objectives of the interaction. We then used these two components as a filter to identify promising interaction interventions within the body of collected literature. Screening the wider social sciences for promising interaction approaches that seem to feature these two interaction components identified three interventions: communities of practice, joint practice development, and mentoring. While these have been proposed in the context of EIDM before, each of the interventions is often positioned to mainly benefit decision-makers skills to use evidence. From an interaction perspective, however, these interventions seem to hold promise to channel the power of social influence to change norms and behaviour in a more targeted manner. In each of the three interventions, the outcome and purpose

of the interaction between decision-makers is defined (i.e. build a common profession; build a common practice; access to a mentor). Below, we therefore discuss these three interventions regarding their relevance and potential to use interaction to influence the professional norms and standards of researchers and decision-makers.

Communities of practice have already been discussed in relation to M2 (agree). In the social sciences, e.g. literature on organisations and adoption of new practices (Wenger 2004; Hildreth & Kimble 2004), CoPs primarily function as a social construct to support members to interact with each other to develop the standards of conducts and practices of their profession. The main emphasis of CoPs is thus to build a joint community rather than providing a more interactive training approach.

CoPs in the research use domain, too, could be repositioned in line with the emphasis on building joint norms and standards for one's professions. The implications of this might be that CoPs might target homogenous professional groups rather than a mix of professions. Creating a CoP for decision-makers interested in EIDM might be a more effective approach to nurture the power of social influence than forming a CoP brining researchers and decision-makers together. Through CoPs, evidence use could be presented as part of the decision-making profession's standard practices and behavioural norms, thereby increasing opportunity and motivation to use evidence. In this conception, the social science contribution identified in Review 2 refers to a change in how CoPs are applied in EIDM, i.e. less of an educational tool and a more discursive tool, which aims to foster agreement on existing practices and standards of conduct.

Joint practice development (JPD) might present a more focused extension of communities of practice. The concept refers to a process by which individuals, groups, or organisations learn from one another through joint interaction to co-construct a new practice (Hargreaves et al 2011; Sebba et al 2012). JPD was first proposed in the educational literature and can formally be defined as '...learning new ways of working through mutual engagement that opens up and shares practices with others' (Fielding et al 2005). JPD interventions consist of three key characteristics: interaction and mutual development related to the construction of a new/improved practice; recognition that each partner in the interaction has something to offer and, as such, formal channels to input into the desired practice are required; the process of interaction and practice development is itself research-informed (National College for School Leadership 2012; Hargraves 2011). The objective of the interaction is clearly defined and aims at the development of professional norms and standards rather than the exchange of skills and creation of relationships. Our scoping review identified a single review of moderate trustworthiness that identified positive effects of JPD on teacher practice (Sebba et al 2012). The review further presented facilitators of effective JPD interventions, which include e.g. clearly articulated aims and improvement priorities; recognition of respective roles and contributions; building on existing relationships and networks.

JPD seems to resonate with interaction interventions aiming to foster decision-makers' evidence use. The targeted practice in this case would refer to the practice of EIDM. Decision-makers thus could work jointly to develop guidelines and standards for the practice of evidence use in their professions. Again, this interaction approach might be better suited for homogenous groups of professionals. The intervention's clearly defined objective and conceptualisation of the roles and benefit of interacting might contribute relevant insights in the application of existing interaction interventions (M4). Applying JPD could increase opportunity to use evidence as different types of

evidence might be considered in the process of practice development. Motivation, too, might increase as decision-makers are in control to shape the definition of what constitutes a practice of evidence use in their own context.

Mentoring is a widely discussed intervention in the social sciences featuring over 50 different definitions (Crisp & Cruz 2009). Most of these associated mentoring with educational objectives; career-related objectives; as well as psychological functions, which include role modeling, acceptance/confirmation, and moral support (Crisp & Cruz 2009; Eller et al 2014). The last two objectives are claimed to be of benefit to mentees' professional development, self-efficacy, self-worth, and professional identity (Eby et al 2010). Our scoping review identified four moderately rated reviews that found significant positive effects of mentoring interventions on all three objectives (Gagliardi et al 2014; Gosh et al 2013; McKenna et al 2011; Sambunjak et al 2006). It therefore transpired that, in the wider literature, mentoring is not confined to educational objectives and as well is positioned to be of relevance to share professional norms and identities.

This latter objective might enhance the application of mentoring interventions in EIDM, which thus far in mainly discussed as an intervention to increase decision-makers' evidence use skills. The mentoring interventions assessed as part of Review 1, for example, exclusively targeted educational objectives only (Abdullah et al 2014). In the light of the above, there might since be a rationale to refocus the conception of mentoring in the context of EIDM. As much as decision-makers' might gain practical EIDM skills through mentorship, the role of mentors and the content of mentorship might be used to nurture professional identities and standards of conduct that are more conducive to the use of evidence. This assumption is, for example, underlined by the findings of Gosh and peer (2013) that mentoring's reciprocal and collaborative features led to an increased organisational commitment and professional identify. Mentoring as an interaction intervention to share and develop professional norms and standards seems relevant to increase both opportunity and motivation to use evidence. As indicated above, this would present an extension and change to the current application of mentorship in EIDM.

Inter-professional education has been discussed in relation to M2 (agree) already, including references to its potential effects. We presented inter-professional education as a tool to bridge professional silos and epistemological tradition to work towards and motivate collaboration between different professionals, which in return might support agreement on, or at least tolerance of, professional norms and practices (Zwarenstein & Reeves 2006; Reeves et al 2013). Our review of reviews identified a single review of high trustworthiness that found mixed effects of inter-professional education to encourage practice change (Reeves et al 2013).

While we discussed the ability of inter-professional education to nurture professional understanding and joint norms and practice in reference to building consensus on fit-for-purpose evidence, this is but one potential standard of practice related to EIDM. Inter-professional education might equally be applied to foster general evidence use norms within decision-making professions. The intervention thus fits in the context of M4 (interact) as an interaction interventions aiming to build professional norms and standards. Decision-makers are exposed to different forms of social influence introducing them to different practices of evidence use (opportunity) as well as reducing professional silos and epistemological reservations (motivation).

CREATION OF NETWORKS

A more formal approach to facilitating interaction interventions is presented by the creation of organised networks. These networks can either comprise researchers and decision-makers or connect decision-makers interested in EIDM with each other. Networks aim to formalise the connections and interactions between network members, e.g. through hosting regular events and communication. They thereby channel and target members' interaction and can target the creation of effective connections. Our scoping review identified two different types of literature on the creation of networks potentially relevant to the research use profession.

Formal networks refer to the foundation of an organised body to connect individuals or organisations with a similar interest. Networks can be broadly defined as structures that link actors (individuals or organizations) who share a common interest or a set of values (Court & Mendizabal 2005) Searching the social science literature regarding relevant interaction interventions, the literature suggests the organisation of formal networks as a promising intervention approach to foster the flow of information and practices between individuals and organisations (e.g. Karl et al 1999; Perkin 2009; Taylor 2015; Willet 2006). Court and Mendizabal (2005), for example, identify six different functions in which networks could achieve this objective: (i) filtering the amount of information to be organised and used in a more productive way; (ii) amplify existing ideas and information; (iii) convening people or groups of people; (iv) facilitating members work processes; (v) building communities with joint values and standards; and (vi) investing to support member' activities. While there is ample literature on the role of networks and their design, our scoping review did not identify review evidence empirically assessing the effectiveness of formal networks. There is some conceptual work on effective network characteristics (e.g. Willard & Creech 2006; Willet 2006; Court & Mendizabal 2005) but this does not comprise a formal review of empirical evidence.

The creation of formal networks is not a new suggestion to increase decision-makers' use of evidence and many such networks are currently in existence e.g. EVIPNet[20], EBPDN[21], Alliance for Useful Evidence[22]. To name but a few functions, networks seems to be relevant to gather evidence and present it to influence policy or programme decisions; they, too, could increase relationships and trust between decision-makers and present an informal channel for consensus-building. There are individual evaluations of EIDM networks (e.g. Data & Richards 2013; Motha et al 2016; Percy-Smith et al 2006) that hint at the challenges of achieving network sustainability. Review 1, too, was, unable to comment on network's effectiveness given a lack of rigorous evaluations (and thus research synthesis) of networks' performances. We conclude therefore that while formal networks remain a conceptual relevant approach to increase decision-makers' exposure to evidence (opportunity) and social influence (motivation), there currently is little synthesised knowledge on formal networks' impact and effective design.

Online networks refer to the organisation of networks using online and mobile technologies. While online networks include popular networks such as *Twitter*, *Facebook*, and *LinkedIn*, any type of formally organised online community presents an online network. Online networks are often subject to the same criticism as online interaction, i.e. that they are less effective and persuasive than

[20] Evidence-informed policy network http://global.evipnet.org
[21] Evidence based policy in Development Network https://partnerplatform.org/ebpdn/
[22] Alliance for Useful Evidence http://www.alliance4usefulevidence.org

traditional face-to-face networks (Elison et al 2007; Golder et al 2007). Our scoping review of the social science literature, however, identified no evidence that online networks are ineffective to facilitate the exchange of information or creation of relationships between network members. A number of moderately-rated reviews attest online networks positive impacts on behaviour change (e.g. Balatsoukas et al 2015; Maher et al 2014). Individual studies further show that tie strength and embeddedness in online networks is sufficient to build social influence (Aral & Walker 2014; Bond et al 2012).

In the context of EIDM, this positions online networks as a viable intervention approach to foster interaction between decision-makers' and researchers. Online technologies could be used to organise a group of decision-makers and/or researchers interested in EIDM into a more informal body of an online network. Online and mobile technologies might be able to extend the reach of the network (i.e. opportunity) and the convenience of accessing it (i.e. motivation). They can be accessed anytime, anywhere and might therefore allow for a different from of interaction and exchange between network members. In sum, online networks present a relevant addition to interaction interventions aiming to build relationships and networks to foster evidence use (M4).

Network analysis is a tool to understand the nature of a network providing insights on information bottlenecks and the most effective space to introduce interventions to the network. Social network analysis maps out social structures within networks highlighting nodes (e.g. network members) and the ties (e.g. interactions, relationships) that connect them (Scott 2013). Statistical network analysis is a recent spin to this methodology incorporating exponential random graph class of models to allow the prediction of ties between network members and their possible function (Shearer et al 2014). Social network analysis has been applied to map the networks of a wide range of decision-makers to highlight how decision-making processes and the spread of behaviour and information are mitigated and reinforced by network structures (Aral & Walker 2014). Unfortunately, our scoping review did not identify evidence reviewing the outcomes of formally analysing social networks to increase interventions' effectiveness. Existing reviews are limited to characterising different network structures, but do not comment on how and which applied interventions might affect these (e.g. Cunningham et al 2011).

Social network analysis seems to be relevant to support interaction interventions (M4) to target programme design and enhance the power of social influence. Understanding the composition of decision-makers' networks could explain why some relationships form and others do not; it could predict which decision-makers to target for invitation to dialogue events, and who is likely to diffuse research evidence to her colleagues (Shearer et al 2014). A study by Palinka's and colleagues (2011), for example, uses social network analysis to show how decision-makers in California, who are identified as key nodes in the organisational network, develop and maintain networks of information and advice based on roles, responsibility, geography, and friendship ties. Encouraging the adoption of evidence-based practices in this network depended on the decision of these network members and the spread of evidence-based practice in the network followed the ties of these decision-makers. Christine and peers (2015) use a similar approach to highlight organisational silos and how they affect the diffusion of evidence. A last example of the possible relevance of network analysis tools to EIDM is presented by Kim and colleagues concept of social network targeting (2015), which is claimed a more cost-effective approach to make use of social network analysis without having to produce a full map of the targeted network. In sum, social network analysis seems to present a

relevant contribution to interaction interventions aiming to influence evidence use. It might primarily affect decision-makers' opportunities to use evidence by improving the flow of evidence through network structures.

Summary of social science interventions relevant to M4 (interact)

Our scoping review of the social science literature explored concepts and interventions that might present relevant insights to contribute to the application of M4 (interact) interventions. We identified four relevant interaction components, which could be applied in two broad groups of interventions (interaction to build professional norms & standards; creation of networks). We assessed these for their likely effects on CMOs and behaviour change outcomes as well as the nature of the insights and contribution to the application of M4 (interact) interventions.

Evidence of effects in the social sciences:

Our scoping review of the social sciences identified social influence and online interaction as the most effective interaction components. The effects of collaboration and relationship building, in contrast, are currently unclear. Throughout all four components, the literature suggests that interaction interventions might be less well-suited to passively disseminate knowledge or behaviours and that the formulation of explicit rationales for, and objectives of, the interaction can benefit programme design.

Screening interaction interventions that incorporated these effective components, we identified evidence of positive impacts for mentoring, joint practice development, and online networks. The first two of these, might be able to use interaction among decision-makers as a tool to build professional norms and standards. In the context of EIDM, this process might leave room to embed norms and standards related to evidence use, thereby increasing motivation and opportunity to use evidence. Further, these interventions appeared most relevant to foster interactions between different groups of decision-makers rather than between decision-makers and researchers per se. Online networks appeared effective to enhance the reach and convenience of networking activities, thereby potentially increasing motivation and opportunity to use evidence.

Lastly, inter-professional education, communities of practice, and the creation of formal networks, and application of network analysis to map decision-making structures were of conceptual relevance but currently lack a reliable evidence-base.

Social science insights for EIDM:

In addition to assessing likely effects of social science interventions on CMOs and behaviour change outcomes, our scoping review also aimed to showcase what insights could be gained from their application to support M4 (interact) interventions.

The use of network analysis to map decision-makers' professional network structure to gather information on network nodes and ties as well as information bottlenecks seem to present an additional tool in the repertoire of interventions aiming to build effective interaction and relationships (M4). The design of inter-professional education programmes to foster professional

norms and standards related to evidence use, too, seemed to present a relevant contribution to M4 (interact) interventions.

A majority of interaction interventions and components identified in the social sciences suggest that changes to the existing application of M4 (interact) interventions potentially improving intervention effectiveness. The interaction components of social influence, collaboration, and building trusted relationships each are currently applied in M4 (interact) interventions; and social science research proposes a number of changes to the prevailing manner in which these are applied. Likewise, the design of communities of practice, joint practice development, mentoring, and online networks could be improved drawing from social science knowledge.

Lastly, the body of evidence in both the social science and the evidence use literature suggests that online interaction, in addition to traditional interaction techniques, should be established as a regular practice in M4 (interact) interventions.

M5 'Skills to access & make sense of evidence': relevant social science interventions

M5 (skills) refers to interventions that aim to provide practical skills to decision-makers that are required to use evidence. This might include e.g. skills to search for and appraise evidence that are usually facilitated through some form of a dedicated educational programme. Review 1 provided evidence that these educational interventions were effective to encourage decision-makers' use of evidence, in particular if interventions supported capability and motivation to use evidence simultaneously. The results of the synthesis, however, did not provide insights into which type of educational programme or pedagogy might be most effective to support the retention of knowledge and acquired behaviour, and neither were we able to unpack the link between educational programmes and increased motivation to use evidence. For our scoping review of the social science literature we therefore searched widely for research on adult education using key words such as 'capacity-building'; andragogy; 'professional development'. We were particular interested in literature explaining how educational effects might be sustained given that Review 1 provided evidence on the effectiveness of M5 (skills) interventions *per se* already. Table 5.5 below lists the twelve identified interventions grouped into four overarching categories.

Table 5.5 M5 (skills) – relevant social science interventions

Intervention	*Conceptual relevance*	*Evidence of effects**
CUSTOMISING CAPACITY-BUILDING		
Targeting	Potential to extend the application and relevance of capacity-building to better match individual decision-makers' organisational and institutional background (motivation; capability).	No evidence identified.

Personalisation	Potential to personalise EIDM capacity-building to decision-makers' identities, preferences, and needs to increase learning outcomes (capability), ownership and motivation to apply EIDM skills.	Mixed, unclear evidence.
Learning analytics	Potential to inform EIDM training by real world data sets (opportunity) and to iterate training courses rapidly to focus on most relevant content/skills (motivation; capability).	Yes, weak evidence.
ADULT LEARNING		
Andragogy principles	Potential to increase EIDM capacity building through drawing from established theories of adult learning (i.e. andragogy), thereby potentially leading to a more rewarding and effective learning experience (motivation and capability).	Yes, strong evidence.
Communities of practice	Potential to build organisational capacities, e.g. protocols, tools, and systems supporting EIDM (capability; opportunity).	No evidence identified.
Mentoring	Potential to obtain EIDM skills with the help of a dedicated mentor (capability).	Yes, strong evidence.
Supervision	Potential to ensure the application of gained professional development skills (i.e. EIDM skills). Supervision sets incentives to apply EIDM skills (motivation) and reinforces learned skills through encouraging practical application (capability; motivation).	Yes, strong evidence
Secondments	Potential for the exchange of individual and organisational capacities through the temporary transfer of staff between organisations (opportunity; capability). Secondments allow decision-makers or researchers to gain an experience of each other's professional contexts (motivation).	No evidence identified.

DIGITIAL EDUCATION		
Online learning	Potential to increase the reach (opportunity) and convenience (motivation) of EIDM capacity-building, in addition to learning outcomes (capability).	Yes, strong evidence.
Apps	Potential to increase the appeal and convenience of EIDM capacity-building. An evidence use apps could reinforce the effects of an educational programme (capability) and provide a convenient and personalised encounter with EIDM (motivation and opportunity).	No evidence identified.
LEARNING OUTCOMES		
Multi-level capabilities	Potential to foster the trajectory of newly developed EIDM skills within the decision-makers' host organisations. Multi-level capabilities embed EIDM skills at an organisational level increasing and sustaining both capability and opportunity to use evidence.	No reviews identified.
Cognitive maturity / critical thinking	Potential to move beyond the teaching of EIDM skills towards the development of thinking patterns/processes that embed the application of these skills (all CMOs).	Yes, weak evidence.
Evidence literacy	Potential to develop a holistic and accessible concept of EIDM as a universal skills set.	No reviews identified.

*We cannot provide a rigorous assessment of the size of the identified effects across interventions.

CUSTOMISING CAPACITY-BUILDING

Reviewing the educational literature on adult learning and capacity-building, we identified a common theme on the importance of customising the learning experiences to make it more relevant to the recipients' needs and increase learning outcomes (e.g. Muñoz et al 2013; Luterbach & Brown 2011; Kislov et al 2014; Finger & Asun 2001). Different learners and different organisations will require different learning content and approaches, and the literature suggested a number of

techniques on how to match the capacity-building programme with learners' needs. Our scoping review identified three possible approaches to customise capacity-building that seemed of particular relevance to educational interventions aiming to support decision-makers' skills to access and make sense of evidence (M5).

Targeting capacity-building refers to an increased focus on whose capacities should be built, for what purpose, and what capacities are likely to be required to support this purpose (Fukuda-Parr & Lopes 2013; NORAD 2015; Labonte & Laverack 2001; Kislov et al 2014). In the literature, there was in particular a discussion to target capacity-building at different organisational levels, i.e. individual, organisational and institutional (Fukuda-Parr & Lopes 2013; Lennie et al 2015; Bonfoh et al 2015). Explicitly targeting programmes at these different levels was positioned as a more holistic programme approach increasing the relevance and sustainability of the educational outcomes (e.g. UNDP 2009; Jörgens et al 2013). While we identified a large body of conceptual literature proposing a better targeting of capacity-building programmes, there was little empirical assessment on the impact of targeted capacity-building and we did not identify any review evidence.

Targeting capacity-building programmes to different levels of organisation seems relevant to M5 (skills) interventions too. In Review 1, we found that the identified capacity-building interventions exclusively aimed to be support individual decision-makers' EIDM skills. Interventions e.g. focused on critical appraisal skills and searching evidence libraries. In the light of the social science literature presented above, this focus on individual decision-makers and single practical skills seems too narrow. Capacity-building to support the use of evidence could therefore benefit from conceptualising EIDM skills less as an individual's capacity and explore the relevance of formulation organisational and institutional EIDM capacities. Critical appraisal as an organisational capacity could, for example, refer to provision of a computerised appraisal system that homogenises the conduction of critical appraisal throughout the organisation. An increased focus on organisational and institutional EIDM capacities is also likely to reveal a number of desirable capacities that are not usually associated with research use. A literature review by Schneider and peers (2014), for example, identified eight organisational capacities that might be able to facilitative research use. These include e.g. relevant policies, IT systems, monitoring and evaluation, intra-staff networks—it seems that few of these capacities would commonly be classified as EIDM skills.

Taking an organisational lens to target capacity-building programme could also pay closer attention to the existing levels of capacities and contextual factors influencing the likely impact of the programme. Review 1 did identify evidence that the prevailing organisational culture of evidence use affects what type of capacity building is required, e.g. active or passive dissemination of skills (Bunn et al 2012). Efforts to conceptualise capacity-building as an organisational intervention suggest, for example, to use the terminology of capacity-sharing or capacity-developing (Champagne et al 2014; Kislov et al 2014) to indicate that the intervention will be tailored according to existing capacities and organisational needs. Repositioning EIDM capacity-building to target multiple levels of originations has the potential to embed the targeted EIDM skills within organisational and institutional structures. This holistic approach could enhance all three behaviour change components in a sustainable manner.

Personalisation of capacity-building is an extension of targeting and allows for an even closer customisation of the educational efforts to learners' need. As a pedagogy personalised learning

refers to a highly structured and responsive approach to foster each individual's learning, characterised by ambitious objectives, challenging personal targets, rapid intervention to keep learners on trajectory, and rigorous assessment to check and maintain learners' progress (Gilbert 2007; DCSF 2008). In the context of adult education and capacity-building the components of target setting & tracking; focused assessment; and differentiation seem particular relevant (see discussion on andragogy). Unfortunately, our scoping review failed to identify any existing reviews assessing the impact of capacity-building or other adult learning programmes applying the pedagogy of personalised learning. In addition to personalisation as a formal pedagogy, personalised capacity-building can also refers to a more basic approach to nurture decision-makers' ownership and identification with the intervention and educational content. Using personalised reminders about learning content and objectives, for example, has been found effective to increase engagement and learning outcomes (Fish & Wickersham 2009; Bloom 2005). Both these reviews were rated as of moderate trustworthiness.

Both presented conceptions of personalisation seem relevant to capacity-building in the context of EIDM. Regarding personalisation as a pedagogy, an EIDM capacity-building in India, for example, allows decision-makers' to set their own EIDM-related learning objectives and uses rapid assessments to design a customised learning strategy for each decision-maker based on her progression and learning habits (Harvard 2016). Initial mid-term evaluations report that this approach increased motivation and content relevance.

Regarding personalisation to increase programme ownership, capacity-building exercises could be personalised to decision-makers' identities and professional values. Using positive identity cues is an effective cognitive technique to enhance learning outcomes (e.g. World Bank 2015). To increase the potential of EIDM training, one could for example trigger decision-makers' professional ethos prior to the learning exercises. Taken together personalisation—either as a pedagogy or a more basic programme approach—seems likely to be of benefit to EIDM capacity-building programmes enhancing their potential impact on motivation and capability to use evidence. Personalisation could therefore be used to enhance existing approaches to capacity-building.

Learning analytics or educational data mining refer to the use of online and mobile technologies to gather rapid feedback on learners' performance to allow for the tailoring of educational approaches (e.g. Siemens & Long 2011; Fullan & Donnelly 2013; Elias 2011). The technique is closely related to and incorporated in personalised learning programmes (DCSF 2008; McLoughlin & Lee 2010). Data is routinely collected on how learners perform on tasks to identity challenging content and effective content and learning techniques. The former are then applied consistently, while the latter are addressed through special support. Online and mobile technologies further allow for the incorporation of real world and up-to-date data sets into learning activities (Clark et al 2014; Siemens & Long 2011). Our scoping review identified a single review of moderate trustworthiness (Papamitsiou & Economides 2014) attesting to the positive effects of using learning analytics to improve educational outcomes.

In the context of EIDM, learning analytics could be used to improve the impact and relevance of EIDM capacity-building programmes. The potential to use real world data sets, e.g. data from decision-makers' own organisations might increase the relevance of the educational content and showcase local sources of evidence. This might support both opportunity and motivation to use

evidence. Learning analytics could also be used to iterate training courses rapidly to focus on most relevant content/skills based on decision-makers' feedback. This again might improve motivation, but also might improve learning outcomes (i.e. capability) as training could be tailored to challenging content and achieve a better fit between teaching approach and learners' needs.

ADULT LEARNING

Educational interventions in the context of EIDM almost exclusively target adult learners. It therefore seems logical that the integration of effective adult learning interventions and principles in the design of EIDM capacity-building programmes might be able to increase intervention impact. As a result, our scoping review of the wider social science literature included key words related to adult learning, aiming to assess what research findings might be relevant to inform educational efforts to increase decision-makers' EIDM skills and knowledge. Below, we first discuss the overall relevance of the adult learning literature to EIDM, before presenting three specific adult learning interventions that seem of particular benefit to research use capacity-building.

Andragogy is the method and practice of teaching adult learners (Knowles et al 2011). The term differs from pedagogy, which is posited as a teacher-focused concept (i.e. teaching strategies for minors), and posited as a form of learner-focused education (i.e. supporting adult's own learning) (Conner 2004; Taylor & Kroth 2009). Andragogy is therefore an approach to support self-directed learning designed around six key assumptions on how adult learners differ from minors: (i) learner's self-concept; (ii) experience; (iii) readiness-to-learn; (iv) orientation to learn; (v) motivation to learn; and (vi) reason to learn (Taylor & Kroth 2009; Knowles et al 2011; Thompson & Deis 2004). While not all of these assumptions are unanimously supported (see e.g. Clardy 2005; Merriam et al 2007), the premise that adult learning is more concerned with assisting the adult to learn—instead of a teacher instilling unknown content to her—seems widely supported (Birzer 2004; Taylor & Kroth 2009). Adult learning thereby might be best understood as 'a personal interactive agreement between the learner and the learning endeavor, the "experience"' (Knowles et al 2011).

Our scoping review identified a large body of reviews on the design of effective adult learning interventions (e.g. Dunst & Trivette 2012; Smith & Gillespie 2007; Taylor 2007; Tusting & Barton 2006). Among these, Dunst and Trivette (2012) provide the most accessible and extensive review. Judged of moderate trustworthiness, their meta-analysis identifies accelerated learning, coaching, guided design, and just-in-time training as four effective adult learning methods. Applying moderator analysis, the review further is able to examine particular design features that increase the impact of these methods. The authors find that adult learning programmes that facilitate less than 20hrs of instruction/training have significantly smaller effect sizes as do programmes that involve more than 40 participants[23]. Interventions that are conducted in the participants' work settings had effect sizes twice as large as interventions using external settings such as university courses. The authors speculate that this comes as a result of learners having an immediate opportunity to apply newly acquired knowledge or skills at the work place.

All in all, there is large body of evidence on the design of effective adult learning interventions, which is beyond the scope of this review. In the context of EIDM, capacity-building and training to

[23] Not cumulative—40 participants attending each training event on average.

foster decision-makers skills to use evidence are likely to benefit from a more formal integration of this body of knowledge to advise on effective learning strategies and settings. Individual programmes could e.g. draw lessons from the findings that adult learning at the work place is suggested to be more effective than at an external venue. However, EIDM capacity-building programmes differ in context and objective and so does the research on adult learning. The main suggestion of this scoping review is therefore for an increased consultation of the adult learning literature when designing EIDM capacity-building programmes. This consultation is likely to improve programme design, thereby potentially leading to a more rewarding and effective learning experience (motivation and capability).

Communities of practice have been extensively discussed as a relevant intervention approach in relation to M2 (agree) and M4 (interact). We defined CoPs as "groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis" (Wenger et al 2002: 4), and positioned them as a tool to support decision-makers to develop professional norms and standards related to the use of evidence, e.g. a joint definition of what constitutes fit-for-purpose evidence. We cautioned, however, that there is currently a lack of reliable research evidence on the effectiveness of CoPs. Below, we offer an additional educational perspective on the relevance of CoPs to M5 (skills) interventions.

Above, we assessed CoP's conceptual relevance to mainly allow for the creation of professional norms and standards encouraging the use of evidence. In their relevance to EIDM, we thus did not position CoPs as an educational intervention. While in the literature on adult learning CoPs are indeed cited as a promising approach to foster self-directed and social learning (Hansman 2001; Merriam et al 2007; Wenger 1999), the findings of Review 1 indicate that this passive form of EIDM skills dissemination is not effective to support evidence use. The application of capacity-building in the wider social science literature, however, is often referring to institutional and organisational capabilities (see section on multilevel capabilities below) and encourages the objective of building multiple levels and orders of capacity within an organisation. The latter might present a promising entry point for the application of CoPs from an educational perspective. Organisation's EIDM capacities, e.g. protocols, forms of conduct, tools, might indeed be shared through CoPs. As they are more relevant to the creation of a joint profession, such capacities might be more receptive to passive diffusion methods. If an EIDM capacity-building programme is thus targeting organisational or team level capacities, CoPs might present a relevant intervention approach and should not be ruled out altogether. Applied in this context, CoPs could foster organisational opportunities and capabilities to apply research evidence. This might present a change to the current use of CoPs.

Mentoring has been discussed in relation to M4 (interact) already including references to mentoring's positive effects on personal and professional outcomes. Mentoring, too, is cited in the literature on adult learning as an effective andragogy (e.g. Rice 2007; Merriam et al 2007). The characteristics of mentorship seem in particular well-suited to support the core principles of effective adult learning, i.e. self-directed learning and an opportunity to apply new knowledge and skills in a work setting (Knowels et al 2011). Searching the social science literature for reviews on the impact of mentorship interventions on educational outcomes, our scoping review identified four moderately rated reviews that found consistently positive effects of mentoring on knowledge and diffusion outcomes (Gagliardi et al 2014; Gosh et al 2013; McKenna et al 2011; Sambunjak et al

2006). In the social science, for example the management profession (Gosh et al 2013), mentorship thus seems to be an effective approach to improve adult learning.

Based on the result of our scoping review, we would therefore position mentoring as an intervention of continued conceptual relevant and potential to support EIDM capacity-building. This contradicts, however, the single review included in Review 1, which did find mixed impacts of mentorships as part of multi-component interventions (Abdullah et al 2014). In this context, the identified social science reviews suggest a number of characteristics, which might be associated with more effective mentorship outcomes and guide a re-design of mentorships to support EIDM. These characteristics include: combining preliminary workshop-based training with individual mentoring; mentors receiving training and being either senior employees or external experts; mentoring being offered for at least an hour periodically over a minimum of six months; the use of screening based criteria to match mentors and mentees; and formal conflict resolution mechanisms and clearly written objectives for mentorship processes (Gagliardi et al 2014; Gosh et al 2013; McKenna et al 2011). There is also some nascent work on team and institutional mentorships to change organisational norms as well as the promise of e-mentoring (Baranik et al 2009; McKenna et al 2011; Wilbank 2014), which might be of relevance to EIDM too. In sum, we would therefore argue that mentoring remains a relevant educational approach to build decision-makers' capability to use of evidence. Incorporating some of the effective programme characteristics suggested in the social sciences might present a relevant contribution to the current design of EIDM mentorship interventions.

Supervision as an educational practice to support the application of knowledge and skills in practice presents the last adult learning intervention identified in our scoping review. Supervision links management, leadership, and adult learning literature and presents a tool to reinforce desired behaviours and practices (Alleyne & Yumaa 2007; Goodyear 2014). A large amount of literature pays testimony to the rationale for integrating supervision techniques into adult learning programmes (e.g. Brannon 1985; Goldman 2011; Trotter 2006). In addition to retention and practical application, supervision can set incentives and direction to the learning process itself, increasing learners' motivation and commitment. There is a large body of literature reviewing the effects of supervision on educational and practice outcome. High-trustworthiness reviews with a particular focus on the educational component of the supervision intervention identified our scoping review include e.g. Farnan et al (2012); Milne & James (2000); Milne (2008). Each of these identifies a positive effect of supervision on educational outcomes.

This strong evidence-base makes a case for the incorporation of supervision techniques into the design of EIDM capacity-building. Supervision of the application of EIDM skills might, on the one hand, reinforce decision-makers' capability to use evidence, and, on the other hand, further encourage a wider behaviour of applying these skills on a more routine basis. Combing capacity-building with a supervision of the use of the targeted capacities might thereby improve all CMOs to use evidence. Supervision has been suggested before in the context of EIDM from a management perspective (e.g. Peirson et al 2012; Yost et al 2015). The contribution offered in the wider social science literature thus refers to the combination of supervision and capacity-building in a combined educational EIDM intervention.

Secondments refer to a temporary transfer of an employee from one organisation to another organisation (or within departments of the same organisation) for a specific purpose and period of

time (Renshaw & Holland 2013). Secondments are common organisational tools applied in the business and public sector to broaden an organisation's skills set (Barkworth 2004; Gerrish et al 2014). Both the host organisation and the secondee are assumed to benefit from this exchange of skills. The host organisation is able to attract a complementary skills set and to gain an independent perspective on their performance, while the secondee and her organisation benefit from the new skills gained during the secondments. Secondments are therefore a popular intervention to exchange expertise and attract new capacities (Renshaw & Holland 2013; Hamilton & Wilike). Our scoping review, however, did not identify any reviews assessing the effectiveness of secondments.

In the context of EIDM, secondments might be an effective tool for organisations to acquire and exchange different capacities and approaches to decision-making. The seconding of researchers to public service and policy organisation and, vice-versa, of decision-makers to research institutions might present an effective approach to build EIDM capacities at an organisational level. Research-to-policy secondments have, for example, been applied in the health care and education professions (Gerrish et al 2014; O'Byrne & Smith 2010; Costely et al 2008) and there seems to be room to focus these initiatives more strongly on EIDM capacities and objectives. Depending on the nature and objective of the secondment, the intervention might target all three components of behaviour change. We need to caution, however, that in Review 1, knowledge brokers, as an intervention approach closely related to secondments, was not found effective to increase evidence use.

DIGITAL EDUCATION

In the information age, education is increasingly provided with the help of digital technologies, changing the nature of learning experiences (Castells 2000; Winters 2014). Digital technologies allow learners to access a vast and free amount of knowledge via the Internet; learn across contexts; learn anytime, anywhere; and monitor and personalise their learning efforts (e.g. Luterbach & Brown 2012; Fullan & Donnelly 2013; Traxler 2010; Sharples et al 2007; UNESCO 2013). This impact of digital technologies on education equally applies to adult learning and capacity-building initiatives. Educational interventions to foster decision-makers' EIDM skills therefore are likely to benefit from an embrace of digital technologies to support learning efforts. Our review of the vast social science literature on the impacts of digital education singled out two overarching interventions that might be of particular relevance to support EIDM capacity-building programmes.

Online learning refers to any type of education that is primarily facilitated using online and mobile technologies. A large body of review evidence including reviews of high trustworthiness attests that online learning is at least as effective as learning using traditional education tools (e.g. Clark et al 2014; Means et al 2010; Hassler et al 2015; Andrews et al 2006).

Given the ubiquity of digital technologies and their special affordances such as connectivity, mobility, and convenience, online learning since seems to present a relevant intervention approach to facilitate EIDM capacity-building. EIDM online learning might further feature a number of unique affordances that traditional capacity-building programmes cannot provide. Using digital technologies, the reach of educational programmes can be enhanced, leaving even the possibility to design a Massive Open Online Course (MOCC) on the topic of EIDM. *Harvard's Evidence for Policy Design* team, for example, currently runs an online EIDM training course for over 500 policymakers in different Indian provinces at once (Harvard 2016). Digital tools further allow the learner to engage

in learning activities anytime, anywhere, greatly enhancing the convenience of the training programme (Traxler 2010; Winters 2015). This ability might be of particular relevance given the busy schedule of most individuals in decision-making positions and the tendency for research producers and users to not reside in close proximity. Lastly, online learning tools also allow users to track their learning efforts and customise the sequence of lessons, exercises, etc. (Luckin et al 2012). All in all, online learning is since a promising educational intervention potentially able to support all three behaviour change components. Facilitating EIDM training programmes using online and mobile technologies would present a relevant extension of current educational practices in EIDM.

Apps have been discussed in relation to M3 (communication & access) already including references to their likely effects. In the context of digital education, apps assume a supplementary role to the main online learning intervention. They are commonly presented as an extension to the formal learning experience allowing learners to access educational content across diverse contexts, e.g. time, space, formal/informal, etc. (Traxler 2010; Sharples et al 2007). Apps might thereby reinforce and contextualise the taught content supporting learning outcomes. In line with the above, we did not identify any review evidence on the educational impact of apps either.

In the context of EIDM, the proposed evidence use app could, e.g. enhance EIDM capacity-building programmes through providing follow-up exercises and opportunities to revive context and access lessons in a different social or professional context. While such an app could provide access to critical appraisal tools or EIDM quizzes, its main function would be to extend the reach and convenience of the main educational intervention. It might thereby support both motivation and capacity to use evidence.

LEARNING OUTCOMES

The above interventions incorporated insights from the social sciences on how the way educational EIDM interventions are delivered can be changed in order to be more relevant to learners' needs (i.e. customisation; incorporating adult learning principles; digital education). The discussion has therefore been concerned with investigating how the way decision-makers acquire EIDM skills can be improved. In order to ensure the sustainability and application of EIDM skills it might in addition be of interest to investigate whether what decision-makers learn can be improved, i.e. what type of decision-maker capacities are most relevant to ensure the long-term application of evidence use skills. Our scoping search of the wider literature on capacity-building and adult education suggested three types of learning outcomes that seem of relevance to redefine the outcome of EIDM training interventions.

Multi-level capabilities or dynamic capabilities refer to the attempt to build capabilities at different levels in an organisation (Kitson & Harvey 2015; Newell et al 2008; Ambrosini et al 2009). This can entail spreading capacity-building at different structures (i.e. individual, team; organisational) or to change the levels of targeted capabilities (e.g. lower to higher order) (Ambrosini et al 2009; Pablo et al 2007). Kislov and colleagues (2014) term the first approach as different 'configuration' of capacity-building and assume a circular transition in which individual capabilities influence group capabilities; groups share capabilities with other groups to influence organisational capabilities; and organisational capabilities re-inform individual capabilities as institutionalised organisational learning is spread to new organisational members. The second concept of an order of capabilities

categorises capacity-building according to the complexity of the taught knowledge and skills (Wang et al 2007). To safeguard the impact and sustainability of capacity-building interventions the reviewed literature suggests to move from lower-order, project-specific capabilities towards higher-order, generic capabilities allowing organisations to adapt to change, absorb new knowledge and innovate (Ambrosini et al 2009; Barreto et al 2010; Kitson & Harvey 2015). Unfortunately, our scoping review did not identify review evidence on the effects of building multi-level EIDM capabilities.

The idea of building multi-level capabilities seems to be of high relevance to EIDM capacity building. In Review 1, we found that the outcomes of capacity-building programmes were largely defined as individual decision-makers' ability to make sense of evidence, e.g. being able to appraise evidence. In the light of the above literature this does not seem to present a sustainable approach to capacity-building. For example, from an organisational perspective vesting knowledge only in individual decision-makers might not present the most effective approach to ensure its application. Staff frequently leave organisations and are re-assigned roles and responsibilities negating the continued application of the EIDM skills within the organisation. In addition, policy and programme decisions are becoming increasingly complex and require a larger amount of information and a diverse range of skills (e.g. Castells 2010). The same applies to EIDM and few decision-makers (or researchers) will possess all skills associated with the use of evidence (i.e. from searching to appraising and synthesising evidence).

Embedding EIDM capacities into organisational structures through building multi-level capabilities therefore appears of relevance and potential benefit to support the impact of capacity-building programmes. A multi-level capabilities lens, for example, might be able to unpack the assumed trajectory of the newly developed EIDM skills within the targeted organisations highlighting at which level of the organisation to target what order of capabilities. The concept of multi-level capabilities therefore seems promising to sustain and embed individual's EIDM skills within an organisation moving from a change in skills and knowledge towards a change in organisational norms and practices. In the long-run this could not only increase the retention of EIDM capacities (capability), but also build organisational opportunities to apply evidence. A discussion paper by Kislov and peers (2014) provides a detailed explanation of this approach.

Cognitive maturity & critical thinking are possible outcomes of capacity-building programmes that not so much aim to support the transfer of knowledge and skills and rather target the change of thought processes and patterns. These cognitive processes and patterns embed and sustain the application of individual skills and knowledge and ensure their transferability across contexts (Aita et al 2007). Literature on adult cognitive development suggests a number of stages in the developmental process that affect how adults perceive and process information. Based on Piaget's (1974) seminal work on cognitive development, the reflective-judgement model (RJM) (King & Kitchener 1994) has emerged as a particular effective explanation and categorisation of adult cognitive development (Nickerson et al 2012). The RJM proposes three stages that characterise how adults perceive and process new information: pre-reflective, in which existing knowledge is certain and difficult to challenge with new information; quasi-reflective, in which the uncertainty of existing knowledge is accepted and new information is adopted if it fits pre-existing beliefs; and reflective, in which different knowledge is weighted against each other and new information leads to a constant re-evaluation and reflection (King & Kitchener 1994; Nickerson et al 2012). This last reflective stage

is associated with adult cognitive maturity and ability of critical thinking. We identified two reviews of moderate-trustworthiness that, found educational strategies which aim to build cognitive maturity to be effective to increase learners' openness to and retention of new information (Aglen 2015; Abrami et al 2008). Interactive and inquiry based pedagogic strategies, such as problem-based and situated learning, the use of reflecting journals, debating exercises, and mentoring were presented as effective interventions to build cognitive maturity.

In the context of EIDM, arguably, reaching this last reflective stage would be of support to the routine practice of using evidence during decision-making. Cognitive mature individuals, who do not perceive new information and practices as a challenge to their existing beliefs and are open to critical reflection and inquiry, seem to be more receptive to the use of evidence. Educational EIDM interventions might be able to benefit from targeting the development of cognitive maturity and critical reflection rather than merely providing individual skills and knowledge related to make sense of evidence. This focus on building thought processes and patterns conducive to the practice of using evidence—rather than individual EIDM skills—could potentially influence all three components of behaviour change and thus appears as a potent contribution to existing practices.

Evidence literacy is an attempt to develop a more holistic and accessible concept for the skill set associated with EIDM (Newman et al 2012; White 2014; Wilson 2012). It attempts to reframe the skills and knowledge required to make evidence-informed decisions as a form of literacy, which is understood in its grander sense of presenting 'competence or knowledge in a specified area' (Oxford Dictionary 2016). This shifts the emphasis away from individual EIDM skills and presents the ability to use evidence as a coherent competence in its own right. The reference to literacy might also make the association of the concept more accessible and less technocratic. Evidence literacy can be understood as an extension of the existing concepts of information and research literacy (Eisenberg et al 2004; Shaipiro & Hughes 1996; Gray et al 2013). Positioning EIDM capacity-building programmes to foster evidence literacies might be a relevant alteration of the current conception of the educational objectives of these programmes, increasing interventions' accessibility and appeal. Not only could this increase motivation to acquire EIDM skills, it could also support efforts to establish evidence use as a norm in decision-making, influencing opportunity to use evidence and behaviour change. The concept of evidence literacy might therefore provide a helpful contribution to popularise EIDM and the knowledge and skills associated with it.

Summary of social science interventions relevant to M5 (skills)

Our scoping review of the social science literature explored concepts and interventions that might present relevant insights to contribute to the application of M5 (skills) interventions. We identified three relevant intervention approaches to guide training and capacity building: customising capacity-building; incorporating adult learning theories; and digital education. In addition, changing the targeted outcome of educational programmes, too, appeared as a relevant intervention approach. We assessed these for their likely effects on CMOs and behaviour change outcomes as well as the nature of the insights and contribution to the application of M5 (skills) interventions.

Evidence of effects in the social sciences:

Scoping the wider literature on education and effective learning, we identified six effective interventions approaches: using learning analytics; considering adult learning principles; mentoring; supervision; online learning; and targeting cognitive maturity. Within this group, research on the use of learning analytics, supervision techniques, online learning, and targeting cognitive maturity generated particularly rich insights. Each of these four interventions was found effective to influence all three components of behaviour change (CMOs): applying either of the four is likely to enhance learning outcomes (capability), learner motivation or identification with the taught content (motivation), as well as opportunity to access or apply the learned capabilities. Given their reliable evidence-base, we therefore position these four interventions as a potent contribution to interventions aiming to increase decision-makers' EIDM skills (M5).

Mentoring and the consideration of adult learning principles were also identified as of potential to support M5 (skills) interventions. There was a convincing evidence-base in the social sciences that mentoring might be able to increase educational outcomes (capability). The incorporation of adult learning principles in the design of EIDM capacity-building programmes, likewise, was found to be of likely benefit to increase capability to use evidence as well as motivation.

Social science interventions of conceptual relevance, but lacking a reliable evidence-base referred to targeting and personalisation of capacity-building programmes, communities of practice, secondments, educational apps, and fostering multi-level capabilities and evidence literacy.

Social science insights for EIDM:

In addition to assessing likely effects of social science interventions on CMOs and behaviour change outcomes, our scoping review also aimed to showcase what insights could be gained from their application to support M5 (skills) interventions.

We identified interventions suggested in the social sciences that provide a different approach to EIDM capacity-building altogether as the application of learning analytics, evidence use apps, and evidence literacy. Learning analytics, in addition, is based on a reliable evidence-base further motivating the relevance of this educational technique.

The remainder of interventions identified in the social science to be of relevance to support interventions aiming to build decision-makers' EIDM skills suggested a change in existing practices rather than different practices. In two instances, this referred to a change in the targeted outcome of EIDM capacity-building, i.e. to target multi-level capabilities and cognitive maturity. This was assumed to embed EIDM capacities in a more sustainable manner in organisational structures and cognitive processes and patterns. A similar change in practice to focus on organisational capacities was targeted by the application of communities of practice. Two interventions aimed to customise the educational efforts more strongly to the targeted audience: targeting and personalisation. Lastly, four interventions aimed to change the manner in which EIDM capacities were taught: online learning, consideration of adult learning principles, mentoring, and supervision.

M6 'Processes & structures of decision-making': relevant social science interventions

Whether evidence is considered during the decision-making process might depend on factors related to the decision-making itself. M6 (structures & processes) refers to interventions that aim to change the process and structures of decision-making in an attempt to make these more receptive to the use of evidence. Review 1 has already established that this seems to be a promising intervention approach to increase decision-makers' motivation and opportunity to use evidence. Interventions aiming to change decision-making structures, e.g. formalising access to evidence use in daily routines, however, presented a small fraction in the sample of identified evidence. In Review 2, we therefore searched the wider social science literature, in particular research on organisational change, behavioural sciences, and management, for additional interventions that might be relevant to change decision-making processes and structures to incorporate an increased use of evidence. Our scoping review identified 14 individual interventions of potential relevance, which are outlined below in table 5.6. The interventions are grouped together according to the level of structural change that they target: individual, organisational, and institutional.

Table 5.6 M6 (structures & processes) – relevant social science interventions

Intervention	*Conceptual relevance*	*Evidence of effects**
INDIVIDUAL DECISION-MAKERS		
Reducing cognitive biases	Potential to reduce barriers to behaviour change such easing cognitive burden and changing mental models used for decision-making. Removing barrier to change might affect motivation and opportunity in the short term and foster behaviour change in the long term.	Yes, weak evidence.
Nudges (e.g. commitment devices, incentives)	Potential to nudge decision-makers to use evidence, e.g. restructuring evidence use as a default option when assessing policy or programme proposals. This might influence motivation to use evidence in the short terms and support behaviour change in the long term.	Yes, weak evidence.
Norms & identities	Potential to establish evidence use a principle of decision-making associated with one's professional conduct and identity. Evidence use norms reinforce and motivate the use of evidence as a desirable behaviour.	Yes, weak evidence.

Coherent behavioural frameworks	Insights of behavioural sciences on facilitating the above have been synthesised in overall framework to guide the design of interventions (e.g. EAST; MINDSPACE). These could be applied to foster the behaviour of evidence use too.	Proposed frameworks include: Dolan et al (2010); Service et al (2013); Richburg-Hayes (2014); World Bank (2015).

DECISION-MAKING AT AN ORGANISATIONAL LEVEL (Organisational change & readiness)

Organisational learning & learning organisation	Potential to enhance the organisational capacity and remit to create an environment in which decisions can be challenged and informed by evidence (motivation and opportunity)	Mixed, unclear evidence.
Organisational norms/culture	Potential to formulate an organisational practice, vision and reputation for using evidence (motivation and opportunity)	Mixed, unclear evidence.
Leadership & management	Certain leadership styles (e.g. egalitarian, transformational) and management approaches (e.g. adaptive) have been positioned to support the establishment of the above organisational characteristics believed to be conducive to EIDM.	Mixed, unclear evidence.
Knowledge management	Potential to formalise and improve the organisational knowledge flow and exchange (all CMOs).	Mixed, unclear evidence.
Facilitation	Changes to existing organisational systems to provide tangible influence (e.g. tools; financial/career incentives; regulation) to use evidence. This includes: • decision-aids / shared decision-making • financial incentives • audit and reminders	Yes, strong evidence.

	• infrastructure (e.g. IT systems)	
INSTITUTIONS & SYSTEMIC ISSUES		
Complexity thinking	Potential to inform an organisational system of constant evaluation, iteration, and adaptation of practices and policies. Evidence informs this constant review and iteration.	No reviews identified.
National institutions & clearinghouses	Potential to enforce and incentivise EIDM through institutions and legal frameworks, such as accreditation, procurement, and cabinet processes.	No reviews identified.
Machine learning & modeling	Potential to change the nature of evidence and synthesis due to machine ability to provide ad hoc, personalised decision advice based on various sources of evidence including Big data and biometric information.	No reviews identified.

*We cannot provide a rigorous assessment of the size of the identified effects across interventions.

INDIVIDUAL DECISION-MAKERS

Our scoping review identified a number of interventions that seemed to be particular relevant to change decision-making structures and processes of individual decision-makers. These interventions are all informed by insights from the behavioural sciences on how human beings make decisions and how this process can be improved. Decision-makers face heavy demands on their time and cognitive recourses and often work in increasingly complex environments facing challenges that do not lend themselves to traditional means of decision-making. Efforts to promote decision-makers' use of evidence compete with a large number of factors for decision-makers' attention. This might lead to a situation in which a decision-maker has the intention and skills to use evidence, the evidence reaches her in an accessible format, but when it comes to the action of making a decision, this decision-makers might not apply the evidence due to the way her decision-making process is structured. Below, based on our scoping review, we outline four interventions that might be able to positively affect individual decision-makers' processes and structures of making a decision.

Reducing cognitive biases refers to techniques to mitigate the effects of a number of well-known biases that affect individual's decision-making. There are up to 150 cognitive biases that mitigate decision-making (Alliance for Useful Evidence 2016; Ariely 2009). These biases can for example include: cognitive burden, i.e. demands on mental capacity and memory; priors, i.e. established beliefs and values; confirmation bias, i.e. interpret and filter information to support preconceptions; sunk costs, i.e. disregarding past investments and cost; loss aversion, i.e. perceiving losses more strongly than gains; present bias, discounting the future in favour of the present; self-serving bias,

i.e. selecting principles of fairness that coincide with one's interest; optimism bias, i.e. overestimating the likelihood of positive outcomes when planning decisions and actions (e.g. Baron 2007; Hilbert 2012; World Bank 2015; Alliance for Useful Evidence 2016). Human decision-makers are subject to these biases and each of them can impede a decision-maker intending and skilled to use evidence from engaging in the behaviour of evidence use. Recognising these biases is a first step to mitigate their structural effect on decision-making and behavioural scientists have developed a large range of techniques to this effect (e.g. Baron 2007; Kahnemann et al 2012; Service et al 2014; World Bank 2015). Our scoping review identified three literature reviews and reports that provide a collection of effective behavioural techniques and mechanisms supporting decision-making and behaviour change (Fox & Sitkin 2015; Richburg-Hayes et a; 2014; World Bank 2015).

Interventions aiming to make decision-making processes and structures more conducive to the use of evidence might be benefit from incorporating these techniques into their programme design. Default options, e.g. evidence databases as a PC homepage, might mitigate the effects of cognitive burden; framing the evidence use as a loss-averting behaviour; highlighting the immediate benefit of research results or using evidence; developing evidence-informed mindlines, i.e. incorporating evidence into mental shortcuts and editing when having to make rapid decisions (Wieringa & Greenhalgh 2015); are but a few possible applications of techniques to reduce cognitive biases that might impede decision-makers' use of evidence. Applying these techniques in order to reduce decision-makers' cognitive biases to facilitate their use of evidence might primarily support motivation and opportunity to use evidence. We would position the application of these interventions as of high potential to positively influence the design of M6 (structures & processes) interventions.

Nudges refer to behavioural techniques that, too, can address cognitive biases but are more proactive and directed in their efforts to change behaviour. Thaler and Sunstein's (2008) seminal work defines a nudge as '(…) any aspect of the choice architecture that alters people's behaviour in a predictable way without forbidding any options or significantly changing their economic incentives'. Nudges attempt to point people toward a particular choice by e.g. changing the description, the anchor, or the reference point. They thereby present a form of gentle persuasion to engage in the desired behaviour (Thaler & Sunstein 2008; World Bank 2015). Examples of nudges include commitment devices, micro-incentives, league tables, feedback, personalised language, social proofs, to name but a few. Our scoping review identified three collections of the literature on using nudges to change the behaviour of decision-makers attesting to nudges' positive effects (Thaler & Sustein 2008; Richburg-Hayes et al 2014; World Bank 2015).

In the context of EIDM, nudging the desired behaviour of evidence use seems to be a promising approach to increase decision-makers' use of evidence. Decision-makers could publicly commit to the use of evidence to their colleagues with a joint reward/sanction for the behaviour. Organisational league tables of evidence users might increase individual's motivation, as could information on how many colleagues used evidence in a past assignment. Personal, hand-written notes and feedback similarly might increase the likelihood that decision-makers access evidence. Conceptually as well as empirically nudges seem to be a highly relevant intervention to support decision-makers' motivation to use evidence. Nudges, currently, seem to be rarely applied in the context of EIDM and might therefore present an effective contribution to interventions aiming to influence structures and processes of decision-making (M6).

Norms and identities—professional as well as social—influence decision-makers' behaviour (e.g. Berkovitz 2004; John et al 2015). Social and professional norms can influence cognitive biases, e.g. priors, confirmation bias, sunk costs and a large range of behaviour interventions, such as nudges, exploits the influence of norms on behaviours (World Bank 2015; Thaler & Sunstein 2008). For example, identity priming and social proof each aim to remind the decision-makers of social or professional norms associated with the targeted behaviour change. . We have already commented on promising interventions relevant to the creation of new norms in reference to M1 (awareness) and M3 (communication & access). Social marketing in particular appeared as a promising approach based on a reliable evidence-base. The distinction between behavioural techniques, and social marketing and communication techniques to support the formation of new norms is blurry and effective interventions are likely to combine aspects of each. For example, identity cues and framing are as much applied in nudges as they are in communication and social marketing. Behaviour can either be triggered by reminding about a professional norm supportive of the desired behaviour or by creating the impression that the desired behaviour in fact is a professional norm. Behavioural techniques contribute to the formation and application of professional norms and our scoping review identified two reviews of the available literature providing evidence in this regard (Richard-Hayes et al 2014; World Bank 2015).

To change decision-makers' processes and structures of decision-making to allow for an increased use of evidence, it might therefore be an effective intervention approach to use social marketing techniques in combination with behavioural techniques to nurture the establishment of evidence use as a professional norm. Such a professional evidence use norm could change decision-makers' habits and routines allowing for decision-making processes that are more receptive to the use of evidence. This might positively influence both motivation and opportunity to use evidence.

Lastly, a number of **coherent behavioural frameworks** have been proposed that combine the behavioural insights on each of the above interventions to allow for a more structured application of behavioural principles (Richard-Hayes et al 2014; Service et al 2014; World Bank 2015). While none of these have been reviewed for their effectiveness, they do provide some guidance on promising behavioural designs and we will briefly provide references to each. First, the World Bank (2015) suggests using a three-tier model of decision-making when designing and implementing effective interventions. Applied models of decision-making are assumed to either (i) think automatically (automatic judgements and decisions); (ii) think socially (judgements and decisions depend on what others around them do and think); (iii) think with mental models (judgements and decisions are embedded into a common perspective on making sense of the world and understanding oneself). For evidence to enter the decision-making process then it would have to trigger either of these models and evidence use interventions could be tailored in this regard. Second, Richburg-Hayes and peers (2014) have generated a matrix mapping out behavioural concepts that could explain a bottleneck regarding the impact of an intervention with proposed behavioural interventions effective to address these. For example, if a cognitive burden, such as a choice conflict, seems to prevent the uptake of information or behaviours (e.g. evidence/evidence use), the matrix suggests the use of defaults; reductions of options; and removal of hassle factors as promising behavioural interventions. Third, the most accessible framework is presented by the Behavioural Insight Team's EAST framework (Service et al 2014). EAST suggests four simply ways of applying behavioural insight in intervention and policy design: (i) make it easy—i.e. harness the power of defaults; reduce the

'hassle factor'; simplify messages; (ii) make it attractive—i.e. attract attention; design rewards and sanctions; (iii) make it social—i.e. show that most people perform the desired behaviour; use the power of networks; make a commitment to others; and (iv) make it timely—i.e. prompt people when they are most receptive; consider the immediate costs and benefits; help people plan their response to events. Many of the principles outlined in the EAST framework seem to be applicable to interventions that aim to increase the use of evidence by decision-makers. We would therefore conclude that behavioural insights are of high relevance to the design of evidence use interventions, in particular in relation to M6 (structures & processes).

DECISION-MAKING AT AN ORGANISATIONAL LEVEL (Organisational change & readiness)

The most direct approach to change decision-making processes and structures might be to change the processes and structure of the organisations in which decision-makers work. There is already a large body of research that suggests that organisational factors are crucial to facilitate the uptake of evidence-based practices (e.g. Attieh et al 2013; Crilly et al 2010; Nutley 2007). This literature, for example, suggests investigating organisation's readiness for the uptake of evidence-based practices and the wider idea that certain types of organisations are more conducive to foster learning among staff (e.g. Greenhalgh et al 2004; Nutley 2007). Review 1, too, indicated that organisational norms and cultures present an important factor in decision-makers' use of evidence. Our scoping review of the wider social sciences therefore reviewed the literature on management, organisational change, and leadership to identify potential organisational interventions or forms of organisation that might support the systematic use of evidence during the decision-making process. Below, we outline five organisational approaches that seemed to be of particular relevance to nurture structures and processes conducive to the use of evidence.

Organisational learning and (the) learning organisations refer respectively to the process of changing organisational processes and structures to be more conducive to staff's learning, and the normative ideal of an organisation that has succeeded in this regard (Ang & Joseph 1996; Edmondson & Moingeon 2004; Örtenblad 2001). As a process, organisational learning is associated with a wide range of organisational factors such as organisational strategy, culture, absorptive capacity, knowledge boundaries (Wang & Ahmed 2003; Oborn & Racko 2012), but there is no agreed-on definition of organisational learning (Nutley et al 2007; Garvin 2003). A key feature of the concept refers to the creation of adaptive (single) as well as generative (double-loop) learning opportunities (Agris & Schon 1996; Gardan 2003) of which the latter characterises a learning organisation. Generative learning occurs when 'the organisation (and its staff) is willing to question long-held assumptions about its mission and capabilities, and it requires the development of new ways of looking at the world based on an understanding of the systems and relationships that link key issues and events' (Gardan 2003). Seng in his 1990 seminal work on organisational learning '*The fifths discipline*' identifies five building blocks that characterise a learning organisation: (i) room for personal mastery; (ii) coherent mental models; (iii) shared vision; (iv) team learning; and (v) systems thinking. As a result, an effective learning organisation is uniquely positioned to master systematic problem solving, experiment with new approaches, and transfer knowledge quickly and efficiently throughout the organisation (Garvin 2003; Seng 1990). There is, however, no agreed-on pathway or sets of interventions that could be applied to foster organisational learning (Gardan 2003; Nutley 2007; Wang & Ahmed 2003). In line with this, our scoping review identified only two reviews (both

of high trustworthiness) that assessed the impacts of interventions targeting an explicit organisational change (Wensig et al 2006; Parmelli et al 2011) and neither found any reliable research evidence.

From the above, the relevance of organisational learning to support EIDM seems clear. An organisational setting that allows for and actively supports decision-makers' pursuit of on-going learning and the questioning of existing beliefs and processes seems to be well-positioned to encourage the use of evidence. The appetite for quick feedback loops and experimentation, too, seems to be supportive of EIDM. Organisational learning as a structured and encouraged process could thus facilitate both opportunity and motivation to use evidence. In the light of the above review of the literature, we thus conclude that the concept of organisational learning is of high relevance to EIDM, but there currently is little empirical guidance on how best to translate this conceptual relevance into practical intervention design.

Organisational norms and culture have been mentioned in the context of organisational learning already but present more encompassing concepts and the perceived outcome of organisational learning (Parmelli et al 2011; Bloor 1999). Organisational norms are part of an organisational culture, which, most basic, can be defined as the multiple aspects of what is shared among people within the same organisation: for example beliefs, values, norms of behaviour, routines, traditions, sensemaking, etc. (Parmelli et al 2011). Organisational norms and culture influence as much the routine processes, habits, and professional identity of individuals as they shape the overall vision and perception of the organisation (Scott et al 2003; Hunt et al 2012). Organisations often-cited in the management literature for their specific organisational culture include e.g. *Apple*, *Google*, and *Toyota* (Büschgens et al 2013). Our scoping review identified three reviews, two of high and one of moderate trustworthiness, that assessed the impact of strategies to change organisational cultures (Parmelli et al 2011; Scott et al 2003; Hunt et al 2012). As with organisational learning, there is currently insufficient evidence to comment on the impacts of these interventions.

In the context of EIDM, an organisational culture of research use could e.g. be based on norms such as appetite of inquiry and critical reflection. This culture and norms could make decision-makers' use of evidence a routine process that is widely regarded and promoted within the organisation's networks. The existence of organisational evidence use cultures and norms could thereby facilitate practical opportunities to use evidence as well as nurture staff's motivation to do so. In Review 1, we identified a number of primary studies assessed in the included reviews that provided examples of this influence of organisational culture on evidence use (Bunn et al 2012; La Rocca et al 2012). Given the reviewed evidence-base, we, present a change in organisational norms and culture as a conceptually relevant, but empirically unclear, intervention approach to support a change in decision-making structures and process.

Leadership & management have been suggested as two key tools to change organisational structures and processes (Ogbonna, 2000; Schein 2010; Bass & Avolio 1993; Bittilana 2010). Both are therefore integral to support organisational learning and organisational norms (Gill 2012; Ogbonna 2000). Effective leadership has been defined as 'exerting intentional influence by one person over another person or group to achieve a certain outcome in a group or organization' (Reichenpfander et al 2014; Yukl 2006). In the context of organisational change, the role of leadership is to establish an overall vision to guide staff on the virtue of change, nurturing buy-in, motivation, and inspiration

to change; and to then facilitate this process through commitment and active interest and provision of resources (Battilana et al 2010; Helfrich et al 2007; Yukl 2006). Management on the other hand refers to the act or skill of controlling and making decisions in an organisation (Merriam-Webster dictionary 2016). In relation to organisational change, management is required to organise and co-ordinate the activities and processes require to nurture this change (Graetz et al 2006). Effective management supervises the process of change through strategic planning, setting of objectives, allocation human and financial recourses (Mullins et al 2007; Bamford & Forrester 2002). While leadership and management are distinct concepts, they often function in tandem to change organisational structures and processes, i.e. leaders formulate, guide, and motivate the aspired change, while management creates and administers the processes and structures required for this change to happen (e.g. Todnem 2005; Kavanagh & Ashkanasy 2006).

There is a vast amount of organisational literature that reflects on different leadership and management models that foster organisational change and innovation (e.g. Cameron & Green 2015; Schein 2010; Acar & Acar 2012; Gill 2002; Todnem 2005) and we are unable to present an exhaustive account of this literature. Our scoping review, too, identified a large number of reviews of leadership and management approaches that can support organisational change, but we did not identify a consensus within the literature on which approaches are most effective (e.g. Reichenpfader et al 2015; Denti & Hemlin 2012; Gifford et al 2007; Wong et al 2013; Cumming et al 2007) As a result, we can only point out leadership and management approaches that seemed to be particular relevant to incite changes to organisational structures conducive to EIDM.

Identified leadership models that are relevant to change decision-making structures to be more susceptible to the use of evidence refer to transformational leadership; distributed leadership; collaborative leadership, and discursive leadership. In the transformational leadership model, often set in contrast to transactional leadership (e.g Aarons 2006), the leader has a strong influence based on trust and respect among staff to drive the establishment of new practices such as EIDM. She sets out a clear rationale and narrative for transformation (e.g. adoption of EIDM) framed as a common goal for all staff to build motivation to change practices. This motivation is then complimented by active stimulation to counter existing practice and direct facilitation to support the transformation of decision-makers' practices (opportunity & motivation) (e.g. Avolio, 1999; Hartley 2003; Sashkin 2004; Wang et al 2011). Distributed leadership (Chreim et al 2010; Harris et al 2007), collaborative leadership (Chrislip 2002), and discursive leadership (Wodak et al 2011), on the other side, refer to leadership models that providing staff with greater decision-making autonomy and incentives for innovation. They therefore present a more bottom-up and non-hierarchical approach to use leadership to build organisational structures to support the use of evidence. Conceptually, each of these leadership models seem highly relevant to create organisational structures and processes that are encouraging the use of evidence.

The management literature itself is aware that a large number of suggested management techniques lack a reliable evidence-base. In response to this observation, increasing calls are leveled for the development of evidence-based management, modeled on the evidence-based medicine movement (e.g. Pfeffer & Sutton 2006; Center for Evidence-based Management 2013; Russeau 2006; Briner et al 2009). Given this lack of a reliable evidence-base, it is challenging to assess which management might be most relevant to support EIDM in the context of organisational change. A number of studies in the health domain highlight the importance of adequate change management

(Ward 2012; Peirson et al 2013). Change management refers to 'the process of continually renewing an organization's direction, structure, and capabilities to serve the ever-changing needs of external and internal customers' (Moran and Brightman, 2001: 111). The conception of change as an ever-present feature of organisational life, both at an operational and strategic level (Burnes 2004; Cameron et al 2015) seems relevant to inform management structures that encourage the use of evidence. Likewise, adaptive management refers to management techniques better geared to be able to cope with constant change and rapid iteration (Williams et al 2007; List et al 2013). Adaptive management assumes that organisations and staff are constantly facing issues for which there is no pre-defined answer or tool to apply. They therefore require a system that can generate relevant tools and solutions allowing for constant iteration and innovation in day-to-day performance (Green 2015; Ramalingam 2015; Rist et al 2013). Adaptive management could present such a system nurturing emergent and contextual change in the face of uncertainty in decision-making. Again, there seems to be some overlap between adaptive management and EIDM, which benefits from rapid iteration and an appetite for organisational change. Alas, as stated before, there is currently little synthesised evidence on these management techniques and we can therefore only point to their conceptual relevance regarding EIDM.

Knowledge management can be defined as 'any process or practice of creating, acquiring, capturing, sharing and using knowledge, wherever it resides, to enhance learning and performance in organisations' (Scarborough et al 1999). Knowledge management conceptually overlaps with organisational learning (Urirate 2008; Sanchez 1996) as it is applied for the purpose of improving organisational performance by fostering an effective flow of information and knowledge through the organisation. Unlike, organisational learning, knowledge management has its roots in information science (Nonaka 1991) and is thus more concerned with the development of tools and systems to manage organisational knowledge and share it effectively throughout the organisation (Maier 2007). Knowledge management is therefore an integral part of organisational learning but does usually not intend to change organisational structures or norms (Urirate 2008; Sanchez 1996). Given its origin in information science, knowledge management tools and systems often refer to online database and electronic dissemination channels, but too include performance incentives to share knowledge or the creation of knowledge broker posts (Earl 2001). Knowledge management interventions can further be divided into knowledge push versus knowledge pull models, with the former aiming to increase the flow of knowledge while the latter targets user demand to share and access knowledge. (Bukowitz & Williams 1994; Earl 2001). Our scoping review identified a vast body of literature on knowledge management ranging across research sectors and including a large number of systematic reviews of varied trustworthiness (e.g. Kothari et al 2011; Thorpe et al 2006; Greenhalgh et al 2005; Karamitri et al 2015). However, there was no consensus among these reviews on the most effective knowledge management practices.

Knowledge management, too, is an integral part of EIDM at an organisational level and the intersection of these two areas of research has been pointed out by a number of scholars (e.g. Dopson & Fitzgerald 2005; Nutley 2007; Greenhalgh et al 2004; Crilly et al 2010). Greenhalgh and colleagues (2004) as well as Crilly and peers (2010) provide particular extensive conceptual reviews of the interplay between knowledge management and EIDM. The importance of organisational systems to store and share knowledge that decision-makers can then access to inform policy and practice decision also featured prominently in Review 1. We identified evidence-on-demand services and online repositories paired with targeted messages as two effective knowledge management

tools. At the same time, we did not identify positive impacts of the isolated provision of online repositories indicating that knowledge management tools require a careful design to fit with decision-makers' habits and needs. Unfortunately, the social science literature on knowledge management does not provide reliable review evidence in this regard either, and we can therefore only highlight the high relevance of this body of literature to EIDM.

Facilitation refers to organisational interventions that aim to change existing organisational systems by providing tangible influence and recourses to support this change. This could consist of, for example, financial/career incentives, practical tools and protocols, committees and regulatory mechanism. Facilitation is suggested in the management literature and emphasises the need to provide practical assistance and recourses to support behaviour change or to remove barriers to change (Nutley 2007; Harvey et al 2001). Searching the social science literature on the effects of facilitation on different behaviour change outcomes, our scoping review did not identify a coherent body of research. Rather, we found evidence on different facilitation techniques.

First, we identified a large number of reviews on the effects of providing IT systems on behaviour change outcomes. Two high-trustworthiness overviews of systematic reviews (Boaz et al 2011; Grimshaw et al 2001) each identified the provision of IT systems to be effective to change the behaviour of medical practitioners. Second, we also identified a single systematic review of high trustworthiness that found decision aids tools to be effective to increase decision-makers' knowledge of available decision options as well as their ability to align decision-making with their personal values (Stacey et al 2011). Third, formal interventions to support shared decision-making were equally found effective to change existing decision-making behaviours and we found a review of reviews of high trustworthiness attesting to this effect (Durand et al 2014). Fourth, there is a vast body of evidence on the effectiveness of financial incentives to change professional behaviour. Among these, the best available evidence comes from a high-trustworthiness overview of systematic reviews that finds cautious evidence that financial incentives are effective to change professional behaviours (Flodgren et al 2011). Fifth, providing audit and feedback on decision-making behaviours is consistently found to lead to small but significant changes in professional behaviour. Our scoping review identified a vast evidence-base including three systematic reviews and overview of reviews (Johnson et al 2015; Ivers et al 2012; Jamtvedt et al 2006). Sixth, while changes to decision-making protocols and committees are often suggested in the literature as an organisational mechanism to encourage behaviour change (e.g. Newhouse 2007; Wise 2009; Peirson et al 2012; Strout et al 2012), our scoping review did not identify existing reviews assessing the effects of these interventions in this regard.

In sum, the identified body of evidence seems to present facilitation as an effective organisational intervention to influence professional behaviour change. This finding is confirmed by a high-trustworthiness overview of systematic reviews, which compares different behaviour change interventions (Johnson et al 2015) and identifies interventions based on action (e.g. audit and feedback, decision-making tools) to be more effective than interventions based on persuasion (e.g. opinion leaders).

The above findings seem to be relevant to inform the design of interventions aiming to make decision-making processes and structures more conducive to the use of evidence. Decision aid tools, for example, could make the process of decision-making more explicit and formally highlight

evidence relevant to the decision to be made. These tools are often embedded into wider efforts to foster shared decision-making, which equally are applicable to make the decision-making process more transparent and open to be informed by different types of perspectives and knowledge. Financial incentives to use evidence might also present a relevant addition to the potential of social incentives presented in relation to M1. Audit and feedback, too, seem to be a relevant intervention to support decision-makers' use of evidence and links to the above potential of supervision techniques (M5). We therefore regard facilitation interventions as of potential to make decision-making processes and structure more receptive to the use of evidence, thereby supporting opportunity and motivation to use evidence.

INSTITUTIONS & SYSTEMIC ISSUES

Processes and structures of decision-making are lastly also embedded in and influenced by institutional settings and systemic issues. Individuals and organisations are part of wider systems and institutions, for example national legislations, cultures, and mindsets. It might therefore be worthwhile to investigate a conceptualisation of EIDM at an institutional or systems level seeing that institutional changes or system characteristics might reinforce or mitigate the use of evidence by decision-makers. Shepherd (2014) coins the term evidence eco-system and uses the analogy of the petro-chemical industry to conceptualise EIDM at a systems level. Other suggestions to describe EIDM at a systems level include the metaphor of an evidence marketplace, e.g. the 'What Works Marketplace' (Neuhaus et al 2015) and the idea of evidence literacies at all levels of decision-making e.g. clinician scientist, citizen scientist (Newman et al 2012; Tooke et al 2014). Each of these concepts represents a more organic and systemic understanding of EIDM. Our scoping review attempted to identify literature in the social sciences that provided insights on how institutional and systemic change might be achieved. Unfortunately, we did not detect any reliable review evidence assessing the impact of interventions or techniques aiming to influence such change. Instead we identified three areas of literature, which might hold insights on building institutions and systems that are of potential to support EIDM.

Complexity thinking or complexity sciences refers to a large body of literature in the natural and social sciences describing and analysing the properties and behaviours of complex systems (e.g. Johnson 2009; Meadows 2008; Bar-Yam 1997; Lansing 2003; Beinhocker 2007). This literature investigates how relationships between actors result in collective behaviour of a system and how the system interacts and forms relationships with its environment (Meadows 2008; Bar-Yam 1997). These non-linear, mutually-reinforcing relationships result in organised but unpredictable behaviours of the system, i.e. complex systems. One of the key features in this process is the independent adaptation of actors in the system to external and internal events, which leads to constant iteration and emergent properties in the system, i.e. there are patterns within the system which are not specifically linked to any individual agent within it (Barder 2012; Lansing 2003). Complex adaptive systems, for example, can be found in biological organisms, ecosystems, rivers, the human brain, flocks of birds, the climate and weather.

There might be virtue in applying some components of complexity thinking to conceptualise the evidence eco-system. Instead of characterising the production, transmission, and use of evidence as a linear process, EIDM could be investigated as an emergent property of a complex system shaped

by constantly evolving relationships and interaction between individual actors adapting to events and each other's behaviour. A complexity lens would embrace experimentation and adaptation as a principal of programme and policy design. It would highlight the creation of quick feedback loops between decision-makers and users of a programme to ensure information on programme implementation and outcomes flows through the system fostering rapid adaptation. In this model, evidence production and use becomes an inherent property and characteristics of both practice and policy. However, approaching EIDM as a complex adaptive system leaves less room for active intervention to foster evidence use, as it cannot be predicted how the system as a whole would adapt in response to a change in one of its components. In general though it seems that there is some conceptual overlap between the literature on complex adaptive systems and EIDM. Tools to investigate these types of systems (e.g. Bowman et al 2015; Ramalingam et al 2014; Horn & Weber 2014) might be of some relevance to unpack the characteristics and behaviours of evidence eco-systems.

National institutions & clearing houses have received a mandate to support EIDM in a number of countries. National institutions have the power to set incentives and rules of decision-making that affect decision-makers at any level. National institutions are therefore a potent mechanism to change decision-making and nurture an institutionalised norm to use evidence (Flitcroft 2014; Gaarder & Briceño 2010). Our scoping review identified a number of national institutions to encourage the use of evidence by decision-makers that are reported in the literature. These fell into two categories: national government departments and institutions producing evidence reviews and guidelines (i.e. clearinghouses). According to Goldman and peers (2015), countries featuring a national department responsible for the production and use of evidence (mainly M&E evidence) include South Africa, Mexico, Colombia, Canada, Chile, Uganda, and Benin. The powers of these departments vary however from formulating non-binding recommendations (e.g. Benin) to tie budget allocations to the strengths of the evidence underlying the policy (e.g. Chile) (Goldman et al 2015; Mackay 2007). Each of the institutions aims to nurture systemic change in decision-making structures either through incentivising or enforcing evidence use during policy decisions[24]. In South Africa, for example, the *National Department of Planning, Monitoring and Evaluation* (DPME) offers technical and financial support to other departments wanting to conduct or commission an evaluation of their policies (incentive); at the same time, however, DPME can enforce the use of evidence as new white papers tabled to cabinet require a review of the evidence related to the proposed policy.

A similar mechanism to set incentives and regulation to increase evidence use is presented by clearinghouse institutions. For example, in the UK, the National Institute for Health Care and Excellence (NICE) has the power to issue legally binding clinical care guideline and technology appraisals, which are based on an extensive review of the evidence and stakeholder consultation (NICE 2016). NICE's accreditation model thereby directly enforces EIDM through a legal institutional framework. The institutional model has attracted national as well as international attention and replication, with the UK creating a network of what works centers loosely based on the NICE model (Halpern et al 2014; Shepherd 2014). A NICE accreditation model, too, has been proposed to review practices in international development (Barder 2013) and the institution has advised on the design

[24] The *What Works Network* in the UK serves a similar role, albeit without explicit administrative powers to enforce evidence use (What Works Network 2014)

of international health policies and interventions (NICE 2016). Clearing house institutions such as NICE institutionally (if not legally) embed the use of evidence and thus present a potent tool to influence systemic change conducive to a culture of EIDM. Other institutional tools to support EIDM suggested in the literature include a change in procurement mechanism (payment by results) (e.g. CDG 2014) and the use of rapid assessment tools to rate government departments on the use of evidence behind policy decisions (Rutter & Gold 2015).

Machine learning & modelling refer to the use of advanced online technologies to change the very nature of decision-making and research use. Most professions in the information age are faced with a situation in which the amount of information and newly created knowledge by far outstrips the capacity of professionals to keep up with the amount of knowledge (Rodin 2016; Castells 2010; Klerings et al 2015). To counter this information overload, digital technologies are used to filter and channel the amount of information. These technologies have evolved rapidly. In 2011, *Watson* a technology platform developed by IBM that uses natural language processing and machine learning to reveal insights from large amounts of unstructured data performed better than human beings in the quiz show *Jeopardy* (New York Times 2011), indicating the ability of machines to not only collect, but further contextualise and synthesise information. The same technology since then has been implemented in the health sector to suggest treatment options (Rodin 2016; Sim 2015). For example, in partnership with *Memorial Sloan Kettering*, *Watson for Oncology* is applied to provide evidence-based treatment options, rapidly reviewing the formal academic health literature, expert commentary, case histories and other data sources against the patient's medical information. In the same vein, we commented above on a policy software being piloted in New Zealand, which provides a 'dynamic micro-simulation model' of the likely effects of different policy options on population outcomes based on the results of published literature (Milne et al 2014).

It would appear that the enhanced 'intellectual' ability of digital technologies raises some fundamental questions about the nature of evidence-informed decision-making (Sim 2015; Klerings et al 2015). These technologies seem to offer potential to accelerate and personalise evidence synthesis and can combine a greater variety of sources of evidence (e.g. big data, biometric information, academic studies). However, their application also raises serious ethical and validity concerns. Sophisticated computer software and advanced machine learning might enhance EIDM in many sectors, but at the same time questions the role of traditional synthesis tools such as systematic reviews and meta-analyses. Established principles of rigour and transparency in synthesising evidence would be in need of a new definition, while the recommendations that can be drawn from the synthesis to inform a decision, in particular on relative and contextualised effects, might see a large increase. We are offering this body of literature as a nascent development, which, however, might have important implications for decision-makers' use of evidence and the nature of EIDM in general in the future.

Summary of social science interventions relevant to M6 (structures & processes)

Our scoping review of the social science literature explored concepts and interventions that might present relevant insights to contribute to the application of M6 interventions. We identified twelve interventions of potential relevance and grouped these into interventions targeting individual, organisational, and institutional structures and processes. We assessed these for their likely effects

on CMOs and behaviour change outcomes as well as the nature of the insights and contribution to the application of M6 interventions.

Evidence of effects in the social sciences:

Our scoping review of the wider social sciences identified a variety of potentially effective interventions to positively influence the decision-making structures and processes of individual decision-makers. These referred to behavioural interventions to mitigate the effects of cognitive biases on decision-making; the provision of nudges to encourage behaviour change; and the creation of professional norms and identities in line with evidence use. These behavioural interventions are of direct relevance to influence the process of decision-making and to increase its receptivity for evidence. A nudge could, for example, be used to increase decision-makers' motivation to use evidence, while the use of defaults to reduce cognitive biases could increase opportunity as well as motivation to use evidence. Given the evidence-base on their application in the social sciences, these behavioural interventions might be able to translate these short-term impacts on motivation and opportunity to use evidence into long-term changes in behaviour. We identified a number of evidence-informed behavioural frameworks that guide the coherent application of these behavioural interventions, which are of direct relevance to support the design of M6 (structures & processes) interventions.

We further identified a large body of literature on interventions aiming to change organisational structures and processes. This literature was of high conceptual relevance proposing many models of how organisational structures and processes could be influenced and designed in a manner that might be allow for a more systematic use of evidence during decision-making processes. Proposed models and interventions included: organisational learning & learning organisations; changing organisational norms/culture; more inclusive leadership & management; knowledge management systems; and facilitation. However, while each of these was of high conceptual relevance, we only identified a conclusive body of research on the positive effects of facilitation interventions (e.g. decision-aid tools, financial incentives; audit & feedback). For the remainder of interventions, there was no consensus within the literature on effective intervention approaches. For example, while organisational learning is positioned as an important and effective approach to support staff performance, programme iteration, and commercial performance, there was no consensus across the synthesised evidence on the design of effective interventions that promote organisational learning. We are therefore only able to point to the relevance of this body of literature to EIDM without making detailed recommendation on which interventions to apply.

Lastly, we also comment on a number of interventions that might be able to foster evidence use at an institutional level. These interventions refer to the application of complexity thinking; national institutions and clearinghouses; and machine learning and modelling. We consider the literature concerning complex systems and machine learning as blue skies thinking and only point out its overlap with some parts of the EIDM literature without commenting on evidence of effects or intervention design. The literature on national institutions and clearing houses, on the other hand, provides evidence on the impact of the former on evidence use. Institutions such as NICE or the South African Department of Planning, Monitoring, and Evaluation (DPME) have established systems that enforce and incentivise the use of evidence by decision-makers. There are currently no rigorous reviews synthesising the effects of these institutions, but reviews of individual institutions point to

their direct impact on evidence use; whether this then translates into an institutionalised norms and systemic change, however, is unclear.

Social science insights for EIDM:

In addition to assessing likely effects of social science interventions on CMOs and behaviour change outcomes, our scoping review also aimed to showcase what insights could be gained from their application to support M6 (structures & processes) interventions.

The social science literature suggested a number of interventions to support the processes of individual decision-makers to become more receptive to evidence use: reducing cognitive biases; nudges; creating professional norms. These interventions aimed to remove barriers to effective decision-making and propose the field of behavioural sciences to contribute relevant insights on effective changes to micro-level decision-making processes.

Social science interventions supporting the change of organisational structures to allow for a greater use of evidence have been suggested in the research use literature before. The identified interventions in this scoping review reinforced and added to these suggestions highlighting how organisational processes and structures could be changed to facilitate an environment that is conducive to the use of evidence. The suggested interventions propose alterations to existing organisational structures and a more regular direct facilitation of EIDM.

We offered complexity thinking as a relevant body of literature that conceptually overlaps with attempts to define EIDM at a systems level. Machine learning and modelling was offered as a future area of research, which might have implications for our understanding of EIDM. Lastly, we also highlighted the relevance and likely effects of using national institutions, such as government departments and clearinghouses, to enhance the sphere of EIDM interventions nurturing an institutionalised use of evidence.

5.3 Overview of synthesis findings of review 2

Review 2 identified over 100 interventions, of which 67 were of high conceptual relevance to the six evidence use mechanisms. We provide a full list of considered interventions in the Technical Report (Appendix F). As noted earlier, the interventions in Review 2 refer to individual programme components (for example, sending reminders as a component of communication interventions); interventions (for example, social marketing as a communication intervention); and/or concepts from which future interventions might be derived (for example, information design as a scientific concept). The social science research also provided insights for possible changes to existing EIDM practices.

To illustrate the breaths of research consulted in Review 2, examples of areas of social science accessed include:

- Media & Communication studies
- Organisational learning and management studies
- Psychology
- Behavioural Sciences
- Adult learning theories
- Development Studies
- Political Sciences
- Sociology
- Information design
- Environment & climate science

Configuring this extensive body of knowledge, for relevant interventions and evidence of their effects, we can single out a number of examples of important areas of literature and contributions from the reviewed social science literature. In Section 3.3 an exhaustive account of these is presented, differentiating the effects of relevant social science interventions (Figures 3.1–3.6) and the insights gained from their application in EIDM (Tables 3.1–3.6).

Behavioural norms: The creation of a social or professional norm for decision-makers to use evidence is a relevant intervention approach to reinforce and motivate behaviour change. Effective interventions to build such social or professional norms included social marketing and incentives.

Advocacy and awareness-raising: Social science research suggests that advocacy and awareness-raising campaigns can be effective to support behaviour change. These strategies could be applied to communicate and popularise the concept of EIDM to increase awareness for the benefits of using evidence during decision-making as well as the risks of not doing so.

Effective communication: This included a large body of literature relevant to how the communication of research evidence could be enhanced. Framing of messages, tailoring communication including audience segmentation, and regular use of reminders are examples of communication techniques reported as effective in the social sciences.

Information design: To support the performance of evidence access options, such as online repositories, research use interventions may gain from an incorporation of information design principles as well as branding techniques and personalisation of access (for example, through evidence use apps) to increase the appeal and cognitive association with these platforms.

Professional identities & practice: There is a large body of literature on interventions using interaction to build a professional identity with common practices and standards of conduct. Interventions positioned in the social science literature to be of benefit in this regard include, for example, communities of practice, mentoring, and inter-professional education. This body of knowledge could be used to enhance these interventions (which currently target mainly educational objectives, such as increasing EIDM capacity), allowing evidence use to become a standard part of decision-makers' professional identity and practice.

Adult learning theories and principles: The integration of adult learning theories and principles with EIDM capacity-building is likely to enhance the long-term performance of interventions supporting decision-makers' EIDM skills.

Organisational structures: Organisational learning and cultures, management and leadership techniques, and other changes to organisational processes and structures (for example, facilitation), are likely to be of direct benefit to interventions aiming to increase the receptivity of decision-making processes and structure to evidence use. A closer integration of this body of knowledge could enhance the appetite and organisational readiness to use evidence.

Individual decision-making: A number of behavioural factors, such as cognitive biases, can influence individual decision-making processes. A body of research in the behavioural sciences holds insights on the design of effective interventions to improve individual's decision-making. Such behavioural interventions, for example nudges and commitment devices, could be applied to enhance the use of evidence during decision-making.

Online and mobile technologies: The application of online and mobile technologies is suggested in the social science literature to increase the reach, convenience, and appeal of interventions. A range of EIDM interventions (e.g. communication, capacity-building, decision aids) could benefit from the integration and regular use of online and mobile technologies.

Institutional frameworks and mechanisms: Institutional frameworks and mechanisms can advocate and nurture structural changes at all levels of decision-making. In the context of EIDM, effective examples include accreditation processes, clearinghouses such as the National Institute for Health and Care Excellence (NICE), and government ministries.

Chapter 6. Summary of findings

Introduction

This chapter brings together the results of Review 1 and Review 2. It summarises what we know (at a review level) about the effects of interventions aiming to increase decision-makers' use of evidence and what additional interventions applied in the broader social sciences are potentially relevant to support these evidence use interventions as well as the mechanisms through which the interventions reach their effects. The chapter will thereby present an overview of the results of our research project to highlight what works in increasing evidence use and what insights the social sciences literature can contribute to the promotion of EIDM.

Review 1 was a systematic review of reviews of the impact of evidence use interventions. Evidence use interventions were grouped according to six intervention mechanisms. Intervention outcomes were broken down into capability, motivation, and opportunity to use evidence (i.e. intermediate outcomes) and final outcomes of the use of evidence by decision-makers. In the absence of sufficient quantitative data for statistical meta-analysis, we used narrative synthesis based on a structured inventory of the included reviews (see Table 4.1; Appendix A) to answer the question of what works to increase decision-makers' use of evidence.

The results of Review 2 present the outcome of a scoping review of the social science literature on research results relevant to the study of EIDM. We applied the same six evidence use mechanisms used in Review 1 as a framework to scope the social science literature for concepts and interventions that might generate insights on how to improve the impact of existing EIDM practices as well as suggest different practices altogether. This scoping exercise is not exhaustive and the suggested social science interventions for use in EIDM may not be unique to this review. Some of the identified concepts and interventions, for example, might have been suggested to be of relevance to support EIDM in theoretical papers, primary studies, and practice reports, each of which was outside the scope of this project.[25] The scoping review configured a vast body of knowledge using a mechanism framework identifying social science interventions and concepts that might be useful to contribute to the application of these mechanisms to support evidence use. These social science insights varied e.g. suggesting different intervention approaches; enhancing existing practices; supporting standardisation of practices, and enhancing interventions' evidence-base. Having identified relevant social science interventions, the scoping review then collected existing reviews on the impact of these interventions (in non-EIDM areas) to present a descriptive overview of the interventions' likely effects and contribution if applied in the context of EIDM.

Chapter structure and diagrams

In sum, Review 1 establishes rigorous synthesised findings on the impact of evidence use interventions, which is complemented by a structured scoping review to identify social science interventions that might provide further insights on efforts to support EIDM. In this chapter, we present the findings of both reviews for each mechanism individually.

[25] At the end of the discussion of each mechanism, we provide a list of suggestions based on our project's findings and point the reader to some examples of primary EIDM literature that raise similar points.

For each mechanism, we present review findings on the effects of evidence use interventions (structured by mechanisms) and social science interventions on CMOs and EIDM/behaviour change in a detailed figure (for example, Figure 6.1). In the top part of the figure the main results of both reviews are presented in a flow diagram: the arrow represents the reviewed evidence use intervention mechanism, and the intervention's effects on CMOs are visualised in circles. A green circle represents evidence of effects, an orange circle highlights evidence of no impact, whereas a blank circle indicates a lack of evidence altogether. Review 1 findings are indicated in the top line of CMO circles and show the effects of the evidence use intervention on decision-makers' CMOs and subsequently evidence use. Review 2 findings then are indicated in the bottom line of CMO circles and show the effects of social science interventions relevant to the reviewed evidence use intervention.

The two boxes below the diagram then provide additional detail on Review 1 findings (i.e. the impact of evidence use interventions); and on Review 2 findings (a list of relevant social science intervention structured according to their effects on CMOs and behaviour change). In the boxes, listings of effective interventions are expressed with a [⊕] symbol; ineffective interventions with a [⊘]; and listings of interventions with an absence of evidence a [○] symbol.

Below each figure, we then provide a more detailed narrative of the findings of both reviews (for the reviews being considered). We commence the discussions with the results from Review 1. Thereafter, we elaborate Review 2 results divided into the likely effects of social science interventions and their relevance and insights if applied in the context of EIDM. This discussion on relevance and insights is presented in tabular format. It is followed by a brief narrative summarising the reported effectiveness of the identified social science interventions and how these effects relate to CMOs and evidence use outcomes. There is then an analysis of each evidence use intervention with a brief reminder and interpretation of the implications of combining the findings of both reviews to draw conclusions on the application and impact of the intervention. Finally, there is a bullet point summary of the key suggestions for each intervention.

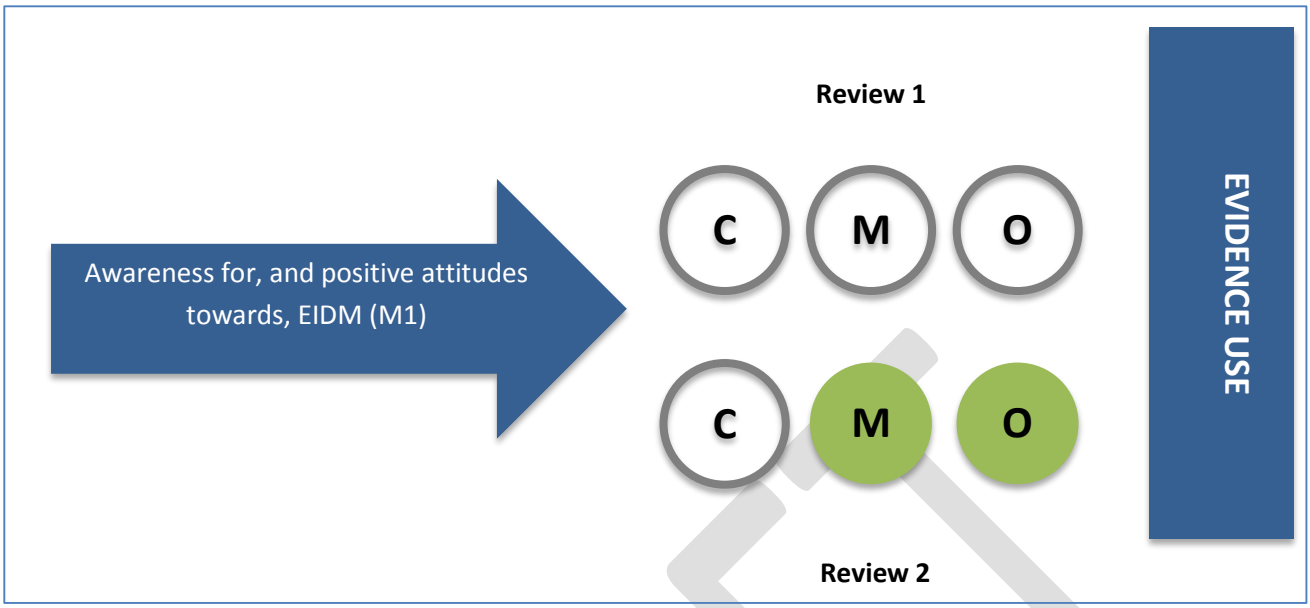
M1 interventions (building awareness for, and positive attitudes towards, EIDM)

Figure 6.1 below presents an overview of Review 1 and Review 2 findings on the effects of interventions that could support decision-makers' use of evidence by building awareness for, and positive attitudes towards, the concept of EIDM (M1 interventions).

Review 1 findings

There is a lack of evidence on the impact of interventions applying M1 (awareness) to support decision-makers' use of evidence. Only three included systematic reviews reported on interventions that applied M1 (awareness). In each of these, M1 (awareness) was combined with other evidence use mechanisms and the outcomes of the interventions could not be attributed to M1 (awareness). We therefore identified an evidence gap and are unable to comment on the role and contribution of M1 (awareness) interventions to increase decision-makers' use of evidence.
Regarding the design of M1 (awareness) interventions components, these focused, by and large, on building motivation to use evidence (for example, by engaging decision-makers in the research process to showcase the importance of evidence) or highlighting the receptivity of decision-makers' policy and practice challenges to evidence.

Figure 6.1: M1 (Awareness) Overview



SYSTEMATIC REVIEW OF REVIEWS OF EIDM LITERATURE (Review 1)

CMOs:

Absence of evidence that M1 interventions have an independent impact.

Evidence use:

Absence of evidence that M1 interventions have an independent impact.

Background:

M1 was only applied as part of multi-mechanism interventions (n=4) and it was not possible to attribute outcomes to the mechanism.

Examples of M1 interventions include:

- Decision-maker participation in the design of a research study to understand value of research;
- Decision-makers asked to identify a policy issue that they would like research advice on.

SCOPING REVIEW OF BROADER SOCIAL LITERATURE (Review 2)

Evidence of effects:

- ⊕ social marketing;
- ⊕ awareness-building campaigns;
  → build norms & motivation to foster behaviour change
- ⊕ social incentives;
- ⊕ identity cues;
  → build motivation & reinforce behavioural norms
- ⊕ user engagement;
  → build motivation & opportunity.

Absence of evidence of effects:

- ○ counter-marketing;
- ○ social group techniques;
- ○ PC-generated models & simulation exercises.

Review 2 findings

The scoping review of the social science literature explored interventions that might present relevant insights to contribute to the application of M1 (awareness) interventions. Four categories of intervention were identified: (i) the creation of social or professional norms; (ii) the provision of a counterfactual to the use of evidence; (iii) re-focusing and designing engagement interventions; and (iv) advocacy for EIDM.

Table 63.1 presents a list of social science interventions identified as of relevance to M1 (awareness) interventions, briefly explaining what insights might be gained from their application in an EIDM context.

Table 6.1: M1 (awareness) social science insights overview

Intervention	*Potential use in EIDM:*
CREATING SOCIAL & PROFESSIONAL EVIDENCE USE NORMS	
Social marketing	marketing a social or professional evidence use norm.
Social incentives	building an intrinsic motivation to use evidence.
Identity cues & priming	triggering and reinforcing nascent evidence use norms.
PROVIDING A COUNTERFACTUAL TO EVIDENCE USE	
Counter-marketing	showing possible negative effects of not accessing evidence.
Social group techniques	challenging the status quo and incite debate on evidence use.
PC models & other simulations	modeling the effects of EIDM vs. non-EIDM policy decisions.
ENGAGEMENT	
User/community engagement	enhancing existing EIDM engagement practices, drawing from effective engagement techniques and positioning engagement to build demand.
ADVOCACY FOR EVIDENCE USE	
Awareness-building campaigns	increasing the visibility and credibility of EIDM.

We then reviewed the reported effectiveness of these interventions in the social sciences to assess their likely effects on CMOs and behaviour change outcomes in relation to M1 (awareness).

Evidence of effects in social sciences:

Social science interventions effective to influence behaviour change include social marketing and awareness-building campaigns. Each of these was identified as being able to nurture social and professional norms of decision-makers. In the context of EIDM, these interventions could be applied to foster the creation of evidence use norms. Social marketing and awareness-building could

influence decision-makers to comply with the social or professional norm of using evidence, thereby supporting motivation to use evidence and behaviour change.

Social incentives and identity cues were also identified in the social sciences as interventions effective to reinforce behavioural norms. Having created a social or professional evidence use norm, social incentives and identity cues could support compliance with this norm and motivation to engage in the targeted behaviour, i.e. motivation to use evidence. User-engagement, as a tool reported in the social sciences as effective to support familiarity and identification with an intervention, might be able to positively influence both motivation and opportunity to use evidence. From a demand-side perspective, users receive an opportunity to be engaged in the production of evidence, assuming that this experience might increase their attitudes towards, and future appetite for, evidence.

Conceptually relevant social science interventions that still lack a reliable evidence-base include interventions aiming to present a counter-factual to evidence use, such as counter-marketing, social group techniques, and PC-generated models and simulation exercises. Conceptually, these might be able to support opportunity as well as motivation to use evidence.

Summary:

Combining the results and additional insights from Review 1 and Review 2, we arrive at the following conclusions:

(1) In Review 1, there was an absence of evidence on the independent effects of M1 (awareness) interventions on CMOs and decision-makers' use of evidence. Nurturing a conceptual uptake of EIDM (i.e. building support for evidence use as a principle of decision-making) is distinct from building awareness for research findings *per se*, and the design of interventions should reflect this.
(2) Interventions supporting the creation of behavioural norms are highly relevant to support the design of M1 (awareness) interventions in the context of EIDM. A social or professional evidence use norm would directly support behaviour change and anchor evidence use as a principle of decision-making.
(3) To anchor evidence use as a routine behaviour, an active promotion of the desired behaviour, based on established marketing and communication techniques, might be effective. This could include the use of social marketing and awareness-building campaigns to promote and frame the behaviour of using evidence.
(4) To build awareness of the importance of EIDM, interventions could communicate more explicitly the risks and consequences of not using evidence, i.e. present a counter-factual to the use of evidence.
(5) User-engagement presents an effective tool to increase decision-makers' ownership of and identification with EIDM. Social science research suggests a number of principles to ensure that engagement is more acceptable and relevant from a decision-makers' point of view.

Taking all of the above work together, our suggestions would be:

- To market and actively promote the concept of EIDM (as for example implemented by the Alliance for Useful Evidence).[26]

[26] http://www.alliance4usefulevidence.org

- To frame evidence use as a desirable social and professional norm (as for example discussed for EIDM by Champagne et al. 2014).
- To highlight the risks and potential consequences of not using evidence (i.e. present a counterfactual to evidence use).
- To target and tailor the engagement of decision-makers more carefully - while considering, in particular, decision-makers' opportunity costs and benefits from the engagement.

M2 interventions (building agreement on policy-relevant questions and fit-for-purpose evidence)

Figure 6.2 below is an overview of Review 1 and Review 2 findings on the effects of interventions that could support decision-makers' use of evidence by building mutual understanding and agreement on policy-relevant questions and what constitutes fit-for-purpose evidence required to answer them (M2).

Review 1 findings

There is a lack of evidence on the impact of interventions applying M2 (agree) to support decision-makers' use of evidence. Only two systematic reviews included in the synthesis featured interventions that employed M2 (agree). In each of these, M2 (agree) was combined with other evidence use mechanisms and therefore the outcomes of the interventions could not be attributed to M2 (agree).[27] We were therefore unable to comment on the role and contribution of M2 (agree) interventions to increase decision-makers' use of evidence.

Regarding the design of M2 (agree) intervention components, both focused on strengthening motivation to use evidence through measures to increase the relevance of evidence to decision-makers' professional needs.

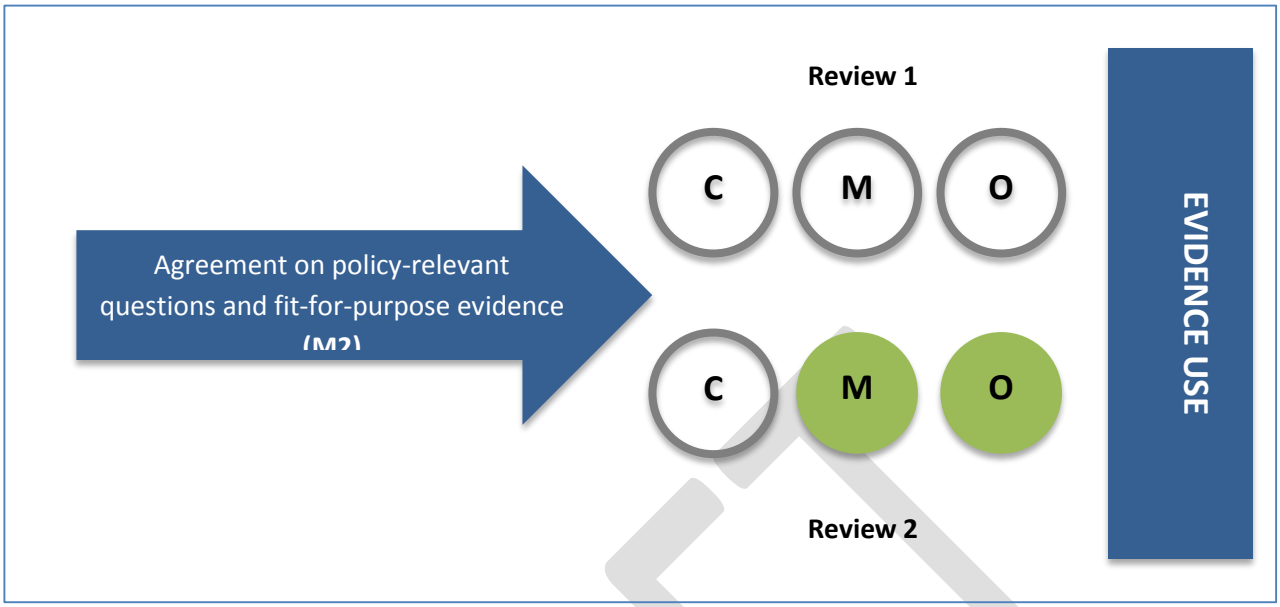
Review 2 findings

The scoping review of the social science literature explored interventions that might present relevant insights to contribute to the application of M2 (agree) interventions. We identified three broad categories of interventions applied in the broader social sciences that present relevant insights to contribute to efforts aiming to build consensus on what constitutes fit-for-purpose evidence and policy-relevant questions: consensus-building techniques; collaborative learning; and user engagement.

Table 6.2 below presents a list of social science interventions identified as of relevance to M2 (agree) interventions, briefly explaining what insights might be gained from their application in an EIDM context.

[27] For example, collaboration between decision-makers and researchers also falls under M4 (interact).

Figure 6.2: M2 (agree) Overview



SYSTEMATIC REVIEW OF REVIEWS OF EIDM LITERATURE (Review 1)

CMOs:

Absence of evidence that M2 interventions have an independent impact.

Evidence use:

Absence of evidence that M2 interventions have an independent impact.

Background:

M2 was only applied as part of multi-mechanism interventions (n=2) and it was not possible to attribute outcomes to the mechanism.

Examples of M2 interventions include:

- Collaboration between researchers and decision-makers to agree on the applicability and utility of evidence;
- Decision-makers were asked to evaluate the relevance of the current evidence to their professional needs, organisational values, standards and policies.

SCOPING REVIEW OF BROADER SOCIAL LITERATURE (Review 2)

Evidence of effects:

- ⊕ Delphi panels;
- ⊕ journal clubs;
- ⊕ user engagement;
  → build consensus on fit-for-purpose, in this process increase motivation and/or opportunity to use evidence.

Absence of evidence of effects:

- ○ feedback mechanisms;
- ○ discursive leadership & collaborative planning;
- ○ communities of practice;
- ○ inter-professional education.

Table 3.2 M2 (agree) social sciences insights overview

Intervention	*Potential use in EIDM:*
CONSENSUS-BUILDING TECHNIQUES	
Delphi-panels, nominal group techniques, etc.	providing a structured and transparent way to reach consensus on fit-for-purpose evidence and relevant questions.
Discursive leadership & collaborative planning	encouraging participation and inclusion of multiple voices on fit-for-purpose evidence and relevant questions.
Feedback mechanisms	providing a channel to express and challenge (existing) notions of fit-for-purpose evidence and relevant questions.
COLLABORATIVE LEARNING	
Inter-professional education	jointly learning about fit-for-purpose from different professional angles and epistemologies.
Communities of practice (CoP)	enhancing existing CoPs, to explicitly target the creation of a professional norms and standards of fit-for-purpose evidence.
Journal clubs	enhancing existing journal clubs, to debate the applicability of evidence and reach consensus on professional standards for fit-for-purpose evidence.
ENGAGEMENT	
User/community engagement	enhancing existing EIDM engagement practices, drawing from effective engagement techniques to providing a formal channel to incorporate decision-makers' perception of fit-for purpose and policy relevance in the production of evidence.

We then reviewed the reported effectiveness of these interventions in the social sciences to assess their likely effects on CMOs and behaviour change outcomes in relation to M2 (agree).

Evidence of effects in the social sciences:

Scoping the wider social science literature, we identified three interventions that were found effective to support consensus-building, and thus appear applicable to serve a similar function with regard to defining fit-for-purpose evidence and relevant questions: Delphi-panels, journal clubs, and user engagement.[28] Delphi-panels, journal clubs, and user engagement each provide a platform in which the relevance of different types of evidence could be discussed (i.e. opportunity to use evidence). These three interventions further appeared effective in facilitating a process that allowed for mutually satisfactory definitions of fit-for-purpose and relevance to be agreed upon, increasing decision-makers' motivation to use evidence.

However, a majority of conceptually relevant interventions to support M2 (agree) lacked a reliable evidence-base. These referred to feedback mechanisms; discursive leadership & collaborative

[28] For a detailed discussion on the distinction and relation between user engagement in Review 1 and Review 2, please see the Technical Report.

planning; communities of practice; and inter-professional education. These interventions are suggested in the social sciences as of potential to support consensus-building, but the scoping review either failed to identify existing reviews of effects or the identified reviews reported mixed effects.

Summary:

Combining the results and further insights from Review 1 and Review 2, we arrive at the following conclusions:

(1) In Review 1, there was an absence of evidence on the independent effects of M2 (agree) interventions on CMOs and decision-makers' use of evidence. While a lack of relevant research evidence is often cited as a barrier to evidence use, there are few suggested demand-side interventions to formalise decision-makers' input to what constitutes fit-for-purpose evidence and relevant questions.
(2) The application of explicit consensus-building techniques could facilitate a discussion on fit-for-purpose evidence and policy-relevant questions. This requires acknowledgement that multiple perspectives on fit-for-purpose and relevance exist and that both concept can be defined by discussion and consensus.
(3) Consensus-building on fit-for-purpose and policy-relevance could be embedded in wider efforts to build a professional identity of evidence use as a principle of decision-making, including set standards of practice and conduct. A number of interactive educational interventions might be relevant in this remit: inter-professional education, communities of practice, and journal clubs.

Taking all of the above work together, our suggestions would be:

- To make the process of building consensus on fit-for-purpose evidence and policy-relevant questions explicit and more formalised.
- To apply formal consensus-building techniques to structure and guide a mutual and satisfactory process of defining fitness-for-purpose and relevance (as for example studied by Dobbins et al. 2008).
- To build a professional identity of evidence use as a principle of decision-making, including standards related to building consensus on fit-for-purpose evidence and setting policy-relevant questions.

M3 interventions (providing communication of, and access to, evidence)

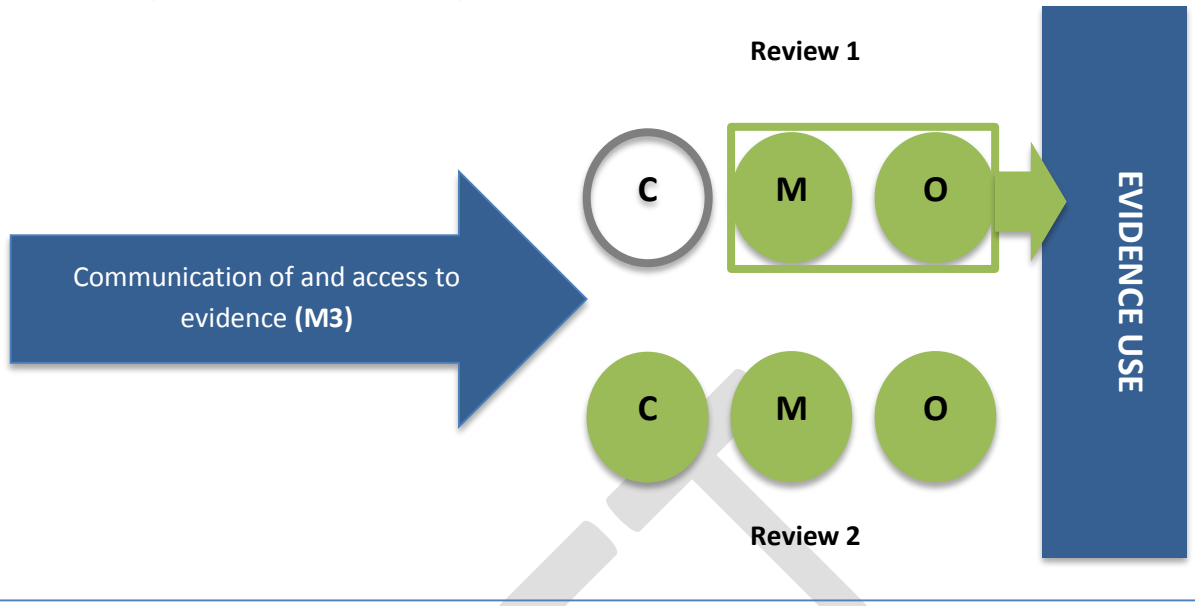
Figure 6.3 below presents an overview of Review 1 and Review 2 findings on the effects of interventions that could support decision-makers' use of evidence through effective communication of and access to evidence (M3).

Review 1 findings

Interventions facilitating access to research evidence, for example through communication strategies and evidence repositories, were only found to be effective at increasing use of evidence if the intervention design simultaneously tried to enhance decision-makers' opportunity and motivation to use evidence. An example of such a programme is the provision of an online repository of evidence plus weekly tailored messages alerting decision-makers to new content relevant to their area of expertise. Interventions that only provided opportunities to use evidence,

for example online repositories without motivation-building features or simple dissemination of evidence without follow-up or adequate targeting, were found to be ineffective. Motivation-building techniques that were effective at improving attitudes towards evidence and intentions to use evidence included personalised and targeted communication techniques, audience segmentation, and user-friendly design techniques. Opportunity to use evidence was increased through user engagement, hassle-free and multiple means of access and online platforms. The included interventions did not target capability to use evidence and we therefore cannot comment on the effects of M3 (communication & access) interventions in this regard.

Figure 6.3: M3 (communication & access) Overview



SYSTEMATIC REVIEW OF REVIEWS OF EIDM LITERATURE (Review 1)

CMOs:

Positive impact on motivation to use evidence, for example through:

⊕ audience segmentation; personalised & targeted messages; and user-friendly, hassle-free design.

Positive impact on opportunity to use evidence, for example through:

⊕ user-engagement; multiple means of access; and online databases to improve opportunity.

Evidence use:

Positive impact on evidence use, but only if M3 intervention combines motivation with opportunity, for example:

⊕ online repository + targeted messages.

No impact on evidence use if M3 intervention only provides opportunity, for example:

⦸ passive dissemination; access to database without follow-up.

SCOPING REVIEW OF BROADER SOCIAL LITERATURE (Review 2)

Evidence of effects:

⊕ social marketing;
⊕ awareness-building campaigns;
⊕ multi-component communication strategies;
→ build opportunity & motivation to foster behaviour change; build capability in multi-component strategies

⊕ tailoring; framing;
⊕ explaining uncertainty;
⊕ narratives; identity cues;
→ retain information (secondary C&O) and motivation to use them

⊕ online and social media;
⊕ branding;
⊕ reminders; timing;
⊕ information design;
→ build motivation &/or opportunity.

Relevant, but no evidence of effects:

○ science communication;
○ design of online repositories;
○ evidence use apps.

Review 2 findings

The scoping review of the social science literature explored interventions that might present relevant insights to contribute to the application of M3 (communication & access) interventions. We identified a number of communication and dissemination techniques, communication strategies, and access options that might be of relevance to support decision-makers' reception of evidence and motivation to apply it. We assessed these for their likely effects on CMOs and behaviour change outcomes as well as the nature of the insights and contribution to the application of M3 (communication & access) interventions.

Table 6.3 below presents a list of social science interventions identified as of relevance to M3 (communication & access) interventions, briefly explaining what insights might be gained from their application in an EIDM context.

Table 6.3 M3 (communication & access) social sciences insights overview

Intervention	*Potential use in EIDM:*
COMMUNICATION TECHNIQUES	
Tailoring & targeting	regularly applying tailoring & targeting to align communication of evidence to decision-makers' professional needs & personal preference.
Framing (gain/loss)	aligning the communication of the research results with the cognitive characteristics of the decision or the desired behaviour.
Framing (norms / identities)	aligning the communication of evidence or the concept of EIDM with the decision-makers' existing norms and identity.
Explaining uncertainty	regularly applying techniques to explain uncertainty to decrease ambivalence in research results.
Narratives	enhancing existing evidence communication practices to increase the relevance and accessibility of research results.
DISSEMINATION TECHNIQUES	
Audience segmentation	fitting EIDM promotion / research message to decision-maker audience.
Online and social media	regularly applying online & social media tools to increase the reach and convenience of evidence and EIDM communication.
Branding	increasing the credibility, visibility, and emotional connection of the concept of EIDM.
Reminders	regularly applying reminders to reinforce communicated research results, triggered frames, and targeted behaviour of accessing evidence.
Timing	enhancing existing timing techniques to increase the timing of evidence communication to decision-makers' receptive hours and life moments.

Intervention	*Potential use in EIDM:*
Information design	increasing the accessibility as well as visual appeal of evidence.
STRATEGIC COMMUNICATION	
Social marketing	marketing a social or professional evidence use norm.
Awareness campaigns	increasing the visibility and credibility of EIDM.
Multicomponent communication strategies	enhancing existing research communication to combine the communication of evidence with practical opportunities or skills to use evidence.
Science communication	enhancing existing science communication to closer target a decision-making audience and a conceptual uptake of EIDM.
ACCESS OPTIONS	
Online repositories	enhancing existing repositories applying IT-design principles to emphasise usability and visual appeal in addition to functionality.
Apps	creating more convenient and personalised access options and tools.

We then reviewed the reported effectiveness of these interventions in the social sciences to assess their likely effects on CMOs and behaviour change outcomes in relation to M3 (communication & access).

Evidence of effects in the social sciences:

Communication techniques found to be effective in the social science literature, and thus likely to be effective to increase motivation to use evidence, include: tailoring, framing, explaining uncertainty, and narratives. Applying these techniques could enhance the way research findings are communicated and might improve decision-makers' reception of and attitude towards the communicated evidence and its findings (motivation). As a secondary outcome, they also might enhance the likelihood that a communicated message will be remembered, thereby potentially increasing opportunities and capabilities to use evidence as decision-makers might better recall the key findings of research studies (opportunity) and display a better understanding of them (capabilities).

Effective dissemination techniques included in the scoping review were online and social media, branding, reminders, timing, and information design. Branding and information design could be of benefit to affect decision-makers' motivation to use evidence. To enhance decision-makers' opportunity to use evidence, by increasing the reach of evidence and the personal convenience of receiving it, online and social media, reminders, and timing appeared as promising interventions. In addition, we identified three communication strategies that were identified as effective in the social science literature and could combine these techniques into a formal and planned effort to encourage behaviour change (in our case evidence use), namely social marketing, awareness-building campaigns, and multi-component communication strategies. Social marketing and awareness-building campaigns hold potential to communicate social and professional evidence use

norms, while multi-component communication strategies encompass all three components of behaviour change.

Lastly, the conceptually relevant interventions for which we identified insufficient evidence of effects referred to: science communication; design of online repositories; and evidence use apps.

Summary:

Combining the results and additional insights from Review 1 and Review 2, we arrive at the following conclusions and suggest a number of principles and effective techniques that could be of particular benefit to interventions providing communication of and access to evidence (M3):

1) In Review 1, we established that communication and access interventions only increase decision-makers' use of evidence if they combine motivation- and opportunity-building components. Social science knowledge suggests a large number of interventions that might support these components, increasing the likelihood that M3 (communication & access) interventions might nurture behaviour change.
2) Communicated evidence should be understandable and user-friendly, but it also should be appealing in design and convenient in access. This requires a better understanding of visual design techniques and decision-makers' preferences and habits of accessing information.
3) Tailoring and targeting, reminders, timing, online and social media, and explaining uncertainty are crucial techniques and could become a regular practice.
4) More attention could be paid to how a research finding is framed. The wording and contextualisation of findings has a large effect on whether the finding will be used.
5) To increase reach and convenience of access to evidence, the use of online and social media platforms remains the most promising approach.
6) Interventions could start to focus on the communication of the concept of evidence use. Promising coherent strategies to communicate the norm and concept of EIDM include social marketing, awareness-raising campaigns, and multi-component communication strategies combining reach-, motivation-, and ability-building components.

Taking all of the above work together, our suggestions would be:

- To enhance the use of interventions communicating and providing access to evidence if they simultaneously build opportunity and motivation to use evidence (based on Review 1).
    - To question the use of passive dissemination and access options (as for example discussed for EIDM by Wilson et al. 2010).
- To build motivation to use evidence, a large variety of communication techniques could be used more regularly to communicate research evidence (for example, framing; tailoring; reminders) (as for example discussed for EIDM by McCormack et al. 2013).
- To apply a formal and multi-component communication strategy to communicate research.
- To use online and social media regularly to communicate research.
- To incorporate IT and visual design principles when creating platforms to access evidence (as for example implemented by Makkar et al. 2015; InfoDesignLab at Norwegian Knowledge Centre for Health Services).[29]
- To formalise access to evidence by embedding it in organisational structures (as for example studied for EIDM by Wilson et al. 2015; Notarianni et al. 2015).

[29] http://www.infodesignlab.com/?page_id=136

- To market and actively promote the concept of EIDM (as for example implemented by the Alliance for Useful Evidence).

M4 interventions (facilitating interactions between decision-makers and researchers)

Figure 6.4 below presents an overview of Review 1 and Review 2 findings on the effects of interventions that could support decision-makers' use of evidence by facilitating interactions between decision-makers and researchers (M4).

Review 1 findings

None of the reviewed interventions focused exclusively on facilitating interactions between decision-makers and researchers. As the M4 (interact) mechanism was only applied as part of multi-mechanism interventions, it was not possible to establish an independent causal link between M4 (interact) and evidence use outcomes. However, it was observed that a large majority of the multi-mechanism interventions that included an unstructured interaction component did not increase evidence use.

In terms of CMOs, unstructured interaction as an approach to share EIDM skills, for example in communities of practice, was found ineffective to improve decision-makers' capability to use evidence. However, the review identified cautious evidence that light-touch approaches such as user-engagement and consultation—rather than full-blown interaction—positively affects CMOs. Similar positive effects from interaction interventions on CMOs were identified in journal club interventions, following which decision-makers reported improved attitudes towards evidence after joint discussions with other decision-makers who were eager to apply evidence.[30] There was insufficient evidence to comment on the impact of M4 (interact) interventions on opportunity to use evidence.

Review 1 concluded that a lack of conceptual clarity (i.e. what constitutes interaction, relationships, trust) and casual clarity (i.e. purpose of the interaction, theory of change how interaction supports evidence use) may impeded the overall effectiveness of M4 (interact) interventions. Finally, the issue of what constitutes an 'effective' relationship and how trust is build was often not explicitly addressed by the reviewed interventions.

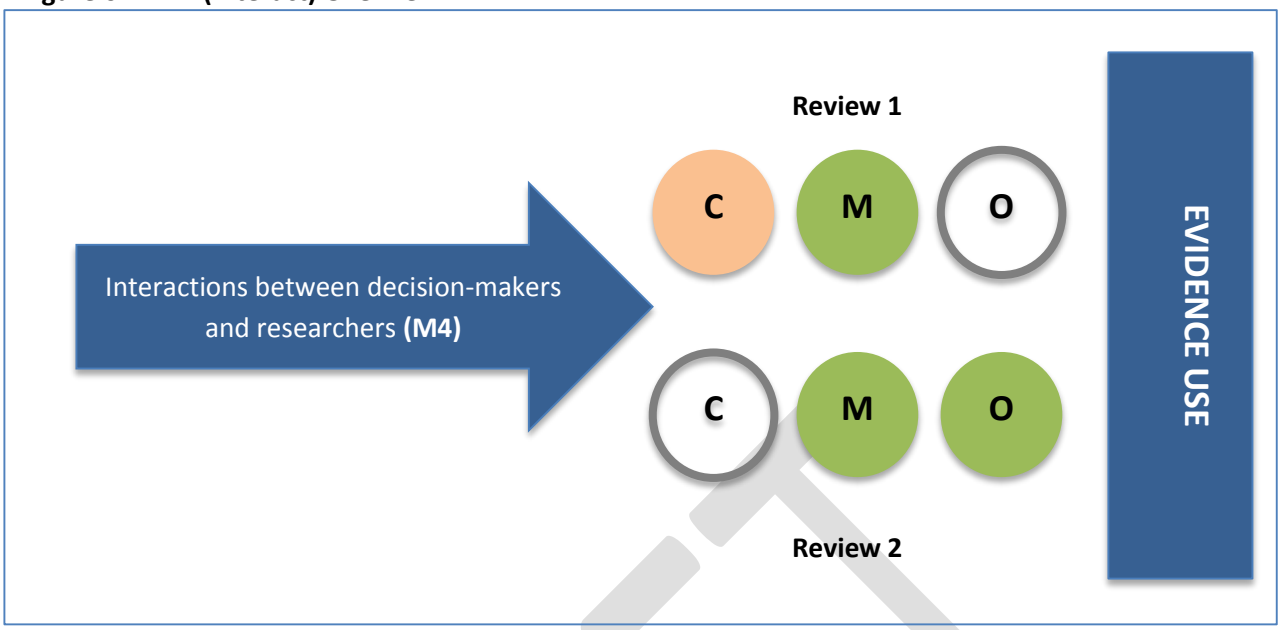
Review 2 findings:

The scoping review of the social science literature explored interventions that might present relevant insights to contribute to the application of M4 (interact) interventions. We identified four relevant interaction components, which could be applied in two broad groups of interventions (interaction to build professional norms & standards; creation of networks). We assessed these for their likely effects on CMOs and behaviour change outcomes as well as the nature of the insights and contribution to the application of M4 (interact) interventions.

Table 6.4 below presents a list of social science interventions identified as of relevance to M4 (interact) interventions, briefly explaining what insights might be gained from their application in an EIDM context.

[30] Journal clubs facilitated by researchers as well as decision-makers.

Figure 6.4: M4 (Interact) Overview



SYSTEMATIC REVIEW OF REVIEWS OF EIDM LITERATURE (Review 1)

CMOs:

Positive impact on motivation to use evidence, for example through:

- ⊕ journal clubs
- ⊕ user engagement.

No impact on capability when unstructured to share EIDM skills and knowledge in combination with M5, for example:

- ⦸ communities of practice; opinion leaders.

Evidence use:

M4 was only applied in multi-mechanism interventions denying casual attribution with evidence use outcomes. Observation does not suggest a link between M4 and evidence use.

Background:

M4 interventions suffered from conceptual and casual clarity impeding overall effectiveness. Interventions claiming to build relationships and trust without a clear theory of change and definition included:

- ○ joint educational meetings; communities of practice; knowledge brokers; opinion leaders.

SCOPING REVIEW OF BROADER SOCIAL LITERATURE (Review 2)

Evidence of effects:

- ⊕ social influence; online interaction;
  → effective components of interaction to increase motivation and influence behaviour change
  → online interaction further effective to enhance the reach & convenience of interaction (opportunity)
- ⊕ mentoring;
- ⊕ joint practice development;
  → build professional norms and standards (opportunity & motivation)
- ⊕ online networks;
  → enhance networking effects (opportunity & motivation).

Absence of evidence of effects:

- ○ communities of practice; inter-professional education; formal networks; network analysis
- ○ [interaction components]: collaboration; building relationships & trust.

Table 6.4 M4 (decision maker-researcher interaction) social science insights overview

Intervention	*Potential use in EIDM:*
COMPONENTS IN INTERACTION INTERVENTIONS	
Social influence	enhancing the targeted use of social influence to foster evidence use norms by providing information on other decision-makers' behaviour
Collaboration	interrogating and formalising the benefits for and demands on decision-makers engaged in collaborative exercises with researchers.
Relationships & trust	interrogating and formalising the theory of change and objective of interaction.
Online interaction	regularly applying online and mobile technologies to increase the reach, convenience and cost-effectiveness of interaction.
INTERACTION TO BUILD PROFESSIONAL NORMS & STANDARDS	
Communities of practice	enhancing existing CoPs to focus less on educational objectives in favour of negotiating and standardising practices and standards of conduct of the EIDM community of practice.
Joint practice development	enhancing existing interactions to provide a formal mechanism to develop a practice of using evidence.
Mentoring	enhancing existing mentorships to focus less on educational objectives in favour of changing professional norms and standards of conducts.
Inter-professional education	formally embedding the joint study of EIDM from different professional angles and epistemologies aiming to create common professional norms and standards.
CREATION OF NETWORKS	
Formal networks	interrogating the role and design of formal bodies organizing decision-makers and/or researchers interested in EIDM.
Online networks	enhancing existing networks to organize a group of decision-makers and/or researchers interested in EIDM into a more informal body using online technologies.
Network analysis	mapping the networks of decision-makers' to target interaction interventions and the introduction of evidence use into an existing network of professional relations.

We then reviewed the reported effectiveness of these interventions in the social sciences to assess their likely effects on CMOs and behaviour change outcomes in relation to M4 (interact).

Evidence of effects in the social sciences:

The scoping review of the social sciences identified social influence and online interaction as the most effective interaction components. The effects of collaboration and relationship building, in contrast, are currently unclear. Throughout all four components, the literature suggests that

unstructured interaction interventions might be less well-suited to disseminate knowledge or behaviours and that the formulation of explicit rationales for, and objectives of, the interaction can benefit programme design.

Screening interaction interventions that incorporated these effective components, we identified evidence of positive impacts for mentoring, joint practice development, and online networks. The first two of these were found able to use interaction among decision-makers as a tool to build professional norms and standards. In the context of EIDM, this process might leave room to embed norms and standards related to evidence use, thereby increasing motivation and opportunity to use evidence. Further, these interventions were relevant to foster interactions between different groups of decision-makers rather than between decision-makers and researchers per se. Online networks were effective to enhance the reach and convenience of networking activities, thereby potentially increasing motivation and opportunity to use evidence.

Lastly, inter-professional education, communities of practice, the creation of formal networks, and the application of network analysis to map decision-making structures were of conceptual relevance but currently lack a reliable evidence-base.

Summary:

Combining the results and additional insights from Review 1 and Review 2, we arrive at the following conclusions and suggest a number of implications for the design and implementation of M4 (interact) interventions:

(1) In Review 1, the majority of the reviewed interventions that focus on unstructured interactions between decision-makers and researchers appear ineffective at improving decision-makers' evidence use, a finding that may be explained by a lack of conceptual clarity (i.e. what constitutes interaction, relationships, trust) and casual clarity (i.e. purpose of the interaction, theory of change how interaction supports evidence use). Evidence from both the research use and social science literature suggests a careful intervention design specifying the nature and purpose of the interaction components to be of benefit to enhance programme impact. This positions interaction models that clearly define decision-makers' role and contribution and consider tangible benefits and decision-makers' opportunity costs of interaction to be most relevant (for example, user engagement).
(2) The assumption that unstructured interaction can foster dissemination of EIDM skills and knowledge is not supported in the literature. Interaction interventions might benefit from a more targeted approach focused on the active processes that interventions can control and facilitate. This refers to fostering social influence, engagement, sharing of norms and practices. Narrowing the scope of interactions' targeted CMOs might increase their final impact on behaviour change.
(3) The idea to building a professional identity of evidence use as an overarching objective of interaction fits with their ability to build professional norms and standards. This could present a raison d'être and align the objectives of the various interaction interventions applying different pathways to support decision-makers' use of evidence. This conceptualisation would also entail a greater emphasis on facilitating interactions between decision-makers, in addition to interaction between researchers and decision-makers.
(4) Interaction interventions could fully embrace the opportunities of scale and convenience offered by online and mobile technologies.

(5) An explicit understanding of decision-makers' network structures could allow for a more effective targeting of interaction interventions. Statistical and social network analysis could present a highly relevant tool in this regard.

Taking all of the above work together, our suggestions would be:

- To increase the conceptual and causal clarity of interaction interventions' objectives and applied tools (i.e. interrogate and define a more explicit theory of change).
- To clearly define decision-makers' role and contribution in interactions and to consider tangible benefits and decision-makers' opportunity costs of interaction.
    - To be cautious when applying demanding interaction models such as collaboration.
- To use interaction to build a professional identity of evidence use with set standards of practice and conduct (as for example discussed for EIDM by Cronin et al. 2015; Uneke et al. 2011).
    - To focus less on applying unstructured interaction to share EIDM skills or to disseminate evidence.
- To focus more on interactions between decision-makers to build EIDM as a professional norm.
- To use online and mobile technologies as a regular means of interaction.
- To use network analysis tools to map decision-making structures and relationships (as for example studied for EIDM by Shearer et al. 2014; Yousefi-Nooraie et al. 2012).

M5 interventions (developing skills to access and make sense of evidence)

Figure 6.5 below is an overview of Review 1 and Review 2 findings on the effects of interventions that could support decision-makers' use of evidence through building decision-makers' skills to access and makes sense of evidence (M5).

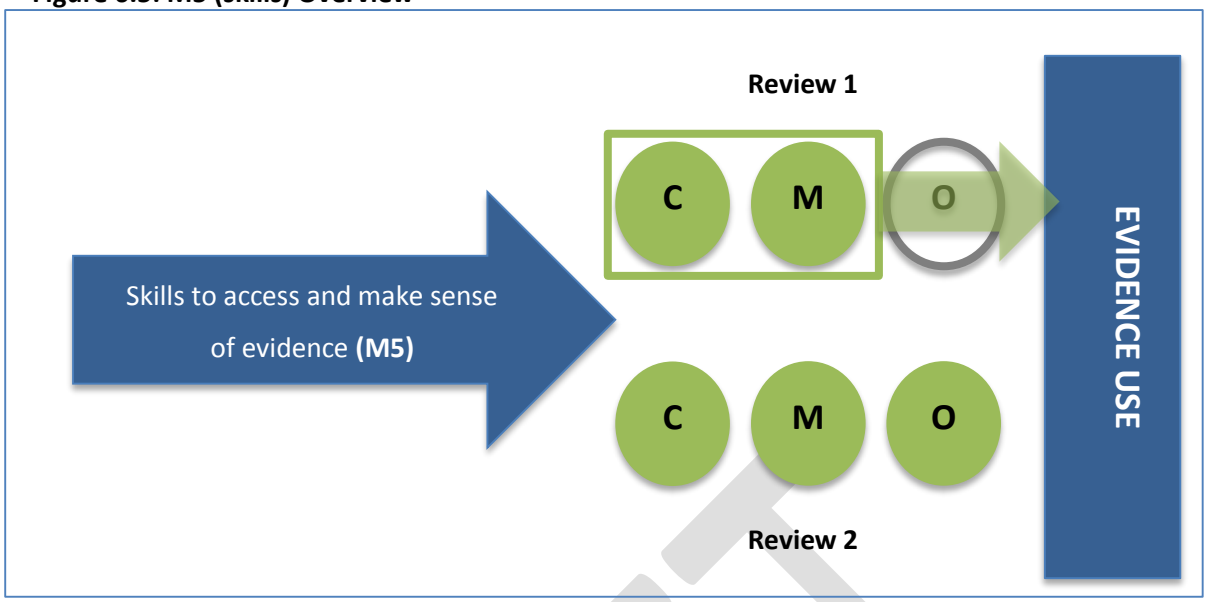
Review 1 findings

Interventions building decision-makers' skills to access and make sense of evidence (M5) were only found to be effective at increasing use of evidence if the intervention design simultaneously tried to enhance both capability and motivation to use research evidence. An example of such an intervention is a capacity-building intervention that fosters decision-makers' EIDM skills as well as attitudes towards evidence. In terms of CMOs, EIDM training interventions, teaching critical appraisal skills in particular, were consistently identified to improve decision-makers' capability to use evidence. The same applies to motivation to use evidence, which was positively influenced by educational programmes even if not explicitly targeted in the programme design. Opportunity to use evidence was not targeted by M5 (skills) interventions and we are therefore unable to comment on the interventions' effectiveness in this regard.

M5 (skills) interventions, however, were found to be ineffective when applied in multi-component interventions if the educational intervention component was diluted and only passively affected in the combined intervention. For example, community of practices or passive presentation of EIDM skills were not effective to increase capability to use evidence or behaviour change. There was also cautious evidence that M5 (skills) interventions, such as critical appraisal training, are not effective if applied at a low intensity. For example, a one-off half day capacity-building programme did not positively affect evidence use, while sustained critical appraisal programmes reported positive effects.

On the other side, in combination with M6 (structures & processes), M5 (skills) was effective to improve decision-makers' CMOs and evidence use. This impact resulted from a combined intervention approach, which embedded EIDM skills within formal organisational processes such as staff supervision to enhance opportunity and motivation to apply the gained capabilities. Lastly, evidence seems to be forthcoming that interventions applying M5 (skills) might benefit from targeting senior decision-makers in order to simultaneously build their skills to supervise staff use of evidence. This intervention approach might result in wider organisational changes that embed the benefits of the educational programme into routine decision-making processes and thereby create new opportunities to use evidence.

Figure 6.5: M5 (skills) Overview



SYSTEMATIC REVIEW OF REVIEWS OF EIDM LITERATURE (Review 1)

CMOs:

Positive impact on capability to use evidence for example, through:

⊕ critical appraisal teaching; university courses; executive training.

Positive impact on motivation to use evidence even if not explicitly targeted, for example in the above.

Evidence use:

Positive impact on evidence use if M5 interventions combine capability and motivation, for example:

⊕ EIDM training course and influence on positive attitudes towards evidence.

Positive impact on evidence use in combination with M6 to embed EIDM skills into organisational processes (M6 adds motivation & opportunity), for example:

⊕ critical appraisal teaching + training & tools to supervise staff use of evidence.

No impact on evidence use in multi-mechanism interventions (M3 & M4), if the educational component is diluted & only

SCOPING REVIEW OF BROADER SOCIAL LITERATURE (Review 2)

Evidence of effects:

- ⊕ learning analytics;
- ⊕ supervision techniques;
- ⊕ online learning;
- ⊕ targeting cognitive maturity/critical thinking; → to build all three components of behaviour change (CMOs) and enhancing retention of capabilities

- ⊕ incorporating adult learning principles;
- ⊕ mentoring;

→ to build capability and motivation.

Absence of evidence of effects:

- ○ targeting and personalisation of capacity-building programmes;
- ○ communities of practice;
- ○ secondments;
- ○ educational apps;
- ○ fostering multi-level capabilities and evidence literacy.

Review 2 findings:

The scoping review of the social science literature explored interventions that might present relevant insights to contribute to the application of M5 (skills) interventions. We identified three relevant intervention approaches to guide training and capacity building: customising capacity-building; incorporating adult learning theories; and digital education. In addition, changing the targeted outcome of educational programmes appeared as a relevant intervention approach. We assessed these for their likely effects on CMOs and behaviour change outcomes as well as the nature of the insights and contribution to the application of M5 (skills) interventions.

Table 6.5 below presents a list of social science interventions identified as of relevance to M5 (skills) interventions, briefly explaining what insights might be gained from their application in an EIDM context.

Table 6.5 M5 (skills) social science insights overview

Intervention	*Potential use in EIDM:*
CUSTOMISING CAPACITY-BUILDING	
Targeting	enhancing existing training practices to match capacity-building to individual decision-makers' organisational and institutional background and needs.
Personalisation	enhancing existing training practices to personalise EIDM capacity-building to decision-makers' identities, preferences, and progress.
Learning analytics	informing EIDM training by real world data sets and to iterate training courses rapidly to focus on most relevant content/skills.
ADULT LEARNING	
Andragogy principles	enhancing existing training practices to closer align EIDM capacity-building with established theories of adult learning.
Communities of practice	repositioning CoPs to target organisational EIDM capacities rather than individual capacities.
Mentoring	enhancing the evidence-base and effective intervention design of mentoring programmes.
Supervision	enhancing existing training interventions through a more formal integration of supervision techniques to support the application of gained EIDM skills.
Secondments	enhancing existing training interventions to combine an exchange of individual and organisational capacities.
DIGITIAL EDUCATION	
Online learning	enhancing existing practice to increase the reach and convenience of EIDM capacity-building.
Apps	increasing the appeal and convenience of EIDM capacity-building.
LEARNING OUTCOMES	

Intervention	*Potential use in EIDM:*
Multi-level capabilities	enhancing existing practice to foster the trajectory of developed EIDM skills within the decision-makers' host organisations to nurture organisational capabilities.
Cognitive maturity / critical thinking	enhancing the teaching of EIDM skills towards the development of thinking patterns/processes that embed the application of these skills.
Evidence literacy	developing a holistic and accessible concept of EIDM as universal skills set.

We then reviewed the reported effectiveness of these interventions in the social sciences to assess their likely effects on CMOs and behaviour change outcomes in relation to M5 (skills).

Evidence of effects in the social sciences:

Scoping the wider literature on education and effective learning, we identified six effective interventions approaches: using learning analytics; considering adult learning principles; mentoring; supervision; online learning; and targeting cognitive maturity. Within this group, research on the use of learning analytics, supervision techniques, online learning, and targeting cognitive maturity generated particularly rich insights. Each of these four interventions was found effective to influence all three components of behaviour change (CMOs): applying either of the four is likely to enhance learning outcomes (capability), learner motivation or identification with the taught content (motivation), as well as opportunity to access or apply the learned capabilities. Given their reliable evidence-base, we therefore position these four interventions as a potent contribution to interventions aiming to increase decision-makers' EIDM skills (M5).

Mentoring and the consideration of adult learning principles were also identified as of potential to support M5 (skills) interventions. There was a convincing evidence-base in the social sciences that mentoring might be able to increase educational outcomes (capability). The incorporation of adult learning principles in the design of EIDM capacity-building programmes, likewise, was found to be of likely benefit to increase capability to use evidence as well as motivation.

Social science interventions of conceptual relevance, but lacking a reliable evidence-base, referred to targeting and personalisation of capacity-building programmes, communities of practice, secondments, educational apps, and fostering multi-level capabilities and evidence literacy.

Summary:

Combining the results and additional insights from Review 1 and Review 2, we arrive at the following conclusions and suggest a number of implications for the design and implementation of educational interventions aiming to build decision-makers' skills to access and make sense of evidence (M5).

(1) In Review 1, M5 (skills) interventions, such as capacity-building and critical appraisal training, are an effective approach to increase decision-makers' use of evidence if they combine capability- and motivation-building intervention components. The active educational intervention component appears to be driving these results and there is no evidence that a

passive diffusion of these skills can be achieved in multi-mechanism interventions (M3 and M4), which do not explicitly target a capacity-building component (for example, in communities of practice).

(2) To improve the impact of educational interventions targeting individual decision-makers, social science literature suggests a number of effective interventions that are able to enhance the retention of learning results as well as increased identification with, and motivation to apply, learning content. These include considering adult learning principles, mentoring, learning analytics, supervision techniques, and online learning.

(3) To improve individual decision-makers' opportunity to use evidence through M5 (skills), educational interventions might benefit from a more formal incorporation into decision-making structures and processes (M6), for example combining capacity-building with supervision.

(4) There is a reliable body of evidence on individual EIDM capacity-building. To ensure the application and sustainability of these EIDM skills, it appears justified to invest more efforts into building organisational and institutional EIDM capacities. Such multi-level capabilities could broaden the concept of EIDM capacities and embed them into formal organisational structures creating increased opportunities to apply capacities.

(5) A similar approach to broaden and embed the concept of EIDM capacities at an individual level refers to the targeting of thought processes and patterns rather than skills sets. Building cognitive maturity and evidence literacies were positioned as relevant approaches in this regard.

(6) The use of online and mobile technologies is likely to be of benefit to the design and outcomes of EIDM capacity-building programmes. We identified online learning, learning analytics, and evidence use apps as of high potential to increase the reach, appeal, and relevance of educational content.

Taking all of the above work together, our suggestions would be:

- To enhance the application of interventions supporting decision-makers' skills to access and make sense of evidence if they simultaneously build capability and motivation to use evidence (Review 1).
    - To interrogate the use of interventions stating an educational objective yet not specifying how the acquisition of EIDM skills will be achieved.
- To draw from adult learning theories to enhance teaching and learning strategies (as for example studied for EIDM by Harvard Evidence for Policy Design 2016).[31]
- To apply learning analytics, online learning, and educational apps (as for example studied for EIDM by Harvard Evidence for Policy Design 2016).
- To link EIDM skills to higher level cognitive capacities and holistic skill sets (as for example discussed for EIDM by Newman 2012).
- To formalise and embed educational interventions in organisational structures (as for example studied for EIDM by Peirson et al. 2012).
- To place more emphasis on organisational EIDM capabilities (as for example studied for EIDM by Kislov et al. 2014).

[31] http://epod.cid.harvard.edu

M6 interventions (influencing decision-making structures and processes)

Figure 6.6 below presents an overview of Review 1 and Review 2 findings on the effects of interventions that could support decision-makers' use of evidence through changing decision-making structures and processes (M6).

Review 1 findings

None of the reviewed interventions focused exclusively on changing decision-making structures and processes. As the M6 (structure & process) mechanism was only applied as part of multi-mechanism interventions, it was not possible to establish an independent causal link between M6 and evidence use outcomes. However, on observation changes in decision-making processes and structures (M6) were associated with improvements in decision-makers' use of evidence when the mechanism was applied in combination with other evidence use mechanisms, in particular M5 (skills) and M3 (communication & access). Evidence-on-demand hotlines and supervision of the application of EIDM skills presented examples of an effective combination of structural changes (M6) with M5 or M3 that led to evidence use.

Regarding CMOs, there is evidence that changes in decision-making structures and processes is an effective means of enhancing decision-makers' opportunity to use evidence, for example, through formalising and embedding access to evidence in combination with M3 (communication & access). Likewise, multi-mechanism M6 (structure & process) interventions appear to be able to influence motivation to use evidence, for example, through setting organisational incentives to use evidence by means of facilitating structures to increase organisational readiness for evidence use. There was a lack of evidence to attribute impacts of M6 (structure & process) interventions on capability to use evidence.

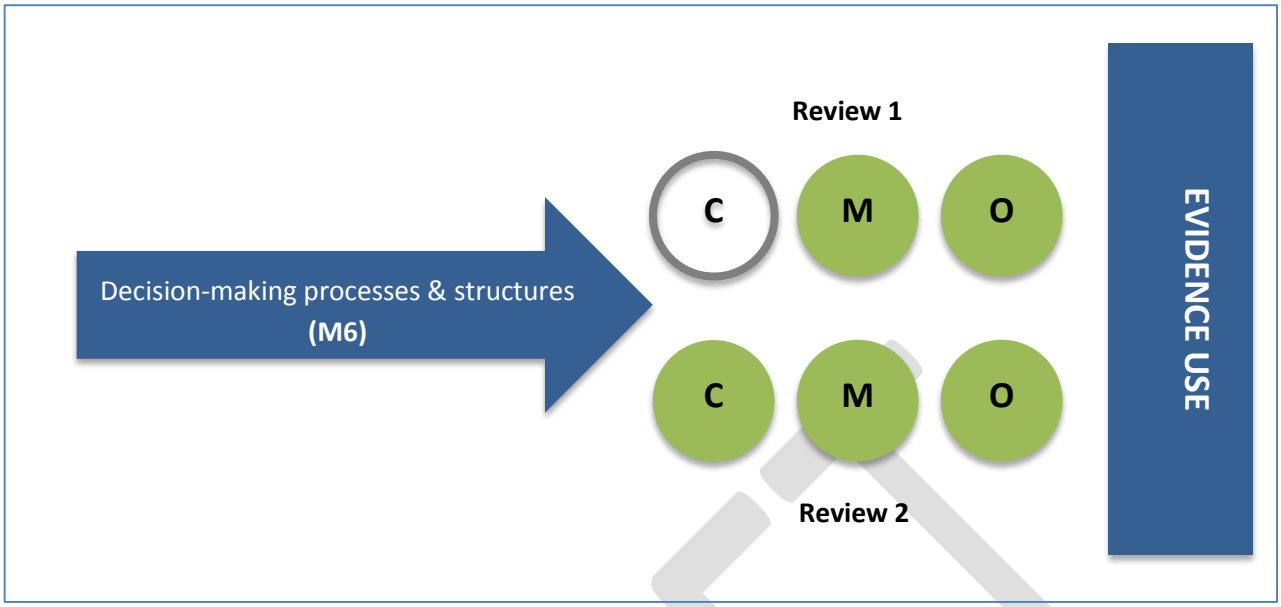
Review 2 findings

The scoping review of the social science literature explored interventions that might present relevant insights to contribute to the application of M6 (structure & process) interventions. We identified twelve interventions of relevance and grouped these into interventions targeting individual, organisational, and institutional structures and processes. We assessed these for their likely effects on CMOs and behaviour change outcomes as well as the nature of the insights and contribution to the application of M6 (structure & process) interventions.

Table 6.6 below presents a list of social science interventions identified as of relevance to M6 (structure & process) interventions, briefly explaining what insights might be gained from their application in an EIDM context.

We then reviewed the reported effectiveness of these interventions in the social sciences to assess their likely effects on CMOs and behaviour change outcomes in relation to M6 (structure & process).

Figure 6.6: M6 (structure & process)



SYSTEMATIC REVIEW OF REVIEWS OF EIDM LITERATURE (Review 1)

CMOs:

Positive impact on motivation to use evidence through setting organisational incentives, for example:

⊕ supervision; executive training on organisational change for research use.

Positive impact on opportunity to use evidence through formalising and embedding access to evidence, for example:

⊕ on-demand evidence summaries; evidence hotlines.

Evidence use:

M6 was only applied in multi-component interventions, denying casual attribution with evidence use outcomes. Observation suggests that M6 may be associated with decision-makers' use of evidence when the mechanism is applied in combination with other mechanisms, in particular M5 and M3

SCOPING REVIEW OF BROADER SOCIAL LITERATURE (Review 2)

Evidence of effects:

⊕ Reducing cognitive biases;
⊕ Nudges;
⊕ Professional identities & norms;
→ remove barriers to behaviour change (opportunity), build motivation & incentives for behaviour change

⊕ Facilitation (i.e. tangible support and tools to change behaviour);
→ facilitate behaviour change (all CMOs)

⊕ National institutions & clearinghouses;
→ enforce evidence use, but unclear institutional change.

Absence of evidence of effects:

○ Organisational learning & norms; leadership & management; knowledge management;
○ Complexity thinking; machine learning.

Table 6.6 M6 (structure & process) social science insights overview

Intervention	*Potential use in EIDM:*
INDIVIDUAL DECISION-MAKERS	
Reducing cognitive biases	reducing cognitive barriers to behaviour change and evidence use during decision-making.
Nudges (for example, commitment devices, incentives)	nudging decision-makers to use evidence, for example, restructuring choice architectures to favour evidence use.
Norms & identities	establishing evidence use a principle of decision-making associated with one's professional conduct and identity.
Coherent behavioural frameworks	drawing from established behavioural frameworks to inform the design of EIDM interventions (for example, EAST; MINDSPACE).
DECISION-MAKING AT AN ORGANISATIONAL LEVEL (change & readiness)	
Organisational learning & learning organisation	enhancing existing efforts to support organisational capacity and structures to create an environment in which decisions can be challenged and informed by evidence.
Organisational norms/culture	formulating an organisational practice, vision, and reputation for using evidence.
Leadership & management	enhancing existing efforts to apply leadership styles and management approaches conducive to organisational change in line with the above organisational characteristics believed to be of support to EIDM.
Knowledge management	enhancing existing efforts to support organisations to systematically collect, store, and circulate formal and tactic knowledge.
Facilitation	regularly providing tangible influence and support for EIDM (for example, audit & feedback; financial/career incentives; decision aid tools).
INSTITUTIONS & SYSTEMIC ISSUES	
Complexity thinking	providing a model of EIDM at a systems level characterised by constant evaluation, iteration, and adaptation of practices and policies.
National institutions & clearinghouses	enforcing and incentivising EIDM through institutions and legal frameworks, such as accreditation, procurement, and cabinet processes.
Machine learning & modeling	changing the nature of evidence and synthesis due to machine ability to provide ad hoc, personalised decision advice based on various sources of evidence, including big data and biometric information.

Evidence of effects in the social sciences:

The scoping review of the wider social sciences identified a variety of effective interventions to positively influence the decision-making structures and processes of individual decision-makers. These referred to behavioural interventions to mitigate the effects of cognitive biases on decision-making; the provision of nudges to encourage behaviour change; and the creation of professional

norms and identities in line with evidence use. These behavioural interventions are of direct relevance to influence the process of decision-making and to increase its receptivity for evidence. A nudge could, for example, be used to increase decision-makers' motivation to use evidence, while the use of defaults to reduce cognitive biases could increase opportunity as well as motivation to use evidence. Given the evidence-base on their application in the social sciences, these behavioural interventions might be able to translate short-term impacts on motivation and opportunity to use evidence into long-term changes in behaviour. We identified a number of evidence-informed behavioural frameworks that guide the coherent application of these behavioural interventions, which are of direct relevance to support the design of M6 (structure & process) interventions.

We further identified a large body of literature on interventions aiming to change organisational structures and processes. This literature was of high conceptual relevance proposing many models of how organisational structures and processes could be influenced and designed in a manner that might allow for a more systematic use of evidence during decision-making processes. Proposed models and interventions included: organisational learning & learning organisations; changing organisational norms/culture; more inclusive leadership & management; knowledge management systems; and facilitation. However, while each of these was of high conceptual relevance, we only identified a conclusive body of research on the positive effects of facilitation interventions (for example, decision-aid tools, financial incentives; audit & feedback). For the remainder of interventions, there was no consensus within the literature on effective intervention approaches. For example, while organisational learning is positioned as an important and effective approach to support staff performance, programme iteration, and commercial performance, there was no consensus across the synthesised evidence on the design of effective interventions that promote organisational learning. We are therefore only able to point to the conceptual relevance of this body of literature to EIDM, and cannot make detailed recommendations on which interventions to apply. This was also highlighted a number of years ago by Nutley and colleagues (2007), who similarly proposed a closer integration of the social science literature on organisational change with EIDM.

Lastly, we also comment on a number of interventions that might be able to foster evidence use at a systems and institutional level. These interventions refer to the application of complexity thinking; national institutions and clearinghouses; and machine learning and modelling. We consider the literature concerning complex systems and machine learning as blue skies thinking and only point out its overlap with some parts of the EIDM literature without commenting on evidence of effects or intervention design. However, there is some evidence on the impact of national institutions and clearinghouses. Institutions such as NICE and the South African Department of Planning, Monitoring, and Evaluation (DPME) have established systems that enforce and incentivise the use of evidence by decision-makers. There are currently no rigorous reviews synthesising the effects of these institutions, but reviews of individual institutions point to their impact on evidence use; whether this then translates into institutionalised norms and systemic change, however, remains unclear.

Summary:

Combining the results and additional insights from Review 1 and Review 2, we arrive at the following conclusions and suggest a number of implications for the design and implementation of interventions aiming to change decision-making processes and structures (M6).

(1) In Review 1, there is some evidence to suggest that changes to decision-making processes and structures (M6) have the potential to increase decision-makers' use of evidence. While there is no evidence that interventions applying the M6 (structure & process) mechanism on its own increase evidence use, there is cautious evidence that they can formalise and embed effective evidence use interventions (for example, M3 and M5) into organisational structures. This can lead to changes in routine work processes and decision-makers' habits resulting in decision-making that is more receptive to evidence use. There is a large body of social science literature that can offer additional insights on the effective design of M6 (structure & process) interventions including advice on how these interventions could be applied in isolation.
(2) The application of behavioural interventions offers large insights into the design of M6 (structure & process) interventions. EIDM—as any form of decision-making—is aggravated by cognitive biases and behavioural traps. Interventions to reduce cognitive biases as well as other nudges have the potential to support the use of evidence during decision-making processes. There are a number of established behavioural frameworks (for example, EAST) that appear of direct relevance to guide the design of M6 (structure & process) interventions.
(3) Direct facilitation of EIDM through the provision of tangible influence and resources (for example, organisational protocols, financial incentives, audits, decision-making tools) has the potential to change decision-makers' behaviour. A reliable body of social science literature supports facilitation as a relevant approach to change professional behaviours.
(4) Based on (1), (2), and (3), M6 (structure & process) interventions have the potential to increase evidence use by increasing the salience of EIDM and formalising the practice as an integral part of decision-making.
(5) There is a large body of literature on organisational change to increase the readiness of organisations to use evidence. The project identified fertile areas of research to hold insights to build organisational structures supportive of EIDM as: organisational learning; organisational norms/culture; transformational and inclusive leadership management approaches; and knowledge management systems. There is, unsurprisingly, no blue-print intervention to build an organisational structure conducive to EIDM and insights of these areas of research require a careful contextual analysis before being used to inform the design of M6 (structure & process) interventions.
(6) Individual states have established institutions mandated to support and institutionalise EIDM. The creation and implementation of these institutions has passed proof of concept but their effects on systemic change is less clear.
(7) Throughout the evidence on M6's (structure & process) impact and the consulted social science literature there is an emphasis to better understand decision-makers and decision-making processes and structures. Insights on decision-makers' mental models, network structures, organisational settings, and professional norms are of benefit to all of the reviewed evidence use mechanisms.

Taking all of the above work together, our suggestions would be:

- To, in general, pay more attention to decision-making processes and structures as an effective organisational tool to increase research receptivity and EIDM capacities (based of Review 1).
- To reduce cognitive barriers to the use of evidence during decision-making.
- To nudge the behaviour of using evidence.
- To create a professional norm of evidence use as a part of decision-makers' work ethos.
- To provide active organisational/managerial facilitation of staff's evidence use (as for example studied for EIDM by Rich et al. 2012; Rutter & Gold 2015).

- To formalise and embed evidence use mechanisms into decision-making processes and structures, in particular convenient organisational access to evidence and EIDM capacities (as for example studied for EIDM by Wilson et al. 2015; Notarianni et al. 2015).
- To pay more attention to the amplifying effects of embedding evidence use mechanisms into organisational structures, both in terms of the size of the effect (i.e. increased and sustained evidence use) and the spread of the effect (i.e. from individual decision-makers to organisational behaviour/performance).
- To carefully consider the literature on organisational change for relevant models and techniques to support structures and processes conducive to innovation (as for example discussed for EIDM by Nutley et al. 2007).
- To enhance institutional models enforcing and incentivising the use of evidence (as for example implemented by NICE, DPME, and the What Works Network).
- To conceptualise the overlap between EIDM and system thinking (as for example discussed for EIDM by Best & Holmes 2010).

Chapter 7. Conclusion

7.1 Scope of project

This project investigated the science of using science; that is, what works to increase the use of research evidence as one factor in decision-making. The project consisted of two reviews of the literature. First, Review 1, a systematic review of reviews of evidence of the efficacy of strategies to increase the use of research evidence by decision-makers (EIDM). This 'research on research use' is a relatively new field of enquiry and we hypothesized that although this literature was informed by studies in the rest of social science, there might be some aspects of social science that were relevant for developing strategies to increase the use of research evidence but that had not been included in systematic reviews in the EIDM literature. The broader social science literature (for example, psychology; management; behavioural sciences) might hold a body of knowledge on areas such as behaviour change, organisational change, learning and motivation, that could be of high relevance to efforts to encourage decision-makers to use evidence. We therefore undertook a scoping review of this broader social science literature to find research of potential relevance to EIDM.

In the absence of an agreed theory of how interventions can effectively influence decision-makers' use of evidence, we required a conceptual framework to structure the project's review of reviews approach. For this purpose we used the underlying mechanisms driving interventions as a structure to categorise evidence use interventions that had been proposed in the EIDM literature. We identified six such intervention mechanisms: awareness of EIDM; agreement about what is evidence; communication and access to evidence; facilitation of engagement between researchers and decision makers; decision makers' skills to access and use evidence; and influencing decision-making structures and processes. In addition, we distinguished evidence use as an outcome measure from the potential intermediate steps consisting of the capability, motivation, and opportunity to use evidence (CMO configuration), which allowed us to present a more nuanced analysis of the interventions' effects. This conceptual framework was used to structure both the systematic review of the EIDM literature and the scoping review of the broader social science literature. Taken together, the research project therefore enhances the understanding of the science of using science by (1) answering what we know about the effects of applied interventions to increase the use of scientific knowledge by decision-makers as well as (2) proposing different interventions and changes to existing interventions that are suggested in the broader social science literature as being of potential benefit to EIDM.

The remainder of this section outlines the main strengths and limitations of the research and a number of key suggestions for future interventions to facilitate EIDM. It concludes with a framework to help plan a theory of change that might be used when developing or evaluating interventions to enable EIDM.

7.2 Strengths and limitations

This research carries the following strengths and limitations.

Strengths:

- This project conducted two connected literature reviews—a systematic review of reviews and a scoping review—combining findings from the research use literature with insights from the wider social sciences.
- The systematic review of reviews conducted a rigorous search, screening, and quality appraisal of existing systematic reviews on the impact of interventions supporting EIDM.
- It presents a structured and transparent map and synthesis of evidence on what works to increase decision-makers' use of evidence.
- We developed and applied a conceptual framework of six mechanisms, CMOs and evidence use outcomes to structure the two reviews, which allowed us to transparently integrate the findings from both the systematic review of reviews and the scoping review.
- The scoping review of the broader social sciences configured a diverse body of literature scoping aspects of social science literature that are relevant for developing strategies to increase the use of research evidence but that had been missed by the systematic reviews in the EIDM literature.
- Combing the findings of both reviews, the project offers insights on (1) what interventions work (and do not work) in supporting EIDM and (2) what other interventions or changes to existing interventions could be applied based on a broader body of knowledge.

Limitations:

- The systematic review of reviews on the impact of evidence use interventions did not include primary evidence and was limited to the data reported in the reviews.
- Included reviews did not always differentiate clearly between interventions and outcomes related to EIDM and interventions and outcomes related to the implementation of evidence-based practices; and we could therefore not draw from the full data set reported in some reviews.
- The applied narrative synthesis does not allow us to implement a standardised and comparable effect size measure. It is therefore challenging to establish relative intervention effects and strengths of effects.
- The social science literature was only scoped and we cannot provide an exhaustive account of interventions.
- The identified bodies of social science evidence were often too extensive and featured multiple reviews of different methods and conclusions. For some areas, for example management literature, we could not identify a consensus on what might be the most effective approach relevant to EIDM.
- Some of the suggested social science interventions (and related concepts) might have been tried and applied in EIDM, but have only been reported in primary or theory papers, which were not covered by the systematic review of reviews. We therefore conducted a brief search for primary evidence at the end of the project in key journals such as *Evidence & Policy* and *Implementation Science*.

7.3 Suggestions for future EIDM interventions

Combining the findings of both reviews, we offer a number of suggestions that might support the future application of interventions aiming to increase EIDM.

- The communication of research studies could incorporate techniques to build motivation to use evidence, for example framing of study findings, tailoring & targeting of communication.
- Access to evidence could be complimented by programme components building motivation, for example, increasing the visual appeal of evidence repositories and linking them to personal mobile devices.
- Building decision-makers' EIDM skills is central to nurturing their use of evidence and educational programmes (for example, capacity-building; critical appraisal training) could be

enhanced, both in the frequency and duration of their application as well as through incorporating social science knowledge on adult learning principles.

- Building systems and structures: across the diverse interventions applied to support EIDM, a common theme referred to the benefits of formalising and embedding interventions within existing decision-making processes and structures, such as evidence-on-demand services integrating push, user-pull and exchange approaches). Changes to decision-making structures and processes could also include direct facilitation of the use of evidence (for example, financial incentives; decision aid tools). Changes to individual decision-making structures could be particularly sensitive to cognitive biases and behavioural traps that might mitigate the use of evidence.
- The concept of evidence use as a professional norm and principle of decision-making could be framed and established to support behaviour change. This could be part of a wider effort to market and promote the concept of EIDM.
- Institutional frameworks and mechanisms (for example, institutions such as NICE, and processes such as accreditation) hold large potential to support EIDM and could see wider application.

The findings of this project may be of benefit to decision-makers at a practice or policy level who are aiming to make greater use of evidence, and researchers planning to engage in future studies related to EIDM. For decision-makers, this review could hold practical insights on how to enhance the receptivity of their organisational decision-making processes and structures to the use of evidence. They might also benefit from insights on building a professional identity of evidence use with common practices and standards of conduct. Findings related to the reduction of decision-making biases and behavioural traps might also be relevant to this audience. Senior decision-makers should consider looking at the role of organisational incentives and protocols to support their staff's use of evidence.

This project may also be useful for researchers in identifying areas for future research on the relationship between EIDM and the wider social sciences. There is scope to develop common indicators and measures of EIDM and conceptualise the overlap and distinction between the research use and implementation science literature. The findings could also be used to further unpack the black box of decision-making to ensure that evidence use interventions increase in relevance and can be embedded into organisational processes and structures. This might help mitigate the danger of creating an unhelpful dichotomy between producers of research and users of research in EIDM. The emphasis on there being a gap between the communities of researchers and decision-makers that fail to interact and understand each other assumes a linear push research production driven model of research use. The science of using science might be able to progress further by starting with the user of evidence and studying their needs and behaviours in decision-making and how research might inform and feed into that.

There is also scope to extend and refine the proposed model of evidence use mechanisms and CMOs. The conceptualisation of the reviewed six mechanisms could be strengthened, plus further iteration of the model is likely to improve understanding about the respective roles and functions of each mechanism. Additional evidence use mechanisms might be proposed and the same applies to relevant social science interventions.

7.4 Guidance to facilitate development of a Theory of Change

In this project we have used levels of intervention, mechanisms and capability, motivation and opportunity to change as a framework to help understand (a) what interventions are trying to

achieve, and (b) the processes they use to try to achieve this (in other words, the 'theory of change' of how the intervention is meant to have its effect). We hope that this framework can help others to plan a theory of change when they develop or evaluate interventions to enable EIDM, and we offer guidance on how to develop such a theory of change.

The guidance emphasises the need to consider both process and contextual variables when designing such interventions. It suggests a contextual analysis to tailor and personalise interventions to (i) different levels of decision-making, (ii) organisational cultures, and (iii) individual determinants of decision-makers. This in turn emphasises the salience of EIDM interventions to better fit with decision-makers' needs and preferences. Finally, the guidance stresses the importance of building evaluation into the design of interventions, applying comparable EIDM outcomes measures and indicators. This generates rapid feedback on the intervention's effects to allow for ongoing experimental iteration of intervention design.

This guidance is not meant to provide an intervention blueprint or universal theory of change. Rather, it presents a tool to encourage thinking about the design of EIDM interventions and an attempt to indicate avenues for the practical application of the project's research results.

Table 4.1 Evidence-informed guidance to develop a ToC for a research use intervention

Steps to consider in the design of EIDM interventions	Suggestions based on Review 1 findings	Suggestions based on Review 2 findings
(1) Decide upon EIDM variable of interests[32]	Consider: • Relevant *level of analysis* • Effective and comparable *outcomes measure* and indicators • Nature of evidence and manner in which it is proposed • *Context:* Existing organisational culture • *Context:* Individual determinants of decision-makers	Conceptualising evidence use as behaviour change allows for the application of a larger body of social science knowledge to influence intervention design and the definition of outcomes, such as: • Evidence use a social norm • Evidence use as a professional identity • Reducing barriers to behaviour change organisational / systemic adaptation and innovation • Evidence literacies
(2) Decide upon relevant CMOs as a focus of intervention and/or intermediate outcome measures[33]	Consider: • Capability to use evidence • Motivation to use evidence • Opportunity to use evidence	Identify bodies of social science knowledge that can support CMOs: • Behavioural science • Adult learning theories • Information design • Advocacy and awareness-raising campaigns • Organisational and management literature • Communication and media science • Political sciences
(3) Consider relevant mechanism	**M1 (awareness) and M2 (agree):** • Evidence gap.	Incorporate social science interventions with potential to support mechanism, such as: • Social marketing

[32] Based on Chapter 3 and 5.
[33] Based on Chapter 1 and 5.

effective to influence CMOs[34]	**M3 (communication & access):** • Effective on evidence use if O and M are combined. • Not effective on evidence use of only O is applied. • Effective on O and M independently. **M4 (interact):** • Lack of effects on evidence use if unstructured and channelled interaction. • Cautions effects on CMOs if well-defined, light touch interactions (e.g. engagement). **M5 (skills):** • Effective on evidence use if C and M are combined. • Not effective on evidence use if short-term application • Effective on C and M independently. **M6 (structure & process):** • Cautions effects on evidence use to embed and sustain C and O. • Ability to enhance and sustain other mechanism's effects.	• Workplace education • Design principles (evidence look and feel) • Communication techniques to increase fit, retention, comprehension, reach and access convenience of research findings • Online and mobile technologies • Facilitation • Organisational learning • Engagement • Evidence use nudge • Counterfactual
(4) Consider possible combinations of mechanisms[35]	Effective mechanism combinations: • M3 + M6 • M5 + M6	Not investigated in Review 2

[34] Based on Chapter 4 and 5.
[35] Based on chapter 4.

	• Complex, intensive interventions Absence of evidence: • M3 + M5 + M6 • M1 + M6 Ineffective mechanism: combinations: • M3 + M4 + M5 • M3 + M4 (if passive) • M4 + M5 (if passive)	
(5) Design intervention[36]	Consider the above to build an intervention Theory of Change, plus: • Contextual analysis to tailor, personalise and time the intervention. • Rapid feedback and evaluation to allow for intervention iteration.	Ensure social science knowledge is integrated in the design of the intervention, such as: behavioural techniques, organisational processes, adult learning techniques, and communication and design principles. Ensure interventions are salient to decision-makers and take into consideration their opportunity costs.

[36] Based on chapter 4, 5 and 6.

References

IN PREPARATION

NB: Details of included studies are available in Appendix D (research evidence use interventions) and Appendix G (broader social science literature).

Aarons, G. A. (2006). Transformational and transactional leadership: Association with attitudes toward evidence-based practice. *Psychiatric Services*, *57*(8), 1162-1169.

Acar, A. Z., & Acar, P. (2012). The effects of organizational culture and innovativeness on business performance in healthcare industry. *Procedia-Social and Behavioral Sciences*, *58*, 683-692.

Ahonen, T. T., & Moore, A. (2005). *Communities dominate brands: Business and marketing challenges for the 21st century*. Futuretext.

Aita, M., Richer, M., Héon, M. (2007). Illuminating the processes of knowledge transfer in nursing. *Worldviews Evidence-Based Nursing*. 4(3), 146–155.

Ambrosini, V., & Bowman, C. (2009). What are dynamic capabilities and are they a useful construct in strategic management?. *International Journal of Management Reviews*, *11*(1), 29-49.

Amin, A., & Roberts, J. (2008). Knowing in action: Beyond communities of practice. *Research policy*, *37*(2), 353-369.

Andrews, R., Freeman, A., Hou, D., McGuinn, N., Robinson, A., & Zhu, J. (2007). The effectiveness of information and communication technology on the learning of written English for 5-to 16-year-olds. *British Journal of Educational Technology*, *38*(2), 325-336.

Ang, S., & Joseph, D. (1996). Organizational learning and learning organizations: Trigger events, processes, and structures. In *Academy of Management Meetings*.

Ariely, D. (2009) *Predictably Irrational: The Hidden Forces that Shape Our Decisions*. London: HarperCollins.

Arksey, H., & O'Malley, L. (2005). Scoping studies: towards a methodological framework. *International journal of social research methodology*, *8*(1), 19-32.

Armstrong, G., Kotler, P., & He, Z. (2012). *Marketing: an introduction*. 11th edition. Prentice Hall.

Arthur, C. (2014). Apps more popular than the mobile web, data shows. *The Guardian*, *2*.

Ahonen, T. T., & Moore, A. (2005). *Communities dominate brands: Business and marketing challenges for the 21st century*. Futuretext.

Bachmann, R., & Inkpen, A. C. (2011). Understanding institutional-based trust building processes in inter-organizational relationships. *Organization Studies*, *32*(2), 281-301.

Bala, M., Strzeszynski, L., & Cahill, K. (2008). Mass media interventions for smoking cessation in adults. *Cochrane Database Syst Rev*, *1*.

Bandiera, O., Barankay, I., & Rasul, I. (2010). Social incentives in the workplace. *The Review of Economic Studies*, 77(2), 417-458.

Bamford, D. R., & Forrester, P. L. (2003). Managing planned and emergent change within an operations management environment. *International Journal of Operations & Production Management*, *23*(5), 546-564.

Barkworth, R. (2004). *Secondments: A Review of Current Research: a Background Paper for IES Research Network Members*. Institute for Employment Studies.

Baron, J. (2007). Thinking and deciding (4th ed.). New York City: Cambridge University Press.

Barreto, I. (2007). Dynamic capabilities: a review of past research and an agenda for the future. *Journal of Management*, 36(1), 256–280.

Baron, R., & Kerr, N. (2003). *Group Process, Group Decision, Group Action 2/E*. McGraw-Hill Education (UK).

Barr, H. (2014). *Interprofessional education*. John Wiley & Sons, Ltd.

Barr H, Koppel I, Reeves S, Hammick M, Freeth D. (2005) *Effective interprofessional education: Assumption, argument and evidence.* London: Blackwell.

Barton, David, and Karin Tusting. *Beyond communities of practice: Language power and social context*. Cambridge University Press, 2005.

Barwick, M. A., Peters, J., & Boydell, K. (2009). Getting to uptake: do communities of practice support the implementation of evidence-based practice?. *Journal of the Canadian Academy of Child and Adolescent Psychiatry/Journal de l'Académie canadienne de psychiatrie de l'enfant et de l'adolescent*.

Bar-Yam, Y. (1997). *Dynamics of complex systems* (Vol. 213). Reading, MA: Addison-Wesley.

Bass, B. M., & Avolio, B. J. (1993). Transformational leadership and organizational culture. *Public administration quarterly*, 112-121.

Battilana, J., Gilmartin, M., Sengul, M., Pache, A. C., & Alexander, J. A. (2010). Leadership competencies for implementing planned organizational change. *The Leadership Quarterly*, *21*(3), 422-438.

Berkowitz, A. D. (2004). *The social norms approach: Theory, research and annotated bibliography*. Higher Education Center for Alcohol and Other Drug Abuse and Violence Prevention. US Department of Education.

Bertrand, J. T., O'Reilly, K., Denison, J., Anhang, R., & Sweat, M. (2006). Systematic review of the effectiveness of mass communication programs to change HIV/AIDS-related behaviors in developing countries. *Health education research*, *21*(4), 567-597.

Beinhocker, E. D. (2006). *The origin of wealth: Evolution, complexity, and the radical remaking of economics*. Harvard Business Press.

Berkowitz, A. D. (2004). The social norms approach: Theory, research and annotated bibliography. *Higher Education Center for Alcohol and Other Drug Abuse and Violence Prevention. US Department of Education*.

Berman, J., Mitambo, C., Matanje-Mwagomba, B., Khan, S., Kachimanga, C., Wroe, E., ... & Ritchie, L. M. P. (2015). Building a knowledge translation platform in Malawi to support evidence-informed health policy. *Health Research Policy and Systems*, *13*(1), 73.

Best, A., & Holmes, B. (2010). Systems thinking, knowledge and action: towards better models and methods. *Evidence & Policy: A Journal of Research, Debate and Practice*, *6*(2), 145-159.

Boaz, A., Baeza, J., & Fraser, A. (2011). Effective implementation of research into practice: an overview of systematic reviews of the health literature. *BMC research notes*, *4*(1), 212.

Bonfoh, B., Mahamat, M. B., Schelling, E., Ouattara, K., Cailleau, A., Haydon, D., ... & Tanner, M. (2015). 29 Individual and Institutional Capacity Building in Global Health Research in Africa. *One Health: The Theory and Practice of Integrated Health Approaches*, 357.

Bornbaum, C. C., Kornas, K., Peirson, L., & Rosella, L. C. (2015). Exploring the function and effectiveness of knowledge brokers as facilitators of knowledge translation in health-related settings: a systematic review and thematic analysis. *Implementation Science*, *10*(1), 162.

Brannon, D. (1985). Adult learning principles and methods for enhancing the training role of supervisors. *The Clinical Supervisor*, *3*(2), 27-41.

Brashers, D. E. (2001). Communication and uncertainty management. *Journal of communication*, *51*(3), 477-497.

Briner, R. B., Denyer, D., & Rousseau, D. M. (2009). Evidence-based management: concept cleanup time?. *The Academy of Management Perspectives*, 23(4), 19-32.

Brouwer W, Kroeze W, Crutzen R, de Nooijer J, de Vries NK, Brug J, Oenema A. (2011). Which intervention characteristics are related to more exposure to internet-delivered healthy lifestyle promotion interventions? A systematic review. *Journal of Medical Internet Research*, 13(1), e2.

Brouwers, M., Stacey, D., & O'Connor, A. (2010). Knowledge creation: synthesis, tools and products. *Canadian Medical Association Journal*, *182*(2), E68-E72.

Briggs, R. O., Kolfschoten, G. L., & Vreede, G. J. D. (2005). Toward a theoretical model of consensus building. *AMCIS 2005 Proceedings*, 12.

Budescu, D. V., Broomell, S., & Por, H. H. (2009). Improving communication of uncertainty in the reports of the Intergovernmental Panel on Climate Change.*Psychological science*, *20*(3), 299-308.

Butin, D. W. (2010). *Service-learning in theory and practice: The future of community engagement in higher education*. Palgrave Macmillan.

Cameron, E., & Green, M. (2015). *Making sense of change management: A complete guide to the models, tools and techniques of organizational change*. Kogan Page Publishers.

Carr, S., & Coren, E. (2007). *Collection of examples of service user and carer participation in systematic reviews*. London, SCIE.

Chambers, R. (2014). *Rural development: Putting the last first*. Routledge.

Chang, S. F., Smith, J. R., Beigi, M., & Benitez, A. (1997). Visual information retrieval from large distributed online repositories. *Communications of the ACM*, *40*(12), 63-71.

Chreim, S., Williams, B. B., Janz, L., & Dastmalchian, A. (2010). Change agency in a primary health care context: The case of distributed leadership. *Health Care Management Review*, *35*(2), 187-199.

Centola, D. (2010). The spread of behavior in an online social network experiment. *Science*, *329*(5996), 1194-1197.

Cialdini, R. B., & Goldstein, N. J. (2004). Social influence: Compliance and conformity. *Annual Review of Psychology*, 55, 591-621.

Champagne, F., Lemieux-Charles, L., Duranceau, M. F., MacKean, G., & Reay, T. (2014). Organizational impact of evidence-informed decision making training initiatives: a case study comparison of two approaches. *Implementation Science*, *9*(1), 53.

Clar C, Campbell S, Davidson L, Graham W (2011) *What are the effects of interventions to improve the uptake of evidence from health research into policy in low and middle-income countries?* UK Department for International Development: London, UK.

Colliander, J., & Dahlén, M. (2011). Following the fashionable friend: The power of social media. *Journal of Advertising Research*, *51*(1), 313-320.

Conner, M. L. (2004). *Andragogy and pedagogy*. Available from: http://agelesslearner.com/intros/andragogy.html

Corning, A. F., & Myers, D. J. (2002). Individual orientation toward engagement in social action. *Political Psychology*, *23*(4), 703-729.

Costley, D., Gannon, S., Sawyer, W., Watson, K., & Steele, F. (2008). *Teacher secondments and placements to university education faculties* (Vol. 12). Sydney: University of Western Sydney.

Chrislip, D. D. (2002). *The collaborative leadership fieldbook* (Vol. 255). John Wiley & Sons.

Cronin, P G., & Sadan, M. (2015). Use of evidence in policy making in South Africa: An exploratory study of attitudes of senior government officials. *African Evaluation Journal*, *3*(1), 10-pages

Cummings, G., Lee, H., MacGregor, T., Davey, M., Wong, C., Paul, L., & Stafford, E. (2008). Factors contributing to nursing leadership: a systematic review. *Journal of Health Services Research & Policy*, *13*(4), 240-248.

Curtis, Kristina E. and Karasouli, Eleni. (2014). An assessment of the potential of health promotion apps to support health behaviour change. *Health Psychology Update*, 23(2), 43-49.

Dahlstrom, M. F. (2014). Using narratives and storytelling to communicate science with nonexpert audiences. *Proceedings of the National Academy of Sciences*, *111*(Supplement 4), 13614-13620.

David, A., & Glore, P. R. (2010). The impact of design and aesthetics on usability, credibility, and learning in an online environment. *Online Journal of Distance Learning Administration*, *13*(4).

Dillenbourg, P. (1999). What do you mean by collaborative learning.*Collaborative-learning: Cognitive and computational approaches*, *1*, 1-15.

Direito, A., Dale, L. P., Shields, E., Dobson, R., Whittaker, R., & Maddison, R. (2014). Do physical activity and dietary smartphone applications incorporate evidence-based behaviour change techniques?. *BMC Public Health*, *14*(1), 646.

Dobbins, M. (2008). Do tailored messages promote evidence-informed decision making in breast cancer prevention? ISRCTN87385891 Available from: http://www.isrctn.com/ISRCTN87385891

Dobbins, M., et al. (2009). A randomized controlled trial evaluating the impact of knowledge translation and exchange strategies. *Implementation Science*, *4*(1), 61.

Dopson, S. & Fitzgerald, L. (eds) (2005). *Knowledge to Action: Evidence-based Healthcare in Context.* Oxford: Oxford University Press.

DRUSSA. (2005) *Literature Review on Knowledge Mobilisation*. DRUSSA.

Edmondson, A., & Moingeon, B. (1998). From organizational learning to the learning organization.

Eisenberg, M. B., Lowe, C. A., & Spitzer, K. L. (2004). Information literacy: Essential skills for the information age. *Management Learning*, 29(1), 5-20.

Epstude, K., & Roese, N. J. (2015). When goal pursuit fails. *Social Psychology*.

Fairhurst, G. & Sarr, R. 1996. *The art of Framing.* San Francisco: Jossey-Bass.

Fairhurst, G. (2007). *Discursive leadership: In conversation with leadership psychology*. Sage.

Fielding, M, Bragg, S, Craig, J, Cunningham, I, Eraut, M, Gillinson, S, Horne, M, Robinson, C & Thorp, J, (2005*). Factors Influencing the Transfer of Good Practice*. Nottingham, DFES Publications

Finger, M., & Asún, J. M. (2001). *Adult education at the crossroads: Learning our way out*. Zed Books.

Fish, W. W., & Wickersham, L. E. (2009). Best practices for online instructors: Reminders. *The quarterly review of distance education*, *10*(3), 279-284.

Flitcroft, K., Gillespie, J., Carter, S., Salkeld, G., & Trevena, L. (2014). Incorporating evidence and politics in health policy: can institutionalising evidence review make a difference?. *Evidence & Policy: A Journal of Research, Debate and Practice*, *10*(3), 439-455.

Freeman, B., et al. "Social media campaigns that make a difference: what can public health learn from the corporate sector and other social change marketers?." *Public health research & practice* 25.2 (2015

Fukuda-Parr, S., & Lopes, C. (Eds.). (2013). *Capacity for development: new solutions to old problems*. Routledge.

Fullan, M., & Donnelly, K. (2013). *Alive in the swamp: Assessing digital innovations in education.* Available at: http://www.nesta.org.uk/publications/alive-swamp-assessing-digital-innovations-education

Galitz, W. O. (2007). *The essential guide to user interface design: an introduction to GUI design principles and techniques*. John Wiley & Sons.

Gill, R. (2002). Change management--or change leadership?. *Journal of change management*, *3*(4), 307-318.

Gill, R. 2012. *Theory and Practice of Leadership*. Second Edition, London, SAGE Publications Ltd

Golder, S. A., Wilkinson, D. M., & Huberman, B. A. (2007). Rhythms of social interaction: Messaging within a massive online network. In *Communities and technologies 2007* (pp. 41-66). Springer London.

Goldman, S. (2011). Enhancing adult learning in clinical supervision. *Academic Psychiatry*, *35*(5), 302-306.

Gough, D. (2007). Weight of evidence: a framework for the appraisal of the quality and relevance of evidence. *Research papers in education*, *22*(2), 213-228.

Gough, D., Oliver, S., & Thomas, J. (Eds.). (2012). *An introduction to systematic reviews*. Sage.

Gough, D., Tripney, J., Kenny, C., & Buk-Berge, E. (2011). *Evidence Informed policy in education in Europe: EIPEE Final project report*. London: EPPI-Centre, Social Science Research Unit, Institute of Education, University of London.

Graetz, F., Rimmer, M., Lawrence, A., & Smith, A. (2006). *Managing organisational change*. John Wiley & Sons.

Hamilton, J., & Wilkie, C. (2001). An appraisal of the use of secondment within a large teaching hospital. *Journal of nursing management*, *9*(6), 315-320.
Hargreaves, D. H. (2011). Leading a self-improving school system. Available from: http://www.nationalcollege.org.uk/docinf o?id=154604&filename=leading-a-self-improving-school-system.pdf
Hart, P. S., & Nisbet, E. C. (2011). Boomerang effects in science communication: How motivated reasoning and identity cues amplify opinion polarization about climate mitigation policies. *Communication Research*, 0093650211416646.Hartley, J., & Hinksman, B. (2003). Leadership development: A systematic review of the literature. *London: NHS Leadership Centre*.
Harvey, G., Loftus-Hills, A., Rycroft-Malone, J., Titchen, A., Kitson, A., McCormack, B., & Seers, K. (2002). Getting evidence into practice: the role and function of facilitation. *Journal of advanced nursing*, *37*(6), 577-588.
Hawkes, Sarah, et al. "Strengthening capacity to apply health research evidence in policy making: experience from four countries." *Health policy and planning* (2015): czv032.
Head, B. W. (2007). Community engagement: participation on whose terms?. *Australian Journal of Political Science*, *42*(3), 441-454.
Heitzig, J., & Simmons, F. W. (2012). Some chance for consensus: Voting methods for which consensus is an equilibrium. *Social Choice and Welfare*, *38*(1), 43-57.
Helander, M. G. (Ed.). (2014). *Handbook of human-computer interaction*. Elsevier.
Helfrich, C. D., Weiner, B. J., McKinney, M. M., & Minasian, L. (2007). Determinants of implementation effectiveness adapting a framework for complex innovations. *Medical Care Research and Review*, *64*(3), 279-303.
Hendrickson, N. (2008). *Counterfactual Reasoning: A Basic Guide for Analysts, Strategists, and Decision Makers (The Proteus Monograph Series, Volume 2, Issue 5, October 2008)*. ARMY WAR COLL CARLISLE BARRACKS PA CENTER FOR STRATEGIC LEADERSHIP.
Hilbert, M. (2012). Toward a synthesis of cognitive biases: How noisy information processing can bias human decision making. *Psychological bulletin*, *138*(2), 211.
Hildreth, P. M., & Kimble, C. (Eds.). (2004). *Knowledge networks: Innovation through communities of practice*. IGI Global.
Hollebeek, L. (2011). Exploring customer brand engagement: definition and themes. *Journal of strategic Marketing*, *19*(7), 555-573.
Horsky, J., Schiff, G. D., Johnston, D., Mercincavage, L., Bell, D., & Middleton, B. (2012). Interface design principles for usable decision support: a targeted review of best practices for clinical prescribing interventions. *Journal of biomedical informatics*, *45*(6), 1202-1216.
Hsu, C. C., & Sandford, B. A. (2007). The Delphi technique: making sense of consensus. *Practical assessment, research & evaluation*, *12*(10), 1-8.
InfoDesginLab. (2016). Co-operation with the Norwegian Cochrane Center. Available from: http://www.infodesignlab.com/?p=756
Innes, J. E., & Booher, D. E. (1999). Consensus building and complex adaptive systems: A framework for evaluating collaborative planning. *Journal of the American planning association*, *65*(4), 412-423.
Irwin, A. (2014). Risk, science and public communication. *Routledge Handbook of Public Communication of Science and Technology*, 160.
Jörgens, H. (2013). *Capacity building in national environmental policy: A comparative study of 17 countries*. H. Weidner, & M. Jänicke (Eds.). Springer Science & Business Media.
John, P., Sanders, M., & Wang, J. (2014). The Use of Descriptive Norms in Public Administration: A Panacea for Improving Citizen Behaviours?.*Available at SSRN 2514536*.
Joyce, M. (2013) *Social media, data & messaging are among the key ingredients.*
Available from: http://www.socialbrite.org/2013/03/13/how-to-build-awareness-for-your-campaign/

Kahneman, D., Lovallo, D., & Sibony, O. (2012). Before you make that big decision. Harvard business review, 89(6), 50-60.
Kacprzyk, J., Fedrizzi, M., & Nurmi, H. (1992). Group decision making and consensus under fuzzy preferences and fuzzy majority. *Fuzzy Sets and Systems*, *49*(1), 21-31.
Kavanagh, J., Trouton, A., Oakley, A., & Powell, C. (2006). A systematic review of the evidence for incentive schemes to encourage positive health and other social behaviours in young people. EPPI-Centre, Social Science Research Unit, Institute of Education, University of London.
Kavanagh, M. H., & Ashkanasy, N. M. (2006). The impact of leadership and change management strategy on organizational culture and individual acceptance of change during a merger. *British Journal of Management*, *17*(S1), S81-S103.
Kelders, S. M., Kok, R. N., Ossebaard, H. C., & Van Gemert-Pijnen, J. E. (2012). Persuasive system design does matter: a systematic review of adherence to web-based interventions. *Journal of medical Internet research*, *14*(6).
Keller, K. L. (2009). Building strong brands in a modern marketing communications environment. *Journal of marketing communications*, *15*(2-3), 139-155.
Kim, D. A., Hwong, A. R., Stafford, D., Hughes, D. A., O'Malley, A. J., Fowler, J. H., & Christakis, N. A. (2015). Social network targeting to maximise population behaviour change: a cluster randomised controlled trial. *The Lancet*, *386*(9989), 145-153.
Kislov, R., Waterman, H., Harvey, G., & Boaden, R. (2014). Rethinking capacity building for knowledge mobilisation: developing multilevel capabilities in healthcare organisations. *Implement Sci*, *9*, 166.
Kitson, A. & Harvery G. (2015). *Developing capacity and driving sustainability and spread of evidence-based innovation*. Available from: http://samples.sainsburysebooks.co.uk/9781136768088_sample_1050458.pdf
Klerings, I., Weinhandl, A. S., & Thaler, K. J. (2015). Information overload in healthcare: too much of a good thing?. *Zeitschrift für Evidenz, Fortbildung und Qualität im Gesundheitswesen*, *109*(4), 285-290.
Kloprogge, P., van der Sluijs, J., and Wardekker, J. (2007). Uncertainty communication. Issues and good practice.
Knoke D, Yang S. (2008). *Social network analysis*. 2nd edn. Los Angeles: Sage Publications.
Knowles, M.S., E.F. Holton and R.A. Swanson, 2011. *The Adult Learner: The Definitive Classic in Adult Education and Human Resource Developmen*t. 7th Edn., Elsevier Science, Amsterdam.
Kothari, A., Boyko, J. A., Conklin, J., Stolee, P., & Sibbald, S. L. (2015). Communities of practice for supporting health systems change: a missed opportunity. *Health Research Policy and Systems*, *13*(1), 33.
Kotler, P., & Armstrong, G. (2013). *Principles of Marketing 15th Global Edition*. Pearson.
Kreuter, M. W., & Wray, R. J. (2003). Tailored and targeted health communication: strategies for enhancing information relevance. *American Journal of Health Behavior*, *27*(1), S227-S232.
Kubacki K , Sharyn Rundle-Thiele , Ville Lahtinen , Joy Parkinson , (2015) "A systematic review assessing the extent of social marketing principle use in interventions targeting children (2000-2014)", *Young Consumers*, Vol. 16 Iss: 2, pp.141 – 158.
Labonte, R., & Laverack, G. (2001). Capacity building in health promotion, Part 1: For whom? And for what purpose?. *Critical Public Health*, *11*(2), 111-127.
Lansing, J. S. (2003). Complex adaptive systems. *Annual review of anthropology*, 183-204.
Lavis, J. N., Robertson, D., Woodside, J. M., McLeod, C. B., & Abelson, J. (2003). How can research organizations more effectively transfer research knowledge to decision makers?. *Milbank quarterly*, *81*(2), 221-248.
Lavis, J. N. (2006). Research, public policymaking, and knowledge-translation processes: Canadian efforts to build bridges. *Journal of Continuing Education in the Health Professions*, *26*(1), 37-45.

Ledgerwood, A., & Boydstun, A. E. (2014). Sticky prospects: Loss frames are cognitively stickier than gain frames. *Journal of Experimental Psychology: General*, *143*(1), 376.
Lee, Hyunkyung (2014). "Collaborative Learning in the Workplace: Practice Issues and Concerns". *International Journal of Advanced Corporate Learning*. doi:10.3991/ijac.v7i2.3850.
Lennie, J., Tacchi, J., Wilmore, M., & Koirala, B. (2015). A holistic, learning-centred approach to building evaluation capacity in development organizations. *Evaluation*, *21*(3), 325-343.
Liverani, M., Hawkins, B., & Parkhurst, J. O. (2013). Political and institutional influences on the use of evidence in public health policy. A systematic review.
Luterbach, K. J., & Brown, C. (2011). Education for the 21st century.*International journal of applied educational studies*, *11*(1), 14-32
Mackay, K., 2006, 'Institutionalization of Monitoring and evaluation systems to improve public sector management', Evaluation Capacity development Paper 15, International Evaluation Group, World Bank, Washington, DC.
Maibach, E. W., Leiserowitz, A., Roser-Renouf, C., & Mertz, C. K. (2011). Identifying like-minded audiences for global warming public engagement campaigns: An audience segmentation analysis and tool development. *PloS one*, *6*(3), e17571.
Maier, R. (2007). *Knowledge Management Systems: Information And Communication Technologies for Knowledge Management* (3rd edition). Berlin: Springer.
Makkar, S. R., Gilham, F., Williamson, A., & Bisset, K. (2015). Usage of an online tool to help policymakers better engage with research: Web CIPHER. *Implementation Science*, *10*(1), 56.
Manela, R. W., & Moxley, D. P. (2002). Best practices as agency-based knowledge in social welfare. *Administration in social work*, *26*(4), 1-24.
Manley, R. A. (2013). The Policy Delphi: a method for identifying intended and unintended consequences of educational policy. *Policy Futures in Education*, *11*(6), 755-768.
Margalit, R., Thompson, S., Visovsky, C., Geske, J., Collier, D., Birk, T., & Paulman, P. (2009). From professional silos to interprofessional education: campuswide focus on quality of care. *Quality Management in Healthcare*, *18*(3), 165-173.
Masys, A. J. (2012). Black swans to grey swans: revealing the uncertainty. *Disaster Prevention and Management: An International Journal*, *21*(3), 320-335.
McCormack, L., Sheridan, S., Lewis, M., Boudewyns, V., Melvin, C. L., Kistler, C., Lux L.J., Cullen, K., & Lohr, K. N. (2013). *Communication and dissemination strategies to facilitate the use of health-related evidence*. Evidence Report/Technology Assessment Number 213. Agency for Health Care Research and Quality. Available from: http://effectivehealthcare.ahrq.gov/ehc/products/433/1756/medical-evidence-communication-executive-131120.pdf
McDermott, L., Stead, M., & Hastings, G. (2005). What is and what is not social marketing: the challenge of reviewing the evidence. Journal of Marketing Management, 21(5-6), 545-553.
McLoughlin, C., & Lee, M. J. (2010). Personalised and self regulated learning in the Web 2.0 era: International exemplars of innovative pedagogy using social software. *Australasian Journal of Educational Technology*, *26*(1).
Meagher-Stewart, D., Solberg, S. M., Warner, G., MacDonald, J. A., McPherson, C., & Seaman, P. (2012). Understanding the role of communities of practice in evidence-informed decision making in public health. *Qualitative health research*, *22*(6), 723-739.
Merriam, S. B., Caffarella, R. S., & Baumgartner, L. M. (2012). *Learning in adulthood: A comprehensive guide*. John Wiley & Sons.
Michie, S., van Stralen, M. M., & West, R. (2011). The behaviour change wheel: a new method for characterising and designing behaviour change interventions. *Implementation Science*, *6*(1), 42.
Milne, B. J., Lay-Yee, R., McLay, J., Tobias, M., Tuohy, P., Armstrong, A., ... & Davis, P. (2014). A collaborative approach to bridging the research-policy gap through the development of

policy advice software. *Evidence & Policy: A Journal of Research, Debate and Practice*, *10*(1), 127-136.
Moat, K. A., & Lavis, J. N. (2014). Supporting the use of research evidence in the Americas through an online" one-stop shop": the EVIPNet VHL. *Cadernos de Saúde Pública*, *30*(12), 2697-2701.
Moore G, Redman S, Haines M, Todd, A (2011) What works to increase the use of research in population health policy and programmes: a review. *Evidence & Policy: A Journal of Research, Debate and Practice*, 7, (3) pp. 277-305.
Morelli, A. 2015. Designing Science. Plenary presentation at the *23rd Cochrane Colloquium Vienna, 3-7 October.* Available from:*https://colloquium.cochrane.org/plenary-sessions-vienna*
Mullins, L. J. (2007). *Management and organisational behaviour*. Pearson education.
Naghavi, N. (2015) Increasing Student Engagement Availbale from: http://www.eng.uwo.ca/gradstudies/PDF/workshops/Increasing%20Student%20Engagement.pdf
Nai-gui, H. B. Y. L. (2010). Teacher Secondment and Teacher Professional Development [J]. *Tsinghua Journal of Education*, *4*, 015.
Nasser, M., Oxman, A. D., Paulsen, E., & Fedorowicz, Z. (2007). Local consensus processes: effects on professional practice and health care outcomes. *The Cochrane Library*.
Newell S, Edelman LF: Developing a dynamic project learning and crossproject learning capability: synthesizing two perspectives. *Inf Syst* J 2008, 18(6):567–591.
Newman, K (2012). Evidence literacy of policy makers -what do we know? Available from: http://www.parliament.uk/pagefiles/77236/KN%20-%20evidence%20literacy.pdf
New York Times. (2011). On Jeopardy. Watson win is all but trivial. Available from: NYT http://www.nytimes.com/2011/02/17/science/17jeopardy-watson.html?pagewanted=all
Nonaka, Ikujiro (1991). "The knowledge creating company". *Harvard Business Review* 69 (6): 96–104.
Notarianni, M., Sundar, P., & Carter, C. (2015). Just in time: How evidence-on-demand services support decision making in Ontario's child and youth mental health sector. *Evidence & Policy: A Journal of Research, Debate and Practice*.
Nolan, J. M., Schultz, P. W., Cialdini, R. B., Goldstein, N. J., & Griskevicius, V. (2008). Normative social influence is underdetected. *Personality and social psychology bulletin*, *34*(7), 913-923.
NSM (2007) Social marketing works. Available from: http://www.nsmcentre.org.uk/sites/default/files/Social_marketing_works_NHS.pdf
Nutley SM, Walter I, Davies HTO (2007) *Using evidence. How research informs public services*. Policy Press: Bristol, UK.
Ogbonna, E. (2000), "Leadership style, organizational culture and performance: empirical evidence from UK companies", The International Journal of Human Resource Management, Vol. 11 No. 4, pp. 766-788.
Oliver K, Innvar S, Lorenc T, Woodman J, Thomas J (2014) A systematic review of barriers to and facilitators of the use of evidence by policymakers. *BMC Health Services Research*, 14:2.
Örtenblad, A (2001). "On differences between organizational learning and learning organization", *The Learning Organization*, Vol. 8 Iss: 3, pp.125 – 133.
Pablo AL, Reay T, Dewald JR, Casebeer AL: Identifying, enabling and managing dynamic capabilities in the public sector. *J Manage Stud* 2007, 44(5):687–708.
Patt, A. G., & Weber, E. U. (2014). Perceptions and communication strategies for the many uncertainties relevant for climate policy. *Wiley Interdisciplinary Reviews: Climate Change*, *5*(2), 219-232.
Pawson, R., & Bellamy, J. L. (2006). Realist synthesis: an explanatory focus for systematic review. *Moving beyond effectiveness in evidence synthesis*, 83.
Peirson, L., Ciliska, D., Dobbins, M., & Mowat, D. (2012). Building capacity for evidence informed decision making in public health: a case study of organizational change. *BMC Public Health*, *12*(1), 1.

Percy-Smith, J., Speller, V., & Nutley, S. M. (2006). *Evidence Informed Policy and Practice: A review of approaches used in health improvement in Scotland*. NHS Health Scotland.
Petrosino, A., Turpin-Petrosino, C., & Buehler, J. (2003). Scared Straight and other juvenile awareness programs for preventing juvenile delinquency: A systematic review of the randomized experimental evidence. *The Annals of the American Academy of Political and Social Science*, *589*(1), 41-62.
Pfeffer, J., & Sutton, R. I. (2006). *Hard facts, dangerous half-truths, and total nonsense: Profiting from evidence-based management*. Harvard Business Press.
Pittinsky, T. L., Shih, M. J., & Trahan, A. (2006). Identity Cues: Evidence From and for Intra-Individual Perspectives on Positive and Negative Stereotyping1. *Journal of Applied Social Psychology*, *36*(9), 2215-2239.
Rhodin, M. (2016) IBM Watson Head Mike Rhodin On The Future Of Artificial Intelligence Available from: http://www.forbes.com/sites/peterhigh/2016/01/18/ibm-watson-head-mike-rhodin-on-the-future-of-artificial-intelligence/4/#2715e4857a0b278721c13e29
Rice, R. (2007). The mentor's use of adult learning theories: are theory and practice co-extensive?. In *Paper presented at the British Educational Research Association Annual Conference* (Vol. 5, p. 8).
Rich, E. C., Lake, T., & Valenzano, C. S. (2012). Paying wisely: reforming incentives to promote evidence-based decisions at the point of care. *Center for Health Care Effectiveness White Paper*, 104.
Rist, L., Campbell, B. M., & Frost, P. (2013). Adaptive management: where are we now?. Environmental Conservation, 40(01), 5-18.
Roberts, M. J., Perera, M., Lawrentschuk, N., Romanic, D., Papa, N., & Bolton, D. (2015). Globalization of continuing professional development by journal clubs via microblogging: a systematic review. *Journal of medical Internet research*, *17*(4).
Rothman, A. J., Bartels, R. D., Wlaschin, J., & Salovey, P. (2006). The Strategic Use of Gain-and Loss-Framed Messages to Promote Healthy Behavior: How Theory Can Inform Practice. *Journal of Communication*, *56*(s1), S202-S220.
Roese, N. J. (1997). Counterfactual thinking. *Psychological bulletin*, *121*(1), 133.
Rousseau, D. M. (2006). Is there such a thing as "evidence-based management"?. *Academy of management review*, *31*(2), 256-269.
Rutter, J. & Gold, J. (2015). Show your workings—Assessing how government uses evidence to make policy. Institute for Government. Available from: http://www.instituteforgovernment.org.uk/publications/show-your-workings
Slater, M. D. (1996). Theory and method in health audience segmentation. *Journal of health communication*, *1*(3), 267-284.
Sanchez, R (1996) *Strategic Learning and Knowledge Management*, Wiley, Chichester.
Sashkin, M. (2004). *Transformational leadership approaches: A review and synthesis.*
Sayers, R. (2006). *Principles of awareness-raising for information literacy: A case study*. Communication and Information (CI), UNESCO Asia and Pacific Regional Bureau for Education.
Schaufeli, W.B. (2013). What is engagement? In C. Truss, K. Alfes, R. Delbridge, A. Shantz, & E. Soane (Eds.), Employee Engagement in Theory and Practice. London: Routledge.
Schein, E. H. (2010). *Organizational culture and leadership* (Vol. 2). John Wiley & Sons.
Scholl, A., & Sassenberg, K. (2014). Where could we stand if I had…? How social power impacts counterfactual thinking after failure. *Journal of Experimental Social Psychology*, *53*, 51-61.
Scott, J. (2012). *Social network analysis*. Sage.
Sharples, M., Taylor, J., & Vavoula, G. (2007) A Theory of Learning for the Mobile Age. In R. Andrews and C. Haythornthwaite (eds.)*The Sage Handbook of Elearning Research*. London: Sage, pp. 221-247.

Shneiderman, B. (1992). *Designing the user interface: strategies for effective human-computer interaction* (Vol. 3). Reading, MA: Addison-Wesley.
Schubart, J. R., Stuckey, H. L., Ganeshamoorthy, A., & Sciamanna, C. N. (2011). Chronic health conditions and internet behavioral interventions: a review of factors to enhance user engagement. *Computers Informatics Nursing*, *29*(2), 81-92.
Shearer, J. C., Dion, M., & Lavis, J. N. (2014). Exchanging and using research evidence in health policy networks: a statistical network analysis. *Implementation Science*, *9*(1), 126.
Shepherd, J. P. (2014). How to achieve more effective services: the evidence ecosystem. What Works Network.
Siemens, G., & Long, P. (2011). Penetrating the Fog: Analytics in Learning and Education. *EDUCAUSE review*, *46*(5), 30.
Sim, I. (2016) *The uneven future of evidence-based medicine*. Available from: https://mhealth.md2k.org/training/webinars/more-webinars/31-dr-ida-sim-gives-3rd-annual-cochrane-lecture
Smith, C., & Gillespie, M. (2007). Research on professional development and teacher change: Implications for adult basic education. *Review of adult learning and literacy*, *7*(7).
Spillane, P. (2006). *Distributed leadership* (1st ed.). San Francisco: Jossey-Bass.
Steele, C. M., & Aronson, J. (1995). Stereotype threat and the intellectual test performance of African Americans. *Journal of personality and social psychology*, *69*(5), 797.
Stevenson, C., Hopkins, N., Luyt, R., & Dixon, J. (2015). The social psychology of citizenship: Engagement with citizenship studies and future research. *Journal of Social and Political Psychology*.
Stauss, K., Milford, T., & DeCoster, V. (2009). Implementing a knowledge management system in a school of social work: The Possibilities, challenges, and lessons learned. *Journal of Technology in Human Services*, *27*(4), 323-338.
Straus, S., & Haynes, R. B. (2009). Managing evidence-based knowledge: the need for reliable, relevant and readable resources. *Canadian Medical Association Journal*, *180*(9), 942-945.
Strout, T. D., Lancaster, K., & Schultz, A. A. (2009). Development and implementation of an inductive model for evidence-based practice: A grassroots approach for building evidence-based practice capacity in staff nurses. *Nursing Clinics of North America*, *44*(1), 93-102.
Sutcliffe, A. (2013). *Human-computer interface design*. Springer.
Susskind, L. E., McKearnen, S., & Thomas-Lamar, J. (1999). *The consensus building handbook: A comprehensive guide to reaching agreement*. Sage.
Taylor, E. W. (2007). An update of transformative learning theory: A critical review of the empirical research (1999–2005). *International journal of lifelong education*, *26*(2), 173-191.
Taylor, B. J., Killick, C., & McGlade, A. (2015). *Understanding and Using Research in Social Work*. Learning Matters.
Thompson, M. A., & Deis, M. H. (2004). Andragogy for adult learners in higher education. *Academy of Educational Leadership Journa*l, 8(3), 77-89.
Tonin, M., & Vlassopoulos, M. (2013). Social incentives matter: Evidence from an online real effort experiment.
Trotter, Yvonne D. "Adult learning theories: Impacting professional development programs." *Delta Kappa Gamma Bulletin* 72.2 (2006): 8.
Trowler, V. (2010). Student engagement literature review. *York: Higher Education Academy*.
Uneke, C., B Ngwu, A Ogbonna, A Ezeoha, P Oyibo, F Onwe. (2009). Strategies to enhance the capacity for evidence-informed health policymaking in Nigeria. *The Internet Journal of Healthcare Administration*. Volume 7 Number 1.
Uneke, C. J., Ezeoha, A. E., Ndukwe, C. D., Oyibo, P. G., Onwe, F., Igbinedion, E. B., & Chukwu, P. N. (2011). Individual and organisational capacity for evidence use in policy making in Nigeria: an exploratory study of the perceptions of Nigeria health policy makers. *Evidence & Policy: A Journal of Research, Debate and Practice*, *7*(3), 251-276.

UNESCO. (2013). Turning on Mobile learning in Europe. Paris: UNESCO.
Ungar, M., Whitman, S., Hart, A., & Phipps, D. (2015). Simulation as a tool for developing knowledge mobilisation strategies: Innovative knowledge transfer in youth services. *Gateways: International Journal of Community Research and Engagement*, *8*(1), 100-117.
Vandelanotte, C., Kirwan, M., Rebar, A., Alley, S., Short, C., Fallon, L., ... & Duncan, M. J. (2014). Examining the use of evidence-based and social media supported tools in freely accessible physical activity intervention websites. *International Journal of Behavioral Nutrition and Physical Activity*, *11*(1), 105
Wakefield, M. A., Loken, B., & Hornik, R. C. (2010). Use of mass media campaigns to change health behaviour. *The Lancet*, *376*(9748), 1261-1271.
Walter I, Nutley SM, Davies HTO (2005) What works to promote evidence-based practice? A cross-sector review. *Evidence & Policy*, 1(3): 335-63.
Walsh, C. R., & Byrne, R. M. J. (2007). The effects of reasons for acting on counterfactual thinking.
Walsham, G. (1992). Management science and organisational change: A framework for analysis. *Omega*, *20*(1), 1-9.
Wang, G., Oh, I. S., Courtright, S. H., & Colbert, A. E. (2011). Transformational leadership and performance across criteria and levels: A meta-analytic review of 25 years of research. *Group & Organization Management*, *36*(2), 223-270.
Weiss, C. H. (1979). The Many Meanings of Research Utilization. *Public Administration Review*, 39(5), 426–431.
Wenger, E. (1999). *Communities of practice: Learning, meaning, and identity*. Cambridge university press.
Wenger, E., McDermott, R. A., & Snyder, W. (2002). *Cultivating communities of practice: A guide to managing knowledge*. Harvard Business Press.
Wenger, E. (2004). Knowledge management as a doughnut: Shaping your knowledge strategy through communities of practice. *Ivey Business Journal*, *68*(3), 1-8.
What Works Network (2014) *What Works Evidence for decision-makers*. Available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/378038/What_works_evidence_for_decision_makers.pdf
White, H. 2014a. 'What will it take to Get Systematic Review Evidence into Policy. Keynote address, Campbell Collaboration Colloquium, Queen's University Belfast, Belfast, October 16–19.
WHO. 2009. Violence prevention, the evidence. Promoting gender equality to prevent violence against women. Series of briefings on violence prevention. WHO, Geneva
Wilbanks, J. E. (2012). E-mentoring: examining the feasibility of electronic, online, or distance mentoring. In *Proceedings of the Southwest Decision Sciences Institute Conference*.
Williams, Byron K.; Robert C. Szaro; Carl D. Shapiro (2007). Adaptive Management: The U.S. Department of the Interior Technical Guide. US Department of the Interior. ISBN 1-4113-1760-2.
Wilson, E. (2012). Forget asking if policymakers understand evidence – do we understand policy? Available from: http://www.impactandlearning.org/2012/12/forget-asking-if-policymakers.html
Wilson, P. M., Petticrew, M., Calnan, M. W., & Nazareth, I. (2010). Disseminating research findings: what should researchers do? A systematic scoping review of conceptual frameworks. *Implementation Science*, *5*(1), 91.
Wilson, P. M., Farley, K., Thompson, C., Chambers, D., Bickerdike, L., Watt, I. S., ... & Turner, R. (2015). Effects of a demand-led evidence briefing service on the uptake and use of research evidence by commissioners of health services: protocol for a controlled before and after study. *Implementation Science*, *10*(1), 7.
Wise, N. J. (2009). Maintaining Magnet status: Establishing an evidence-based practice committee. *AORN journal*, *90*(2), 205-213.

Wodak, R., Kwon, W., & Clarke, I. (2011). 'Getting people on board': Discursive leadership for consensus building in team meetings. *Discourse & Society*, *22*(5), 592-644.
Wood, D. (2014). *Interface Design: An Introduction to Visual Communication in UI Design*. Fairchild Books.
Wood, A. F., & Smith, M. J. (2004). *Online communication: Linking technology, identity, & culture*. Routledge.
Yang, K., & Pandey, S. K. (2011). Further dissecting the black box of citizen participation: When does citizen involvement lead to good outcomes?. *Public Administration Review*, *71*(6), 880-892.
Yousefi-Nooraie, R., Dobbins, M., Brouwers, M., & Wakefield, P. (2012). Information seeking for making evidence-informed decisions: a social network analysis on the staff of a public health department in Canada. *BMC health services research*, *12*(1), 1.
Yukl, G. A. (2006). *Leadership in organizations, 6th Ed.,* Upper Saddle River, NJ, Pearson/Prentice Hall.
Zucker, D., Hopkins, R. S., Sly, D. F., Urich, J., Kershaw, J. M., & Solari, S. (2000). Florida's" truth" campaign: a counter-marketing, anti-tobacco media campaign. Journal of public health management and practice, 6(3), 1-6

Appendices

Appendix A: Summary tables of reviews included in Review 1

HIGH TRUST / HIGH RELEVANCE REVIEW			
Short Title	**Interventions**	**Mechanism of evidence use**	**Outcomes result**
Bunn (2011) Strategies to promote the impact of systematic reviews on healthcare policy: a systematic review of the literature	• Intervention 1 [Info] Multifaceted intervention: The study involved program managers and program directors from 108 health departments across Canada, who were randomly assigned to one of three interventions of varying intensity for 12 months (n=36 per group): i) access to an online registry of systematic reviews of public health interventions – the most minimal intervention (HE) ;	**Mechanism of evidence use** • (M3) effective communication & awareness of evidence [Info] access to health-evidence.ca → opportunity (access to evidence portal and SR summaries)	Intended CMO mechanism configuration: ☐ Capability ☐Motivation ☒Opportunity Achieved CMO outcome configuration + Evidence use: ☐ Cap ☐Mot ☐Opp ☐ Evidence Use <u>Study results</u>*:* Having access to a registry of synthesised and translated research evidence (control group) has no impact on EIDM ($p<0.45$).

	ii) access to the same online registry plus tailored, weekly targeted messages for seven weeks, advising of articles in the registry relevant to their program area (healthy weight promotion) (TM) – a middle intensity intervention;	**Mechanism of evidence use** • (M3) effective communication & awareness of evidence [Info] tailored, targeted messages and access to health-evidence.ca → opportunity (access to evidence portal and SR summaries); motivation (targeted and tailored messages) [only when opportunity and motivation are combined]	Intended CMO mechanism configuration: ☐ Capability ☒Motivation ☒Opportunity Achieved CMO outcome configuration + Evidence use: ☐ Cap ☐Mot ☐Opp ☒ Evidence Use <u>Study results:</u> Targeted messaging significantly more effective in promoting EIDM than other strategies (p<.009); In the RCT of KTE strategies in public health decision making (Dobbins et al, 2009a), the use of targeted messages was more effective in promoting evidence-informed decision making compared with alternatives such as a website offering access to an online registry of research evidence or knowledge-brokering groups.
	or iii) access to the same online registry plus tailored, targeted messages, plus a knowledge broker (KB) who worked one-on-one with the decision-makers in the public health departments – the greatest intensity intervention. The KB helped to	**Mechanism of evidence use** • (M3) effective communication & awareness of evidence [Info] tailored, targeted messages and access to health-evidence.ca → opportunity (access to evidence portal and SR summaries); motivation (targeted and tailored messages) [only when opportunity and motivation are combined]	Intended CMO mechanism configuration: ☒ Capability ☒Motivation ☒Opportunity Achieved CMO outcome configuration + Evidence use: ☐ Cap ☐Mot ☐Opp ☐ Evidence Use <u>Study results:</u> In the RCT (Dobbins et al, 2009a), the authors found that knowledge

	develop plans for individual and organisational capacity building, identified new evidence, assisted in the interpretation of evidence, and conducted training sessions to help participants critically appraise different knowledge sources	• (M4) effective interactions & relationships [Info] a knowledge broker who worked one on one with decision makers in the public health departments → opportunity (access to knowledge broker, who makes evidence relevant); motivation (broker, who motivates evidence use) • (M5) capacity to access & make sense of evidence [Info] Access to a knowledge broker who worked one on one with decision makers in the public health departments facilitating capacity development → capability (skill development through broker)	brokering did not have a significant impact and was less effective than tailored, targeted messages. Knowledge brokering was, however, more effective in organisations that placed less value on research than those that already recognised the importance of evidence-based decision making. This, they said, could be because there was less scope for improvement in organisations that already had a positive culture towards research use.
	• Intervention 2 [Info] Three articles report on one intervention where public health policymakers are offered the opportunity to receive five relevant systematic reviews in 1996, and followed up at three months [14] and two years	**Mechanism of evidence use** • (M3) effective communication & awareness of evidence [Info] dissemination of SRs → motivation (giving consent to receive review); opportunity (having access to reviews)	Intended CMO mechanism configuration: ☐ Capability ☒Motivation ☒Opportunity Achieved CMO outcome configuration + Evidence use: ☒ Cap ☒Mot ☒Opp ☒ Evidence Use <u>Study results:</u> 96% of respondents reported that the systematic reviews played a part in developing new guidelines. 47% reported that

	[15,16]. The initial survey asked policymakers and managers if they would like to receive a one-time delivery of the five systematic reviews [14]. The systematic reviews offered to the participants covered the public health topics on the effectiveness of: home visiting; community development projects; maternal-child interventions; adolescent suicide prevention; and heart health projects [14-16]. Among other questions, all follow-up surveys specifically asked about the use of the systematic reviews to make a decision related to policy [14-16].		they contributed a great deal to the development of new recommendations for practice. Decision makers valued the use of the systematic reviews to a greater extent than they did other types of information. 63% reported using at least one systematic review in the previous two year to make a decision. 50% perceived the systematic review as having a great deal of influence on programme justification and 41% on planning decisions. 44% indicated that the systematic review has not influenced policy development at all. 57% had heard of systematic reviews. When prompted with a description, 86% said the description sounded familiar and 62% were able to give examples of reviews they knew about. When asked about what priority reviews should be given in the research agenda, 62% said high and 9% top. For those who read the reviews, most focused on the conclusions, discussion and results. Very few looked at tables.
Comments/remarks:			

On intervention 1: KB was more effective in those organisations that placed less value on research evidence and was less effective in those organisations that already recognised the importance of evidence-based decision making. The authors observed that knowledge brokers along with access to systematic reviews showed a trend towards a positive effect when organizational research culture is perceived as low. However, health departments with a low organizational research culture only benefited slightly when they received the tailored message plus access to the online registry of systematic reviews, yet showed great improvements when the research culture was high. These relationships need to be further explored, but they do offer support to the importance of organisational factors. *Included primary studies*: Ciliska et al (1999); Dobbins et al (2001a, 2001b); Dobbins et al (2004b); Dobbins et al (2009a; 2009b).			
Perrier (2011) Interventions encouraging the use of systematic reviews by health policymakers and managers: a systematic review	**Intervention** • Intervention 1 [*same intervention as in Bunn (2012) Intervention 2, which provided more detail*] [Info] Three articles report on one intervention where public health policymakers are offered the opportunity to receive five relevant systematic reviews in 1996, and followed up at three months [14] and two years [15,16]. The initial survey asked policymakers and managers if they would like to receive a one-time delivery of the five systematic reviews [14]. The systematic reviews offered to the participants covered the public health topics on the effectiveness of: home visiting; community development projects; maternal-child interventions; adolescent	**Mechanism of evidence use** • (M3) effective communication & awareness of evidence [Info] Communication and provision of the SRs → motivation (giving consent to receive review); opportunity (having access to reviews)	Intended CMO mechanism configuration: ☐ Capability ☒Motivation ☒Opportunity Achieved CMO outcome configuration + Evidence use: ☒ Cap ☒Mot ☒Opp ☒ Evidence Use <u>Study results:</u> Ciliska et al. [14] report that three months after the intervention, 91% of participants remembered receiving systematic reviews. Of these, 23% said it played a part in program planning or decision making. Of this group, 57% reported it influenced recommendations made to others, and that 64% of those recommendations were accepted [14]. When prompted with a description, 86% said the description sounded familiar and 62% were able to give examples of reviews they knew about. 96% of respondents reported that the systematic reviews played a part in developing new guidelines. 47% reported that they contributed a great deal to the development of new recommendations for

	suicide prevention; and heart health projects [14-16]. Among other questions, all follow-up surveys specifically asked about the use of the systematic reviews to make a decision related to policy [14-16].		practice. Decision makers valued the use of the systematic reviews to a greater extent than they did other types of information. The two articles by Dobbins et al. [15,16] describe the survey conducted two years later. Recipients of this survey indicated a 63.1% utilization rate of at least one of the systematic reviews in the two years since they had been in contact.
	• Intervention 2 [*same intervention as in Bunn (2012)* Multifaceted intervention: The study involved program managers and program directors from 108 health departments across Canada, who were randomly assigned to one of three interventions of varying intensity for 12 months (n=36 per group): i) access to an online registry of systematic reviews of public health interventions – the most minimal intervention (HE) ;	**Mechanism of evidence use** • (M3) effective communication & awareness of evidence [Info] access to health-evidence.ca → opportunity (access to evidence portal and SR summaries)	Intended CMO mechanism configuration: ☐ Capability ☐Motivation ☒Opportunity Achieved CMO outcome configuration + Evidence use: ☐ Cap ☐Mot ☐Opp ☐ Evidence Use

			Study results*:* Having access to a registry of synthesised and translated research evidence (control group) has no impact on EIDM ($p<0.45$).
	ii) access to the same online registry plus tailored, weekly targeted messages for seven weeks, advising of articles in the registry relevant to their program area (healthy weight promotion) (TM) – a middle intensity intervention;	**Mechanism of evidence use** • (M3) effective communication & awareness of evidence [Info] tailored, targeted messages and access to health-evidence.ca → opportunity (access to evidence portal and SR summaries); motivation (targeted and tailored messages) [only when opportunity and motivation are combined]	Intended CMO mechanism configuration: ☐ Capability ☒Motivation ☒Opportunity Achieved CMO outcome configuration + Evidence use: ☐ Cap ☐Mot ☐Opp ☒ Evidence Use Study results: Targeted messaging significantly more effective in promoting EIDM than other strategies ($p<.009$); In the RCT of KTE strategies in public health decision making (Dobbins et al, 2009a), the use of targeted messages was more effective in promoting evidence-informed decision making compared with alternatives such as a website offering access to an online registry of research evidence or knowledge-brokering groups.
	or iii) access to the same online registry plus tailored, targeted messages, plus a knowledge broker (KB) who worked one-	**Mechanism of evidence use** • (M3) effective communication & awareness of evidence [Info] tailored, targeted messages and access to health-	Intended CMO mechanism configuration: ☒ Capability ☒Motivation ☒Opportunity

	on-one with the decision-makers in the public health departments – the greatest intensity intervention. The KB helped to develop plans for individual and organisational capacity building, identified new evidence, assisted in the interpretation of evidence, and conducted training sessions to help participants critically appraise different knowledge sources	evidence.ca → opportunity (access to evidence portal and SR summaries); motivation (targeted and tailored messages) [only when opportunity and motivation are combined] • (M4) effective interactions & relationships [Info] a knowledge broker who worked one on one with decision makers in the public health departments → opportunity (access to knowledge broker, who makes evidence relevant); motivation (broker, who motivates evidence use) • (M5) capacity to access & make sense of evidence [Info] Access to a knowledge broker who worked one on one with decision makers in the public health departments facilitating capacity development → capability (skill development through broker)	Achieved CMO outcome configuration + Evidence use: ☐ Cap ☐Mot ☐Opp ☐ Evidence Use <u>Study results:</u> In the RCT (Dobbins et al, 2009a), the authors found that knowledge brokering did not have a significant impact and was less effective than tailored, targeted messages. Knowledge brokering was, however, more effective in organisations that placed less value on research than those that already recognised the importance of evidence-based decision making. This, they said, could be because there was less scope for improvement in organisations that already had a positive culture towards research use.

Comments:

General: This review is including the exact same studies as Bunn (2012).

On intervention 1: The significant predictors for use of systematic reviews are: the position of the participant – being a director (OR 9.82, 95% CI 1.48 to 65.32) or manager (OR 14.04, 95% CI 2.22 to 88.96) as compared with medcial and associate medical officers of health; having the expectation to use reviews in future

(OR19.25, 95% CI 2.44 to 151.99); having the perception that reviews would overcome limited critical appraisal skills (OR 3.36, 95% CI 1.36 to 8.31); and that reviews were easy to use (OR 3.01, 95% CI 0.98 to 9.29) (Dobbins 2001a). *On intervention 2:* KB was more effective in those organisations that placed less value on research evidence and was less effective in those organisations that already recognised the importance of evidence-based decision making. The authors observed that knowledge brokers along with access to systematic reviews showed a trend towards a positive effect when organizational research culture is perceived as low. However, health departments with a low organizational research culture only benefited slightly when they received the tailored message plus access to the online registry of systematic reviews, yet showed great improvements when the research culture was high. These relationships need to be further explored, but they do offer support to the importance of organisational factors. *Included primary studies*: Ciliska et al (1999); Dobbins et al (2001a, 2001b); Dobbins et al (2004b); Dobbins et al (2009a; 2009b).			
Hyde (2000) Systematic review of the effectiveness of teaching critical appraisal	**Intervention** • Intervention 1 [Info] *Teaching critical appraisal* Although categorisation of the interventions is again complicated by incomplete reporting, they seem to broadly fall into four types: · Courses with predominantly small group formats in the studies · Courses with predominantly large group formats ie lectures in the studies	**Mechanism of evidence use** • (M5) capacity to access & make sense of evidence [Info] Critical appraisal training → capability (CA skills)	Intended CMO mechanism configuration: ☒ Capability ☐Motivation ☐Opportunity Achieved CMO outcome configuration + Evidence use: ☒ Cap ☒Mot ☐Opp ☒ Evidence Use <u>Study results:</u> The impact of critical appraisal teaching on clinicians' behaviour (principally reading behaviour) was mixed. Of the eight comparisons for this outcome six had major threats to validity. Most, but not all, of the comparisons showed benefit of critical appraisal teaching, two acting in the opposite direction. Critical appraisal teaching was seen to consistently increase skills: fourteen of the sixteen comparisons for this outcome showed a positive effect. There were four comparisons of the impact on attitudes- all were positive, but it

	· One-off workshops and study days [In two cases a mixture of large group formats and small group sessions is used; the latter employs a format with an intermediate student to tutor ratio of approximately 20. · Other one-off interventions. One study employed a single one hour seminar with an intermediate student to tutor ratio of 18. The second study employed two interventions. One involved a one hour lecture (although this would have apparently only been delivered to nine students) and the other a slide-tape program in which no tutor would have been directly involved.		was not possible to separate out real effects from a tendency for participants to respond in a "desired" manner. There is evidence that critical appraisal teaching has positive effects on participants attitudes, knowledge and skills, but there are gaps in the evidence as to whether it impacts on decision making or patient health, or on satisfaction. The overall pattern of results was mixed, both between studies and within studies where a number of criteria had been used to assess reading behaviour change. Of the eight comparisons, two favoured the control, five favoured CAT and one neither. The actual assessment of written patient write-ups by Landry, probably the most relevant behaviour measure used, was amongst the five comparisons favouring CAT. Two changes were statistically significant, both occurring in comparisons favouring CAT, and both provided by the study by Hicks. Giving due caution to the fact that this analysis constitutes a crude form of vote counting, giving equal weight to the included comparisons, the above provides very tentative support that CAT can bring about behaviour change. Thus the highly statistically significant result on reading behaviour in the study by Hicks, referred to a change on a five-point Likert

			scale from 2 on average before the intervention, to 3 after (1 being infrequent). Similarly in the assessment of actual use of literature by Landry, the favourable change noted in number of articles cited in each write-up represented on average 0.5 of an additional article in the CAT intervention group.
Commentary: *Included primary studies:* Bennet (1987); Burls (1997); Caudill (1993); Cuddy (1984); Frasca (1992); Gehlbach (1980); Hicks (1994); Hilson (1992); Ibbotson (1987); Kitchens (1989); Landry (1994); Linzer (1988); Raddack (1986); Reigelmann (1986); Seeling (1991; 1993)			
Ilic (2014) Methods of teaching medical trainees evidence-based medicine: a systematic review.	**Intervention** • Intervention 1 [Info] Various EBM formal education interventions: Eg, online clerkship in EBM, content covered in the online programme included construction of clinical questions, literature searching and appraisal. Teaching content was consistent across both interventions – with content including question framing, literature searching,	**Mechanism of evidence use** • (M5) capacity to access & make sense of evidence [Info] educational interventions → capability (ability to engage in EBM)	Intended CMO mechanism configuration: ☒ Capability ☐Motivation ☐Opportunity Achieved CMO outcome configuration + Evidence use: ☒ Cap ☒Mot ☐Opp ☒ Evidence Use <u>Study results:</u> All studies reported significant improvements in EBM competency (knowledge, skills, attitudes and behaviour) posteducation (Table 1). Based on their level of evidence (all RCTs) and that four of the five studies had a low risk of bias, it was concluded that there was good evidence to support that any form of teaching EBM significantly increases learner competency in EBM knowledge, skills, attitudes and behaviour. Behaviour change outcomes

	critical appraisal of systematic reviews and meta-analysis and application of findings. The computer-based teaching utilised the slides from the lecture-based teaching, with audio over-dubbing and guidance for use on a computer.		include eg: number of searches performed on MEDLINE during clerkship.
Commentary: *Included primary studies:* Bradley (2005); Davis (2007; 2008); Haidet (2004); Ilic (2012); Johnston (2009); Koufogiannakis (2005); Nango (2010); Schilling (2006)			
Yost (2015) The effectiveness of knowledge translation interventions for promoting evidence-informed decision-making among nurses in tertiary care: a systematic review and meta-analysis.	**Intervention** • Intervention 1 [Info] Multi-faceted educational interventions: Educational meetings followed by the use of a mentor to promote EIDM behaviours.	**Mechanism of evidence use** • (M4) effective interactions & relationships [Info] mentorships → opportunity (access to mentor); motivation (mentorship) • (M5) capacity to access & make sense of evidence [Info] educational meetings → capability (EIDM skills)	Intended CMO mechanism configuration: ☒ Capability ☒Motivation ☒Opportunity Achieved CMO outcome configuration + Evidence use: ☐ Cap ☒Mot ☐Opp ☐ Evidence Use <u>Study results:</u> Of four studies implementing KT interventions to promote engagement in EIDM behaviours [35, 37, 42, 60], three did not have an effect, with very low to low confidence in the findings. Two studies evaluated the effectiveness of educational meetings followed by the use of a mentor to promote a range of EIDM behaviours [37, 60]. The meta-analysis (Fig. 2) found that multifaceted KT interventions (educational

			meetings and use of a mentor) did not increase change in self-reported engagement in a range EIDM behaviours at 6 months compared to no intervention [WMD (weighted mean difference) = 2.7, 95 % CI (−1.7, 7.1) P = 0.23, I2= 0 %] as measured by the EBP implementation scale [37, 60]. Tsai [35], however, demonstrated an effect comparing the impact of 8 weeks (~40 h) of educational meetings on research utilization to usual practice. The intervention had a small effect on nurses' self-reported participation in research.
Commentary: *Included primary studies:* Melynk (2010); Trammer (2002); Tsai (2003); Wallen (2010)			
Thompson (2007) Interventions aimed at increasing research use in nursing: a systematic review.	**Intervention** • Intervention 1 [Info] Organization of a multi-disciplinary team of practitioners and researchers aimed at solving a clinical problem using research findings. Within this intervention there were components of education and marketing. The intervention lasted 28 weeks and was divided into six stages (Table 6). Each stage was sequential and lasted	**Mechanism of evidence use** • (M1) awareness of need for evidence to inform decision-making [Info] 1. Problem identification and assessment of research bases for utilization → motivation (identify problem); opportunity (realise the value of research to address problem) • (M2) agreement to what constitutes fit-for-purpose evidence [Info] Researches/ practitioners collaboration workshop (not	Intended CMO mechanism configuration: ☒ Capability ☒Motivation ☒Opportunity Achieved CMO outcome configuration + Evidence use: ☐ Cap ☐Mot ☐Opp ☒ Evidence Use <u>Study results:</u> One study was found in which formation of multidisciplinary committees was reported to be effective at increasing nurses' research use related to oncology pain [24].

	between two and nine weeks. Stages were constructed around collaboration of members of the multidisciplinary team working to operationalize an existing research utilization process (the Conduct and Utilization of Research in Nursing Project) [42]. Unlike other interventions, education was not the primary component. Nurses and investigators participated in activities related to optimal pain management. The phases included: 1. Problem identification and assessment of research bases for utilization 2. Evaluation of research relevancy to problem selection, nursing department values, standards and policies, and potential cost and benefit 3. Innovation design to meet the needs of the problem within the scope of the research base. 4. Actual or construct replication and evaluation of the innovation. 5. Decision to adopt, alter or reject the innovation. 6. Development of means to extend	focused on education but on interaction). See step 2. Evaluation of research relevancy to problem selection, nursing department values, standards and policies, and potential cost and benefit. → capability (evaluation of relevancy); motivation (being aware of ones own values); opportunity (assessing standards and policies) • (M3) effective communication & awareness of evidence [Info] assessment and access of research base → opportunity to use evidence • (M4) effective interactions & relationships [Info] Researcher / practitioner collaboration workshop (not focused on education but on interaction!) → opportunity (collaboration); • (M5) capacity to access & make sense of evidence [Info] Education minor component of collaboration, but skills related to six steps relevant. → capability (skills along the six phases) • (M6) structures & processes [Info] See the six phases, and active change of nurses working processes. → capability (research skills); motivation (value of research	

	the innovation within and outside of the setting.	to solve clinical problem); opportunity (getting engaged in research)	
	• Intervention 2 [Info] Educational meetings. Educational meetings focused on conducting a research study and using the findings. High intervention: Nurses learned how to review and critique research literature, completed a literature review on a clinical practice, participated in the design of a research study to address the identified clinical problem, and participated in the implementation of the study. Low intervention: Nurses learned about the literature related to a clinical problem and discussed now best to implement the research study. Research utilization education designed and based on 6 steps of research utilization.	**Mechanism of evidence use** • (M1) awareness of need for evidence to inform decision-making [info] participation in the design of a research study to address the identified clinical problem. → opportunity (participation in design of research study); motivation (use research to address clinical problem) • (M5) capacity to access & make sense of evidence [Info] educational meetings of different structure and intensity → capability (EBM skills); opportunity (participation in design of a research study) • (M6) structures & processes [info] participation in the design of a research study to address the identified clinical problem. → opportunity (participation in design of research study); capacity (obtaining research experience); motivation (use research to address clinical problem)	Intended CMO mechanism configuration: ☒ Capability ☒Motivation ☒Opportunity Achieved CMO outcome configuration + Evidence use: ☐ Cap ☐Mot ☐Opp ☐ Evidence Use <u>Study results:</u> Tranmer measured research use both in nurses who participated and nurses from the same unit as those who participated [26]. There were no significant changes in research utilization scores in either group. This suggests that, based on this study, educational meetings are ineffective whether a nurse participates directly (attending education meetings) or indirectly (working with nurses who attended educational meetings but not attending themselves). However, no definite conclusions can be drawn due to design limitations. These results are supported by Tsai's study, in which she tested a series of educational strategies focused on research use totaling 65 hours and delivered over eight weeks [27]. In summary, based on this review, educational meetings of varying content, duration, and frequency cannot be said to be

			effective research utilization interventions in nursing. The studies were few in number and were of poor quality. Clearly, there is inconclusive evidence and educational meetings require more rigorous investigations to determine their effect in nursing.
Commentary: *On intervention 2:* Educational meetings of varying content, frequency and duration (Table 6) were also found to be ineffective. Tranmer, who did not describe frequency of their intervention, reported non-significant changes in research utilization scores regardless of whether the intervention was twenty hours and focused on literature critiquing, research design, and protocol implementation, or eight hours and focused solely research design and implementation [26]. These results are supported by Tsai's study, in which she tested a series of educational strategies focused on research use totaling 65 hours and delivered over eight weeks [27]. *Included primary studies:* Dufault (1995); Trammer (2002); Tsai (2003);			
Moore (2011) What works to increase the use of research in population health policy and programmes: a review	**Intervention** • Intervention 1 [Info] *same intervention as in Bunn (2012)* Multifaceted intervention: The study involved program managers and program directors from 108 health departments across Canada, who were randomly assigned to one of three interventions of varying intensity for 12 months (n=36 per group): i) access to an online registry of systematic reviews of public	**Mechanism of evidence use** • (M3) effective communication & awareness of evidence	Intended CMO mechanism configuration: ☐ Capability ☐Motivation ☒Opportunity

	health interventions – the most minimal intervention (HE) ;	[Info] access to health-evidence.ca → opportunity (access to evidence portal and SR summaries)	Achieved CMO outcome configuration + Evidence use: ☐ Cap ☐Mot ☐Opp ☐ Evidence Use <u>Study results</u>*:* Having access to a registry of synthesised and translated research evidence (control group) has no impact on EIDM ($p<0.45$).
	ii) access to the same online registry plus tailored, weekly targeted messages for seven weeks, advising of articles in the registry relevant to their program area (healthy weight promotion) (TM) – a middle intensity intervention;	**Mechanism of evidence use** • (M3) effective communication & awareness of evidence [Info] tailored, targeted messages and access to health-evidence.ca → opportunity (access to evidence portal and SR summaries); motivation (targeted and tailored messages) [only when opportunity and motivation are combined]	Intended CMO mechanism configuration: ☐ Capability ☒Motivation ☒Opportunity Achieved CMO outcome configuration + Evidence use: ☐ Cap ☐Mot ☐Opp ☒ Evidence Use <u>Study results:</u> Targeted messaging significantly more effective in promoting EIDM than other strategies ($p<.009$); In the RCT of KTE strategies in public health decision making (Dobbins et al, 2009a), the use of targeted messages was more effective in promoting evidence-informed decision making compared with alternatives such as a website offering

	or iii) access to the same online registry plus tailored, targeted messages, plus a knowledge broker (KB) who worked one-on-one with the decision-makers in the public health departments – the greatest intensity intervention. The KB helped to develop plans for individual and organisational capacity building, identified new evidence, assisted in the interpretation of evidence, and conducted training sessions to help participants critically appraise different knowledge sources	**Mechanism of evidence use** • (M3) effective communication & awareness of evidence [Info] tailored, targeted messages and access to health-evidence.ca → opportunity (access to evidence portal and SR summaries); motivation (targeted and tailored messages) [only when opportunity and motivation are combined] • (M4) effective interactions & relationships [Info] a knowledge broker who worked one on one with decision makers in the public health departments → opportunity (access to knowledge broker, who makes evidence relevant); motivation (broker, who motivates evidence use) • (M5) capacity to access & make sense of evidence [Info] Access to a knowledge broker who worked one on one with decision makers in the public health departments facilitating capacity development → capability (skill development through broker)	access to an online registry of research evidence or knowledge-brokering groups. Intended CMO mechanism configuration: ☒ Capability ☒Motivation ☒Opportunity Achieved CMO outcome configuration + Evidence use: ☐ Cap ☐Mot ☐Opp ☐ Evidence Use <u>Study results:</u> In the RCT (Dobbins et al, 2009a), the authors found that knowledge brokering did not have a significant impact and was less effective than tailored, targeted messages. Knowledge brokering was, however, more effective in organisations that placed less value on research than those that already recognised the importance of evidence-based decision making. This, they said, could be because there was less scope for improvement in organisations that already had a positive culture towards research use.

	• Intervention 2 [Info] Responses to the dissemination of a research report on breast cancer prevention were compared between two groups of public health units in Ontario: the first group comprised three public health teams that had interacted with the research organisation commissioned to produce the research report, and the second group comprised three teams that had not. The first group's interaction extended over a year and included providing feedback to the research organisation on draft versions of the report, and attending a meeting where members of the research organisation presented the report's findings.	**Mechanism of evidence use** (M3) effective communication & awareness of evidence [Info] mailing of research reports to decision-makers as well as presentation of report's findings → opportunity (access to research); • (M4) effective interactions & relationships [info] interaction between researchers and decision-makers during report writing → capability (better understanding of report); motivation (attach greater value to report	Intended CMO mechanism configuration: ☒ Capability ☒Motivation ☒Opportunity Achieved CMO outcome configuration + Evidence use: ☒ Cap ☒Mot ☒Opp ☐ Evidence Use <u>Study results:</u> Kothari, Birch, and Charles (2005) used a quasi-experimental study design (i.e., one that had a comparison group) and qualitative methods in determining whether the uptake of information contained in a research report hinged on being involved in developing the report itself. Analysis of the teams' comments suggested that the interaction process helped to educate the interacting teams about the research process and its limitations for the breast health report. Interacting teams were more articulate about the value of the report, and had higher expectations about being able to use the report. However, there was no difference between the two groups in the use of the report: both groups reported using the document to confirm the appropriateness of current knowledge and practices, and to compare the breast health practices in their region with those in other regions. A large difference was found between interacting and comparison teams regarding their intent to use the research findings in future activities. Interacting teams expected to use local

			data in report for presentations, media communications, the development of educational materials, and strategic and program planning. The comparison teams made little mention of the report's future use.
	• Intervention 3 Training in research receptivity a) Taylor and colleagues (2004) used a prospective randomised controlled trial to assess the effectiveness and cost of the Critical Appraisal Skills Programme (CASP), one of the most widely used forms of critical appraisal skills training in the UK. The program is designed to help participants systematically examine research to assess study validity, the results, and their relevance to a particular clinical scenario. Participants practise these skills during the training session, by critically appraising a systematic review article, and then receive follow-up materials following the training session.	**Mechanism of evidence use** • (M5) capacity to access & make sense of evidence [Info] Practical training on critical appraisal skills. Participants practise these skills during the training session, by critically appraising a systematic review article, and then receive follow-up materials following the training session. → capability (CA skills)	Intended CMO mechanism configuration: ☒ Capability ☐Motivation ☐Opportunity Achieved CMO outcome configuration + Evidence use: ☒ Cap ☐Mot ☐Opp ☐ Evidence Use <u>Study results:</u> The primary analyses showed statistically significant ($p<0.05$) but small improvements in overall knowledge about research principles and in the ability to critically appraise research results in the training group compared with the control group. No differences were found in perceived confidence, attitude towards research, or evidence-seeking behaviour. The program cost was approximately 250 GBP per person, the majority of which was salary costs for the participants attending the training (around 140 GBP). Secondary analyses showed a bigger difference in research knowledge, but no other significant difference.

	Denis and colleagues (2008) evaluated the Executive Training for Research Application (EXTRA) program, led by the Canadian Health Services Research Foundation (CHSRF). This program aims to improve receptor capacity for research among senior health service executives and the organisations in which they work. The two-year program is structured around residency sessions, the development and implementation of an intervention project, an information management component, a mentoring system, and learning networks.	**Mechanism of evidence use** • (M5) capacity to access & make sense of evidence [Info] Executive training for research application focused on integrating research into programming → capability (CA skills); opportunity (design an intervention programme; networking) • (M6) structures & processes [Info] Executive training for research application focused on integrating research into programming → opportunity (information management component; mentoring system; learning network)	Intended CMO mechanism configuration: ☒ Capability ☐Motivation ☒Opportunity Achieved CMO outcome configuration + Evidence use: ☒ Cap ☒Mot ☒Opp ☐ Evidence Use <u>Study results:</u> The results showed that the proportion of participants who rated themselves as excellent or very good on research literacy increased from 16% to 71%; knowledge of research-based evidence increased from 17% to 90%; skills for doing research increased from 0% to 24%; assessing the quality of research increased from 12% to 52%; knowledge of change management increased from 50% to 95%; and ability to promote the use of research evidence in their organisation increased from 16% to 86%. Participants had also identified more opportunities to use research in collaboration with other professionals (increase from 16% to 86%). Organisational changes (opportunities to learn more about research at work, opportunities to use research in collaboration with other professionals) showed more modest gains (0% to 24%, 0% to 9%).

	• Intervention 4 [Info] *same intervention as in Bunn (2012):* Dissemination of SRs to policymaker via mail. Decision-makers were offered the opportunity to receive five relevant systematic reviews in 1996, and followed up at three months [14] and two years [15,16]. The initial survey asked policymakers and managers if they would like to receive a one-time delivery of the five systematic reviews [14]. The systematic reviews offered to the participants covered the public health topics on the effectiveness of: home visiting; community development projects; maternal-child interventions; adolescent suicide prevention; and heart health projects [14-16]. Among other questions, all follow-up surveys specifically asked about the use of the systematic reviews	• (M3) effective communication & awareness of evidence [Info] dissemination of SRs → motivation (giving consent to receive review); opportunity (having access to reviews)	Intended CMO mechanism configuration: ☐ Capability ☒Motivation ☒Opportunity Achieved CMO outcome configuration + Evidence use: ☒ Cap ☒Mot ☒Opp ☒ Evidence Use <u>Study results:</u> 96% of respondents reported that the systematic reviews played a part in developing new guidelines. 47% reported that they contributed a great deal to the development of new recommendations for practice. Decision makers valued the use of the systematic reviews to a greater extent than they did other types of information. 63% reported using at least one systematic review in the previous two year to make a decision. 50% perceived the systematic review as having a great deal of influence on programme justification and 41% on planning decisions. 44% indicated that the systematic review has not influenced policy development at all. 57% had heard of systematic reviews. When prompted with a description, 86% said the description sounded familiar and 62% were

	to make a decision related to policy [14-16].		able to give examples of reviews they knew about. When asked about what priority reviews should be given in the research agenda, 62% said high and 9% top. For those who read the reviews, most focused on the conclusions, discussion and results. Very few looked at tables.
Commentary: *On intervention 1:* KB was more effective in those organisations that placed less value on research evidence and was less effective in those organisations that already recognised the importance of evidence-based decision making. The authors observed that knowledge brokers along with access to systematic reviews showed a trend towards a positive effect when organizational research culture is perceived as low. However, health departments with a low organizational research culture only benefited slightly when they received the tailored message plus access to the online registry of systematic reviews, yet showed great improvements when the research culture was high. These relationships need to be further explored, but they do offer support to the importance of organisational factors. *On interventions 3:* Taylor CA was very short and less intensive than Denis. The study (ie Taylor) suggests that a half-day training session for practitioners may elicit small improvements in research knowledge and critical appraisal skills, but no change in attitudes towards the use of evidence or evidence-seeking behaviour. One-off educational interventions may have limited effect on the use of research. In contrary, Denis suggests it is possible to increase self-reported research literacy and skills. However, this study uses only self reported outcomes and has small numbers. It is a highly intensive course for senior managers and its applicability to NSW Health is possibly limited. *Included primary studies*: Dennis (2008); Dobbins (2001) Dobbins (2009); Kothari (2005); Taylor (2004)			
LaRocca (2012) The effectiveness of knowledge translation strategies used in public	**Intervention** • Intervention 1 [Info] Communities of practice Barwick et al. [21] was the third study that evaluated changes in knowledge by administering a	**Mechanism of evidence use** • (M4) effective interactions & relationships [Info] Evidence-based tool introduced to communities of practice → opportunity (learning together, sharing practices and	Intended CMO mechanism configuration: ☒ Capability ☐Motivation ☒Opportunity Achieved CMO outcome configuration + Evidence use: ☐ Cap ☐Mot ☐Opp ☐ Evidence Use

health: a systematic review.	20-item true or false questionnaire measuring participants knowledge related to the use of an evidence based tool recently introduced into practice. Members in the community of practice group were defined as deliberate communities of people who share knowledge, learn together and create common practices supporting knowledge exchange among practitioners.	knowledge); capability (learning together, sharing practices and knowledge) • (M5) capacity to access & make sense of evidence [Info] Communities of practice to learn together and share knowledge. → capability (skills, knowledge);	<u>Study results:</u> Barwick et al. [21] was the third study that evaluated changes in knowledge by administering a 20-item true or false questionnaire measuring participants knowledge related to the use of an evidence based tool recently introduced into practice. Statistically significant between group differences were not reported between practitioners involved in an interactive communities of practice group versus usual practice. There were no statistically significant differences on the outcome change in practice on participants allocated to communities of practice in Barwick et al. [21] versus usual practice.
	• Intervention 2 [Info] dissemination channels including print, CD-ROM, and Internet. Di Noia et al. [22] disseminated adolescent substance abuse prevention program materials to school personnel, community providers and policy makers through pamphlet, CD-ROM, and Internet channels. The KT strategy in Di Noia et al. [22] did not require participants to physically travel anywhere or set	**Mechanism of evidence use** • (M3) effective communication & awareness of evidence [Info] Dissemination of targeted information materials. → opportunity (access to information); motivation (salient commination)	Intended CMO mechanism configuration: ☐ Capability ☒Motivation ☒Opportunity Achieved CMO outcome configuration + Evidence use: ☒ Cap ☒Mot ☒Opp ☐ Evidence Use <u>Study results:</u> Di Noia et al. [22] disseminated adolescent substance abuse prevention program materials to school personnel, community providers and policy makers through pamphlet, CD-ROM, and Internet channels. At 6 month follow-up, respondents who received prevention materials disseminated via CD-ROM and

	aside a pre-specified time to review materials over the Internet, CD-ROM, or pamphlet thereby allowing participants to review materials at their own convenience. Materials were also sent out to participants by mail, fax, or email according to their preference and materials were tailored to include constituency specific content responsive to differing prevention needs.		Internet showed significantly greater knowledge of where to locate drug abuse prevention findings and materials compared to those who received printed pamphlets. The KT strategy did not require participants to physically travel anywhere or set aside a pre-specified time to review materials over the Internet, CD-ROM, or pamphlet thereby allowing participants to review materials at their own convenience. Materials were also sent out to participants by mail, fax, or email according to their preference and materials were tailored to include constituency specific content responsive to differing prevention needs. Post hoc analyses in the study by Di Noia et al. [22] favoured dissemination of materials via the Internet.
	• Intervention 3 [Info] Technical assistance and staff training from consultants Forsetlund et al. [23] tested a multi-faceted strategy designed to lead participants through steps outlined in Rogers' model of innovation diffusion. The strategy for the intervention group included an 11 course skill building workshop on evidence-based public health	**Mechanism of evidence use**. • (M3) effective communication & awareness of evidence [Info] access to web-based information service → opportunity (access to evidence) • (M5) capacity to access & make sense of evidence [Info] training workshop on EIDM skills → capacity (EIDM skills)	Intended CMO mechanism configuration: ☒ Capability ☐Motivation ☒Opportunity Achieved CMO outcome configuration + Evidence use: ☒ Cap ☐Mot ☐Opp ☐ Evidence Use <u>Study results:</u> Statistically significant differences were found between the two groups for both concept ($p = 0.001$) and source knowledge scores ($p<0.01$)

	involving small group problem-based activities and discussion, goal setting, access to web-based information services (inclusive of a question and answer service, discussion list, and ongoing support services), and 3 newsletters. The control group received access to library services only.	• (M6) structure & processes [Info] on-demand question and answer service. → opportunity (web-based information services, inclusive of a question and answer service, discussion list, and ongoing support services)	While the KT strategies evaluated in Forsetlund et al. showed significant between group differences on the outcome knowledge, the KT strategies did not translate into significant changes in practice. Participants in Forsetlund et al. [23] who received the multi-faceted strategy related to EIDM showed no change in the use of research in written reports after the intervention.
	• Intervention 4 [Info] *same intervention as in Bunn (2012)* Multifaceted intervention: The study involved program managers and program directors from 108 health departments across Canada, who were randomly assigned to one of three interventions of varying intensity for 12 months (n=36 per group): i) access to an online registry of systematic reviews of public health interventions – the most minimal intervention (HE) ;	**Mechanism of evidence use** • (M3) effective communication & awareness of evidence [Info] access to health-evidence.ca → opportunity (access to evidence portal and SR summaries)	Intended CMO mechanism configuration: ☐ Capability ☐Motivation ☒Opportunity Achieved CMO outcome configuration + Evidence use: ☐ Cap ☐Mot ☐Opp ☐ Evidence Use

	ii) access to the same online registry plus tailored, weekly targeted messages for seven weeks, advising of articles in the registry relevant to their program area (healthy weight promotion) (TM) – a middle intensity intervention;	**Mechanism of evidence use** • (M3) effective communication & awareness of evidence [Info] tailored, targeted messages and access to health-evidence.ca → opportunity (access to evidence portal and SR summaries); motivation (targeted and tailored messages) [only when opportunity and motivation are combined]	Study results*:* Having access to a registry of synthesised and translated research evidence (control group) has no impact on EIDM ($p<0.45$). Intended CMO mechanism configuration: ☐ Capability ☒Motivation ☒Opportunity Achieved CMO outcome configuration + Evidence use: ☐ Cap ☐Mot ☐Opp ☒ Evidence Use Study results: Targeted messaging significantly more effective in promoting EIDM than other strategies ($p<.009$); In the RCT of KTE strategies in public health decision making (Dobbins et al, 2009a), the use of targeted messages was more effective in promoting evidence-informed decision making compared with alternatives such as a website offering access to an online registry of research evidence or knowledge-brokering groups.
	or iii) access to the same online registry plus tailored, targeted	**Mechanism of evidence use** • (M3) effective communication & awareness of evidence [Info] tailored, targeted messages and access to health-	Intended CMO mechanism configuration: ☒ Capability ☒Motivation ☒Opportunity

	messages, plus a knowledge broker (KB) who worked one-on-one with the decision-makers in the public health departments – the greatest intensity intervention. The KB helped to develop plans for individual and organisational capacity building, identified new evidence, assisted in the interpretation of evidence, and conducted training sessions to help participants critically appraise different knowledge sources	evidence.ca → opportunity (access to evidence portal and SR summaries); motivation (targeted and tailored messages) [only when opportunity and motivation are combined] • (M4) effective interactions & relationships [Info] a knowledge broker who worked one on one with decision makers in the public health departments → opportunity (access to knowledge broker, who makes evidence relevant); motivation (broker, who motivates evidence use) • (M5) capacity to access & make sense of evidence [Info] Access to a knowledge broker who worked one on one with decision makers in the public health departments facilitating capacity development → capability (skill development through broker)	Achieved CMO outcome configuration + Evidence use: ☐ Cap ☐Mot ☐Opp ☐ Evidence Use <u>Study results:</u> In the RCT (Dobbins et al, 2009a), the authors found that knowledge brokering did not have a significant impact and was less effective than tailored, targeted messages. Knowledge brokering was, however, more effective in organisations that placed less value on research than those that already recognised the importance of evidence-based decision making. This, they said, could be because there was less scope for improvement in organisations that already had a positive culture towards research use.
Commentary: *On intervention 1:* KB was more effective in those organisations that placed less value on research evidence and was less effective in those organisations that already recognised the importance of evidence-based decision making. The authors observed that knowledge brokers along with access to systematic reviews showed a trend towards a positive effect when organizational research culture is perceived as low. However, health departments with a low organizational research culture only benefited slightly when they received the tailored message plus access to the online registry of systematic reviews, yet showed great improvements when the research culture was high. These relationships need to be further explored, but they do offer support to the importance of organisational factors. *Included primary studies:* Barwick (2009); Di Noia (2003); Dobbins (2009); Forsetlund (2003)			
High relevance / moderate trustworthiness reviews			

Short Title	**Interventions**	**Mechanism of evidence use**	**Outcomes result**
Chambers, (2011) Maximizing the Impact of Systematic Reviews in Health Care Decision Making: A Systematic Scoping Review of Knowledge-Translation Resources	**Intervention** • Intervention 1 [Info] Summaries of SRs. We identified eleven resources that provided value-added summaries of systematic reviews. Six of these resources reported on methods, for example, how reviews were selected for summarizing and the criteria used to assess the quality of the methodology. In addition to a summary of key points, the most common features were evaluations of the review's methodological quality and/or its generalizability across settings (table 1). Two services (Effective Health Care Program policymaker summaries and SBU Alert report summaries) appeared to relate the evidence to the local context in a few but not all cases. One service (the WHO Reproductive Health Library) included concise commentaries on Cochrane	**Mechanism of evidence use** • (M3) effective communication & awareness of evidence [Info] Producing more accessible of summary products of SRs → motivation [local context,]; opportunity (access to evidence) • (M6) Structures & Processes [Info] On-demand services (ARIF; STEPP) → motivation [local context, convenient access]; opportunity (special channel for decision-makers to receive rapid access to relevant evidence)	Intended CMO mechanism configuration: ☐ Capability ☒Motivation ☒Opportunity Achieved CMO outcome configuration + Evidence use: ☐ Cap ☒Mot ☒Opp ☒ Evidence Use <u>Study results:</u> Evidence of Usefulness/Use. All the evaluations reported on the re sources' perceived usefulness to policymakers, and four provided evidence of actual use. Handoll and colleagues reported that a summary of a Cochrane review had been of direct use to local researchers, resulting in the routine use of the Cochrane Library. Finally, the study of seventeen requests for information from the ARIF service found that actions following the appraisal of evidence included a new service developed and put in place (1), influenced primary care purchasers not to purchase a service (1), did not succeed in influencing primary care purchasers (2), and a topic taken up by a regional group (2). No action was taken in nine cases, although further work was planned or in progress in eight of these (Packer and Hyde 2000). Library. The STEPP program in South Africa, which produces overviews of systematic

	reviews written by independent subject experts.		review evidence in response to policymakers' requests, received only one request in a year.
	• Intervention 2 [Info] Policy briefs based on SRs. We included three series of policy briefs (table 3), although only those by the McMaster Health Forum were unambiguously based primarily on systematic reviews. The EVIPNet and HEN products were described as using the best available evidence and varied in their use of systematic reviews. Only one of the three series was produced in response to policymakers.	**Mechanism of evidence use** • (iii) effective communication & awareness of evidence [Info] Production of briefs for policymakers	Intended CMO mechanism configuration: ☐ Capability ☒Motivation ☒Opportunity Achieved CMO outcome configuration + Evidence use: ☐ Cap ☐Mot ☐Opp ☐ Evidence Use <u>Study results:</u> The McMaster Health Forum policy briefs have been evaluated, but the results are not available for wider circulation. At Regular evaluations of the Policy Liaison Initiative summaries also have been conducted, but they are the property of the Australian Department of Health and Aging and are not available for wider circulation

Commentary:

On intervention 1: On-demand services had mixed effects. Where used they were effective, but often they simply were not. The STEPP program in South Africa, which produces overviews of systematic review evidence in response to policymakers' requests, received only one request in a year. Again, this dearth of requests was attributed to policymakers' occupation with implementing policies. A lack of culture and mechanisms for raising questions about the effects of interventions also was thought to inhibit policymakers' use of the service (data from unpublished reports). The evaluations also found a number of challenges in translating systematic review evidence for policymakers. Two studies reported that some users found the review summaries/overviews too long and complex (Dilkes, Hill, and Ryan 2008; Rosenbaum, Glenton, and Oxman 2008). A third found only limited support for summaries of Cochrane reviews (Handoll and Madhok 2001). This was attributed in

<table>
<tr><td colspan="4">part to "policy overload" in the NHS, which reduced interest in resources not directly related to current national policies and the existence of other products covering similar ground (e.g., Effective Health Care), as well as increasing local access to the full text of reviews via the Cochrane Library.

Included primary studies:
Handoll and Madhok (2001); Packer and Hyde (2000). Young et al (2005) Rosenbaum et al 2008; Dikes et al (2008)</td></tr>
<tr><td>Mitton (2007)

Knowledge Transfer and Exchange: Review and Synthesis of the Literature</td><td>Intervention
• Intervention 1[same as intervention 2 in Moore (2011)]
[Info] Co-production / decision-makers involvement in production of research report.

Responses to the dissemination of a research report on breast cancer prevention were compared between two groups of public health units in Ontario: the first group comprised three public health teams that had interacted with the research organisation commissioned to produce the research report, and the second group comprised three teams that had not. The first group’s interaction extended over a year and included providing feedback to the research organisation on draft versions of the report, and attending a meeting where</td><td>Mechanism of evidence use

(M3) effective communication & awareness of evidence
[Info] mailing of research reports to decision-makers as well as presentation of report’s findings
→ opportunity (access to research);

• (M4) effective interactions & relationships
[info] interaction between researchers and decision-makers during report writing
→ capability (better understanding of report); motivation (attach greater value to report)

• (M6) structures & processes
[Info] Involving decision-makers in research;
→ motivation (greater value of report); capability (better understanding of report)</td><td>Intended CMO mechanism configuration:
☒ Capability ☒Motivation ☒Opportunity

Achieved CMO outcome configuration + Evidence use:
☒ Cap ☒Mot ☒Opp ☐ Evidence Use

<u>Study results:</u> Kothari, Birch, and Charles (2005) used a quasi-experimental study design (i.e., one that had a comparison group) and qualitative methods in determining whether the uptake of information contained in a research report hinged on being involved in developing the report itself. Analysis of the teams’ comments suggested that the interaction process helped to educate the interacting teams about the research process and its limitations for the breast health report. Interacting teams were more articulate about the value of the report, and had higher expectations about being able to use the report. However, there was no difference between the two groups in the use of the report: both groups reported using the document to confirm the appropriateness of current knowledge and</td></tr>
</table>

	members of the research organisation presented the report's findings		practices, and to compare the breast health practices in their region with those in other regions. A large difference was found between interacting and comparison teams regarding their intent to use the research findings in future activities. Interacting teams expected to use local data in report for presentations, media communications, the development of educational materials, and strategic and program planning. The comparison teams made little mention of the report's future use.
	• Intervention 2 [Info] Three articles report on one intervention where public health policymakers are offered the opportunity to receive five relevant systematic reviews in 1996, and followed up at three months [14] and two years [15,16]. The initial survey asked policymakers and managers if they would like to receive a one-time delivery of the five systematic reviews [14]. The systematic reviews offered to the participants covered the public health topics on the effectiveness of: home visiting; community development projects; maternal-child interventions; adolescent	**Mechanism of evidence use** • (M3) effective communication & awareness of evidence [Info] dissemination of SRs → motivation (giving consent to receive review); opportunity (having access to reviews)	Intended CMO mechanism configuration: ☐ Capability ☒Motivation ☒Opportunity Achieved CMO outcome configuration + Evidence use: ☒ Cap ☒Mot ☒Opp ☒ Evidence Use <u>Study results:</u> 96% of respondents reported that the systematic reviews played a part in developing new guidelines. 47% reported that they contributed a great deal to the development of new recommendations for practice. Decision makers valued the use of the systematic reviews to a greater extent than they did other types of information. 63% reported using at least one systematic review in the previous two year to make a decision. 50% perceived the systematic review

	suicide prevention; and heart health projects [14-16]. Among other questions, all follow-up surveys specifically asked about the use of the systematic reviews to make a decision related to policy [14-16].		as having a great deal of influence on programme justification and 41% on planning decisions. 44% indicated that the systematic review has not influenced policy development at all. 57% had heard of systematic reviews. When prompted with a description, 86% said the description sounded familiar and 62% were able to give examples of reviews they knew about. When asked about what priority reviews should be given in the research agenda, 62% said high and 9% top. For those who read the reviews, most focused on the conclusions, discussion and results. Very few looked at tables.
	• Intervention 3 [Info] *Same interventions as intervention 1 in Bunn (2012)* Multifaceted intervention: The study involved program managers and program directors from 108 health departments across Canada, who were randomly assigned to one of three interventions of varying		

	intensity for 12 months (n=36 per group): i) access to an online registry of systematic reviews of public health interventions – the most minimal intervention (HE) ; ii) access to the same online registry plus tailored, weekly targeted messages for seven weeks, advising of articles in the registry relevant to their program area (healthy weight promotion) (TM) – a middle intensity intervention;	**Mechanism of evidence use** • (M3) effective communication & awareness of evidence [Info] access to health-evidence.ca → opportunity (access to evidence portal and SR summaries) **Mechanism of evidence use** • (M3) effective communication & awareness of evidence [Info] tailored, targeted messages and access to health-evidence.ca → opportunity (access to evidence portal and SR summaries); motivation (targeted and tailored messages) [only when opportunity and motivation are combined]	Intended CMO mechanism configuration: ☐ Capability ☐Motivation ☒Opportunity Achieved CMO outcome configuration + Evidence use: ☐ Cap ☐Mot ☐Opp ☐ Evidence Use Study results*:* Having access to a registry of synthesised and translated research evidence (control group) has no impact on EIDM ($p<0.45$). Intended CMO mechanism configuration: ☐ Capability ☒Motivation ☒Opportunity Achieved CMO outcome configuration + Evidence use: ☐ Cap ☐Mot ☐Opp ☒ Evidence Use Study results: Targeted messaging significantly more effective in promoting EIDM than other strategies ($p<.009$); In the RCT of KTE strategies in public health decision making (Dobbins et al, 2009a), the use of targeted messages was more effective in promoting

	or iii) access to the same online registry plus tailored, targeted messages, plus a knowledge broker (KB) who worked one-on-one with the decision-makers in the public health departments – the greatest intensity intervention. The KB helped to develop plans for individual and organisational capacity building, identified new evidence, assisted in the interpretation of evidence, and conducted training sessions to help participants critically appraise different knowledge sources	**Mechanism of evidence use** • (M3) effective communication & awareness of evidence [Info] tailored, targeted messages and access to health-evidence.ca → opportunity (access to evidence portal and SR summaries); motivation (targeted and tailored messages) [only when opportunity and motivation are combined] • (M4) effective interactions & relationships [Info] a knowledge broker who worked one on one with decision makers in the public health departments → opportunity (access to knowledge broker, who makes evidence relevant); motivation (broker, who motivates evidence use) • (M5) capacity to access & make sense of evidence [Info] Access to a knowledge broker who worked one on one with decision makers in the public health departments facilitating capacity development → capability (skill development through broker)	evidence-informed decision making compared with alternatives such as a website offering access to an online registry of research evidence or knowledge-brokering groups. Intended CMO mechanism configuration: ☒ Capability ☒Motivation ☒Opportunity Achieved CMO outcome configuration + Evidence use: ☐ Cap ☐Mot ☐Opp ☐ Evidence Use <u>Study results:</u> In the RCT (Dobbins et al, 2009a), the authors found that knowledge brokering did not have a significant impact and was less effective than tailored, targeted messages. Knowledge brokering was, however, more effective in organisations that placed less value on research than those that already recognised the importance of evidence-based decision making. This, they said, could be because there was less scope for improvement in organisations that already had a positive culture towards research use.

Comments/remarks:

On intervention 3: KB was more effective in those organisations that placed less value on research evidence and was less effective in those organisations that already recognised the importance of evidence-based decision making. The authors observed that knowledge brokers along with access to systematic reviews showed a trend towards a positive effect when organizational research culture is perceived as low. However, health departments with a low organizational research culture only benefited slightly when they received the tailored message plus access to the online registry of systematic reviews, yet showed great improvements when the research culture was high. These relationships need to be further explored, but they do offer support to the importance of organisational factors.

Included primary studies: [all studies reported here are covered in other reviews] Kothari et al (2005); Dobbins et al (2001a, 2001b); Dobbins et al (2007)

HIGH TRUST / MODERATE RELEVANCE REVIEWS

Short Title	Interventions	Mechanism of evidence use	Outcomes result
Abdullah (2014) Measuring the effectiveness of mentoring as a knowledge translation intervention for implementing empirical evidence: a systematic review.	• Intervention 1 [Info] Mentorship Characteristics Of mentoring interventions varied across studies based on (a) mode of delivery, (b) frequency and length of mentoring intervention, and (c) type of mentor selection process. Mentoring interventions were delivered via a single approach (individual or group meetings), or via mixed approach (combination of individual or group meetings, or e-mail; see Table 4). The	• (M4) effective interactions & relationships [Info] Mentorship relationships as a support mechanism. No study looked at relationship building → opportunity (relations with other EBP-inclined decision-makers as well as mentor); • (M5) capacity to access & make sense of evidence [Info] Mentors as part of a constant training process, educational sessions → capability (skills in EBP/EIDM); • (M6) structures & processes	Intended CMO mechanism configuration: ☒ Capability ☒Motivation ☒Opportunity Achieved CMO outcome configuration + Evidence use: ☒ Cap ☒Mot ☒Opp ☐ Evidence Use <u>Study results:</u> Compared to educational meetings, nurses who received mentoring as part of a multifaceted intervention had increased beliefs in EBP (F1, 15 = 3 3.105, p < .001) and had sustained beliefs at 9 months post intervention (F1, 15 = 7.335, p = .016; Levin et al., 2011).

	mentoring interventions varied from 3 to 12 sessions (Median=7.5 with each session approximately 2 hours and scheduled over 14 to 360 days (Median = 90). Some mentors were physicians nominated by their peers. Other mentors were nurses or other healthcare professionals selected to support nurses. Only Johnston and colleagues (2007) discussed the mentor selection process, indicating key leaders were selected as mentors.	[Info] Mentors as a tool to increase organisational culture and readiness for EBP (as part of a multifaceted intervention) → opportunity (readiness for EBP/org culture); motivation (org culture)	Compared to educational meetings, nurses who received mentoring as part of a multifaceted intervention improved implementation of EBP ($F1,15 = 10.39$, $p = .006$) and sustained implementation at 9 months post-intervention ($F2,30 = 5.85$, $p = .007$; Levin et al., 2011). Compared to educational materials alone, physicians exposed to mentoring as part of a multifaceted intervention reported improvement in their skills for supporting patients' informed decision-making Compared to no intervention, nurses exposed to mentoring as part of a multifaceted intervention had increased beliefs in EBP (M = 57.2%–62.6% vs. 58.0%–58.2%, $p = .025$; Wallen et al., 2010) or no difference (Mariano et al., 2009). Nurses also had improved perceptions of organizational culture and readiness for EBP (M = 77.2%– 89.5% vs. M = 80.9%–82.9%, $p = .025$; Wallen et al., 2010.
Comments/remarks:			

Mentoring was exclusively applied as part of multi-component evidence use interventions, which makes the attribution of outcomes to mechanisms challenging. *On intervention 1:* Physician mentors were selected via peers in most medical studies, while nurses' and healthcare professionals' mentors were selected via key leaders in one nursing study. The extent to which selection processes affect relationships and the uptake of evidence into practice is difficult to conclude from this review.			
Hines (2015) The effectiveness of interventions for improving the research literacy of nurses: A systematic review.	**Intervention** • Intervention 1 [Info] Workplace Learning for Nurses' Research Literacy. Four studies examined the effectiveness of a variety of educational interventions delivered in a workplace environment. Interventions trialed were quite diverse: a 1-day workshop, a 6- week "virtual journal club" online program, a 6-week research knowledge course, and a 6-month clinical fellowship program that included the supported conduct of a research implementation project. Most of these workplace interventions were delivered face-to- face, but one was delivered online using the "Second Life" virtual environment.	**Mechanism of evidence use** • (M5) capacity to access & make sense of evidence [Info] Various professional development programmes virtual journal clubs 1-day workshop 6-week research course 6 month clinical fellow-ship programme → capability (EBP knowledge, skills; self-efficiency regarding research use; CA skills); motivation and opportunity (education paired with research implementation programme)	Intended CMO mechanism configuration: ☒ Capability ☐Motivation ☒Opportunity Achieved CMO outcome configuration + Evidence use: ☒ Cap ☒Mot ☐Opp ☐ Evidence Use <u>Study results:</u> The interventions varied in their approach to research education, with all four studies report some statistically significant improvements. For EBP knowledge and practice as measured by the EBPQ scale, Ecoff (2009) reports evidence of an effect for a research implementation clinical fellowship program in terms of knowledge and skills (p=.03) but not for EBP practice (p = .09). The 6-week research education course conducted by Swenson-Britt and Reineck (2009) showed a significant improvement in three of the four domains measured by the NURSES research self-efficacy scale: quantitative methods (p = .0001), using theory (p = .004), and using evidence (p = .007) but not for literature searching (p = .51). Both Billingsley et al. (2013) and Chang et al. (2013)

			measured participants' critical appraisal ability, albeit with different scales and using different types of workplace intervention. Billingsley (2013) used a "virtual online environment" (Second Life) as a platform for nurses in a variety of clinical specialties to participate in virtual journal clubs and reports significantly improved self-assessed critical appraisal competency in terms of determining research design (p = .002), identifying population (p=.007), interpreting statistics (p=.001), determining if conclusions are supported by results, identifying implications for practice (p = .02), identifying the limitations of study designs (p = .001), and interpreting qualitative findings (.002), but no improvement was seen for participants' ability to identify the sample (p = .11). Chang et al.'s intervention utilized a 1-day research education workshop and reported significant improvements across confidence in critical appraisal of a research study, a systematic review and a clinical guideline (all p < .001) as well as the overall change from pretest to posttest (p < .001; 2013).
	• Intervention 2 [Info] University Learning for Nurses' Research Literacy. Formal university courses for	**Mechanism of evidence use** • (M5) capacity to access & make sense of evidence [Info] Self-directed study using online materials interactive lectures and participating in group work attending traditional	Intended CMO mechanism configuration: ☒ Capability ☐Motivation ☒Opportunity

	improving research knowledge and for improving critical appraisal skills (Jones et al., 2011). Although these university courses were all run over a similar one-semester timeline, they used a variety of approaches both in the structure and delivery of their curricula. One study compared an interactive, student-centered approach using group work and hands-on activities with a traditional approach utilizing didactic lectures, textbook readings and research critique activities. The intervention group (n = 106) assigned themselves to small groups in which they completed activities such as Thiel's "cookie experiment" (Thiel, 1987) and other activities designed to create experiential learning (Liou et al., 2013).	didactic lectures online activity-based learning, integrating practical tasks and supporting reading material with glossaries and other reference material to improve research knowledge and understanding. → capability (research knowledge); motivation and opportunity (education paired with research implementation programme)	Achieved CMO outcome configuration + Evidence use: ☒ Cap ☐Mot ☐Opp ☐ Evidence Use Study results: Self-directed study using online materials not especially adapted or designed for the purpose was found to have no greater effectiveness in terms of improving research knowledge than attending interactive lectures and participating in group work (Morris, 1999) or attending traditional didactic lectures (Woo & Kimmick, 2000). Conversely, self-directed study using a specially adapted online learning course was found to have a statistically significant effect on research knowledge ($p < .001$; Reviriego et al., 2014). The program used by Reviriego et al. utilized online activity-based learning, integrating practical tasks and supporting reading material with glossaries and other reference material to improve research knowledge and understanding. It was also translated into an appropriate local language and context (2014). The most methodologically rigorous of these studies, the quasi-experimental study by Liou et al. (2013) used an approach unique among these included studies. In terms of data relevant to this review, Liou et al. report statistically significant increases for the experimental group in objectively measured

			research knowledge at posttest (p < .001) and also at the end of the following semester (2013).
Comments/remarks: The study makes comments on the relative effectiveness of educational interventions: Online learning was utilized by several included studies in universities and workplaces, however effectiveness varied between studies. Of the five studies that investigated virtual, online, or e-learning, those that used interactive strategies rather than an online replication of the face-to-face coursework found statistically significant differences or improvements in participants' research knowledge (p < .001; Liou et al., 2013;Reviriego et al., 2014), and critical appraisal skills (p < .002; Billingsley et al., 2013). Studies (n = 2) where the online coursework was identical to the classroom content (filmed or live lectures uploaded online) found no difference in participants' research knowledge (Tsugihashi et al., 2013; Woo & Kimmick, 2000). For one study, the group who received the Internet-based intervention completed the course with poorer results than the group who received the course in person, although the difference was not statistically significant (p = .44; Woo & Kimmick, 2000). It is important to note that the online intervention used by Woo and Kimmick was entirely self-directed, whichmay be a strong influencing factor on the results (2000). Interactivity or activity-based learning appears to be an important element throughout the included studies, with virtual journal clubs, group-based interactive programs, interactive lectures, face-to-face group learning, and clinical fellowship programs all showing evidence of effectiveness in terms of research knowledge, critical appraisal ability, or research selfefficacy measured at the end of the intervention (Billingsley et al., 2013; Chang et al., 2013; Ecoff, 2009; Liou et al., 2013; Morris, 1999; Swenson-Britt & Reineck, 2009). The single included study of traditional lecture-style classroom learning found no statistically significant effect in improving critical appraisal skills.			
Horsley (2011) Teaching critical appraisal skills in healthcare settings (Review)	**Intervention** • Intervention 1 [Info] Critical appraisal teaching Journal club to build Critical Appraisal Skills. Linzer 1988 examined whether a journal club improved internal medicine interns reading habits, knowledge of epidemiology and biostatistics, and critical	**Mechanism of evidence use** (M5) capacity to access & make sense of evidence [Info] critical appraisal teaching → capability (skills to appraise and synthesise evidence)	Intended CMO mechanism configuration: ☒ Capability ☐Motivation ☐Opportunity Achieved CMO outcome configuration + Evidence use: ☒ Cap ☐Mot ☐Opp ☐ Evidence Use <u>Study results:</u> The investigators reported that the percentage improvements in knowledge in the two groups are 10% in intervention compared with 2% in control (no P value or confidence

	appraisal skills. The general medicine faculty delivered the intervention which included a half-day workshop based on the Critical Appraisal Skills Programme (CASP) (not fully described within the report). Critical Appraisal teaching. MacRae 2004 evaluated the effectiveness of an Internet-based, critical appraisal skills intervention to determine its impact on physician critical appraisal skills. A total of 83 practicing surgeons with no postgraduate training in clinical epidemiology were randomised to a curriculum in critical appraisal skills that included a clinical and methodological article, a listserve discussion, and clinical and methodological critiques or those receiving only the articles. Intervention group participants received eight packages (once monthly containing articles) and questions designed to guide critical appraisal and other		interval reported). A trend was found that suggested that the more journal club sessions a participant attended, the more knowledge was acquired, resulting in a 'dose-response' relationship in the intervention group that was absent from the control group. All included studies reported critical appraisal-related outcomes Linzer 1988 demonstrated an improvement of 1.5 correct test questions in the intervention group compared to a 0.3 improvement in the control group (mean scores). This translated into a 1.2 correct question difference between intervention and control group, which was calculated to be statistically significant between groups (P = 0.04). MacRae 2004 reported the overall mean score from an exam (a locally developed test of critical appraisal) that demonstrated statistically significant differences (mean% (SD)) between the intervention group (58.8% (8)) and the control participants (50% (8)) (P <0.01). Taylor 2004 used an 18- question multiple-choice outcome questionnaire focused on attitude and confidence statements. Critical appraisal skills were assessed by the appraisal of a systematic review article independently assessed by two authors. They reported overall

	supportive resources (listed previously. Taylor 2004 evaluated the effectiveness and costs of a critical appraisal skills educational intervention that was specifically aimed at healthcare professionals. A total of 145 self selected general practitioners, hospital physicians, professions allied to medicine, and healthcare managers and administrators were randomised to either receive a half-day critical appraisal skills training workshop or a waiting list control. The intervention group received a halfday workshop based on the Critical Appraisal Skills Programme (CASP).		knowledge scores as intention-to-treat analysis mean difference as 2.6. This was statistically significant at P≤ 0.05. Findings from Taylor 2004 resulted in no statistically significant differences observed between the intervention and comparator groups (intention-to-treat mean difference 1.2 (95% CI .01 to 2.4). There were also no differences observed in the ability to appraise methodology or relevance/generalisability of evidence. No differences were found in perceived confidence, attitude towards research, or evidence-seeking behaviour. The authors note that the cost associated with one-off workshops (estimated to be GBP 250) is challenged by their findings.
Comments/remarks: This is a Cochrane review and only included studies with a sophisticated experimental design. Additional outcomes in some studies but outside the scope of the review and thus not reported in the results.			
Murthy (2012)	• Intervention 1		

Interventions to improve the use of systematic reviews in decision-making by health system managers, policy makers and clinicians.	[Info] *same as intervention as intervention 1 in Bunn (2011)* Multifaceted intervention: The study involved program managers and program directors from 108 health departments across Canada, who were randomly assigned to one of three interventions of varying intensity for 12 months (n=36 per group): i) access to an online registry of systematic reviews of public health interventions – the most minimal intervention (HE) ;	**Mechanism of evidence use** • (M3) effective communication & awareness of evidence [Info] access to health-evidence.ca → opportunity (access to evidence portal and SR summaries)	Intended CMO mechanism configuration: ☐ Capability ☐Motivation ☒Opportunity Achieved CMO outcome configuration + Evidence use: ☐ Cap ☐Mot ☐Opp ☐ Evidence Use <u>Study results</u>*:* Having access to a registry of synthesised and translated research evidence (control group) has no impact on EIDM ($p<0.45$).
	ii) access to the same online registry plus tailored, weekly targeted messages for seven weeks, advising of articles in the registry relevant to their program area (healthy weight promotion)	**Mechanism of evidence use** • (M3) effective communication & awareness of evidence [Info] tailored, targeted messages and access to health-evidence.ca → opportunity (access to evidence portal and SR	Intended CMO mechanism configuration: ☐ Capability ☒Motivation ☒Opportunity

	(TM) – a middle intensity intervention; or iii) access to the same online registry plus tailored, targeted messages, plus a knowledge broker (KB) who worked one-on-one with the decision-makers in the public health departments – the greatest intensity intervention. The KB helped to develop plans for individual and organisational capacity building, identified new evidence, assisted in the interpretation of evidence, and conducted training sessions to help participants critically	summaries); motivation (targeted and tailored messages) [only when opportunity and motivation are combined] **Mechanism of evidence use** • (M3) effective communication & awareness of evidence [Info] tailored, targeted messages and access to health-evidence.ca → opportunity (access to evidence portal and SR summaries); motivation (targeted and tailored messages) [only when opportunity and motivation are combined] • (M4) effective interactions & relationships [Info] a knowledge broker who worked one on one with decision makers in the public health departments → opportunity (access to knowledge broker, who makes evidence relevant); motivation (broker, who motivates evidence use)	Achieved CMO outcome configuration + Evidence use: ☐ Cap ☐Mot ☐Opp ☒ Evidence Use <u>Study results:</u> Targeted messaging significantly more effective in promoting EIDM than other strategies (p<.009); In the RCT of KTE strategies in public health decision making (Dobbins et al, 2009a), the use of targeted messages was more effective in promoting evidence-informed decision making compared with alternatives such as a website offering access to an online registry of research evidence or knowledge-brokering groups. Intended CMO mechanism configuration: ☒ Capability ☒Motivation ☒Opportunity Achieved CMO outcome configuration + Evidence use: ☐ Cap ☐Mot ☐Opp ☐ Evidence Use <u>Study results:</u> In the RCT (Dobbins et al, 2009a), the authors found that knowledge brokering did not have a significant impact and was less effective than tailored, targeted messages. Knowledge brokering was,

	appraise different knowledge sources	• (M5) capacity to access & make sense of evidence [Info] Access to a knowledge broker who worked one on one with decision makers in the public health departments facilitating capacity development → capability (skill development through broker)	however, more effective in organisations that placed less value on research than those that already recognised the importance of evidence-based decision making. This, they said, could be because there was less scope for improvement in organisations that already had a positive culture towards research use.
	• Intervention 2 [Info] Access to Cochrane reviews on pregnancy and childbirth, a video on Evidence Based-Medicine and a single educational visit versus no intervention. During a single education visit the principles of evidencebased medicine were outlined, staff were shown how to find and select Cochrane pregnancy and childbirth reviews and apply them to their own clinical practice, and were given the results of an audit of the unit activities against guidelines developed by the unit.	**Mechanism of evidence use** • (M3) effective communication & awareness of evidence [Info] access to Cochrane review → opportunity (access to Cochrane reviews) • (M5) capacity to access & make sense of evidence [Info] educational training to apply ebm principles in assessing guidelines in use → capability **(**CA skills and their theoretical application on a practice guidelines); motivation (audit of actual practice)	Intended CMO mechanism configuration: ☒ Capability ☒Motivation ☒Opportunity Achieved CMO outcome configuration + Evidence use: ☐ Cap ☐Mot ☐Opp ☐ Evidence Use <u>Study results:</u> CA skills and their theoretical application on a practice guidelines were assessed: Two experienced obstetricians used a set of rules to independently score the extent to which labour ward guidelines were evidence-based. The study reported that labour ward guidelines seldom agreed with the evidence at baseline and did not improve significantly by ninemonths after the educational visit. The median score (out of a maximum score of 16) increased from a baseline score of 1.5 (range 0

			to 7.8) to 2.75 (range 0 to 9.5) at follow-up for the units in the intervention group and from 2 (range 0 to 7.5) to 4 (range 0 to 9.5) for the units in the control group at follow-up.
	• Intervention 3 [Info] Provision of a summary of findings table for a Cochrane Review versus no intervention: One RCT (Rosenbaum 2010) reported user satisfaction with accessing the summary of findings (SoF) table in Cochrane Reviews. The study randomised participants to three groups: (a) Cochrane Review with SoF table with full formatting; (b) Cochrane Review with SoF table with limited formatting; and (c) Cochrane Review with no SoF table.	**Mechanism of evidence use** • (iii) effective communication & awareness of evidence [Info] SoF tables for reviews as a tool to guide understanding of reviews → motivation (usability of SoF tables)	Intended CMO mechanism configuration: ☐ Capability ☒Motivation ☐Opportunity Achieved CMO outcome configuration + Evidence use: ☐ Cap ☒Mot ☐Opp ☐ Evidence Use <u>Study results:</u> Rosenbaum 2010 also assessed the participants' preferences and attitudes about the inclusion of SoF tables in the Cochrane Reviews. All participants were provided with the formatted versions of SoF tables along with an explanation sheet on the terms used in the SoF table. Eighty-one per cent agreed or strongly agreed that SoF tables should be included in Cochrane Reviews, 75% found the accompanying explanation sheet about the SoF tables helpful, and 65% agreed with the proposed format of the SoF table. The overall median effect of the differences in responses for Cochrane Reviews with SoF table versus

			Cochrane Reviews without one was 16% (range 1% to 28%).
Comments/remarks: *On intervention 1:* The number of actual evidence-based strategies, policies, and interventions for healthy body weight being implemented by public health departments were counted in the study by Dobbins. KB was more effective in those organisations that placed less value on research evidence and was less effective in those organisations that already recognised the importance of evidence-based decision making. The authors observed that knowledge brokers along with access to systematic reviews showed a trend towards a positive effect when organizational research culture is perceived as low. However, health departments with a low organizational research culture only benefited slightly when they received the tailored message plus access to the online registry of systematic reviews, yet showed great improvements when the research culture was high. These relationships need to be further explored, but they do offer support to the importance of organisational factors.			
Quinn (2014) How can knowledge exchange portals assist in knowledge management for evidence-informed decision making in public health?	**Intervention** • Intervention 1 [Info] Knowledge Exchange Portal (KEP), defined broadly on the basis of two published definitions [16,17] as a web platform that enables a single point of access to information, applications and/or people (i.e. for knowledge exchange) in an organised manner for a specific target audience. For the purposes of this review, portals that functioned solely as interfaces for aggregated searching across multiple academic or library	**Mechanism of evidence use** • (M3) effective communication & awareness of evidence [Info] Easy access to evidence via knowledge sharing online platform. → opportunity (access to evidence)	Intended CMO mechanism configuration: ☐ Capability ☐Motivation ☒Opportunity Achieved CMO outcome configuration + Evidence use: ☐ Cap ☒Mot ☐Opp ☐ Evidence Use <u>Study results:</u> Two evaluation articles [23,24] and one case study [21] reported on the performance of KEPs via web usage data on trends in the number, type, origin and retention of users over time. While Khanna et.al [23] and McKibbon [24] both demonstrated an increase in number of unique visits to their respective portals over time, the retention of users (i.e. high bounce rates and low proportion of returning

	databases were excluded. However, portals that enabled aggregated database searching plus additional collaborative or interactive functionality tailored for a public health audience and for evidence-informed decision making (e.g. decision support tools, interactive tutorials etc.) were included.		visits) remained a problem. Dobbins et.al [21] reported a relatively stable number of total site visits for their target audience over time but with a substantial increase in time spent per visit (from 35 seconds to over 4 minutes), which they accredit to implementing more knowledge translation strategies e.g. tailored email updates, distribution of an electronic newsletter and making webcasts, webinars and videos accessible through the portal.
Comments/remarks: *On intervention 1:* The Dobbins study cited frequently above shows how this usage of portals might translate into EIDM: In terms of portals contributing to evidence-informed decision making (EIDM) in public health, Dobbins et.al [20] conducted a randomised controlled trial (RCT) with 108 regional public health units in Canada and investigated the use of three knowledge translation strategies on EIDM: (i) access to a KEP (HealthEvidence.ca); (ii) access to HealthEvidence.ca plus tailored electronic messaging (TM) and (iii) access to HealthEvidence.ca plus tailored messaging plus access to an organisational knowledge broker (KB). The second TM intervention group was associated with a significant increase in the use of evidence in recent public health policies and programs ($p < 0.001$) [20]. The impact of these interventions on 'evidence use' was modified by organisational culture [20], indicating that organisations with a low research culture favoured the KB intervention, whereas organisations with a high research culture benefited most from the TM intervention. There is thus some evidence to suggest that the use of a knowledge exchange portal in combination with tailored and targeted messaging can increase the use of evidence in policy and program decision making at the organisational level.			
Stacey (2010) Knowledge translation to fitness trainers: A systemic review	**Intervention** • Intervention 1 [Info] *Empty review*	Empty review	Empty review

Comments/remarks: No evaluations of knowledge translation interventions were identified.			
Wallace (2014) Improving the uptake of systematic reviews: a systematic review of intervention effectiveness and relevance.	**Intervention** • Intervention 1 [Info] clinically integrated e-learning courses. E-learning course to postgraduate medical trainees from different specialities in primary and secondary care. 3 e-learning modules focusing on systematic reviews, with unlimited access over 6 weeks. E-learning course for postgraduate trainees in 6 obstetrics and gynaecology departments, 5 e-learning modules focusing on systematic reviews, over 5 weeks with on the job training, self-directed learning. E-learning course focusing on systematic reviews with postgraduate doctors at internship level in 7 teaching hospitals. Clinically integrated e-learning EBM course 3 modules involving critical appraisal of systematic reviews, unlimited access over 6 weeks. 1 computer (CD-ROM) session focusing on	**Mechanism of evidence use** • (M3) effective communication & awareness of evidence [Info] Training courses coupled with access to reviews → opportunity (access to reviews) • (M5) capacity to access & make sense of evidence [Info] Training courses coupled with access to reviews → capability (SR knowledge and skills);	Intended CMO mechanism configuration: ☒ Capability ☐Motivation ☒Opportunity Achieved CMO outcome configuration + Evidence use: ☒ Cap ☒Mot ☐Opp ☐ Evidence Use <u>Study results:</u> No outcomes assessed evidence use, unclear what knowledge and attitude gain refers to. Clinically integrated elearning courses and a computer-based series of teaching sessions brought about some knowledge and attitude gain from baseline. On average, knowledge scores improved significantly ($p<0.001$). Attitudinal gains on two questions only ($p=0.00$, $p=0.007$). The intervention group outperformed by control group by 3.5 points (95% CI −2.7 to 9.8) for knowledge gain: not statistically significant.

	systematic reviews and meta-analyses a standardised structure of 40 min.		
	• Intervention 2 [Info] *same as intervention as intervention 1 Bunn (2011)* Multifaceted intervention: The study involved program managers and program directors from 108 health departments across Canada, who were randomly assigned to one of three interventions of varying intensity for 12 months (n=36 per group): i) access to an online registry of systematic reviews of public health interventions – the most minimal intervention (HE) ;	**Mechanism of evidence use** • (M3) effective communication & awareness of evidence [Info] access to health-evidence.ca → opportunity (access to evidence portal and SR summaries)	Intended CMO mechanism configuration: ☐ Capability ☐Motivation ☒Opportunity Achieved CMO outcome configuration + Evidence use: ☐ Cap ☐Mot ☐Opp ☐ Evidence Use <u>Study results</u>*:* Having access to a registry of synthesised and translated research evidence

			(control group) has no impact on EIDM ($p<0.45$).
	ii) access to the same online registry plus tailored, weekly targeted messages for seven weeks, advising of articles in the registry relevant to their program area (healthy weight promotion) (TM) – a middle intensity intervention;	**Mechanism of evidence use** • (M3) effective communication & awareness of evidence [Info] tailored, targeted messages and access to health-evidence.ca → opportunity (access to evidence portal and SR summaries); motivation (targeted and tailored messages) [only when opportunity and motivation are combined]	Intended CMO mechanism configuration: ☐ Capability ☒Motivation ☒Opportunity Achieved CMO outcome configuration + Evidence use: ☐ Cap ☐Mot ☐Opp ☒ Evidence Use <u>Study results:</u> Targeted messaging significantly more effective in promoting EIDM than other strategies ($p<.009$); In the RCT of KTE strategies in public health decision making (Dobbins et al, 2009a), the use of targeted messages was more effective in promoting evidence-informed decision making compared with alternatives such as a website offering access to an online registry of research evidence or knowledge-brokering groups.
	or iii) access to the same online registry plus tailored, targeted messages, plus a knowledge broker (KB) who worked one-on-one with the decision-makers in the public health departments – the greatest intensity intervention. The KB helped to	**Mechanism of evidence use** • (M3) effective communication & awareness of evidence [Info] tailored, targeted messages and access to health-evidence.ca → opportunity (access to evidence portal and SR	Intended CMO mechanism configuration: ☒ Capability ☒Motivation ☒Opportunity

	develop plans for individual and organisational capacity building, identified new evidence, assisted in the interpretation of evidence, and conducted training sessions to help participants critically appraise different knowledge sources	summaries); motivation (targeted and tailored messages) [only when opportunity and motivation are combined] • (M4) effective interactions & relationships [Info] a knowledge broker who worked one on one with decision makers in the public health departments → opportunity (access to knowledge broker, who makes evidence relevant); motivation (broker, who motivates evidence use) • (M5) capacity to access & make sense of evidence [Info] Access to a knowledge broker who worked one on one with decision makers in the public health departments facilitating capacity development → capability (skill development through broker)	Achieved CMO outcome configuration + Evidence use: ☐ Cap ☐Mot ☐Opp ☐ Evidence Use <u>Study results:</u> In the RCT (Dobbins et al, 2009a), the authors found that knowledge brokering did not have a significant impact and was less effective than tailored, targeted messages. Knowledge brokering was, however, more effective in organisations that placed less value on research than those that already recognised the importance of evidence-based decision making. This, they said, could be because there was less scope for improvement in organisations that already had a positive culture towards research use.
	• Intervention 3 [Info] brief summaries of systematic reviews and a manual of Cochrane reviews. Four short, one-page systematic review summaries delivered by email or mail, on patient-controlled analgesia. Patient manual of	**Mechanism of evidence use** • (M3) effective communication & awareness of evidence [Info] Summaries of reviews, made more user-friendly for patients. → motivation (packaging of evidence)	Intended CMO mechanism configuration: ☐ Capability ☒Motivation ☒Opportunity Achieved CMO outcome configuration + Evidence use: ☐ Cap ☒Mot ☒Opp ☐ Evidence Use Study results: Short summaries of systematic reviews improve awareness of review evidence.

	summaries of Cochrane reviews: 80 page, A5 size manual with 22		

Comments/remarks:

On intervention1: Individual studies found that computer-based teaching is as effective as lecture-based teaching; e-learning about systematic reviews can be harmonised across different languages and specialities; and e-learning and standard classroom-based teaching both improve knowledge.

On intervention 2: The number of actual evidence-based strategies, policies, and interventions for healthy body weight being implemented by public health departments were counted in the study by Dobbins. KB was more effective in those organisations that placed less value on research evidence and was less effective in those organisations that already recognised the importance of evidence-based decision making. The authors observed that knowledge brokers along with access to systematic reviews showed a trend towards a positive effect when organizational research culture is perceived as low. However, health departments with a low organizational research culture only benefited slightly when they received the tailored message plus access to the online registry of systematic reviews, yet showed great improvements when the research culture was high. These relationships need to be further explored, but they do offer support to the importance of organisational factors.

Moderate trust / moderate relevance reviews

Short Title	**Interventions**	**Mechanism of evidence use**	**Outcomes result**
Gray (2013) Implementing Evidence-Based Practice: A Review of the Empirical Research Literature	• Intervention 1 [Info] Enhancing supervisor skills: Clinical supervision as a way of promoting the skills, critical inquiry, and learning environment required for EBP. Structured, professional supervision designed to promote EBP: online library 8-week online program containing 25 quality, reviewed articles.	**Mechanism of evidence use** • (M3) effective communication & awareness of evidence [Info] online library for supervisors → opportunity (access to evidence) • (M5) capacity to access & make sense of evidence [Info] Structured, professional supervision designed to	Intended CMO mechanism configuration: ☒ Capability ☒Motivation ☒Opportunity Achieved CMO outcome configuration + Evidence use: ☒ Cap ☐Mot ☒Opp ☒ Evidence Use Study results: Collins-Comargo (2007) examined qualitative data from focus groups with 80 child welfare supervisors who participated in a structured supervision program

	Supervisors read, apply, and report on use of one article per week. Programs for supervisors designed to enhance supervisory competence and the application of research evidence to practice. Two part learning lab for supervisors and middle managers to learn the use of an EIDM tool in supervision over a 3-month period.	promote EBP. Technical input from supervisor → capability (EBP skills/ EBP related supervision skills) • (M6) structures & processes [Info] Supervisor to change supervision style to ensure evidence use. → opportunity (professional setting more conducive to evidence use); motivation (incentives for evidence use through supervision)	and concluded that, with appropriate support from management, the supervision program resulted in a more analytical approach to practice and improved supervisees' application of evidence. Straussner et al. (2006) found a statistically significant improvement in levels of capability to support supervisees, evaluate quality of practice, and apply empirical evidence to practice after exposure to the Substance Abuse Treatment Online Library. Both pre- and posttests, however, indicated that the application of research evidence to practice remained the aspect of supervision in which participants felt least competent.
	• Intervention 2 [Info] Research audio tapes Listen to Research in Practice tapes while driving. The other intervention addressing the time barrier sought to optimize time use by providing audio recordings of research summaries for practitioners to listen to while driving (Hagell & Spencer, 2004).	**Mechanism of evidence use** • (M3) effective communication & awareness of evidence [Info] Listening to audio recordings of research summaries for practitioners to listen to while driving. → opportunity (time to access evidence)	Intended CMO mechanism configuration: ☐ Capability ☐Motivation ☒Opportunity Achieved CMO outcome configuration + Evidence use: ☐ Cap ☐Mot ☐Opp ☐ Evidence Use <u>Study results:</u> The other intervention addressing the time barrier sought to optimize time use by providing audio recordings of research summaries for practitioners to listen to while driving (Hagell & Spencer, 2004). There was mixed evidence as to whether the tapes facilitated EBP implementation.

	• Intervention 3 [Info] WWfC—what works for children implementation officer works with practitioners in workshops and seminars and prepares research summaries in response to practice questions. The ‘‘What Works for Children’’ project provided the assistance of an implementation officer to work directly with busy practitioners to identify practice questions where research evidence could be helpful, conduct searches for relevant research, and disseminate evidence summaries to practitioners (Stevens et al., 2005).	**Mechanism of evidence use** • (M1) awareness of need for evidence to inform decision-making [Info] Provision of the assistance of an implementation officer to work directly with busy practitioners to identify practice questions where research evidence could be helpful → motivation (realise merit of research evidence); opportunity (evidence presented as integral to decision-making) • (M3) effective communication & access to evidence [Info] On-demand searches, dissemination, and summary of relevant research by researchers for decision-makers → opportunity (on-demand access) • (M4) effective interactions & relationships [Info] joint workshops and seminars → unclear • (M6) structures & processes [Info] Implementation officer to provide on-demand services and access to evidence to decision-makers. → opportunity (to receive timely EIDM related support)	Intended CMO mechanism configuration: ☐ Capability ☒Motivation ☒Opportunity Achieved CMO outcome configuration + Evidence use: ☐ Cap ☒Mot ☒Opp ☐ Evidence Use <u>Study results:</u> Overwhelmingly, the summaries were found to be accessible by participants, but less than half (45%) said that their future delivery of services would be affected by the intervention.
Commentary/remarks:			

Harris (2011) Are journal clubs effective in supporting evidence-based decision making? A systematic review.	**Intervention** • Intervention 1 [Info] A journal club (JC) is an interactive approach to making sense of evidence, which is commonly defined as 'a group of individuals who meet regularly to discuss the clinical applicability of articles in current medical journals' Interaction during meetings was generally described as a presentation by the person responsible for finding articles, followed by a discussion. The articles described various levels of involvement. In eight clubs, the responsible resident presented the summary and/or chaired the discussion. In four clubs it was a joint effort by mentor and presenter with varying levels of input from the faculty facilitator during or immediately after the presentation. One club used small group work to appraise and fed findings back to the larger group (Swift). Eleven	**Mechanism of evidence use** • (M2) agreement to what constitutes fit-for-purpose evidence [Info] discuss the clinical applicability of evidence → motivation; (discuss the clinical applicability of evidence) • (M3) effective communication & access to evidence [Info] joint discussion about and access of evidence → opportunity (access articles); motivation (read more articles) • (M4) effective interactions & relationships [Info] Participants working together in regular journal clubs. → opportunity (chance to present and discuss evidence and receive feedback) • (M5) capacity to access & make sense of evidence [Info] reading habits; CA skills → opportunity (reading habits); motivation (confidence to appraise); capability (CA skills)	Intended CMO mechanism configuration: ☒ Capability ☒Motivation ☒Opportunity Achieved CMO outcome configuration + Evidence use: ☒ Cap ☒Mot ☒Opp ☐ Evidence Use <u>Study results:</u> Improvements in reading habits Eleven of the eighteen studies assessed changes in reading habits. Of the seven studies using mentoring and assessing reading habits, four reported positive change in reading habits. Where didactic support was used, three studies produced improved reading habits, but three did not. Three of five studies using adult learning showed improved reading. Of the five using a structured review instrument, three showed improved reading. Increased confidence in ability to critically appraise the quality of research The seven studies assessing confidence reported an overall increase in perceived ability to

	reported that the applicability of the evidence was covered, but only seven of these specifically mention discussion of applicability during the sessions, with the other four evaluating it without describing it.		critically appraise. Four of the studies reporting positive change included mentoring, four used didactic support, four used adult learning and four used a structured review instrument. Increased knowledge and skills in critical appraisal Five of the seven studies that used objective tests of critical appraisal demonstrated an improvement. Three of the studies demonstrating improvement in knowledge and skills included mentoring in JCs, while four included didactic support and four used a structured review instrument. Ability to apply evidence in clinical contexts Seven of the eighteen studies looked at the ability of JCs to promote application of evidence in practice, and five found a self-reported positive relationship (Elnicki, Lee, Linzer 1988, O'Sullivan, Spillane). The Linzer study compared a control group that participated in a seminar series with an intervention group who participated in a JC. Although there was no significant difference in critical appraisal knowledge scores between the two groups, the JC group reported greater perceived ability to

			use information in practice. The active ingredients in this study were mentoring to promote understanding and group discussion to consider applicability. The O'Sullivan study contains the same active ingredients, noting that although both JCs included critical appraisal, the learner centred club which had interactive discussion was better at promoting ability to determine clinical utility. Four of the studies reporting ability to use evidence in practice included mentoring.
Commentary/remarks: *On intervention 1:* Realist synthesis identified potentially 'active educational ingredients', including mentoring, brief training in clinical epidemiology, structured critical appraisal tools, adult-learning principles, multifaceted teaching approaches and integration of the JC with other clinical and academic activities.			
Li (2009) Use of communities of practice in business and health care sectors: A systematic review	**Intervention** • Intervention 1 [Info] Communities of practice. Learning and sharing information through socialization appeared to be the central characteristic of CoPs 1. Social interaction – Interaction of individuals in formal or informal settings, in person or through the use of communication technologies. 2. Knowledge-sharing – The	**Mechanism of evidence use** • (M1) awareness of need for evidence to inform decision-making [Info] Communities of practice Identities 1. Social interaction – Interaction of individuals in formal or informal settings, in person or through the use of communication technologies to increase awareness of EIDM as a professional norm. Identity-building – The process of acquiring a professional identity, or an identity of being an expert in the field. → motivation (social influence; identity building); opportunity (professional norm)	Intended CMO mechanism configuration: ☒ Capability ☒Motivation ☒Opportunity Achieved CMO outcome configuration + Evidence use: ☐ Cap ☐Mot ☐Opp ☐ Evidence Use <u>Study results:</u> Empty review regarding effects: CoP research in the health sector focused mainly on the exploration of how people shared information, created knowledge, and built a professional identity in a social setting. Researchers predominantly used in-depth

	process of sharing information that is relevant to the individuals involved. 3. Knowledge-creation – The processes of developing new ways to perform duties, complete a task, or solve a problem. 4. Identity-building – The process of acquiring a professional identity, or an identity of being an expert in the field.	• (M4) effective interactions & relationships [Info] Communities of practice: 1 Learning and sharing information through socialization appeared to be the central characteristic of CoPs. → opportunity (sharing of knowledge); motivation (identity; norms) • (M5) capacity to access & make sense of evidence [Info] Communities of practice: 1 Learning and sharing information through socialization appeared to be the central characteristic of CoPs. → capability (knowledge sharing); • (M6) Structures & processes [Info] Communities of practice Identities 1. Social interaction – Interaction of individuals in formal or informal settings, in person or through the use of communication technologies. 4. Identity-building – The process of acquiring a professional identity, or an identity of being an expert in the field. → motivation (processional identities; social influence)	interviews and participant observations (Additional files 3 and 4). Action research methods, in which participants were involved in the development, growth, and evaluation of the group, were also used [33,34,37]. In this review, we did not find any paper in the health sector that met the eligibility criteria for the quantitative analysis (Additional files 3 and 4); and so the effectiveness of CoP in this sector remained unclear.
Remarks/commentary: No evidence on the effects of Community of Practice on CMOs as the review is empty.			
Mairs (2013)	**Intervention** • Intervention 1 [Info] Online Knowledge	**Mechanism of evidence use**	Intended CMO mechanism configuration: ☐ Capability ☒Motivation ☒Opportunity

Online strategies to facilitate health-related knowledge transfer: a systematic search and review	management strategies: online listservs and virtual journal clubs (VJC). All knowledge management strategies included an interactive component that allowed users to provide feedback or share knowledge between other members of the target audience.	• (M3) effective communication & awareness of evidence [Info] online listservs and virtual journal clubs (VJC) All online knowledge management strategies included an interactive component that allowed users to provide feedback or share knowledge between other members of the target audience. → opportunity (access to information) motivation (efficient and accessible medium). • (M4) effective interactions & relationships [Info] online listservs and virtual journal clubs (VJC) All online knowledge management strategies included an interactive component that allowed users to provide feedback or share knowledge between other members of the target audience. → opportunity (feedback and share knowledge; non-threatening medium to discuss appropriation) • (M6) structures & processes [Info] tool for knowledge management: embedded into team building and staff meeting/discussion; → opportunity (feedback and share knowledge; non-threatening environment for discussing appropriation	Achieved CMO outcome configuration + Evidence use: ☐ Cap ☒Mot ☒Opp ☐ Evidence Use <u>Study results:</u> Overall, online knowledge management strategies to facilitate health-related knowledge translation were viewed as an inexpensive, efficient and accessible means to provide not only healthcare professionals but also patients with pertinent health information. Berger et al. (2011) discussed one example of a successful knowledge management strategy, the VJC, as an implementation in a clinical nursing setting allowing staff to access information and engage in discussion and team building at their own convenience. Nurses reported that the VJC offered them a non-threatening environment to engage with the literature and understand how proposed best practices could be applied in their own clinical settings.
	• Intervention 2 [Info] Virtual communities of practice, online discussion	**Mechanism of evidence use** • (M4) effective communication & awareness of evidence	Intended CMO mechanism configuration: ☒ Capability ☒Motivation ☒Opportunity

	forums marked by high degrees of collegiality, sharing of time and resources, interactive and progressive problem solving, and a breakdown of geographical and hierarchical barriers.	[Info] viral exchanges and discussions → opportunity (to access knowledge) • (M4) effective interactions & relationships [Info] virtual exchanges and discussions → opportunity (to interact and discuss joint problems); motivation (collegial, breakdown of hierarchies) • (M5) capacity to access & make sense of evidence [Info] Virtual CoP as a place where new knowledge can be acquired → Capability (sharing and acquisition of knowledge)	Achieved CMO outcome configuration + Evidence use: ☐ Cap ☒Mot ☒Opp ☐ Evidence Use <u>Study results:</u> Based on both the number of relevant knowledge translation articles identified and the applicability of results provided, VCoPs were found to be a pragmatic way for health professionals, the general public and other key stakeholders to interact and share knowledge. Potential benefits of VCoPs identified in the literature included: time efficiency, structural flexibility, networking capabilities, mentoring opportunities and access to information. In addition, members of a VCoP are able to access these virtual forums at their convenience, unrestricted by geography or physical conditions. Trust was also found to be an important component of a successful VCoP. Virtual communities of practice have been found to be an effective means of collaboration and information sharing and in the creation, acquisition and dissemination of knowledge.
Comments/remarks:			

On intervention 1: Online strategies for health-related knowledge translation can act as vehicles to link researchers, practitioners, policymakers and consumers, thus facilitating the timely and relevant exchange of information, including where gaps in knowledge exist. Patients Like Me, for example, is a platform for patients with life-changing illnesses to share their experience with their condition, to find other similar patients and to share their experiences with one another, and to learn from aggregated data reports of others to improve their outcomes. The goal of Patients Like Me was to help patients answer the question: 'Given my status, what is the best outcome I can hope to achieve, and how do I get there?' *On intervention 2:* Trust was also found to be an important component of a successful VCoP. Specifically, trust between members is more likely to occur when members share a common purpose and when they are provided with the opportunity to get to know one another.			
Menon (2009) Strategies for rehabilitation professionals to move evidence-based knowledge into practice: a systematic review.	**Intervention** • Intervention 1 [Info] an active multi-component KT intervention Active multifaceted KT intervention (experimental group): Interactive educational sessions, Opinion leaders, Printed materials, Outreach visit vs Passive dissemination (control group): Guidelines by mail	**Mechanism of evidence use** • (M3) effective communication & awareness of evidence [Info] Opinion leaders, Printed materials, Outreach visit → opportunity (access to information); motivation (opinion leader) • (M4) effective interactions & relationships [Info] Interactive educational sessions, opinion leaders → opportunity (access to expertise/advise of opinion leader); motivation (opinion leader that one respects/identifies) • (M5) capacity to access & make sense of evidence [Info] interactive educational sessions → capability (unclear)	Intended CMO mechanism configuration: ☒ Capability ☒Motivation ☒Opportunity Achieved CMO outcome configuration + Evidence use: ☐ Cap ☐Mot ☐Opp ☐ Evidence Use <u>Study results:</u> No evidence (level 5) supports the effectiveness of an active multi-component KT intervention for improving occupational therapists' attitudes towards EBP specifically. Moderate evidence (level 1b) from one high-quality RCT suggests that the use of an active multi-component KT intervention is ineffective for improving physical therapists' attitudes towards EBP compared with passive dissemination (see Table III). This trial (22) found no significant differences in physical therapists' attitudes towards EBP when comparing questionnaire responses of the

			experimental and control groups at post-intervention (p = 0.07–0.29).
	• Intervention 2 [Info] active single KT intervention. In the before-after study, 7 occupational therapists participated in a journal club, which consisted of interactive discussions and a critical appraisal of the literature on evidence- based management of chronic obstructive pulmonary disease.	**Mechanism of evidence use** • (M3) effective communication & awareness of evidence [Info] Journal club discussing EBM literature. → opportunity (access to evidence) • (M4) effective interactions & relationships [Info] journal club, which consisted of interactive discussions and a critical appraisal of the literature on evidence- based management of chronic obstructive pulmonary disease → opportunity (interactive discussion with fellow decision-makers on EIDM topics) • (M5) capacity to access & make sense of evidence [Info] journal club, which consisted of interactive discussions and a critical appraisal of the literature on evidence- based management of chronic obstructive pulmonary disease → capability (CA skills)	Intended CMO mechanism configuration: ☒ Capability ☐Motivation ☒Opportunity Achieved CMO outcome configuration + Evidence use: ☐ Cap ☒Mot ☐Opp ☐ Evidence Use <u>Study results:</u> There is limited evidence (level 3) from one before-after study suggesting that the use of an active single KT intervention may be effective for improving occupational therapists' attitudes towards EBP (see Table III). In the before-after study, 7 occupational therapists participated in a journal club, which consisted of interactive discussions and a critical appraisal of the literature on evidence- based management of chronic obstructive pulmonary disease (27). All 7 therapists reported that they experienced positive changes in their attitude towards EBP when comparing their questionnaire responses at baseline and 3 months post-intervention.
	• Intervention 3 [Info] active single KT intervention. The trial (28) examined the use of an opinion leader for providing evidence-	**Mechanism of evidence use** • (M5) capacity to access & make sense of evidence [Info] opinion leaders to facilitate educational sessions → capability (CA skills); motivation (opinion leader)	Intended CMO mechanism configuration: ☒ Capability ☒Motivation ☐Opportunity

	based educational sessions (focused on identifying research needs/priorities and critical appraisal of literature) compared with passive dissemination (i.e. printed material).		Achieved CMO outcome configuration + Evidence use: ☐ Cap ☐Mot ☐Opp ☐ Evidence Use <u>Study results:</u> Limited evidence (level 2a) from a fair-quality RCT suggests that the use of an active single KT intervention is ineffective for improving physical therapists' attitudes towards EBP. The trial (28) examined the use of an opinion leader for providing evidence-based educational sessions compared with passive dissemination (i.e. printed material). No significant differences in physical therapists' attitudes towards EBP were found when comparing questionnaire responses of the experimental and control groups at post-intervention.
Commentary/remarks: *On intervention 1:* There is a paucity of information to reliably code for mechanisms.			
Walter (2005) What works to promote evidence-based practice: a cross-sector review	**Intervention** • Intervention 1 [Info] Dissemination involves circulating or presenting the findings from research to policy makers and practitioners, whether orally or in written or other formats such as videos. publication in academic journals Simple circulation of written	**Mechanism of evidence use** • (M3) effective communication & awareness of evidence [Info] publication in academic journals Simple circulation of written research findings conferences and workshops to support the dissemination of written materials mass media → opportunity (access to evidence); • (M4) effective interactions & relationships [Info] conferences and workshops to support the dissemination of written materials	No EIDM outcomes. Intended CMO mechanism configuration: ☐ Capability ☐Motivation ☒Opportunity

	research findings conferences and workshops to support the dissemination of written materials mass media	→ opportunity (access to other decision-makers interested in using evidence)	
	• Intervention 2 [Info] Interaction: Interactive approaches for promoting research use aim to strengthen the links between the research and policy or practice communities. They rely on increasing the interaction between researchers and research users in order to support the flow of information between the two groups. They are typically enacted through developing partnerships or collaborations between researchers, policy makers and practitioners.	**Mechanism of evidence use** • (M4) effective interactions & relationships [Info] research to policy/practice partnerships (f2f) → opportunity (new relationships with producers of evidence as well as like-minded decision-makers motivated to use evidence)	No EIDM outcomes. Intended CMO configuration: ☐ Capability ☐Motivation ☒Opportunity
	• Intervention 3 [Info] Social influence: using influential others to encourage research uptake. Social influence interventions focus on interactions within policy and	**Mechanism of evidence use** • (M1) awareness of need for evidence to inform decision-making [Info] Influence of significant other to change norms and behaviours; social processing of information through discussion with colleagues. Patient-mediated interventions,	No EIDM outcomes. Intended CMO configuration: ☒ Capability ☒Motivation ☒Opportunity

	practice contexts, rather than with researchers, to help promote research use. The chance to discuss new information, such as that from research, with others provides the opportunity for social influence to be exerted or for a consensus to develop through 'social processing' (Cousins and Leithwood, 1993). The aim is to alter local values and norms as a means to secure EBPP. Educational interventions that involve discussion with colleagues or practice experts; Opinion leaders; Patient-mediated interventions, which provide patients rather than experts or peers with research-based information.	which provide patients rather than experts or peers with research-based information → motivation (norms, influence); opportunity (norms, influence) • (M4) effective interactions & relationships [Info] Social influence: Influence of significant other to change norms and behaviours educational interventions that involve discussion with colleagues or practice experts; social processing of information through discussion with colleagues. → motivation (norms, influence); • (M5) capacity to access & make sense of evidence [Info] educational interventions that involve discussion with colleagues and significant other / opinion leaders) → capability (education); motivation (inspiration to acquire skills) • (M6) Structures & processes [Info] Influence of significant other to change norms and behaviours → motivation (norms, influence); opportunity (norms, influence)	

	• Intervention 4 [Info] Facilitation: providing tangible support for the use of research. Facilitative interventions focus on enabling evidence-based practice by providing various forms of support: technical, financial, organisational or emotional Some facilitative interventions have focused on enhancing individuals' skills and motivation to access, interpret and apply research, eg training and capacity-building.	**Mechanism of evidence use** • (M5) capacity to access & make sense of evidence [Info] Educational interventions, training, capacity-building → capacity (individual skills); motivation • (M6) structures and processes [Info] Organisational resources and tools (eg computerised decision-making tools) Leadership; Organisational culture → opportunity (organisational support for EIDM); motivation (organisational support for EIDM)	No EIDM outcomes. Intended CMO configuration: ☒ Capability ☒Motivation ☒Opportunity
	• Intervention 5 [Info] Reinforcement: feedback and rewards to encourage research use. Reinforcement approaches to developing EBPP use 'reinforcers', both positive and negative, to control behaviour and action. For example, incentive-based interventions provide some form of reward or encouragement for using or disseminating research. Alternatively, reminders and audit and feedback give information to individuals or	• (M6) structures and processes [Info] Reinforcement structures and processes to reinforce EIDM-related behaviours → opportunity (reinforcement of EIDM-related behaviours); motivation (reinforcement of EIDM-related behaviours)	No EIDM outcomes. Intended CMO configuration: ☐ Capability ☒Motivation ☒Opportunity

	groups in order to reinforce appropriate evidence-based practice. Financial incentives.		
Commentary/remarks: Seminal study but focused on practice change. Included here for reference.			

Appendix B: Search strategy (studies on research evidence use interventions)

Search sources

Electronic databases:

Healthcare:

- Medline/PubMed
- Cochrane Library

Social Sciences:

- Academic Search Complete
- Campbell Collaboration
- ERIC

Psychology/Behavioural Sciences:

- PsycINFO

Organisational:

- Business Source Complete

Communication:

- Communication and Mass Media complete

Other:

- Google Scholar

Journals hand-searched:

- Evidence to Policy
- Implementation Science
- Systematic Reviews
- Organisation science
- Research Policy
- Journal of Applied Behavioural Sciences
- Journal of Behavioral Decision Making
- Megamot: Behavioral Sciences Quarterly

Websites searched:

- The Behavioural Insights team http://www.behaviouralinsights.co.uk/publications/
- Harvard Business School: Negotiation, Organizations & Markets Unit Working Paper Series http://papers.ssrn.com/sol3/JELJOUR_Results.cfm?form_name=journalbrowse&journal_id=205096

- Alliance for Health Policy and Systems Research http://www.who.int/alliance-hpsr/en/
- EVIPNet (the Evidence-Informed Policy Network http://www.evipnet.org
- McMaster KT+ Database http://plus.mcmaster.ca/kt/
- Coalition for Evidence-based Education (CEBE)
- Centre for the Use of Research and Evidence in Education (CUREE)
- Evidence Informed Policy and Practice in Education in Europe (EIPPEE)

Search query

#1 ("research utilization" OR "research utilisation" OR "research dissemination" OR "research diffusion" OR "research uptake" OR "evidence utilisation" OR "evidence utilization" OR "evidence uptake" OR "knowledge utilisation" OR "knowledge utilization" OR "knowledge dissemination" OR "knowledge diffusion" OR "knowledge uptake" OR "knowledge mobilization" OR "knowledge mobilization" OR "research use" OR "evidence use" OR "data use" OR "knowledge use" OR "knowledge application" OR "knowledge exchange" OR "knowledge translation" OR "research translation" OR "knowledge transfer" OR "research transfer" OR "knowledge broker*" OR "research adoption" OR "knowledge adoption" OR "knowledge sharing")

#2 ("evidence to policy" OR "research to policy" OR "knowledge to action" OR "research to action" OR "research into practice" OR "use of evidence" OR "use of research" OR "uptake of research" OR "uptake of evidence" OR "utilisation of research" OR "utilisation of evidence" "impact of research")

#3 (#1 OR #2)

This Master search string (**#3**) will be applied in the above databases and adapted to fit the specific requirements of each database. We will apply a time filter focusing on publications from 1980 onwards. This cut-off date seems justified as the idea of research utilisation in public policy received increased attention after the seminal 1979 publication of Weiss' 'The many meanings of research utilisation'. Where applicable, we used the databases' methods filter to yield only review studies. For the databases where this was not possible, we supplemented the master search string with the following review terms:

#4 ("literature review" OR "research synthesis" OR meta-analysis OR "systematic review")

These review terms where then connected with the AND Boolean to the master search string:

(#4) AND #3

Appendix C: Search strategy (studies from the broader social science literature)

Mechanisms	*Concepts to search for*
1) Awareness of the need for, and positive attitudes towards, the use of evidence to inform decision-making	SEARCH QUESTIONS: How to build awareness? How to change attitudes? How to popularise a concept? How do you sensitize people for an issue? How to build identities / create norms? How to persuade people? Evidence use as a leitmotiv? EXAMPLES OF IDENTIFIED CONCEPTS & INTERVENTIONS Marketing / Branding Leadership Norms & Identities / Social influence Policy simulation models Information/research literacy User engagement Agenda setting Agency culture Data driven learning/assessment Information/research literacy
2) Agreement to what constitutes fit-for-purpose evidence	SEARCH QUESTIONS:

How to build consensus/agreement?

How to increase ownership?

How to facilitate discussion/debate?

EXAMPLES OF IDENTIFIED CONCEPTS & INTERVENTIONS

Persuasion

Consensus building techniques

User engagement

Collaborative learning

Ownership

Patient/public involvement / community engagement

Decision aids/tools; shared decision-making

Discursive leadership

Joint practice development

Communities of practice

Information/research literacy

3) Communication and awareness of, and access to, the evidence

SEARCH QUESTIONS:

How to communicate effectively?
When to communicate?
Who to communicate to?
Who should communicate?
What to communicate?
How to design web platforms?
Online vs paper communication?

EXAMPLES OF IDENTIFIED CONCEPTS & INTERVENTIONS

Tailoring and personalisation
Reminders
Branding
Anchoring and Framing
Data visualisation

Online social networks
Social marketing
Communication of risks/uncertainties
Public branding
Agenda setting/mass media
Audience segmentation
Narratives/story telling
Counter-marketing to change norms/perceptions
Personalisation

4) Interaction and relationships between decision-makers and researchers

SEARCH QUESTIONS:

How to build relationships?

How to build trust?

How to support social learning/social influence?

What is effective interaction?

What is constitutes interaction?

What is the role of networks?

What is the role of collaboration?

EXAMPLES OF IDENTIFIED CONCEPTS & INTERVENTIONS

Collaboration

Communities of practice,

Journal clubs

Norms / Social influence

Online social networks

Network analysis

Relationship building

Role models

5) Skills to access and make sense of evidence

SEARCH QUESTIONS:

What is effective learning?

What is effective adult learning?

What is effective professional development?

What is effective capacity-building?

What are effective leaning tools in a professional environment?

EXAMPLES OF IDENTIFIED CONCEPTS & INTERVENTIONS

Targeted and personalised training
Andragogy
Mentoring
Journal clubs
Secondments
Online training
Norms / Social influence

Inter-professional education and collaboration

Data-driven learning

Information/research literacy

6) Structures and processes of decision-making receptive/susceptible to evidence use

SEARCH QUESTIONS:

What are barriers/facilitators to decision-making?

How do people make decisions?

What influences decisions?

What supports behaviour change in a decision-making context?

How to create professional norms?

What organisational/intuitional factors influence decision-making?

What is the role of leadership & management?

EXAMPLES OF IDENTIFIED CONCEPTS & INTERVENTIONS

Persuasion, incentives, coercion,
Salience and habits
Identities and social norms
Simulation models
Organisation learning

Leadership/Management

Organisational capabilities (eg knowledge management)

Organisational norms

Finance

Professional protocols (appraisal; promotion; decision aids)

Accreditation

Institutional theory

Examples of literature consulted:

- Media & Communication studies
- Organisational learning and management studies
- Psychology
- Behavioural Sciences
- Adult learning theories
- Development Studies
- Political Sciences
- Sociology
- Information design
- Environment & climate science

Appendix D: Included studies on research evidence use interventions

*** denotes linked papers**

1. Abdullah G, Rossy D, Ploeg J, Davies B, Higuchi K, Sikora L, Stacey D (2014) Measuring the effectiveness of mentoring as a knowledge translation intervention for implementing empirical evidence: a systematic review. *Worldviews On Evidence-Based Nursing / Sigma Theta Tau International, Honor Society Of Nursing*, 11(5): 284-300.
2. Barwick MA, Schachter HM, Bennett LM, McGowan J, Ly M, Wilson A, Bennett K, Buchanan DH, Fergusson D, Manion I (2012) Knowledge translation efforts in child and youth mental health: a systematic review. *Journal Of Evidence-Based Social Work*, 9(4): 369-395.
3. Bunn F, Sworn K (2011) Strategies to promote the impact of systematic reviews on healthcare policy: a systematic review of the literature. *Evidence & Policy*, 7(4): 403–28.
4. Chambers D, Wilson P, Thompson C, Hanbury A, Farley K, Light K (2011) Maximizing the Impact of Systematic Reviews in Health Care Decision Making: A Systematic Review of Knowledge-Translation Resources. *The Milbank Quarterly*, 89(1): 131-156.
5. Clar C Campbell S, Davidson L, Graham W (2011) *What are the effects of interventions to improve the uptake of evidence from health research into policy in low and middle-income countries?* DFID: London, UK.
6. Coomarasamy A, Taylor R, Khan K (2003) A systematic review of postgraduate teaching in evidence-based medicine and critical appraisal. *Medical Teacher*, 25(1): 77-81.
7. Elueze IN (2015) Evaluating the effectiveness of knowledge brokering in health research: a systematised review with some bibliometric information. *Health Information And Libraries Journal*, 32(3): 168-181.
8. Goldner EM, Jenkins EK, Fischer B (2014) A narrative review of recent developments in knowledge translation and implications for mental health care providers. *Canadian Journal Of Psychiatry. Revue Canadienne De Psychiatrie*, 59(3): 160-169.

9. Gray M, Joy E, Plath D, Webb SA (2013) Implementing Evidence-Based Practice: A Review of the Empirical Research Literature. *Research on Social Work Practice*, 23(2): 157-166.
10. Harris J, Kearley K, Heneghan C, Meats E, Roberts N, Perera R, Kearley-Shiers K (2011) Are journal clubs effective in supporting evidence-based decision making? A systematic review. BEME Guide No. 16. *Medical Teacher*, 33(1): 9-23.
11. Hemsley-Brown J (2004) Facilitating research utilisation: a cross a sector review of research evidence. *International Journal of Public Sector Management*. 17(6): 534-552.
12. Hines S, Ramsbotham J, Coyer F (2015) The effectiveness of interventions for improving the research literacy of nurses: A systematic review. *Worldviews on Evidence-Based Nursing*, 12(5): 265–272.
13. Horsley T, Hyde C, Santesso N, Parkes J, Milne R, Stewart R (2011) *Teaching critical appraisal skills in healthcare settings (Review).* Cochrane Database of Systematic Reviews 2011, Issue 11. Art. No.: CD001270.
14. Hyde C, Parkes J, Deeks J, Milne R (2000) *Systematic review of effectiveness of teaching critical appraisal*. ICRF/NHS Centre for Statistics in Medicine, Institute of Health Sciences: Oxford.

    *Norman GR, Shannon SI (1998) Effectiveness of instruction in critical appraisal (evidence-based medicine) skills: a critical appraisal. *Canadian Medical Association Journal*, 158(2): 177-181.

    *Taylor R, Reeves B, Ewings P, Binns S, Keast J, Mears R (2000) A systematic review of the effectiveness of critical appraisal skills training for clinicians. *Medical Education,* 34: 120-125.
15. Ilic D, Maloney S (2014) Methods of teaching medical trainees evidence-based medicine: a systematic review. *Medical Education*, 48(2): 124-135.
16. Jones AC, Sanjesh CR, Pohar SL, Albrecht L, Scott SD (2015) Translating Knowledge in Rehabilitation: Systematic Review. *Physical Therapy,* 95(4): 663-677.
17. LaRocca R, Yost J, Dobbins M, Ciliska D, Butt M (2012) The effectiveness of knowledge translation strategies used in public health: a systematic review. *BMC Public Health*, 12: 751-751.
18. Li LC, Grimshaw JM, Nielsen C, Judd M, Coyte PC, Graham ID (2009) Use of communities of practice in business and health care sectors: A systematic review. *Implementation Science*. 4(1): 1-9.
19. Lode K, Sørensen EE, Salmela S, Holm AL (2015) Clinical Nurses' Research Capacity Building in Practice—A Systematic Review*. Open Journal of Nursing*, 5: 664-677.
20. Mairs K, McNeil H, McLeod J, Prorok JC, Stolee P (2013) Online strategies to facilitate health-related knowledge transfer: a systematic search and review. *Health Information And Libraries Journal*, 30(4): 261-277.
21. Marsh J (2012) Interventions promoting educators' use of data: Research insights and gaps. *Teachers College Record*, 114(11): 1-48.
22. McCormack B, Rycroft-Malone J, Decorby K, Hutchinson AM, Bucknall T, Kent B, Schultz A, Snelgrove-Clarke E, Stetler C, Titler M, Wallin L, Wilson V (2013) A realist review of interventions and strategies to promote evidence-informed healthcare: a focus on change agency. *Implementation Science,* 8: 107.

23. Menon A, Korner-Bitensky N, Kastner M, McKibbon KA, Straus S (2009) Strategies for rehabilitation professionals to move evidence-based knowledge into practice: a systematic review. *Journal Of Rehabilitation Medicine*, 41(13): 1024-1032.
24. Mitton C, Adair CE, McKenzie E, Patten SB, Waye PB (2007) Knowledge transfer and exchange: review and synthesis of the literature. *The Milbank Quarterly*, 85(4): 729-768.

    *IHE (2008) Effective Dissemination of Findings from Research. The Institute of Health Economics: Alberta.
25. Moore G, Redman S, Haines M, Todd A (2011) What works to increase the use of research in population health policy and programmes: a review. *Evidence & Policy*, 7(3): 277–305.

    *Moore G, Todd A, Redman S (2009) *Strategies to increase the use of evidence from research in population health policy and programs: a rapid review*. Sax Institute: Sydney.
26. Murthy L, Shepperd S, Clarke MJ, Garner SE, Lavis JN, Perrier L, Roberts NW, Straus SE (2012) Interventions to improve the use of systematic reviews in decision-making by health system managers, policy makers and clinicians. *The Cochrane Database Of Systematic Reviews*. 9: CD009401.
27. Perrier L, Mrklas K, Lavis JN, Straus SE (2011) Interventions encouraging the use of systematic reviews by health policymakers and managers: a systematic review. *Implementation Science,* 6: 43.
28. Quinn E, Huckel-Schneider C, Campbell D, Seale H, Milat AJ (2014) How can knowledge exchange portals assist in knowledge management for evidence-informed decision making in public health?. *BMC Public Health*, 14: 443-443.
29. Scott SD, Albrecht L, O'Leary K, Ball GDC, Hartling L, Hofmeyer A, Jones CA, Klassen TP, Kovacs Burns K, Newton AS, Thompson D, Dryden DM (2012) Systematic review of knowledge translation strategies in the allied health professions. *Implementation Science,* 7: 70.
30. Siron S, Dagenais C, Ridde V (2015) What research tells us about knowledge transfer strategies to improve public health in low-income countries: A scoping review. *International Journal of Public Health*, 60(7):849-63.
31. Stacey D, Hopkins M, Adamo KB, Shorr R, Prud'homme D (2010) Knowledge translation to fitness trainers: A systemic review. *Implementation Science,* 5: 28-36.
32. Thompson DS, Estabrooks CA, Scott-Findlay S, Moore K, Wallin L (2007) Interventions aimed at increasing research use in nursing: a systematic review. *Implementation Science*, 2: 15.
33. Wallace J, Byrne C, Clarke M (2014) Improving the uptake of systematic reviews: a systematic review of intervention effectiveness and relevance. *BMJ Open*, 4(10): e005834-e005834.

    *Wallace John, Byrne Charles, Clarke Mike (2012) Making evidence more wanted: a systematic review of facilitators to enhance the uptake of evidence from systematic reviews and meta-analyses. *International Journal of Evidence-Based Healthcare*, 10: 338–346.

34. Walter I, Nutley SM, Davies HTO (2005) What works to promote evidence-based practice? A cross-sector review. *Evidence & Policy*, 1(3): 335-63.

*Nutley SM, Walter I, Davies HTO (2009) Promoting evidence-based practice. Models and mechanisms from cross-sector review. *Research on Social Work Practice*, 19(5): 552-559.

*Nutley SM (2003) *Increasing research impact: early reflections from the ESRC Evidence Network*. ESRC UK Centre for Evidence Based Policy and Practice: Working Paper 16.

35. Williamson A, Makkar SR, McGrath C, Redman S (2015) How Can the Use of Evidence in Mental Health Policy Be Increased? A Systematic Review. *Psychiatric Services,* 66(8): 783-797.

36. Yost J, Ganann R, Thompson D, Aloweni F, Newman K, Hazzan A, McKibbon A, Dobbins M, Ciliska D (2015) The effectiveness of knowledge translation interventions for promoting evidence-informed decision-making among nurses in tertiary care: a systematic review and meta-analysis. *Implementation Science*, 10(1): 1-15.

Appendix E: Examples of excluded studies in Review 1

Examples of excluded reviews (non-effectiveness reviews)

1) Aglen Bjørg (2015) Pedagogical strategies to teach bachelor students evidence-based practice: A systematic review. *Nurse Education Today*. http://dx.doi.org/10.1016/j.nedt.2015.08.02

2) Almeida Celia, Báscolo Ernesto (2006) Use of research results in policy decision-making, formulation, and implementation: a review of the literature. *Cadernos De Saúde Pública*, 22 Suppl: 7

3) Allen Kacie, Zoellner Jamie, Motley Monica, Estabrooks Paul A (2011) Understanding the Internal and External Validity of Health Literacy Interventions: A Systematic Literature Review Using the RE-AIM Framework. *Journal of Health Communication*, 16: 55-72.

4) Barac Raluca, Stein Sherry, Bruce Beth, Barwick Melanie (2014) Scoping review of toolkits as a knowledge translation strategy in health. *BMC Medical Informatics And Decision Making*, 14: 121-121.

5) Becheikh Nizar, Saliha Ziam, Othman Idrissi, Yan Castonguay, Réjean Landry (2010) How to improve knowledge transfer strategies and practices in education? Answers from a systematic literature review. *Research in higher education journal*, 7: 1-21.

6) Contandriopoulos Damien, Lemire Marc, Denis Jean-Louis, Tremblay Émile (2010) Knowledge exchange processes in organizations and policy arenas: A narrative systematic review of the literature. *Milbank Quarterly*, 88(4): 444-483.

7) Funk S G, Tornquist E M, Champagne M T (1995) Barriers and facilitators of research utilization. An integrative review. *The Nursing Clinics Of North America*, 30(3): 395-407.

8) Humphries Serena, Stafinski Tania, Mumtaz Zubia, Menon Devidas (2014) Barriers and facilitators to evidence-use in program management: a systematic review of the literature. *BMC Health Services Research*, 14: 171-171.
9) Innvaer Simon, Vist Gunn, Trommald Mari, Oxman Andrew (2002) Health policy-makers' perceptions of their use of evidence: a systematic review. *Journal Of Health Services Research & Policy*, 7(4): 239-244.
10) Jahed J, Bengel J, Baumeister H (2012) [Transfer of research findings into medical practice]. *Gesundheitswesen (Bundesverband Der Ärzte Des Öffentlichen Gesundheitsdienstes (Germany))*, 74(11): 754-761.
11) Li Jing Hua, Chang Xiao Ran, Lin Li, Ma Li Ya (2014) Meta-analytic comparison on the influencing factors of knowledge transfer in different cultural contexts. *Journal of Knowledge Management*, 18(2): 278-306.
12) Liang Zhanming, Howard Peter F, Leggat Sandra G, Murphy Gregory (2012) A framework to improve evidence-informed decision-making in health service management. *Australian Health Review*, 36(3): 284-289.
13) Milner Margaret, Estabrooks Carole A, Myrick Florence (2006) Research utilization and clinical nurse educators: A systematic review. *Journal Of Evaluation In Clinical Practice*, 12(6): 639-655.
14) Morgan Gareth (2010) Evidence-Based Health Policy: A Preliminary Systematic Review. *Health Education Journal*, 69(1): 43-47.
15) Nidhra Srinivas, Yanamadala Muralidhar, Afzal Wasif, Torkar Richard (2013) Knowledge transfer challenges and mitigation strategies in global software development—A systematic literature review and industrial validation. *International Journal of Information Management*, 33(2): 333-355.
16) Oborn Eivor, Barrett Michael, Racko Girts (2013) Knowledge translation in healthcare: Incorporating theories of learning and knowledge from the management literature. *Journal Of Health Organization And Management*, 27(4): 412-431.
17) Oliver Kathryn, Simon Innvar, Theo Lorenc, Jenny Woodman, James Thomas (2014) A systematic review of barriers to and facilitators of the use of evidence by policymakers. *BMC Health Services Research*, 14: 2.
18) Orton Lois, Lloyd-Williams Ffion, Taylor-Robinson David, O'Flaherty Martin, Capewell Simon (2011) The Use of Research Evidence in Public Health Decision Making Processes: Systematic Review. *PLoS ONE*, 6(7): 1-10.
19) Pun Kit Fai, Nathai-Balkissoon Marcia (2011) Integrating Knowledge Management into Organisational Learning: A Review of Concepts and Models. *Learning Organization*, 18(3): 203-223.
20) Rajić Andrijana, Young Ian, McEwen Scott A, (2013) Improving the utilization of research knowledge in agri-food public health: a mixed-method review of knowledge translation and transfer. *Foodborne Pathogens And Disease*, 10(5): 397-412.
21) Reay Trish, Berta Whitney, Kohn Melanie Kazman (2009) What's the Evidence on Evidence-Based Management?. *Academy of Management Perspectives*, 23(4): 5-18.
22) Rossall Hannah, Boyes Chris, Montacute Kim, Doherty Patrick (2008) Developing research capacity in health librarians: a review of the evidence. *Health Information And Libraries Journal*, 25(3): 159-174.

23) Salter Katherine L, Kothari Anita (2014) Using realist evaluation to open the black box of knowledge translation: a state-of-the-art review. *Implementation Science,* 9: 115.
24) Scurlock-Evans Laura, Dominic Upton (2015) The Role and Nature of Evidence: A Systematic Review of Social Workers' Evidence-Based Practice Orientation, Attitudes, and Implementation. *Journal of Evidence-Informed Social Work*, 12(4): 369-399.
25) Sebba Judy (2013) An exploratory review of the role of research mediators in social science. *Evidence & Policy,* 9(3): 391-408.
26) Solomons Nan M, Spross Judith A (2011) Evidence-based practice barriers and facilitators from a continuous quality improvement perspective: an integrative review. *Journal Of Nursing Management*, 19(1): 109-120.
27) Squires Janet E, Hutchinson Alison M, Boström Anne-Marie, O'Rourke Hannah M, Cobban Sandra J, Estabrooks Carole A (2011) To what extent do nurses use research in clinical practice? A systematic review. *Implementation Science:* 6: 21.
28) Straus Sharon E, Tetroe Jacqueline M, Graham Ian D (2011) Knowledge translation is the use of knowledge in health care decision making. *Journal Of Clinical Epidemiology*, 64(1): 6-10.
29) Strydom Wilma F, Funke Nikki, Nienaber Shanna, Nortje Karen, Steyn Maronel (2010) Evidence-based policymaking: a review. *South African Journal of Science*, 106(5/6): 1-8.
30) Wallace John, Byrne Charles, Clarke Mike (2012) Making evidence more wanted: a systematic review of facilitators to enhance the uptake of evidence from systematic reviews and meta-analyses. *International Journal Of Evidence-Based Healthcare*, 10(4): 338-346.
31) Wieringa Sietse, Trisha Greenhalgh (2015) 10 years of mindlines: a systematic review and a commentary. *Implementation Science*, 10: 45.
32) Zwarenstein Merrick, Reeves Scott (2006) Knowledge Translation and Interprofessional Collaboration: Where the Rubber of Evidence-Based Care Hits the Road of Teamwork. *Journal of Continuing Education in the Health Professions*, 26(1): 46-54.
33) Zwolsman Sandra, te Pas Ellen , Hooft Lotty, Wieringa-de Waard Margreet , van Dijk Nynke (2012) Barriers to GPs' use of evidence-based medicine: a systematic review.. *The British Journal Of General Practice: The Journal Of The Royal College Of General Practitioners*. 62(600): e511-e521.

Appendix F: List of social science interventions considered in Review 2

Review 2 identified social science interventions of conceptual relevance to mechanisms

Mechanisms	*Social science interventions of conceptual relevance to mechanisms*
1) Awareness of the need for, and positive attitudes towards, the use of evidence to inform decision-making	- Social branding - Mass media - Social marketing - Norms (social/professional) - Patient/public involvement; community/stakeholder engagement - Decision aids/tools; - Leadership/role models - Awareness building (eg gender/environmental awareness), mixed with changing norms - Communities of practice - Information/research literacy - Counter-marketing (consequences of not using evidence) - Identify cues and timing
2) Agreement to what constitutes fit-for-purpose evidence	- Patient/public involvement / community engagement - Decision aids/tools; shared decision-making - Consensus-building techniques (e.g. discursive leadership; local consensus processes on user suggestions/complaints) - Delphi panels - Communities of practice - Journal clubs - Inter-professional education - Information/research literacy
3) Communication and awareness of, and access to, the evidence	TECHNIQUES - Social marketing (branding) - Communication of risks/uncertainties - Framing/priming (in line with norms/identities) (gain vs loss) - Anchoring - Targeting & tailoring (in line with norms/identities) - Public branding - Agenda setting/mass media - Audience segmentation - Narratives/story telling - Data visualisation

- Awareness building campaigns
- Reminders
- Counter-marketing to change norms/perceptions
- Personalisation

MEDIUM
- Online
- Social networks/media
- Blogs
- Design of knowledge exchange platforms / online tools
- Interactive communication tools
- Evidence to recommendation frameworks
- Personalised packaging of evidence using recognizable brands, logos, etc,

COMMUNICATOR

- Timing of communication: Life moments; Policy circle; Receptive hours of decision-makers

OTHER
- Science communication (vox.com)
- Science journalism
- Nudges

4) Interaction and relationships between decision-makers and researchers

- Patient/public involvement / community engagement
- Collaboration techniques
- Joint practice development
- Formal networks and formal network analysis
- Social networks and information seeking/social learning
- Mentoring
- Communities of practice
- Norms (social/professional)
- Building relationships / trust
- Secondments/work placements
- Identify cues and timing

5) Skills to access and make sense of evidence

- Mentoring
- Changing cognitive maturity rather than skills
- How individual skills link to org impact / multi-level capabilities
- Supervision and org change
- Effective TTT approaches

- Inter-professional education and collaboration
- Professional motivation and confidence
- Targeted and personalised training
- Data-driven assessments/learning
- Information/research literacy
- Principles of effective learning
- Principles of effective adult learning
- Principles of effective professional development

6) Structures and processes of decision-making

INDIVIDUAL:

- Models of decision-making (automatic vs social)
- Known biases in decision-making (eg cognitive burden; loss aversion)
- Incentives (social / financial)
- Professional norms/identities
- Leadership/role models
- Social cognitive theories to change routines/habits
- Professional motivation and confidence
- Nudges /commitment devices (public/private)
- Opportunity cost of using evidence
- Dog fooding/red teaming to change habits/routines (Changing priors?)
- Evidence-informed Mindlines
- Gamification
- Identify cues and timing

ORGANISATIONAL:

- Learning organisation vs organisational learning
- Organisational norms/culture (eg blame vs agency; failfests)
- Organisational readiness (eg capabilities/infrastructure)
- Protocols/business cases; decision-making/performance aids
- Promotion systems/brokering posts; Secondments/work placements
- Leadership
- Supervision / management and org change
- Accreditation
- Knowledge management

- Adaptive management
- Nudges
- On demand services (not yet searched!)
- Data-driven assessment / organisation learning

NATIONAL:

- Gov Institutionalisation of evidence use
- Evidence use in operational policies first
- Evidence use in all policy processes (budgeting, implementation) not just in policy content
- Nudges
- Policy simulation models
- IBM outthink / 'Decision-makers like me'? algorithms

SYSTEMIC

- Marketplace for evidence / ideas
- Evidence literacies (Information/research literacy)
- Institutionalisation of evidence use (e.g. what works centres/NICE)
- Complex adaptive systems
- Experimentation, Iteration, feedback loops, replication, scaling and terminating
- Evidence use as a leitmotiv? .

Appendix G: Included reviews from the broader social science literature

List of social science reviews included in Review 2.

M1
Stead, M., Gordon, R., Angus, K., & McDermott, L. (2007). A systematic review of social marketing effectiveness. *Health education*, *107*(2), 126-191.
McDermott L, Stead M, Hastings GB, Kent R, Banerjee S (2005). A Systematic Review of the Effectiveness of Social Marketing Nutrition and Food Safety Interventions.
Modi, Shilpa and Firestone, Rebecca (2014) Social Marketing can Make People Healthier: The Evidence That Social Marketing Works. Population Services International
Kavanagh, J., Trouton, A., Oakley, A., & Powell, C. (2006). *A systematic review of the evidence for incentive schemes to encourage positive health and other social behaviours in young people*. EPPI-Centre, Social Science Research Unit, Institute of Education, University of London.
World Bank (2015). World Development Report 2015: Mind, Society, and Behavior. *Washington, DC: World Bank.*
Richburg-Hayes, L., Anzelone, C., Dechausay, N., Datta, S., Fiorillo, A., Potok, L., ... & Balz, J. (2014). Behavioral Economics and Social Policy: Designing Innovative Solutions for Programs Supported by the Administration for Children and Families. *Office of Planning, Research and Evaluation, Administration for Children and Families, US Department of Health and Human Services*.
O'Mara-Eves, A., Brunton, G., McDaid, G., Oliver, S., Kavanagh, J., Jamal, F., ... & Thomas, J. (2013). Community engagement to reduce inequalities in health: a systematic review, meta-analysis and economic analysis. *Public Health Research*, *1*(4).

Shippee, N. D., Domecq Garces, J. P., Prutsky Lopez, G. J., Wang, Z., Elraiyah, T. A., Nabhan, M., ... & Erwin, P. J. (2013). Patient and service user engagement in research: a systematic review and synthesized framework. *Health Expectations*.

Domecq, J. P., Prutsky, G., Elraiyah, T., Wang, Z., Nabhan, M., Shippee, N., ... & Erwin, P. (2014). Patient engagement in research: a systematic review. *BMC health services research*, *14*(1), 89.

Mockford, C., Staniszewska, S., Griffiths, F., & Herron-Marx, S. (2012). The impact of patient and public involvement on UK NHS health care: a systematic review. *International Journal for Quality in Health Care*, *24*(1), 28-38.

Fulu, E., Kerr-Wilson, A., & Lang, J. (2014). What works to prevent violence against women and girls. *Evidence Review of interventions to prevent violence against women and girls Pretoria: Medical Research Council*.

M2

Diamond, I. R., Grant, R. C., Feldman, B. M., Pencharz, P. B., Ling, S. C., Moore, A. M., & Wales, P. W. (2014). Defining consensus: a systematic review recommends methodological criteria for reporting of Delphi studies. *Journal of clinical epidemiology*, *67*(4), 401-409.

Bero, L. A., Grilli, R., Grimshaw, J. M., Harvey, E., Oxman, A. D., & Thomson, M. A. (1998). Closing the gap between research and practice: an overview of systematic reviews of interventions to promote the implementation of research findings. *Bmj*, *317*(7156), 465-468.

Johnson, M. J., & May, C. R. (2015). Promoting professional behaviour change in healthcare: what interventions work, and why? A theory-led overview of systematic reviews. *BMJ open*, *5*(9), e008592.

Reeves, S., Zwarenstein, M., Goldman, J., Barr, H., Freeth, D., Hammick, M., & Koppel, I. (2008). Interprofessional education: effects on professional practice and health care outcomes. *Cochrane Database of systematic reviews*, *1*.

Ranmuthugala, G., Plumb, J. J., Cunningham, F. C., Georgiou, A., Westbrook, J. I., & Braithwaite, J. (2011). How and why are communities of practice established in the healthcare sector? A systematic review of the literature. *BMC health services research*, *11*(1), 273.

Ranmuthugala, G., Plumb, J., Cunningham, F., Georgiou, A., Westbrook, J., & Braithwaite, J. (2010). Communities of practice in the health sector: a systematic review of the peer-reviewed literature. *Sydney: University of New South Wales, Australian Institute of Health Innovation*.

Ebbert, J. O., Montori, V. M., & Schultz, H. J. (2001). The journal club in postgraduate medical education: a systematic review. *Medical teacher*, *23*(5), 455-461.

Honey, C. P., & Baker, J. A. (2011). Exploring the impact of journal clubs: a systematic review. *Nurse education today*, *31*(8), 825-831.

Deenadayalan, Y., Grimmer-Somers, K., Prior, M., & Kumar, S. (2008). How to run an effective journal club: a systematic review. *Journal of evaluation in clinical practice*, *14*(5), 898-911.

M3

Noar, S. M., Benac, C. N., & Harris, M. S. (2007). Does tailoring matter? Meta-analytic review of tailored print health behavior change interventions. *Psychological bulletin*, *133*(4), 673.

Lustria, M. L. A., Noar, S. M., Cortese, J., Van Stee, S. K., Glueckauf, R. L., & Lee, J. (2013). A meta-analysis of web-delivered tailored health behavior change interventions. *Journal of health communication*, *18*(9), 1039-1069.

Short, C. E., James, E. L., Plotnikoff, R. C., & Girgis, A. (2011). Efficacy of tailored-print interventions to promote physical activity: a systematic review of randomised trials. *Int J Behav Nutr Phys Act*, *8*(1), 113.

Rothman, A. J., Bartels, R. D., Wlaschin, J., & Salovey, P. (2006). The Strategic Use of Gain-and Loss-Framed Messages to Promote Healthy Behavior: How Theory Can Inform Practice. *Journal of Communication*, *56*(s1), S202-S220.

Wansink, B., & Pope, L. (2015). When do gain-framed health messages work better than fear appeals?. *Nutrition Reviews*, *73*(1), 4-11.

Cornelissen, J. P., & Werner, M. D. (2014). Putting framing in perspective: A review of framing and frame analysis across the management and organizational literature. *The Academy of Management Annals*, *8*(1), 181-235.

McCormack, L., Sheridan, S., Lewis, M., Boudewyns, V., Melvin, C. L., Kistler, C., ... & Lohr, K. N. (2013). Communication and dissemination strategies to facilitate the use of health-related evidence.

Zipkin, D. A., Umscheid, C. A., Keating, N. L., Allen, E., Aung, K., Beyth, R., ... & Schardt, C. (2014). Evidence-based risk communication: a systematic review. *Annals of internal medicine*, *161*(4), 270-280.

Winterbottom, A., Bekker, H. L., Conner, M., & Mooney, A. (2008). Does narrative information bias individual's decision making? A systematic review. *Social science & medicine*, *67*(12), 2079-2088.

Hi-Res (2013) Literature review on the effectiveness of online and mobile technologies for changing health behaviours. Available from: http://www.ana.org.nz/sites/default/files/Literature%20Review%20on%20online%20and%20mobile%20based%20technologies%20for%20heatlh%20promotion.pdf

Evans, W. D., Blitstein, J., Hersey, J. C., Renaud, J., & Yaroch, A. L. (2008). Systematic review of public health branding. *Journal of health communication*, *13*(8), 721-741.

Noar, S. M., Palmgreen, P., Chabot, M., Dobransky, N., & Zimmerman, R. S. (2009). A 10-year systematic review of HIV/AIDS mass communication campaigns: have we made progress?. *Journal of health communication*, *14*(1), 15-42.

Kubacki, K., Rundle-Thiele, S., Lahtinen, V., & Parkinson, J. (2015). A systematic review assessing the extent of social marketing principle use in interventions targeting children (2000-2014). *Young Consumers*, *16*(2).

Bertrand, J. T., O'Reilly, K., Denison, J., Anhang, R., & Sweat, M. (2006). Systematic review of the effectiveness of mass communication programs to change HIV/AIDS-related behaviors in developing countries. *Health education research*, *21*(4), 567-597.

Moorhead, S. A., Hazlett, D. E., Harrison, L., Carroll, J. K., Irwin, A., & Hoving, C. (2013). A new dimension of health care: systematic review of the uses, benefits, and limitations of social media for health communication. *Journal of medical Internet research*, *15*(4).

Cheung, A., Weir, M., Mayhew, A., Kozloff, N., Brown, K., & Grimshaw, J. (2009). Overview of systematic reviews of the effectiveness of reminders in improving healthcare professional behavior. *Ethics*.

Shepherd, J. P. (2014). How to achieve more effective services: the evidence ecosystem. What Works Network.

West, V. L., Borland, D., & Hammond, W. E. (2015). Innovative information visualization of electronic health record data: a systematic review. *Journal of the American Medical Informatics Association*, *22*(2), 330-339.

Bala, Malgorzata M., et al. "Mass media interventions for smoking cessation in adults." *Cochrane Database Syst Rev* 6.6 (2013).

Vandelanotte, C., Kirwan, M., Rebar, A., Alley, S., Short, C., Fallon, L., ... & Duncan, M. J. (2014). Examining the use of evidence-based and social media supported tools in freely accessible physical activity intervention websites. *International Journal of Behavioral Nutrition and Physical Activity*, *11*(1), 105.

Kohl, L. F., Crutzen, R., & de Vries, N. K. (2013). Online prevention aimed at lifestyle behaviors: a systematic review of reviews. *Journal of medical Internet research*, *15*(7).

Webb, T., Joseph, J., Yardley, L., & Michie, S. (2010). Using the internet to promote health behavior change: a systematic review and meta-analysis of the impact of theoretical basis, use of

behavior change techniques, and mode of delivery on efficacy. *Journal of medical Internet research*, *12*(1), e4.

Kelders, S. M., Kok, R. N., Ossebaard, H. C., & Van Gemert-Pijnen, J. E. (2012). Persuasive system design does matter: a systematic review of adherence to web-based interventions. *Journal of medical Internet research*, *14*(6).

M4

Pittaway, L., Robertson, M., Munir, K., Denyer, D., & Neely, A. (2004). Networking and innovation: a systematic review of the evidence. *International Journal of Management Reviews*, *5*(3-4), 137-168.

Greenhalgh, T., Robert, G., Macfarlane, F., Bate, P., & Kyriakidou, O. (2004). Diffusion of innovations in service organizations: systematic review and recommendations. *Milbank Quarterly*, *82*(4), 581-629.

Walter, I., Nutley, S., & Davies, H. (2005). What works to promote evidence-based practice? A cross-sector review. *Evidence & Policy: A Journal of Research, Debate and Practice*, *1*(3), 335-364.

Flodgren, G., Parmelli, E., Doumit, G., Gattellari, M., O'Brien, M. A., Grimshaw, J., & Eccles, M. P. (2011). Local opinion leaders: effects on professional practice and health care outcomes. *Cochrane Database Syst Rev*, *8*(8).

Balatsoukas, P., Kennedy, C. M., Buchan, I., Powell, J., & Ainsworth, J. (2015). The Role of Social Network Technologies in Online Health Promotion: A Narrative Review of Theoretical and Empirical Factors Influencing Intervention Effectiveness. *Journal of medical Internet research*, *17*(6).

Balatsoukas, P., Kennedy, C. M., Buchan, I., Powell, J., & Ainsworth, J. (2015). The Role of Social Network Technologies in Online Health Promotion: A Narrative Review of Theoretical and Empirical Factors Influencing Intervention Effectiveness. *Journal of medical Internet research*, *17*(6).

Centola, D. (2010). The spread of behavior in an online social network experiment. *science*, *329*(5996), 1194-1197.

Sebba, J., Kent, P., & Tregenza, J. (2012). Joint Practice Development (JPD). What does the Evidence Suggest are Effective Approaches.

Gagliardi, A. R., Webster, F., Perrier, L., Bell, M., & Straus, S. (2014). Exploring mentorship as a strategy to build capacity for knowledge translation research and practice: a scoping systematic review. *Implement Sci*.

Sambunjak, D., Straus, S. E., & Marušić, A. (2006). Mentoring in academic medicine: a systematic review. *Jama*, *296*(9), 1103-1115.

McKenna, A. M., & Straus, S. E. (2011). Charting a professional course: a review of mentorship in medicine. *Journal of the American College of Radiology*, *8*(2), 109-112.

Ghosh, R., & Reio, T. G. (2013). Career benefits associated with mentoring for mentors: A meta-analysis. *Journal of Vocational Behavior*, *83*(1), 106-116.

Pittaway 2004; Greenhalgh et al 2005; Walter et al 2005; Flodgren et al 2011; Johnson et al 2015

Cunningham, F. C., Ranmuthugala, G., Plumb, J., Georgiou, A., Westbrook, J. I., & Braithwaite, J. (2012). Health professional networks as a vector for improving healthcare quality and safety: a systematic review. *BMJ quality & safety*, *21*(3), 239-249.

M5

Fish, W. W., & Wickersham, L. E. (2009). Best practices for online instructors: Reminders. *The quarterly review of distance education*, *10*(3), 279-284.

Bloom, B. S. (2005). Effects of continuing medical education on improving physician clinical care and patient health: a review of systematic reviews. *International journal of technology assessment in health care*, *21*(03), 380-385.

Papamitsiou, Z., & Economides, A. A. (2014). Learning Analytics and Educational Data Mining in Practice: A Systematic Literature Review of Empirical Evidence. *Journal of Educational Technology & Society*, *17*(4), 49-64.

Dunst, C. J., & Trivette, C. M. (2012). Moderators of the effectiveness of adult learning method practices. *Journal of Social Sciences*, *8*(2), 143.

Smith, C., & Gillespie, M. (2007). Research on professional development and teacher change: Implications for adult basic education. *Review of adult learning and literacy*, *7*(7).

Tusting, K., & Barton, D. (2006). Models of adult learning: a literature review.

Taylor, E. W. (2007). An update of transformative learning theory: A critical review of the empirical research (1999–2005). *International journal of lifelong education*, *26*(2), 173-191.

Farnan, J. M., Petty, L. A., Georgitis, E., Martin, S., Chiu, E., Prochaska, M., & Arora, V. M. (2012). A systematic review: the effect of clinical supervision on patient and residency education outcomes. *Academic Medicine*, *87*(4), 428-442.

Milne, D., & James, I. (2000). A systematic review of effective cognitive-behavioural supervision. *British Journal of Clinical Psychology*, *39*(2), 111-127.

Milne, D., Aylott, H., Fitzpatrick, H., & Ellis, M. V. (2008). How does clinical supervision work? Using a "best evidence synthesis" approach to construct a basic model of supervision. *The Clinical Supervisor*, *27*(2), 170-190.

Haßler, B., Major, L., & Hennessy, S. (2015). Tablet use in schools: a critical review of the evidence for learning outcomes. *Journal of Computer Assisted Learning*.

Clark, D. B., Tanner-Smith, E. E., & Killingsworth, S. S. (2015). Digital Games, Design, and Learning A Systematic Review and Meta-Analysis. *Review of educational research*, 0034654315582065.

Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2009). Evaluation of Evidence-Based Practices in Online Learning: A Meta-Analysis and Review of Online Learning Studies. *US Department of Education*.

Aglen, B. (2016). Pedagogical strategies to teach bachelor students evidence-based practice: A systematic review. *Nurse education today*, *36*, 255-263.

Abrami, P. C., Bernard, R. M., Borokhovski, E., Wade, A., Surkes, M. A., Tamim, R., & Zhang, D. (2008). Instructional interventions affecting critical thinking skills and dispositions: A stage 1 meta-analysis. *Review of Educational Research*, *78*(4), 1102-1134.

M6

Fox, C. R., & Sitkin, S. B. (2015). Bridging the divide between behavioral science and policy. *Behavioral Science & Policy*, *1*, 1-12.

Leonard, T. C. (2008). Richard H. Thaler, Cass R. Sunstein, Nudge: Improving decisions about health, wealth, and happiness. *Constitutional Political Economy*, *19*(4), 356-360.

Parmelli, E., Flodgren, G., Beyer, F., Baillie, N., Schaafsma, M. E., & Eccles, M. P. (2011). The effectiveness of strategies to change organisational culture to improve healthcare performance: a systematic review. *Implement Sci*, *6*(1), 33.

Reichenpfader, U., Carlfjord, S., & Nilsen, P. (2015). Leadership in evidence-based practice: a systematic review. *Leadership in Health Services*, *28*(4), 298-316.

Denti, L., & Hemlin, S. (2012). Leadership and innovation in organizations: A systematic review of factors that mediate or moderate the relationship. *International Journal of Innovation Management*, *16*(03), 1240007.

Gifford, W., Davies, B., Edwards, N., Griffin, P., & Lybanon, V. (2007). Managerial leadership for nurses' use of research evidence: an integrative review of the literature. *Worldviews on Evidence-Based Nursing*, *4*(3), 126-145.

Wong, C. A., Cummings, G. G., & Ducharme, L. (2013). The relationship between nursing leadership and patient outcomes: a systematic review update. *Journal of nursing management*, *21*(5), 709-724.

Cummings, G., Lee, H., MacGregor, T., Davey, M., Wong, C., Paul, L., & Stafford, E. (2008). Factors contributing to nursing leadership: a systematic review. *Journal of Health Services Research & Policy*, *13*(4), 240-248.

Scott, T., Mannion, R., Marshall, M., & Davies, H. (2003). Does organisational culture influence health care performance? A review of the evidence. *Journal of Health Services Research & Policy*, *8*(2), 105-117.

Hunt, J., Sanchez, A., Tadd, W., & O'Mahony, S. (2012). Organizational culture and performance in health care for older people: a systematic review. *Reviews in Clinical Gerontology*, *22*(03), 218-234.

Kothari, A., Hovanec, N., Hastie, R., & Sibbald, S. (2011). Lessons from the business sector for successful knowledge management in health care: a systematic review. *BMC health services research*, *11*(1), 173.

Thorpe, R., Holt, R., Macpherson, A., & Pittaway, L. (2005). Using knowledge within small and medium-sized firms: a systematic review of the evidence. *International Journal of Management Reviews*, *7*(4), 257-281.

Karamitri, I., Talias, M. A., & Bellali, T. (2015). Knowledge management practices in healthcare settings: a systematic review. *The International journal of health planning and management*.

Grimshaw, J. M., Shirran, L., Thomas, R., Mowatt, G., Fraser, C., Bero, L., ... & O'Brien, M. A. (2001). Changing provider behavior: an overview of systematic reviews of interventions. *Medical care*, II2-II45.

Stacey, D., Bennett, C. L., Barry, M. J., Col, N. F., Eden, K. B., Holmes-Rovner, M., ... & Thomson, R. (2011). Decision aids for people facing health treatment or screening decisions. *Cochrane Database Syst Rev*, *10*(10).

Durand, M. A., Carpenter, L., Dolan, H., Bravo, P., Mann, M., Bunn, F., & Elwyn, G. (2014). Do interventions designed to support shared decision-making reduce health inequalities? A systematic review and meta-analysis. *PloS one*, *9*(4), e94670.

Flodgren, G., Eccles, M. P., Shepperd, S., Scott, A., Parmelli, E., & Beyer, F. R. (2011). An overview of reviews evaluating the effectiveness of financial incentives in changing healthcare professional behaviours and patient outcomes. *Cochrane Database Syst Rev*, *7*(7).

Jamtvedt, G., Young, J. M., Kristoffersen, D. T., O'Brien, M. A., & Oxman, A. D. (2006). Audit and feedback: effects on professional practice and health care outcomes. *Cochrane Database Syst Rev*, *2*(2).

Ivers, N., Jamtvedt, G., Flottorp, S., Young, J. M., Odgaard-Jensen, J., French, S. D., ... & Oxman, A. D. (2012). Audit and feedback: effects on professional practice and healthcare outcomes. *The Cochrane Library*.

Appendix H: Coding strategy

Study description		
Study date	☐ Details (specify)	
Source	☐ Details (specify)	
Type of literature	☐ Details (specify)	
Broad topic	☐ Details (specify)	
Relation to evidence use	☐ General consideration of evidence *E.g. reviews that look at any intervention aiming to improve research use* ☐ Specific consideration/implementation of evidence *E.g. reviews looking at interventions aiming to improve mechanisms of research use* ☐ Related social sciences literature	
Abstract		
Design	☐ Systematic review ☐ Rapid review ☐ Systematized literature review ☐ Realist review ☐ Scoping review ☐ Cross-sector review ☐ Primary study	
Included number of primary evidence (if review)	☐ Details (specify)	
Search cut of (if review)	☐ Details (specify)	
Weight of evidence rating:	☐ High trustworthiness ☐ Moderate trustworthiness ☐ Low trustworthiness	☐ High relevance ☐ Moderate relevance ☐ Low relevance

Context	
Region/country	☐ Details (specify)
Population	☐ Details (specify)
Professional context	☐ Details (specify)
Nature of the evidence used	☐ Evidence qualifies as research evidence ☐ Evidence is of reliable quality ☐ Evidence is adequately represented in the process of encouraging use
Intervention	
Intervention(s) to increase evidence use	(i) (ii) (iii) (iv) (v)
Mechanisms of increasing evidence use [Each of the listed interventions will be coded for the 7 mechanisms)	Awareness of evidence to inform decision-making (capacity - education, environmental restructuring; opportunity- enablement) Agreement to what constitutes fit-for-purpose evidence (capacity - education, environmental restructuring; opportunity –enablement) ☐ Effective communication and awareness of evidence (capacity, opportunity, motivation – education, training, environmental restructuring) ☐ Effective interaction and relationships between decision-makers and researchers (capacity, opportunity and motivation – training, modelling, environmental restructuring) ☐ Capacity to access and make sense of evidence (capacity - training and modelling, environmental restructuring) ☐ Motivation to use evidence including personal characteristics, norms, contexts, and incentives = motivation (persuasion, incentivisation, coercion, environmental restructuring) ☐ Opportunity to use evidence including contexts, processes and resources (opportunity - enablement, environmental restructuring)

Components of behaviour change [Each of the 7 mechanisms will be coded for the 3 components of behaviour change]	☐ Capability (to chance behaviour, i.e. use evidence during decision-making) ☐ Motivation (to chance behaviour, i.e. use evidence during decision-making) ☐ Opportunity (to chance behaviour, i.e. use evidence during decision-making)
Outcomes results [For each reviewed intervention, broken down per mechanism and CMO where possible]	
Outcomes	
Outcomes [List aggregated outcome categories investigated in the review]	(i) (ii) (iii) (iv)
Outcome measure [List for each outcome category]	
Outcome indicator	

[List for each outcome category]	
Level of analysis [List for each outcome category]	☐ individual ☐ immediate organisational context (such as where people live or work) ☐ broader organisational context (such as local government) ☐ national and international organisations
Findings	
Review findings	Effective interventions: (i) (ii) … Unclear outcome: (i) (ii) … Ineffective interventions: (i) (ii)
Authors' conclusions	
Other	

Appendix I: Critical appraisal tool

Rapid fitness-for-purpose appraisal:

WEIGHT OF EVIDENCE B	Trustworthiness	WEIGHT OF EVIDENCE C	Relevance
1. Consider the precision of the study inclusion and exclusion criteria in the review. Do they cover appropriate parameters to identify the literature as framed by the research question?	☐ High ☐ Moderate ☐ Low ☐ Unclear	1. Consider the relevance of the review's problem definition and its breadths and depths in exploring its objective (eg scope, overlap) to the research question.	☐ High ☐ Moderate ☐ Low ☐ Unclear
2. Consider the scope and implementation of the applied search strategy (eg search sources, terms, and reporting).	☐ High ☐ Moderate ☐ Low ☐ Unclear	2. Consider the nature of the research evidence that is used. In particular, assess: if it is research evidence; if it is of high quality; if it is accurately represented; if there is a risk that poor quality of research might be a cofounder.	☐ High ☐ Moderate ☐ Low ☐ Unclear

3. Consider the application of the critical appraisal tool (where applicable). This includes the design of the tool, its application, and the usage of the critical appraisal findings in the synthesis of the review	☐ High ☐ Moderate ☐ Low ☐ Unclear	3. Consider the relevance of the review's definition of evidence use (eg outcome measures and indicators of use) to the research question.	☐ High ☐ Moderate ☐ Low ☐ Unclear
4. Consider the fitness for purpose and adequacy of the methods of synthesis and synthesis findings. This includes the methodological fitness of the included primary studies (and data) to inform the review's conclusions. Where applicable, it also entails a discussion of the heterogeneity across the included primary studies.	☐ High ☐ Moderate ☐ Low ☐ Unclear	4. Consider the relevance of the context of evidence use (eg user context; organisational context; historic context)	☐ High ☐ Moderate ☐ Low ☐ Unclear
5.Consider the authors' discussion of the limitations to the review as well as potential conflict of interest and whether these have been taken into account during the conduct of the review.	☐ High ☐ Moderate ☐ Low ☐ Unclear	5. Consider whether users' perspectives have been incorporated in the review process.	☐ High ☐ Moderate ☐ Low ☐ Unclear
6. Any other methodological aspects of the review that might undermine confidence in the methods of the review?	State:	6. Any other non-methodological aspects of the review that might undermine the relevance of the review to the research question.	State:

How trustworthy are the reviews' findings given the assessment of its methodological quality?

☐ High

☐ Moderate

☐ Low

Overall score:

How relevant are the review's findings to the research question?

☐ High

☐ Moderate

☐ Low

Overall score:

Appendix J: Interventions and components of behaviour change

Evidence use mechanism	Used in isolation	Used in combination	Considered ☒ C ☒ M ☒ O Assessed ☒ C ☒ M ☒ O ☒ E
M1: Awareness of the need for, and positive attitudes towards, the use of evidence to inform decision-making	2	4+(8) 12	☒ C ☒ M ☒ O ☒ E C: 11 12 12 A: 0 1 1 2
M2: Agreement to what constitutes fit-for-purpose evidence	0	3	☒ C ☒ M ☒ O ☒ E C: 3 3 3 A: 1 1 1 1
M3: Communication and awareness of, and access to, the evidence	9+(2) 11	26+(6) 32	☒ C ☒ M ☒ O ☒ E C: 15 32 40 A: 9 14 11 9
M4: Interaction and relationships between decision-makers and researchers	2	13+(12) 25	☒ C ☒ M ☒ O ☒ E C: 23 23 25 A: 4 9 6 5
M5: Skills in accessing and making sense of evidence	7+(5) 12	16+(15) 31	☒ C ☒ M ☒ O ☒ E C: 40 20 28 A: 15 13 5 7
M6: Structures and processes of decision-making susceptible to evidence use	0+(2) 2	10+(10) 20	☒ C ☒ M ☒ O ☒ E C: 18 19 21 A: 4 5 6 6

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