Journal of Clinical Epidemiology 79 (2016) 120–129

Journal of Clinical Epidemiology

Evidence & Gap Maps: A tool for promoting evidence informed policy and strategic research agendas

Birte Snilstveit[a,*], Martina Vojtkova[b], Ami Bhavsar[a], Jennifer Stevenson[a], Marie Gaarder[c]

[a]*International Initiative for Impact Evaluation (3ie), London International Development Centre, London, UK*
[b]*NatCen, Northampton Square, London, UK*
[c]*Independent Evaluation Group (IEG), World Bank, Washington, DC, USA*

Accepted 6 May 2016; Published online 4 July 2016

Abstract

A range of organizations are engaged in the production of evidence on the effects of health, social, and economic development programs on human welfare outcomes. However, evidence is often scattered around different databases, web sites, and the gray literature and is often presented in inaccessible formats. Lack of overview of the evidence in a specific field can be a barrier to the use of existing research and prevent efficient use of limited resources for new research. Evidence & Gap Maps (EGMs) aim to address these issues and complement existing synthesis and mapping approaches. EGMs are a new addition to the tools available to support evidence-informed policymaking. To provide an accessible resource for researchers, commissioners, and decision makers, EGMs provide thematic collections of evidence structured around a framework which schematically represents the types of interventions and outcomes of relevance to a particular sector. By mapping the existing evidence using this framework, EGMs provide a visual overview of what we know and do not know about the effects of different programs. They make existing evidence available, and by providing links to user-friendly summaries of relevant studies, EGMs can facilitate the use of existing evidence for decision making. They identify key ''gaps'' where little or no evidence from impact evaluations and systematic reviews is available and can be a valuable resource to inform a strategic approach to building the evidence base in a particular sector. The article will introduce readers to the concept and methods of EGMs and present a demonstration of the EGM tool using existing examples.

Keywords: Evidence-informed policy; Evidence synthesis; Systematic review; Impact evaluation; Research prioritization; EGM

1. Introduction

The world is facing major policy challenges across all areas affecting human welfare, including climate change, aging populations, and global poverty. The funding available for implementing policies and programs to address these issues is limited. Therefore, it is important that limited resources are used on programs that work. Good intentions are not enough, and the use of evidence to inform decision making has the potential to improve lives (Chalmers, 2005).

To this end, a range of organizations are engaged in the production and promotion of evidence on the effects of health, social, and economic development programs on human welfare outcomes. Thus, there has been a rapid increase in the publication of high-quality primary studies and systematic reviews of effects across a range of sectors, including public health, education, crime and justice, social welfare, environmental management, and international development [1].

The increasing evidence base also presents challenges, however. Studies of effects and systematic reviews of such studies are scattered across different journals, libraries, and web sites. They are often presented in inaccessible formats and are of variable quality. This can mean missed opportunities for the best available evidence to inform decisions about policies and practice. It also risks a waste of limited resources for research if new studies are not informed by the existing literature [2].

Evidence & Gap Maps (EGMs) present a new tool for addressing some of these challenges, complementing existing approaches in the family of systematic approaches to reviewing evidence [3]. This article provides an overview of the concept and methods of EGMs. The next section will introduce readers to the concept of EGMs. This is followed by sections outlining how EGMs can be used to inform

Funding: The work was supported by the International Initiative for Impact Evaluation (3ie).

* Corresponding author. 36 Gordon Square, London WC1H 0PD, UK. Tel.: 0044(0)2079588352.
E-mail address: bsnilstveit@3ieimpact.org (B. Snilstveit).

http://dx.doi.org/10.1016/j.jclinepi.2016.05.015
0895-4356/

What is new?

- Evidence & Gap Maps (EGMs) provide an innovative and visual approach to establishing what we know and do not know about effects of interventions in a thematic area.
- Evidence & Gap Maps can support evidence-informed decision-making by making evidence from existing systematic reviews available in a user-friendly format.
- EGMs can be a tool for research prioritization and strategic research commissioning by quickly identifying existing evidence gaps.
- Researchers and commissioners should consider using EGMs to identify ''absolute evidence gaps'' and areas with potential for evidence synthesis.

policymaking and research agenda setting, respectively. Section 5 outlines the methods for conducting EGMs, and Section 6 compares EGMs to existing synthesis and mapping approaches. The final section concludes.

2. What are EGMs?

EGMs provide an innovative approach to making high-quality evidence available to users and to support strategic conduct and commissioning of new research. They are thematic collections of evidence on effects structured around a framework which schematically represents the types of interventions and outcomes of relevance to a particular sector or thematic area. By doing so, they consolidate what we know and do not know about effects in a particular area.

A key feature of EGMs is that they provide a visual display of evidence from systematic reviews and impact evaluations in a given sector or thematic area structured around a framework (matrix) of key interventions and outcomes. Fig. 1 provides a graphic illustration of an EGM on Water, Sanitation and Hygiene interventions [4], produced using a new interactive Web-based platform. The rows of the framework list the interventions included in the map, whereas the columns list relevant outcomes structured along the causal chain, from intermediate outcomes to final outcomes.

Taken together, the framework sets the parameters of the interventions and outcomes covered by the EGM. The bubbles in the map represent studies, with the size of the bubble indicating the relative number of studies. The gray bubbles represent primary studies, whereas the colored bubbles are systematic reviews. The colors indicate the confidence in findings from the review based on an adapted version of the SURE checklist [5] (Snilstveit, 2014). This allows users to explore the quantity and quality of existing studies and access summaries of included studies.

The use of visualization to present complex information is increasingly promoted as a useful tool for research translation [6–9]. The evidence gap map methodology thus forms part of a broader movement exploring different research translation tools that can promote greater user

Fig. 1. EGM graphic. EGM, Evidence & Gap Maps.

access and usability of existing evidence. Like the Evidence-Based Policing Matrix [7], the EGM has been designed with the assumption that translation tools covering a range of policy problems and solutions may be more useful to decision makers than databases of studies or reviews outlining specific interventions that are effective or ineffective. The visual matrix of interventions and outcomes along the causal chain allows a unique categorization of available impact evaluation and systematic review evidence, allowing the user to identify new insights about the breadth and quality of the available evidence and what areas present demand for more high-quality research.

The methods for conducting EGMs draw on the principles and methodologies used in existing evidence mapping and synthesis approaches. Fig. 2 provides an overview of the main steps of an EGM. As can be seen from the figure, EGMs have six main steps, from developing scope, setting inclusion criteria, systematic searching, data extraction, and analysis/visualization. We elaborate on each step in a later section.

EGMs can serve different purposes, which can be broadly separated into two categories: (1) facilitating evidence-informed decision making by making evidence available and presenting it in an accessible format; and (2) facilitating strategic use of scarce research funding by identifying key ''gaps'' in the available evidence where future research should be focused. We discuss these in more detail in the following sections.

3. Why EGMs?: supporting evidence-informed policymaking

The rationale for systematic reviews is that intervening in people's lives without considering the best available evidence risks wasting opportunities and doing harm [2]. However, in many fields, the increase in production of systematic reviews run the risks of creating many of the same problems systematic reviews were designed to address.

First, although major systematic review organizations like the Cochrane and Campbell Collaborations provide libraries of high-quality systematic reviews organized by topic area, most systematic reviews are published in different journals and web sites without a central repository. This makes it difficult for decision makers to easily access all available systematic reviews relevant to a particular policy area.

Second, not all systematic reviews are created equal [10]. The variability in quality often observed for primary studies also applies to systematic reviews. For instance, an EGM on the effects of productive safety nets on extreme poverty in low- and middle-income countries identified 18 existing systematic reviews. However, when appraising the quality of these reviews, the researchers identified major issues with eight of these reviews and important limitations in seven, with only three reviews given a rating of high confidence in the findings [11]. Finally, systematic reviews are often published in inaccessible formats. Reports are typically written in technical language and run into hundreds of pages. This can

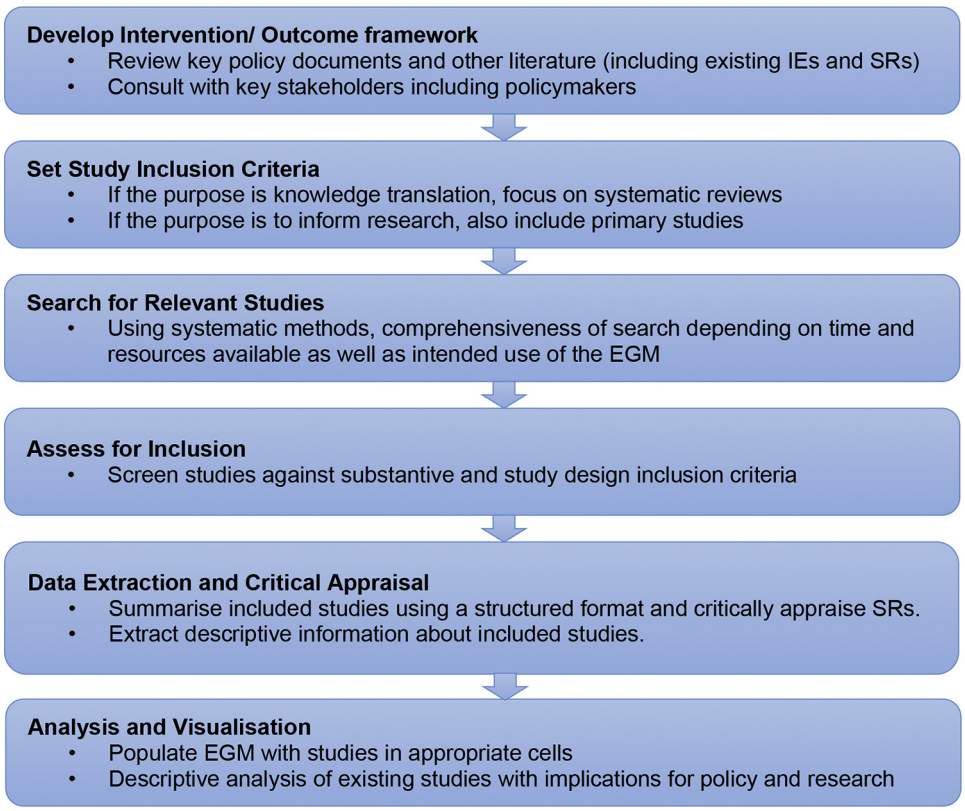


Fig. 2. Summary of methods. IEs, impact evaluations; SRs, systematic reviews.

make it difficult for a nonspecialist audience to distil key findings and identify implication for policy and practice.

EGMs aim to address these issues by providing an accessible overview of systematic reviews in a thematic area. All included reviews are critically appraised and summarized in plain language, with free access to these summaries. Users can explore the findings of different studies and to make an informed judgment about how to interpret the findings from these systematic reviews in light of the result of the critical appraisal. Bringing together the evidence from systematic reviews of different interventions in this way can also allow users to assess the comparative effects of different interventions (cf: [7]) quickly and efficiently. Finally, policy processes move fast and decision makers do not always have time to wait for new systematic reviews to be completed. EGMs can be conducted relatively quickly to identify the most up to date, high-quality systematic reviews and ensure that the best existing evidence is available when decision makers need it. An example of this is an EGM of systematic reviews of primary and secondary education programs in L&MICs [12] (see Box 1). It was conducted as part of a large-scale systematic review looking at the comparative effects of different interventions. The EGM was produced and made publicly available in less than 6 months, whereas the review was still underway. In this way, it allowed users to access the best existing evidence before the systematic review was completed.

4. Why EGMs?: funding research that matters

Despite an increase in funding for research on intervention effects in recent years, resources fall short of what is required to close important evidence gaps. It is therefore important to ensure that funding goes to studies that matter. This means studies should address important evidence gaps and be informed by existing research [2]. EGMs can help address this in several ways.

EGMs provide a visual representation of evidence gaps where new primary studies or systematic reviews can add most value. They highlight "absolute gaps" where there are few or no studies, and where primary studies could be targeted. It should be noted that the existence of a few primary studies in a field does not mean that doing another one in this field is less "worthy" than doing one in a field where there are none—rather, they would serve slightly different purposes. Carrying out a few more studies in a field where some already exist may get us to a level of evidence where greater generalizations are possible through systematic reviews. On the other hand, carrying out the first study in a virgin evidence field will have very limited external validity but may open development practitioners' and researchers' eyes to entirely new questions and insights.

Identifying the type of evidence gaps that exist might be of particular relevance for funders of impact evaluations who want to target their funding toward important evidence gaps and evidence needs. For instance, institutions involved in program financing, such as international development organizations, can overlay an EGM of the existing evidence on a map of ongoing and planned projects in the sector or subsector in question. An inventory of such projects will help determine which priority research questions can be investigated in the short to medium term [15].

EGMs can also help identify "synthesis gaps" where systematic reviews can add particular value. Many systematic reviews fail to provide policy-relevant findings due to a lack of primary evidence. Although highlighting the lack of evidence is an important finding in itself, it can be discouraging if substantial time and resources have been invested in a review. EGMs can help mitigate this issue by identifying areas with substantial unsynthesized primary evidence. Because EGMs map the availability and quality of existing evidence syntheses, they can also highlight areas with systematic reviews of low quality or with sufficient new evidence to warrant an update of an existing review.

EGMs identify broad trends in a particular area of research and highlight key shortcomings in the existing evidence base. For example, the heterogeneity of outcome measures used in primary studies can be a barrier to evidence synthesis. Because EGMs include a survey of outcome measures, they can make it easier for researchers to select outcome measures commonly used in the literature. Similarly, existing studies may fail to assess policy-relevant outcomes or exclude important population groups. For instance, an EGM on productive safety nets maps poverty found that although many of the included interventions focus on poverty reduction, few existing studies actually measure poverty outcomes (Vojtkova et al., 2015). Moreover, the few studies that did present findings on poverty typically failed to define this appropriately. By highlighting such trends in evidence production, EGMs can help identify how future studies can add most value.

Finally, EGMs can highlight a range of issues related to the quantity, quality, and characteristics of the existing evidence base. In doing so, they can inform a strategic approach to building the evidence base on a particular issue. By identifying areas of high policy relevance where evidence is lacking, they can feed into setting research priorities and ensure limited resources are used to address important evidence gaps. An example of this is the EGM on Water, Sanitation and Hygiene interventions cited previously, which is being used by the Independent Evaluation group of the World Bank to prioritize evaluation questions in its upcoming evaluation of the World Bank Group's support to Water and Sanitation and by 3ie to inform decisions on where to prioritize the production of new evidence.

5. Methods for conducting EGMs

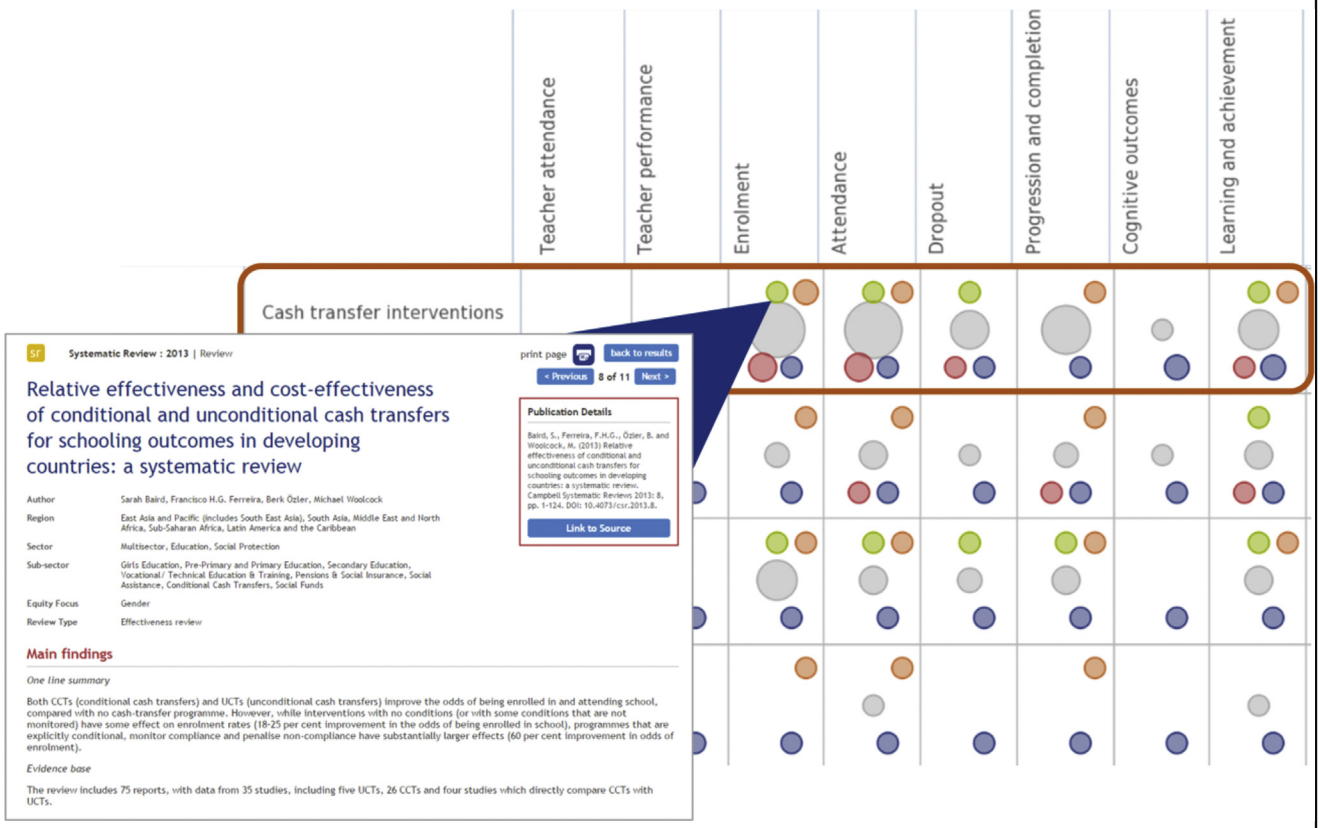
The methods for conducting draw on the principles and methodologies adopted in existing evidence mapping and synthesis approaches. Fig. 2 summarizes the main steps for conducting an EGM, as outlined in more detail in the following.

Box 1 Supporting evidence-informed policymaking

EGM providing access to evidence on Primary and Secondary Education interventions

An interactive EGM of Primary and Secondary Education interventions in low- and middle-income countries provides access to user-friendly summaries of 18 published systematic reviews [12]. The reviews cover a range of interventions, from cash transfers to deworming of school children. In the following, we summarize the findings from high-quality systematic reviews identified by the map and a snapshot of the interactive EGM where users can explore these findings.

- Conditional cash transfers [13]: Both conditional cash transfers and unconditional cash transfers improve the odds of children being enrolled in and attending school. However, programs that are explicitly conditional have larger effects than those that are not conditional or do not monitor the enforcement of conditions.
- Deworming [14]: Regular deworming treatments for school children in areas where intestinal worms are common are unlikely to have an impact on school performance or measures of cognition. The evidence on whether it affects student school attendance is unclear and generally poor.
- School feeding [Kristjansson et al. (2009)]: Studies of school feeding programs, where children were fed meals or snacks at school, found that beneficiary children attended school more frequently, and achieved better results for Maths achievement and short-term cognitive tasks.



5.1. Develop intervention/outcome framework

The first step in producing an EGM is to develop an intervention/outcome framework for the substantive scope of the map. It is important because it establishes the universe of relevant interventions and outcomes and therefore allows users to identify and prioritize evidence gaps. The framework should be developed based on a review of key policy and academic literature, including existing intervention/outcome typologies.

To ensure the relevance and acceptability of the framework this initial step should involve consultation with key stakeholders, such as academic experts, policy makers,

practitioners, and funders. The rows of the framework lists relevant interventions, whereas the columns include policy-relevant outcomes structured along the causal chain, from intermediate outcomes to final outcomes and cost-effectiveness.

5.2. Setting study inclusion criteria

The substantive inclusion criteria for the map are primarily drawn from the framework, although depending on research objectives there may be additional population-based inclusion criteria. For instance, 3ie's EGMs are typically limited to studies from low- and middle-income countries. EGMs are concerned with identifying evidence on intervention effects and are therefore restricted to primary studies which allow for causal inference of the effects of interventions on specific outcomes and/or systematic reviews of such studies.

There are two main options for inclusion restrictions depending on the main purpose of the gap map. If the main purpose is to provide a resource for decision makers, EGMs should rely on systematic reviews that critically appraise and synthesize all the available evidence on a particular intervention (Grimshaw et al., 2012). (Nevertheless, we recognize that systematic reviews, and by extension, systematic review gap maps may not always provide evidence on the circumstances under which an intervention may work. Therefore, combining evidence from a gap map with local evidence, including impact evaluations, may be useful [16].) Although single studies can be useful for informing policy in particular contexts, they should not serve as a basis for making generalized conclusions about effects without being interpreted in the context of the available global evidence [2] (Grimshaw et al. 2012). If the main purpose is to identify gaps in the existing evidence base to inform research agendas for new primary research and evidence synthesis, EGMs should include both systematic reviews and primary studies. If time and resources allow, EGMs should include both primary studies and systematic reviews. However, EGMs that only include systematic reviews can be conducted rapidly and if the main objective is to inform an imminent policy decision, focusing only on systematic reviews can address this objective, with primary studies added later on.

5.3. Searching for relevant studies and assessing inclusion

The search strategy should be systematic and comprehensive but also needs to be manageable. One of the benefits of EGMs is that they can be done relatively quickly, so there is a need to strike a balance between an exhaustive and feasible search. The comprehensiveness of the search effort depends on the intended use of the gap map, as well as the time and resources available. Systematic reviews are the appropriate units for informing policy (Grimshaw et al., 2012), and EGMs should aim to design a search strategy sufficiently sensitive to identify all relevant existing systematic reviews meeting the substantive inclusion criteria. However, the purpose of mapping primary studies is primarily to inform future research by identifying the size and characteristics of the evidence base. Authors may therefore consider a more basic search strategy for such studies, as the additional resources required for the highly sensitive search strategy may not be justified [17].

Existing approaches to evidence scoping, mapping, and synthesis include a number of techniques to reduce the resource intensity of the search process while maximizing yields [17–19]. EGMs aim to provide a rapid mapping approach and authors should consider methods typically applied for Rapid Reviews, such as only searching English language literature, covering a limited time period, using specific search strings [17] (EGMs share similarities with the evidence maps produced by the Global Evidence Mapping Initiative [20]. The focus of these evidence maps is to describe the quality, design, and characteristics of research in broad topic areas. In preparing the evidence maps, the authors found that using highly sensitive searches with low precision proved unmanageable. Hence, information specialists developed search strings using specific search terms and terms frequently used as keywords in relevant papers and compared this with a highly sensitive search string typically used for systematic reviews [17]. The latter returned significantly more references, but the basic search strategy did not miss any references of significance and the authors conclude ''results indicate that the EM search method is unlikely to miss the key articles necessary for decision making'' (p. 159). The time and resource savings were significant for the more basic search strategy, and the authors suggest the additional resources required for the highly sensitive search strategy not justified for the evidence map.) and applying a restriction on publication status [18,19]. Other techniques that can increase the efficiency of the search include focusing on key repositories of impact evaluations (In international development, these include 3ie's Database of Impact Evaluations, J-PAL, the Cochrane Register of Trials. In education, this includes What works clearinghouse.) and systematic reviews. (Including the Campbell Library, the Cochrane Library, the Environmental Evidence Library, the Database of Abstracts of Reviews of Effects [DARE], R4D, Heathsystemsevidence.org, Healthevidence.org, and the 3ie database of systematic reviews.) Many of these databases are based on regular searches of academic databases and web sites or are hosted by providers of research so regularly updated with new output.

Authors should supplement searches with subject-specific searches in academic databases and relevant web sites. Other techniques such as snowballing (Snowballing refers to tracking back and pursuing references of relevant articles from both primary studies and reviews to increase the body of evidence [21].), citation tracking [1], and use of listservs can be highly effective ways to identify relevant

literature. Finally, text-mining technology has been adopted in other large-scale mapping projects, reducing the time and workload of identifying studies for inclusion [22,23]. Although text mining has yet to be broadly implemented in reviews in the social sciences [24], the technology has great potential for use in mapping exercises like EGMs. Screening of studies for inclusion in an EGM follows a similar approach to what is adopted in systematic reviews. References are downloaded into reference management software and systematically assessed against inclusion criteria.

5.4. Data extraction, user-friendly summaries, and critical appraisal

EGMs do not provide any synthesis of findings of included studies, and data extraction is therefore relatively limited, focused on extracting descriptive information from included primary studies and systematic reviews. This is done using a structured coding tool including details about the interventions and outcomes covered in the framework, definition of outcome measures, type of study, study population, geographical scope, and other information that may be relevant for a particular project.

A key feature of 3ie EGMs is that they provide direct access to user-friendly summaries of included studies, together with a critical appraisal of all systematic reviews included in the map. We use the same format as the summaries we produce for our online evidence databases (3ie hosts two databases of evidence on the effects of social and economic development interventions in low- and middle-income countries. The Impact Evaluation Repository is an index of all published impact evaluations of development interventions and the 3ie database of systematic reviews includes systematic reviews of the effects of development interventions. Both databases contain a publication records with a structured study summary and links to full-text articles. The databases are open access and available from http://www.3ieimpact.org/en/evidence.), including information about background, methods, and main findings of studies. The graphical display of the EGM then provides links to these summaries in pop-up boxes in the relevant intervention/outcomes intersection in the EGM tool, as demonstrated in Box 1 previously. Researchers may also consider developing summary of findings tables for all included systematic reviews [25] as a way of making findings more user friendly, although this will add to the time and resources required for a project.

We provide critical appraisal of included systematic reviews, but not primary studies. The resources required for appraising hundreds of primary studies would defeat the purpose of EGMs to be a rapid and affordable approach to gathering evidence. As the inclusion and mapping of existing primary studies is primarily to identify gaps in the literature, rather than for informing policy decisions, we do not consider the critical appraisal of such studies to be essential.

For the critical appraisal of systematic reviews, we use a standardized critical appraisal tool (adapted from [5]; available in Snilstveit et al., 2014), giving reviews an overall rating of high, medium, or low confidence in findings. This appraisal assesses the quality of the methods used by the systematic review rather than the quality of the studies in the review. The appraisal is conducted by two people, with a final review by a third researcher with expertise in systematic reviews. In the interactive EGM tool, the results of the appraisal are displayed using traffic light color coding to indicate the overall rating of the systematic review so that users can visually assess the quality of systematic reviews in the field.

5.5. Analysis and visualization

The analysis of studies included in an EGM is primarily descriptive, without any formal synthesis of the findings of included studies. The studies are mapped onto the framework matrix according to the interventions and outcomes covered in each study. Studies may be repeated in several places in the map if they cover several interventions or outcomes. By mapping existing studies in this way, the EGMs provide a visual overview of areas with few or no studies and areas with sufficient primary studies for evidence synthesis. Systematic reviews are displayed in red, orange, or green to indicate study quality, and this gives users an easy overview of the quality of existing syntheses. The interactive platform also allows users to filter the studies according to study design, geographical location, and population.

A summary report with implications for policy and future research can add significant value to the EGM. The report should describe the EGM methodology as well as main findings in terms of the size and characteristics of the available evidence, highlighting important evidence gaps and trends identified in the research literature. The report can also usefully summarize the findings from systematic reviews considered of sufficient quality for informing policy [26].

6. What do EGMs add to existing synthesis and mapping approaches?

The 3ie EGM is a recent addition to the range of different approaches to evidence scoping, mapping, and synthesis. These range from scoping studies [27], evidence maps (Hetrick et al., 2010), the evidence-based policing matrix (Lum et al., 2012), systematic reviews [28], overview of reviews [26], and rapid reviews/evidence assessments [19,29]. Table 1 provides a comparison of EGMs and other scoping and mapping methodologies according to a number of key characteristics. As can be seen from the table, their methodologies differ across a range of dimensions, from their aim, scope, type of evidence included, as well as the comprehensiveness of search, data extraction, and analysis (In developing Table 1, we attempted to locate key references for the various types of evidence mapping/

Table 1. Comparison of EGMs and other scoping/mapping approaches

Methodology	Theme/ sector focus	Included evidence			Systematic search	Critical appraisal	Analysis	Intervention-outcome framework visualization	Access to user-friendly summaries
		SRs	IEs[a]	Other					
3ie EGM [30]	Yes	Yes	Yes	No	Yes	Yes (SRs only)	Descriptive	Yes	Yes
Evidence-based policing matrix [7]	Yes	No	Yes	No	Yes	Yes (primary studies)	Visual display of primary studies	For one outcome[b]	Yes
Evidence map (GEM, Headspace) [17,20]; http://www.evidencemap.org	Yes	Yes	Yes	Yes	Yes	No	Descriptive	No	Yes
Scoping study [27,31–34]	Yes	Can do	Can do	Can do	May be limited	No	Descriptive	No	No
Systematic map [35–37]	Yes	Can do	Can do	Can do	Yes	Limited	Descriptive	No	No
Rapid evidence assessment [18,19,29]	No	Can do	Yes	Can do	Yes (but may be limited)	Limited	Synthesis of study findings	No	No
Systematic reviews [1,16,28,38,39]	No	No	Yes	Can do	Yes	Yes (primary studies)	Synthesis of study findings	No	Can do
Overviews of systematic reviews [26]	No	Yes	No	No	Yes	Yes (SRs only)	Yes (c)	No	No

Abbreviations: EGM, Evidence & Gap Maps; SRs, systematic reviews; IEs, impact evaluations.

[a] Impact evaluations: used to describe primary studies using counterfactual analysis to attribute changes in an outcome to a specific intervention. Such studies include both randomized and nonrandomized studies.

[b] The evidence-based policing matrix includes a visualization of the existing evidence in a matrix based on three key dimensions of crime prevention interventions. The number of studies, as well as direction of effects, is also displayed in the matrix.

synthesis products, but in practice, there are overlaps and the labels included in our typology are not consistently applied by all authors.).

For instance, evidence maps, scoping studies, and systematic maps tend to have a broad scope and are primarily focused on identifying and describing the characteristics of the evidence base [31,35,40]. Although in some cases they may provide summaries of the included studies, the analysis is typically descriptive and limited in depth. On the other hand, rapid reviews/evidence assessments, systematic reviews, and overviews of reviews have a more narrow scope, focusing on a particular intervention or outcome, but with greater depth of analysis and knowledge translation potential (Gannann et al., 2009; [26,28]).

The 3ie EGM draws on the principles and methodologies adopted in existing evidence mapping and synthesis products. For instance, by focusing on a sector or subsector, they have a broad substantive scope similar to evidence maps, scoping studies, and systematic maps. However, they focus on studies assessing intervention effects, as well as systematic reviews of such studies, whereas other mapping/scoping approaches typically include a broader range of evidence to address questions other than those of intervention effectiveness [31,35].

Most other mapping/scoping approaches are generally not intended to provide inputs to policy and practice [33] but rather focus on mapping the existing evidence [20,31,35], with the purpose of identifying research gaps and specific research questions. EGMs are developed to both identify research gaps and to provide a (rapid) resource for informing policy and practice.

The Evidence-Based Policing Matrix developed by Cynthia Lum and colleagues (2011) is the methodology with most similarities to EGMs. It is the only other evidence product we are aware of that combines a graphical visualization of the evidence according to a policy-relevant framework and provides users with direct links to user-friendly summaries of included studies. However, the matrix only includes primary studies, whereas evidence and gap maps also include systematic reviews. Finally, the Evidence-Based Policing Matrix has a more narrow focus on one outcome, rather than a set of outcomes.

3ie EGMs are unique in that they bring together the following key features: (1) a broad scope typically focusing on a sector or subsector rather; (2) focus on primary studies and systematic reviews of intervention effects; (3) visualization of the existing evidence using a framework of interventions and outcomes (using a theory-based approach with a focus on outcomes along the causal chain); (4) review and critical appraisal of systematic review evidence, visually displayed in the map; (5) links to a database with summaries of systematic reviews and impact evaluations.

7. Conclusion

EGMs represent one of a multitude of tools and sources of information to aid decision making for policy and practice. They are not a cheap alternative to new primary studies or systematic reviews and serve a different purpose from such studies. EGMs can be used as a tool for informing policy by making systematic review evidence more readily available to users in ready packaged collections. But for them to be used as such they rely on the availability of high-quality systematic reviews. They can also inform future research and ensure funding goes to studies that matter. By highlighting ''absolute gaps'' and ''synthesis gaps,'' they can assist researchers and commissioners in adopting a strategic approach to closing the evidence gap. Our aim is to produce EGMs across a broad range of sectors and subsectors to make the best available evidence accessible to decision makers and ensure limited resources for research are used on studies that matter!

Acknowledgments

The authors thank Annette Brown, Claire Allen, Dafni Skalidou, Hugh Waddington, Howard White, Phil Davies, and Peter Tugwell for comments on previous drafts of this article. The authors are also grateful for the feedback from the anonymous peer reviewer. All errors are the responsibility of the authors.

References

[1] White H, Waddington H. Why do we care about evidence synthesis? An introduction to the special issue. J Dev Effect 2012;4:359−87.
[2] Ioannidis JP. Evolution and translation of research findings: from bench to where? PLoS Clin Trials 2006;1(7):e36.
[3] Moher D, Stewart L, Shekelle P. All in the family: systematic reviews, rapid reviews, scoping reviews, realist reviews, and more. Syst Rev 2015;4:183.
[4] Waddington H, et al. 3ie Evidence Gap Map. London: International Initiative for Impact Evaluation; 2015. Available at http://gapmaps.3ieimpact.org/evidence-maps/water-sanitation-and-hygiene-evidence-gap-map. Accessed July 28, 2016.
[5] The SURE Collaboration. SURE checklist for making judgements about how much confidence to place in a systematic review. In: SURE guides for preparing and using policy briefs. Version 2.1. updated November 2011. Sure Collaboration, Available at www.evipnet.org/sure. Accessed September 28, 2016.
[6] Greenhalgh T, Howick J, Maskrey N. Evidence based medicine: a movement in crisis? BMJ 2014;348:3725.
[7] Lum C, Koper CS, Telep CW. The evidence-based policing matrix. J Exp Criminology 2011;7:3−26.
[8] McCandless D. Information is Beautiful. London: Collins; 2009.
[9] Rosling H, Zhang Z. Health advocacy with Gapminder animated statistics. J Epidemiol Glob Health 2011;1:11−4.
[10] Schlossera RW, Wendt O, Sigafoos J. Not all systematic reviews are created equal: considerations for appraisal. Evid Based Commun Assess Interv 2007;1:138−50.
[11] Vojtkova M, Stevenson J, Verboom B, Prasannakumar Y, Snilstveit B. Productive Safety Nets Evidence Gap Map, 3ie Evidence Gap Map. London: International Initiative for Impact Evaluation; 2014. Available at http://gapmaps.3ieimpact.org/evidence-maps/productive-safety-nets-gap-map-all-populations. Accessed July 28, 2016.
[12] Snilstveit B, Stevenson J, Philips D, Gallagher E. Primary and Secondary Education Evidence Gap Map, 3ie Evidence Gap Map. London: International Initiative for Impact Evaluation; 2015. Available at http://gapmaps.3ieimpact.org/evidence-maps/primary-and-secondary-education-evidence-gap-map. Accessed July 28, 2016.
[13] Baird S, Ferreira FHG, Özler B, Woolcock M. Relative effectiveness of conditional and unconditional cash transfers for schooling outcomes in developing countries: a systematic review. Campbell Syst Rev 2013;8. http://dx.doi.org/10.4073/csr.2013.8.
[14] Taylor-Robinson DC, Maayan N, Soares-Weiser K, Donegan S, Garner P. Deworming drugs for soil-transmitted intestinal worms in children: effects on nutritional indicators, haemoglobin, and school performance. Cochrane Database Syst Rev 2015;1−157.
[15] Tanner J, et al. Delivering the millennium development goals to reduce maternal and child mortality: a systematic review of impact evaluation evidence. Washington D.C: Independent Evaluation Group (IEG), World Bank; 2013.
[16] Lavis JN. How can we support the use of Systematic Reviews in policymaking? PLoS Med 2009;6:e1000141. http://dx.doi.org/10.1371/journal.pmed.1000141.
[17] Parkhill AF, Clavisi O, Pattuwage L, Chau M, Turner T, Bragge P, et al. Searches for evidence mapping: effective, shorter, cheaper. J Med Libr Assoc 2011;99:157−60.
[18] Khangura S, Konnyu K, Cushman R, Grimshaw J, Moher D. Evidence summaries: the evolution of a rapid review approach. Syst Rev 2012;1(10):1−9.
[19] The UK Civil Service. Government Social Research REA Toolkit 2008 [online] 2008. Available at http://www.civilservice.gov.uk/networks/gsr/resources-and-guidance/rapid-evidence-assessment/what-is. Accessed July 17, 2013.
[20] Bragge P, Clavisi O, Turner T, Tavender E, Collie A, Gruen R. The Global Evidence Mapping Initiative: scoping research in broad topic areas. BMC Med Res Methodol 2011;11:92.
[21] Greenhalgh T, Peacock R. Effectiveness and efficiency of search methods in systematic reviews of complex evidence: audit of primary sources. BMJ 2005;331:1064−5.
[22] O'Mara-Eves A, Thomas J, McNaught J, Miwa M, Ananiadou S. Using text mining for study identification in systematic reviews: a systematic review of current approaches. Syst Rev 2015;4:59.
[23] Shemilt I, Simon A, Hollands GJ, Marteau TM, Ogilvie D, O'Mara-Eves A, et al. Pinpointing needles in giant haystacks: use of text mining to reduce impractical screening workload in extremely large scoping reviews. Res Synth Methods 2015;5:31−49.
[24] Thomas J. Diffusion of innovation in systematic review methodology: why is study selection not yet assisted by automation? OA Evid Based Med 2013;1(2):1−6.
[25] Schünemann HJ, Oxman AD, Higgins JPT, Vist GE, Glasziou P, Guyatt GH. Chapter 11. updated March 2011. In: Higgins JPT, Green S, editors. Cochrane Handbook for Systematic Reviews of Interventions Version 5.1.0. The Cochrane Collaboration; 2011. Available at www.cochrane-handbook.org. Accessed July 28, 2016.
[26] Becker LA, Oxman AD. 'Overviews of reviews', Chapter 22. updated March 2011. In: Higgins JPT, Green S, editors. Cochrane Handbook for Systematic Reviews of Interventions Version 5.1.0. The Cochrane Collaboration; 2011. Available at www.cochrane-handbook.org. Accessed July 28, 2016.
[27] Anderson S, Allen P, Peckham S, Goodwin N. Asking the right questions: scoping studies in the commissioning of research on the organisation and delivery of health services. Health Res Policy Syst 2008;6(7):1−12.
[28] Cooper H, Hedges LV, Valentine JC. The handbook of research synthesis and meta-analysis. New York: Russell Sage Foundation; 2009.

[29] Ganann R, Ciliska D, Thomas H. Expediting systematic reviews: methods and implications of rapid reviews. Implement Sci 2010;5:1−10.

[30] Gaarder M. Evidence on links in the causal chain: agriculture, nutrition and health. Delhi: International Initiative for Impact Evaluation; 2010.

[31] Arksey H, O'Malley L. Scoping studies: towards a methodological framework. Int J Soc Res Methodol 2005;8:19−32.

[32] Davis K, Drey N, Gould D. What are scoping studies? A review of the nursing literature. Int J Nurs Stud 2009;46:1386−400.

[33] Grant MJ, Booth A. A typology of reviews: an analysis of 14 review types and associated methodologies. Health Info Libr J 2009;26:91−108.

[34] Levac D, Colquhoun H, O'Brien KK. Scoping studies: advancing the methodology. Implementation Sci 2010;5:1−9.

[35] Bates S, Clapton J, Coren E. Systematic maps to support evidence base in social care. Evid Policy 2007;3:539−51.

[36] Bates S, Rutter D. Developing the process of systematic mapping-the social welfare literature. SCIE, London; 2008. Available at http://www.campbellcollaboration.org/artman2/uploads/1/SocialWelfare_Rutter.pdf. Accessed July 28, 2016.

[37] Oakley A, Gough D, Oliver S, James T. The politics of evidence and methodology: lessons from the EPPI-Centre. Evid Policy 2005;1:5−31.

[38] Chandler J, Churchill R, Higgins J, Lasserson T, Tovey D. Methodological Expectations of Cochrane Intervention Reviews (MECIR): Methodological standards for the conduct of new Cochrane Intervention Reviews, Version 2.2 2011. Available at http://www.editorial-unit.cochrane.org/sites/editorial-unit.cochrane.org/files/uploads/MECIR_conduct_standards%202.2%2017122012_0.pdf. Accessed July 17, 2013.

[39] Higgins JPT, Green S, editors. Cochrane Handbook for Systematic Reviews of Interventions Version 5.1.0. The Cochrane Collaboration; 2011. updated March 2011. Available at. www.cochrane-handbook.org Accessed July 28, 2016.

[40] Gough D, Thomas J. 'Commonality and diversity in reviews', Chapter 3. In: Gough D, Oliver S, Thomas J, editors. An introduction to Systematic Reviews. London: Sage; 2012.