Identification and appraisal of methods and approaches used in the development and production of Evidence and Gap Maps (EGM)

Protocol of an Evidence and Gap Map (EGM)

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1 | BACKGROUND

1.1 | Introduction

1.1.1| The problem, condition or issue

The amount of published research in any research domain, for example health research, is substantial[1]. The sheer volume available is an overwhelming obstacle to finding, accessing, navigating and making sense of the evidence base on any particular issue. This is an impediment to multiple stakeholders who want to efficiently develop the evidence base or use and benefit from effective interventions within it.

The lack of clarity on the state of the evidence results in funders putting ultimately limited resources into reproducing already available evidence and contributing to research waste[2] as well as researchers not focusing their work on deficiencies or gaps in knowledge in the evidence base. If evidence is not accessible it cannot be utilised effectively by a range of stakeholders who want to easily access and be aware of what the evidence informs is effective to support decision making about care planning and treatment choices. These people include policy makers, who aim to translate the knowledge in the evidence base into practice as well as clinicians, service providers, service users and their families.

This makes the task of meaningfully collating evidence on a particular topic, sector, subsector or domain extremely useful. Relatively new methodological practices such as scoping reviews and evidence mapping are available to support this[3-5].

Evidence mapping is a type of evidence synthesis[6] that implicitly aims to ensure that knowledge of the available evidence is accessible to end users. With the earliest example dating back to 2003[3], the practice has an important role to play in identifying and highlighting existing research available in a certain area[4], as the foundation for other, more focused syntheses[3], in informing and directing the focus of future research[6], in adding to debates and decisions on specific issues[7], and in evidence informed policy making [3,6-9[check if 2]].

A range of different approaches, methods and products have been developed for evidence mapping in recent years[4]. In comparison with scoping views, for which the guidance and reporting standards[10-16] and exemplar reviews on methodological matters[17-19] show that what is considered a scoping review is relatively standardized, more work is still needed to better standardize the methods and products of evidence mapping or an evidence map.

Confusingly, the term ‘evidence map’ can be, and is, used interchangeably to refer to both the process, of evidence mapping and many of the products of an evidence mapping process. Regarding the

process, what constitutes an 'evidence map' includes a systematic search that is broad, in scope, as well as the aim to identify gaps in knowledge and/or future research needs[11] and the presentation of the results in a user-friendly format[1,12]. There is much diversity in the type and from of the products of evidence mapping. These are known by many different names including an 'evidence map', an 'evidence and gap map' (EGM) and a 'systematic map'. They often include a visual figure or graph, or a searchable database[1,12]. It is unlikely that these mapping products will converge into a single product, because of the variety of objectives of different mapping reviews and the various needs of maps users. Therefore developments in the methods of evidence mapping need to occur in relation to each mapping product.

At this time, work to further develop EGM methods is needed, so that they are increasingly robust and so that stakeholders can be sure in what to expect from this form of evidence map. This work includes reviewing the characteristics of EGMs to inform where development is needed, which may also inform changes in processes of producing other evidence maps products more widely.

1.1.2 | The intervention

Evidence and Gap Maps, or Evidence Gap Maps (EGMs) are one example of an emerging evidence mapping product. The first time an evidence map was labelled an 'Evidence Gap Map' (EGM) was in 2010; it had a focus on the health and nutritional impact of agricultural interventions[4,20]. Since then an increasing number of products called EGMs have been produced. They are known to present the entire evidence base of a particular domain in a systematic, visual manner and in a number of formats. For example, with a 2-dimensonal framework, such as the map in Figure 1a. Another known format is as a bubble plot, as in the case of the map shown in Figure 1b.

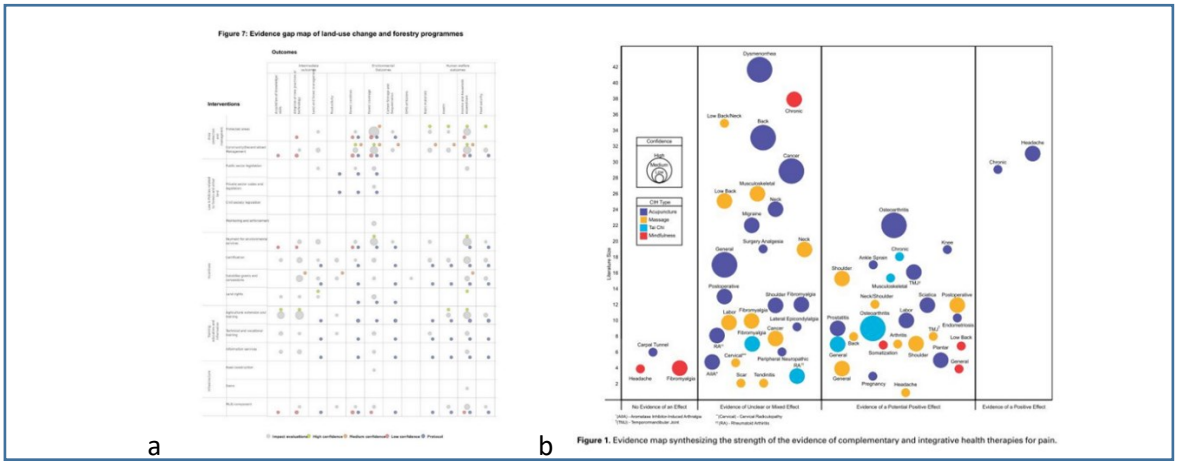

Figure 1 details figure 1.a: A 2-dimensonal framework visualising the results of a mapping review produced by Snilstveit et al (2016)[21] Figure 1.b: A bubble plot visualising the results of a mapping review produced by Giannitrapani et al (2019)[22]

EGMs enable vast amounts of information of evidence to be collated together across a number of research areas. This means they are an important instrument in increasing the breadth of evidence that can be synthesised together. When they are produced by certain software, such as EPPIi mapper[23], they can be web-based and interactive[3,4] which means they have the potential to be accessible to a wider range of stakeholders and evidence users.

Their distinction as a unique evidence mapping product has been increased by the production of checklists of the methodological expectations for conducting and reporting EGMs by the Campbell Collaboration[4,24-26]

The methods used in producing EGMs have been evolving over time; for example, those of visualisation to make the maps more accessible and meaningful for users [8]. As EGMs are increasingly used to systematically resent research and support further synthesise, there is an increasing urgency to further develop the methods used in their production; in particular, in terms of developing the accessibility, usability and utility for various stakeholders.

1.1.3 | Why it is important to develop this EGM.

In order to develop the methods of EGM production, it is important to clarify the range and type of approaches that have been used to make EGMs so far, as well as what they do with the evidence they collate and the associated methods used in their production. This indicates the need for an evidence review process that is broad in scope. Producing an EGM of the review results allows the results of a rigorous and systematic review to be collated and presented in an accessible, interactive and visual manner.

The overall aim of this EGM is to identify, describe and appraise the approaches that have been used to make the evidence presented within published EGMs useable and meaningful. This is important to ensure that future maps are made in a way that leads to them having the greatest utility for a range of map users.

2 | OBJECTIVES

This EGM will be guided by the overarching question, ‘what are the characteristics of the methods used to produce, present and update Evidence and Gap Maps (EGMs) which impact the utility and usability of EGMs for stakeholders and/or end users?. The analysis will be directed by a number of sub-questions set out below.

Research questions

a) What is the range and type of visualisation approaches that have been used in published and available EGMs?
b) What are the available platforms for constructing EGMs and how have they developed over time to offer a range of visualisation tools?
c) What is the nature of stakeholder involvement in the development of known EGMs?
d) How are involved stakeholders included in the decisions that determine the format and content of the map?
e) How have 'gaps' been synthesised and displayed in the EGMs identified?
f) When and how are existing EGMs updated?

3 | METHODS

3.1| EGM: Definition

Saran and White (2018) define an EGM as '...a systematic [visual] presentation of the availability of relevant evidence [of effects] for a particular policy domain'[4]. There are a number of evidence mapping products that fit this definition. The EGM we are producing from this protocol will be interactive, web based and present the results using a 2-dimensional framework as the primary level of display.

This map will be produced in line with the Methodological Expectations of Campbell Collaboration Intervention Reviews (MECCIR) checklist for evidence and gap maps: Conduct and reporting standards [ref 8 and 9], as well as the recently published guidance for producing Campbell evidence and gap maps10.

The purpose of this map is to present, in a visual and interactive manner, a collation of the results of a systematic search for studies that display their results using a visual evidence map/an EGM. The intention of this map is to enhance the accessibly to and availability of this particular evidence base and help inform the development of the methods of production, presentation and updating of such an evidence synthesis product.

3.2| Framework development and scope

The scope of this EGM is to capture the full range of visualisation types that evidence maps used in any research domain; including but not limited to the domains of health, environmental and sustainable human development.

The map will be interactive and in the form of a matrix with multiple layers of information available for users to explore beyond a surface layer that is initially displayed. The software used to produce this map will be EPPI- mapper[23].

The matrix framework for the surface layer of the map will be developed by the research team in consultation with our stakeholders based on knowledge of the types of EGMs at the start of the project.

The matrix of this EGM is not based on an intervention/outcome, or classic PICO framework (where rows include the interventions of interest and the columns the outcomes). Rather the dimensions of the framework are determined by the scope of interest. The categories used will enable the users to see the distribution of types of visual evidence maps (for example, bubble or matrix) across different research domains (e.g. health, environmental, or security and justice). It is not expected that sub categories are needed at this point.

Each cell in the base layer of the map will show studies that contain evidence on a particular domain that displays the results in a particular way. Further attributes, which relate to study characteristics and the research questions, will be seen and explored by using the filter settings within the map. These filters enable focused exploration of the map.

3.3 | Existing EGMs and or/relevant systematic reviews

There are currently no existing EGMs or systematic review that collate EGM studies with a focus on their methods.

3.4 | Stakeholder engagement

This protocol was revised following feedback from methodologists, and after consultations with a small group of potential end-users and some members of the developing advisory group of this mapping project. These included researchers (1), local authority commissioners (2) and patient and public involvement members (3). As the review develops, they will be involved in various aspects of the review. So far they have been involved in the planning and protocol stages.

The practice of stakeholder engagement in this project has been impacted by the Covid 19 pandemic. Recruitment to the advisory group was paused and rather than meet together as a group, involvement was on a one-to-one basis or in or small groups. These were often online or conducted outside. As the project develops, if pandemic restrictions allow, we aim to recruit further

stakeholders to join the advisory group. Larger meetings, possibly in person, may occur to discuss the draft results and findings of the project, as well as the way the data is visualised, reported and presented. Although more flexible small meetings will also occur to suit social restrictions in place, as well as the stakeholders preferences, needs and availability.

3.5 | Conceptual framework

Not applicable. Since this is an EGM that seeks to address a methodological research question (rather than to map interventions) there is no conceptual framework to apply to this EGM. Nevertheless, it is worth noting that areas in the map where there are no studies present, where there are gaps, may not indicate need for more research.

3.6 | Dimensions

The first two (primary) dimensions.

These will be shown in the top layer of the EGM which will be constructed as a 2-dimensional matrix framework. The framework consists of rows and columns, which relate to the following:

Rows: The topic or domain of research in which the study is interested (topic of interest). For example, health research, educational research or environmental research

Columns: The design of the visualisation used in the study (map design). For example, matrix, bubble or heatmap.

Where the rows and columns intercept, cells are created in the framework. Each cell will show studies which contains evidence that relates to that particular combination of domain of research and map design. It is possible for studies to appear in more than one cell.

Other (secondary) dimensions

These relate to the way information is organised in that map and also to how the map functions of the software EPPI- mapper[23] can be used. They include:

- **Display style:** It will be possible for the user to determine the style in which this information is displayed from a list of styles (mosaic, bubble, donut and heat map). The display will then vary in number, dimension or size in relation to the number of studies included in that cell.

- **Filters:** It will be possible for map users to limit the studies shown in each cell to aspects of one or a number of study characteristics (for example: certain years within the 'year of publication' study characteristic and/or certain types of publication within the 'form of publication' study characteristic) and limit the studies shown in each cell to that filtered section. Details of the filters we will use can be found in the filter section below.

- **Segmenting variable(s):** In each cell it is possible to display the included studies in a number of different colours (currently up to 6). This capacity can be employed to display different categories (segments) of a study characteristic (variable) in a number of ways, including:

    - Splitting, or segmenting, one study characteristic (variable) into up to four parts. This can be used for a continuous variable (such as age) and also for non-continuous (such as publication type). This is possible when a study characteristic has up to four distinct categories (for example: it is possible to have just 3 or 4 types of publication within the type of publication study characteristic). It is also possible when the study characteristic is a continuous variable (for example, age), as this can also be segmented into up to four segments; equally or otherwise.

    - Segment two variables into two parts each. This is possible when there are at least two variables (study characteristics) in the map that are segmented into two parts (for example: the interactivity of the map is one variable that could be segmented into two parts. That is 1. The map is interactive and 2. The map is not interactive).

    We plan to utilize the capacity to segment three variables each into two parts as follows.

    - Map interactivity. This will be segmented into 'map is interactive 'and the 'map is not interactive'.

    - Stakeholder involvement. This will be segmented into two parts to show whether or not there was stakeholder involvement used in the map development.

    - Plan to update map: This will be into two parts to show whether or not a plan to update the map is reported in the studies.

3.6.1 Different map layers

The map will contain information in a number of layers.

- The top layer of the map, will be the 2-dimensional matrix framework. This will show the studies that relate to that particular combination of the primary dimensions within a number of cells. Each cell in the matrix framework will be clickable, leading the map user to a second layer of the map.

- The second layer of the map, when entered, will show the user an overview box listing the studies relating to the cell they have clicked; limited by any filtered they have applied. Clicking on any study listed in the overview will take the user to the summary box for that study.

- The third layer of the map, will show a summary box for a study selected in the second layer. This will reveal additional information about the study included in the reports and publications that are relevant to an individual cell of one research domain and one visualisation type.

Within the summary box for each study in a cell in the second layer of the map, greater detail will also be provided on:

- The study title
- The authors names
- Other bibliographic details
- The full citation of included study/map
- A Link to the full text of the report on the map

The final summary information will be determined following a review of the included maps and after consideration of ideas from the research team and other stakeholders. We may, for example, following consultation with stakeholders, decide to offer a short description of the map.

The map itself will be embedded within an overarching layer, in the form of a web page, which will be accessible by URL. This will contain an introduction to the map, information on how a user can use and read the map and a link to an accompanying narrative summary report of the map. The report outline will ensure that all the key aspects of the review and the map are covered.

3.7 Eligibility criteria

3.7.1 | Types of publication

All types of publications including published articles, and reports, will be considered relevant for inclusion. Unpublished studies, and their relevant material, in the form of conference abstracts or dissertations will be sought; with final inclusion being determined by consultation with the research team. Reports and publicly available documents published with Maps fitting the definition will be included. Sources and documented material that do not contain methodological details, for example feature articles, opinion pieces and letters with be excluded. Other sources and publications, including protocols, working papers, articles in conference proceedings, editorials, websites and chapters in textbooks will be considered in the screening process to see if they are relevant for inclusion.

3.7.2 | Types of intervention/problem

In this case we are identifying an EGM as the intervention of interest to map. Therefore, any study, from any research domain, that describes the development or production of an EGM, and includes an EGM (or a link to one) will be included.

An evidence review product will be considered an EGM if:

- The methodology used identifies itself as producing an EGM

Or

- There is a visual presentation of the evidence base of a systematic and robust evidence review process that is labelled or referred to as an EGM. Where a 'visual presentation' refers to an image, picture, figure or diagram, chart or illustration that is interactive or otherwise.

Or

- The results of a systematic, pre-defined process contains a visual presentation of the evidence base that fits the definition of an EGM.

There is currently no one widely accepted term for an EGM. Two suggested definitions are as follows:

- A visual tool for presenting the state of evidence in particular thematic areas, with the aim to provide easy access to the best available evidence and highlight knowledge gaps [2].
- 'a systematic [visual] presentation of the availability of relevant evidence [of effects] for a particular policy domain' [4].

Both these definitions, and other key references, will be used as a guide to develop a screening tool for confirming if a visualisation is an EGM or not.

3.7.3 | Types of population (as applicable)

Not applicable.

3.6.5 | Types of outcome measures (as applicable)

Not applicable.

3.6.6 | Other eligibility criteria

Due to the limited time available and the prohibitive costs of translation, only publications or websites written in English will be considered for inclusion.

Articles published prior to 2010 will be considered ineligible for inclusion because this is when the first time an evidence mapping product was called an EGM.

We will include any studies that relate to EGMs whether or not they are 'accompanied by a descriptive report to summarize the evidence for stakeholders such as researchers, research commissioners, policy makers, and practitioners' which is an element that Saran and White (2018) consider as optional to their proposed definition.

3.8 | Search methods and sources

We will search for articles, papers and reports on the following medical and social care databases. Epistemonikos, MEDLINE (via OvidSp), EMBASE (via OvidSp), and PsycINFO (via OvidSp), CINAHL (via EBSCOhost, ASSIA via ProQuest), Social Policy and Practice (via OvidSp), Web of Science Core Collection (including social care and conference abstract databases) and ProQuest Theses & Dissertations. We will use the search terms 'evidence and gap map', 'evidence gap map', 'evidence map' , 'gap map', 'living map', 'living evidence map' or 'systematic map*' in the title and abstract fields of the databases listed. The search strategy is presented in Box 1 below for Ovid MEDLINE and will be adjusted for the other databases.

Database: Ovid MEDLINE(R) ALL <1946 to July 21, 2020>
Search Strategy:
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1 "evidence and gap map".ti,ab. (12)
2 evidence gap map.ti,ab. (10)
3 evidence map.ti,ab. (120)
4 gap map.ti,ab. (25)
5 living map.ti,ab. (1)
6 living evidence map.ti,ab. (1)
7 systematic map*.ti,ab. (458)
8 1 or 2 or 3 or 4 or 5 or 6 or 7 (693)
****

Box 1: The search strategy for this scoping review formulated for MEDLINE

Additionally, a supplementary search of Google scholar using the phrases 'evidence gap map' with be undertaken; the first 20 pages will be reviewed.

To ensure that any relevant reports not published in academic sources are included, we will search for grey literature via the websites of relevant organisations known to commission or produce EGMs such as 3ie, EPPI- Centre, and the Campbell Collaboration. Where necessary, contact will also be made with relevant academics known to be working with visual evidence maps to enquire about other maps they are aware of that may fit the full text inclusion criteria. Any map of maps, their review reports and reference lists that are already obtained, or obtained in this process, will be checked for other maps not included.

3.9 | Analysis and presentation

3.9.1 | Report structure

There will be a descriptive report that will summarise the evidence. It will be organised around the overarching aim and research questions. The results will include a narrative description with supporting visualisations (including tabulations, graphs and charts) of the characteristics of included studies including:

a) The methods the studies used
b) The topic of interest of studies
c) The range and type of visualisations used (map design)
d) The available platforms for constructing maps
e) The nature of plans for updating the maps
f) The nature of stakeholder involvement
g) How gaps are considered, displayed and synthesised in EGMs

3.9.2 | Filters for presentation

The filters on the online evidence map will include the following things. The exact list of subcategories that will be used will be determined by the studies.

Bibliographic data

- Form of publication
    - Journal article
    - Grey literature
    - Dissertation/thesis
    - Published report
    - Other
    - Unsure/Unclear
- Year of publication
    - 2010
    - 2011
    - 2012
    - 2013
    - 2014

    - 2015
    - 2016
    - 2017
    - 2018
    - 2019
    - 2020
    - 2021

Contextual information

- Funding
    - Government or government related
    - NGO/charity
    - Multilateral agency (WHO/world bank)
    - Academic/research institution
    - Other
    - Unclear/not stated
- Who hosts the map
    - Governmental agency
    - Charity
    - University
    - Other institution
    - business
    - other

Study characteristics /Attributes of the study

- Topic of the map interest,
    - Health
    - Education
    - Software engineering
    - Environmental
    - Other
- Methods used
    - Evidence mapping
    - Systematic review
    - Scoping review
    - Other
- If the study reports a Protocol being used (yes/no)

The map design/visualisation type

- Bubble
- Matrix
- Other(s) Please note this list will be determined by what is reported in the studies.

Other features of the maps

- If the map is 'living' (yes/no)
- If the map is Interactive (yes/no)
- If there is a plan to update the map (yes/no)

Stakeholder involvement characteristics:

- Is stakeholder involvement reported
- At what stage have they reportedly been involved
    - Prior to the mapping process (for example topic selection)
    - During the mapping process (for example during data extraction)
    - After the map has been made (for example dissemination)

Features of how gaps are reported in the studies

- Are gaps mentioned in the background
    - YES
    - NO
- mentioned in the aims
    - YES
    - NO
- Mentioned in the methods
    - YES
    - NO
- mentioned in the results
    - YES
    - No
- Mentioned in the discussion
    - YES
    - NO

3.9.3 | Dependency

Each entry in the map will be a mapping study, mapping some domain of evidence. We will link all publications (e.g. protocols and different reports) that are part of the same study (not updated studies), so they will only appear once on the map. Studies that cover multiple topic areas or visualisation types (the two axis of the matrix) may appear multiple times within the map.

3.10 | Data collection and analysis

3.10.1 | Screening and study selection

All records retrieved from the databases will be exported into EndNote for screening. Material not in the databases will be imported into EndNote so that everything is held in one place**.**

Once clear duplicates have been removed, two reviewers will independently screen all the title and abstracts according to the eligibility criteria. Screening guidelines will be developed in the form of a questionnaire (See Appendix A for the draft title and abstract screening form). Any discrepancies will be resolved by discussion and if needed with the wider research team.

This will be followed with a round of full text screening, using a guide based on the eligibility criteria and developed from the reflections of those completing the title and abstract screening. These will also be double screened following initial training on applying the screening guide. Discrepancies will be resolved by discussion and if needed with the wider research team.

3.10.2 | Data extraction and management

After screening, data extraction will take place in EPPI-Reviewer4[27]. A draft data extraction form has been developed for this process. This form will be piloted and modified if required.

Data extracted will include:

- Publication details such as journal name and study title,
- Study details such research area and topic of interest,
- Details of the study methods
- Details of map design
- Details of Stakeholder involvement.
- Details of if and where gaps are mentioned in the reports/studies
- Details of the maps features including map interactivity and plans for updating the maps
- Other details about the maps will be extracted including, if it is live, how it is accessed, who hosts the map, when it was produced and if there is a plan to update the map.

Data extraction will be undertaken by one reviewer and checked by a second member of the research team, with any inconsistencies identified and resolved through discussion and consultation with the wider team as needed. The data extraction tool will be modified and tested through stakeholder and advisor consultation and piloting the process. The tool will be informed by the research question and the structure of the map.

3.10.3 | Tools for assessing risk of bias/study quality of included reviews

We will not undertake an assessment of risk of bias or quality appraisal of the studies that are included in this map.

3.11 | Dissemination plans

It is expected that the completed review will be written up and submitted for publication to an open access journal publication. We aim to submit to the Campbell Collaboration for consideration for publication within the Campbell Library to maximise the dissemination reach of this review.

In addition, we will work with stakeholders to ensure that the findings are presented in multiple formats. Targeted dissemination will include attending and presenting at conferences, through social media and the production of a conference poster. All team members will use their knowledge user networks to further promote dissemination.

In order to ensure that the review and its findings are shared widely key authors will also share the review, its process and findings, with those involved in health research. This will ensure that the work is accessible to a range of audiences and support involvement in health research.

All dissemination activities will observe reporting guidelines and ensure that information shared is accurate complete and transparent.

4 |DECLARATIONS OF INTEREST

None**.**

5 | PLANS FOR UPDATING THE EGM

We plan to update this EGM as sources of funding allow.

6 | SOURCES OF SUPPORT

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