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Scoping Review, Systematic Review & Meta-Analysis

Knowledge-Synthesis Methodologies

Narrative Review[1] — Scoping Review[2] — Rapid Review[3] — Systematic Review[4] — Meta-analysis[5]

1. Green BN, Johnson CD, Adams A. (2001). Writing narrative literature reviews for peer-reviewed journals: secrets of the trade, Chiropr Rehabil,15, 5–19.
2. Colquhoun HL, Levac D, O'Brien KK, et al. Scoping reviews: time for clarity in definition, methods, and reporting. *Journal of clinical epidemiology. 2014;67(12):1291-1294.*
3. Khangura S, Konnyu K, Cushman R, Grimshaw J, Moher D. Evidence summaries: the evolution of a rapid review approach. *Systematic reviews. 2012;1(1):1-9.*
4. Centre for Reviews Dissemination. *Systematic reviews: CRD's guidance for undertaking reviews in health care. New York: Centre for Reviews and Dissemination; 2009.*
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PART 1   **SCOPING REVIEW**

PART 2   **SYSTEMATIC REVIEW & META-ANALYSIS**

PART 1

THE FUNDAMENTAL
of Scoping Review

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Today's Focus

1 **What**

2 **Why**

3 **How**

What is Scoping Review?

Why Scoping Review?

How to conduct Scoping Review?

Definition

- Indication
- Scoping vs Systematic review

- 5 tips
- 7 steps

MEDICAL EDUCATION IN REVIEW

Scoping reviews in medical education: A scoping review

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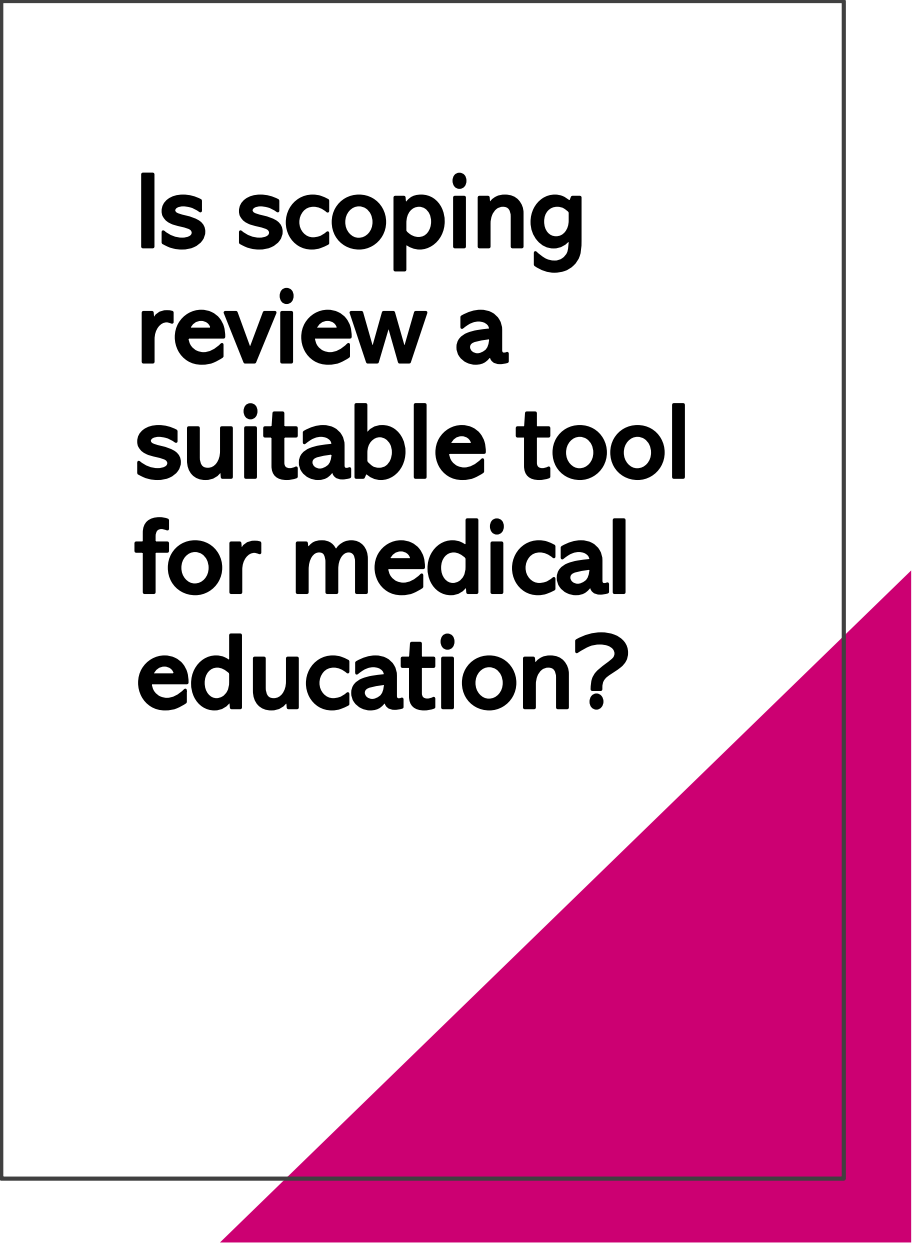Education, Faculty of Medicine, McGill
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Abstract

Objectives: Over the last two decades, the number of scoping reviews in core medical education journals has increased by 4200%. Despite this growth, research on scoping reviews provides limited information about their nature, including how they are conducted or why medical educators undertake this knowledge synthesis type. This gap makes it difficult to know where the field stands and may hamper attempts to improve the conduct, reporting and utility of scoping reviews. Thus, this review characterises the nature of medical education scoping reviews to identify areas for improvement and highlight future research opportunities.

Method: The authors searched PubMed for scoping reviews published between 1/1999 and 4/2020 in 14 medical education journals. The authors extracted and summarised key bibliometric data, the rationales given for conducting a scoping review,

I have a topic but…

I am unsure about the adequacy of available literature related to this topic

Investigate scope of literature

I am unsure about the extent, range, & nature of research activity related to this topic

Investigate research conduct

There are too many literature in this area and I could not see the link among these literature

Clarify concept & Identify factors related to concept

I am unsure about the research gap in the existing literature

Knowledge gap

..and I want to do systematic review, but I am unsure about the potential RQ & inclusion criteria, for systematic review

Precursor of systematic review

Definition of Scoping review

A type of evidence synthesis that systematically identifies & maps the breath of evidence available on a particular topic, field, concept or issue, irrespective of source (i.e primary research, reviews, non-empirical evidence), within and across particular contexts. Scoping review can clarify key concept/ definition in the literature, and identify key characteristics of factors related to a concept, including those related to methodological research

(JBI scoping review network, 2020)

2 Scoping review vs Systematic review

Features	Scoping review	Systematic review
Review question	What are the effective teaching strategies in surface anatomy?	What are the roles of work-based learning in surface anatomy curriculum?
Sources	All literature related to teaching strategies in surface anatomy that has been proven effective	Literature limited to work-based learning in surface anatomy
Selection criteria	▪ Arskey & O'Malley (2005) ▪ Extended SR protocol (Levac et al. 2010) ▪ PRISMA-ScR (Tricco et al., 2018) ▪ JBI scoping review methodology (JBI, 2015, 2022)	The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)
Data evaluation and synthesis	A standalone review or a precursor for a systematic review	A standalone review or a pre-requisite for meta-analysis
Provision of implications for practice	Scoping review should not be conducted if the authors want to make specific recommendation for practice	

A scoping review presents an overview of a potentially large and diverse body of literature pertaining to a broad topic whereas…

A systematic review attempts to collate empirical evidence from a relatively smaller number of studies pertaining to a focused research question

How to produce a publishable scoping review?

- Tip 1: Explore the indication of ScR
- Tip 2: Provide a clear title
- Tip 3: Comply to the latest guideline
- Tip 4: Publish your protocol
- Tip 5: Write a good scoping review

Tip 2: Clear Title

Concept

Example:
Factors influencing test anxiety in **health professions education students**: **a scoping review**

Context

The title should include the phrase: "…: **a scoping review**."

Population

Congruent with the review objectives, questions, and inclusion criteria **(PCC mnemonic)**

Clear, explicit and reflect the **core elements** of the review

❌ Titles should **not** be phrased as question or conclusion

❌ The title should not be more than 25 words for ease of understanding

"PCC" mnemonic:
- Population
- Concept
- Context

1 2 3

Tip 3: Comply with latest guideline

Arksey & O'Malley SR protocol (2005)

→

Extended protocol (Levac et al, 2010)

→

JBI Scoping Review Protocol (Peters et al, 2015, 2017)

→

PRISMA-ScR (Tricco et al., 2018)

→

Updated JBI scoping review protocol (JBI, 2020)

6-stage protocol: (1) identifying the initial research question, (2) identifying relevant studies, (3) selecting specific studies, (4) charting the data, (5) collating, summarizing, and reporting the results & (6) Consultation (optional)

Enhancement of each stage in Arksey and O'Malley protocol & stage-6 is compulsory

It is a systematic approach to the conduct and reporting of the review and allows transparency of process (From authors' details until writing conclusion)

Reporting checklist (20 essential items and 2 optional items)

Enhanced JBI Scoping Review Protocol with checklist (congruent with PRISMA-ScR)

	Arksey and O' Malley framework (2005, p. 22-23)	Enhancements proposed by Levac et al. (2010, p. 4-8)	*Enhancements proposed by Peters et al (2015, 2017, 2020). **JBI Scoping Review Protocol**
1.	Identifying the research question	Clarifying and linking the purpose and research question	Defining and aligning the objective/s and question/s
2.	Identifying relevant studies	Balancing feasibility with breadth and comprehensiveness of the scoping process	Developing and aligning the inclusion criteria with the objective/s and question/s
3.	Study selection	Using an iterative team approach to selecting studies and extracting data	Describing the planned approach to evidence searching, selection, data extraction, and presentation of the evidence.
4.	Charting the data	Incorporating a numerical summary and qualitative thematic analysis	Searching for the evidence
5.	Collating, summarizing and reporting the results	Identifying the implications of the study findings for policy, practice or research	Selecting the evidence
6.	Consultation (optional)	Adopting consultation as a required component of scoping study methodology	Extracting the evidence
7.			Analysis of the evidence
8.			Presentation of the results
9.			Summarizing the evidence in relation to the purpose of the review, making conclusions and noting any implications of the findings

7 Steps to conduct scoping review (JBI protocol):

Step 1: Develop a protocol

Step 2: Formulate research question

Step 3: Searching for relevant studies

Step 4: Study selection

Step 5: Charting evidence

Step 6: Results (Data synthesis)

Step 7: Conclusion

Steps to conduct scoping review:

Step 1: Develop a protocol

Step 2: Formulate research questions

Step 3: Searching for relevant studies

Step 4: Study selection

Step 5: Charting evidence

Step 6: Results

Step 7: Conclusion

1) **WRITE THE PROTOCOL** (research plan) to reduce possible bias in the research process. Checklist:
   a) **Introduction:**
      - Background literature on the study context (brief but concise)
      - The rationale of conducting scoping review
      - Aim & objectives – what the scoping review intended to inform
      - Research questions
   b) **Inclusion criteria:**
      - Types of participants
      - Concept
      - Context
      - Sources
   c) **Methods:**
      - Search strategy
      - Extraction of results
      - Presentation of results

2) **PUBLISH THE PROTOCOL:**
   - Review teams should indicate where this can be accessed (Journal or Open Access Repository)

Where to publish the scoping review protocol ?

WoS, Q2

APC: 1690 GBP

BMC Part of Springer Nature

Search

Explore journa

Systematic Reviews

Home   About   Articles   Submission Guidelines

Search articles within this journal

Call for papers: The role of systematic reviews in evidence-based research

Systematic Reviews invites submissions of manuscripts to our new thematic series highlighting the contribution that systematic reviev make in evidence-based research.

We welcome submissions of research articles, systematic reviews, methodology and commentaries.

Open-access repositories

Welcome to PROSPERO
International prospective register of systematic reviews ❌

Scoping review is currently ineligible for registration in the Prospero

The place to share your research
OSF is a free, open platform to support your research and enable collaboration. ✔

Open Science Framework (https://osf.io/)

figshare (https://osf.io/) ✔

R^G **Research gate** ✔

protocol exchange
An open repository (preprint server) of community-contributed protocols sponsored by Nature Portfolio.
We welcome protocols from all areas of the natural sciences.
SUBMIT A PROTOCOL   BROWSE PROTOCOLS ✔

Protocol exchange

Scientific Protocols
A free and easy way to share scientific protocols
Sign up with GitHub ✔

Scientific Protocols

Example of Published Protocol

Virtual reality in medical students' education: a scoping review protocol

Jiang Haowen [ID],[1] Sunitha Vimalesvaran,[1] Bhone Myint Kyaw [ID],[1] Lorainne Tudor Car[2,3]

ABSTRACT

Background Virtual reality (VR) is a technology that produces a virtual manifestation of the real world. In recent years, VR has been increasingly used as a tool in medical education. The use of VR in medical education has large potential, as it allows for distance learning and training which may be challenging to deliver in real life. VR encompasses different tools and applications. There is a need to explore how VR has been employed in medical education to date.

Objective The objective of this scoping review is to conceptualise the VR tools available and the applications of VR in undergraduate medical education as reported in the literature. This scoping review will identify any gaps in this field and provide suggestions for future research.

Methods and analysis The relevant studies will be examined using the Joanna Briggs Institute methodological

Strengths and limitations of this study

► A systematic and comprehensive search of electronic databases and grey literature sources will ensure that all available evidence is identified.
► The scoping review will strictly follow the Joanna Briggs Institute methodology for scoping reviews.
► A stakeholder consultation will allow us to further validate the findings and address potential gaps in the article.
► A formal assessment of the quality of evidence will not be performed and this may lead to some studies of poor quality being included.
► Only studies written in English and published after 2010 will be included.
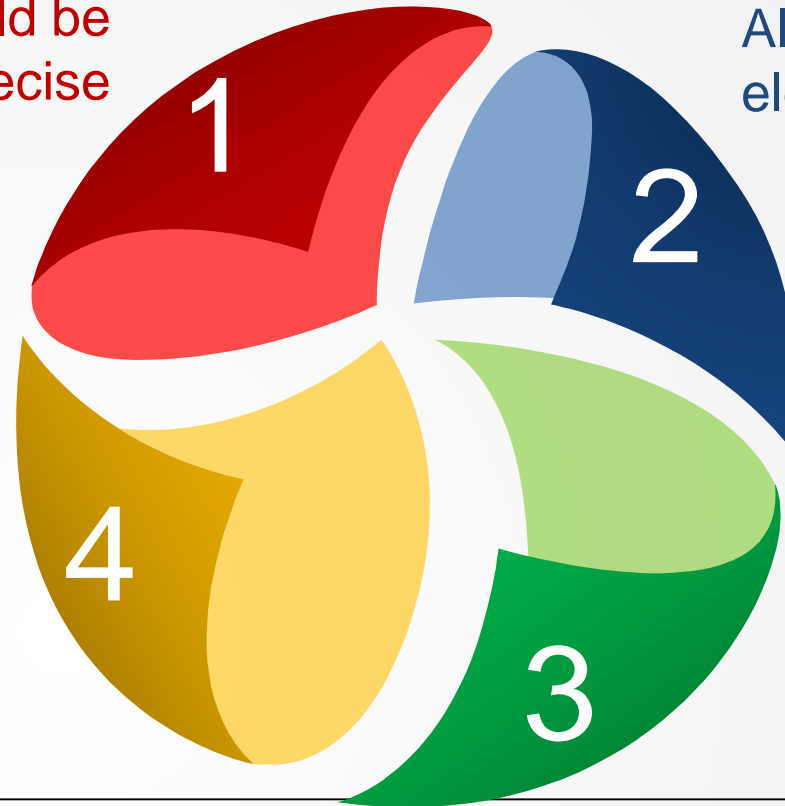
Title: Pediatric tonsillectomy quality of life assessment instruments: a scoping review

EXAMPLE OF INCLUSION CRITERIA

1) **Population (P):** Pediatric patients 16 years of age or younger undergoing tonsillectomy

2) **Concept (C):** The QoL questionnaires utilized in the studies must be in English, & include frequency of use, age parameters, respondent and domains assessed, the validity evidences are included.

3) **Context (C):** (1) Pediatric patients undergoing tonsillectomies for chronic tonsillitis or SDB, and (2) quantitative QoL questionnaires are used pre- and/or postoperatively by parents or caregivers of patients treated with tonsillectomies or adenotonsillectomies.

4) Types of evidence sources: (1) current review will consider both experimental and epidemiological study designs, (2) Quality of life questionnaires utilized in reviews and conference abstracts will not be included to avoid duplication of data

Steps to conduct scoping review:

Step 1: Develop a protocol

Step 2: Formulate research questions

Step 3: Searching for relevant studies

Step 4: Study selection

Step 5: Charting evidence

Step 6: Results

Step 7: Conclusion

Specific & general databases

Use more than 2 databases.

Searching relevant studies
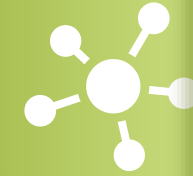
3-step search strategy

Check quality of the search

1. Initial search to identify keywords and search terms (2 databases)
2. Use identified keywords to conduct actual search (more than 2 databases)
3. Grey literature search & reference list scanning

Librarian to peer review the electronic search strategy using the **PRESS checklist** (McGowan et al., 2016)

PRESS (Peer-reviewed Electronic Seacrh Strategies (PRESS) checklist

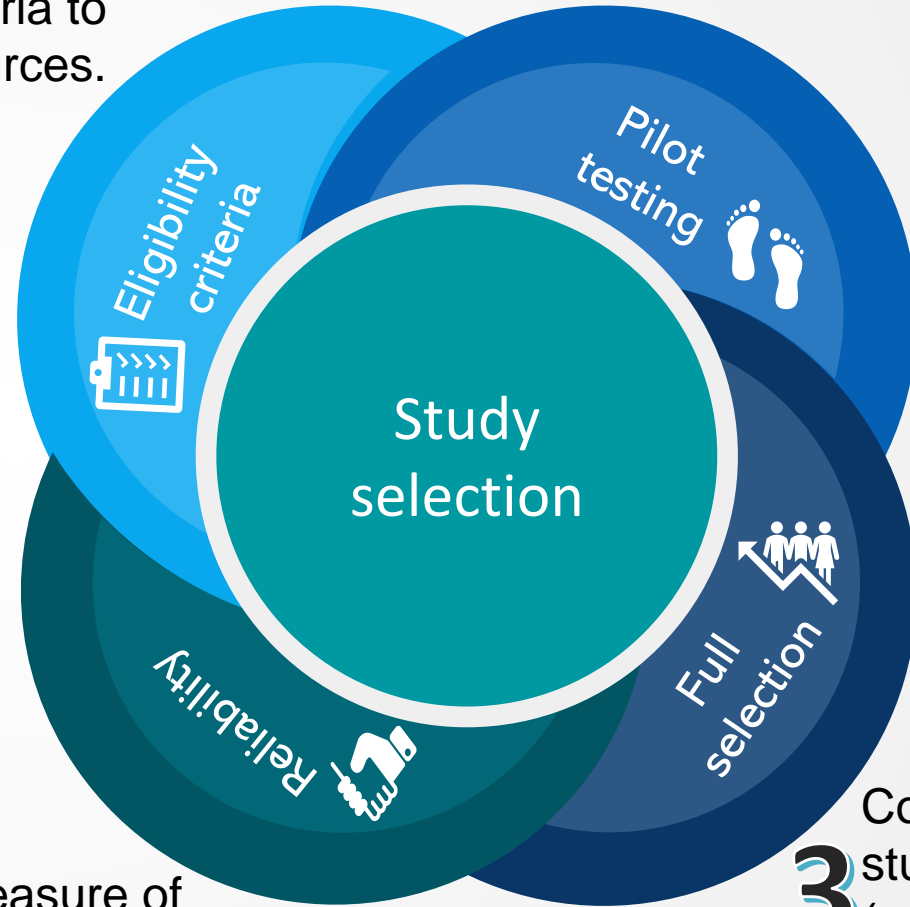**Table 1.** Study eligibility criteria.

Study Characteristics	Inclusion criteria	Exclusion criteria
(1) Period	Published within the period from January 1, 1986, to March 31, 2021.	Outside these dates
(2) Language	English	Other than the English
(3) Title	With the overwhelming theme relating to mental wellbeing and medical professionalism	Not covering both or one of the two themes (mental wellbeing or medical professionalism)
(4) Abstract	• Pertaining to the original research and available in a peer-reviewed journal • Pertaining to studies conducted internationally or nationally • Pertaining to studies within the context of undergraduate medical education • Pertaining to studies with medical students and faculty as the participants • Pertaining to studies that explored and highlighted mental wellbeing and medical professionalism	• Non-peer-reviewed or non-original research • Ideas, editorials, opinions, case reports and reviews • Pertaining to postgraduate medical education • Students and faculty from other health professions
(5) Full-text	• With full-text articles available • Elaborated the relationship between mental wellbeing and medical professionalism • With a robust analysis of the results • With a well-designed exploration intervention • Reported the effects of mental wellbeing on medical professionalism and/or vice versa	• Failed to elaborate the relationship between mental well-being and medical professionalism • Not having a vigorous analysis of the results. • Not reporting effects of mental wellbeing on medical professionalism and/or vice versa

The title, abstract and full text can be considered suitable if they coincide with the applicable study inclusion criteria.

Example of data extraction form

Table 2: Example of a basic draft extraction tool

Source of evidence (citation)	Year	Country	Participants		Cancer		Treat-ment/s	Screening tool/s (+ validated Y/N)	Assessment tool/s (+ validated Y/N)
			Sex	Age	Type	Stage			

Steps to conduct scoping review:

Step 1: Identify research question

Step 2: Develop inclusion criteria

Step 3: Search strategy

Step 4: Study Selection

Step 5: Charting evidence

Step 6: Result (Data synthesis)

Step 7: Conclusion

Data synthesis focuses on charting evidence and identifying gaps

PRISMA-ScR flow diagram

- It maps out the number of records identified, included and excluded, and the reasons for exclusions.

Frequency and Percentage

- Table
- Maps (Evidence gap map, bubble chart, mapping of key concept)
- Figure (Integrative framework, Analytical framework)

Narrative description

- Categorizing evidence into categories (thematic constructions of evidence) (Not a thematic analysis)
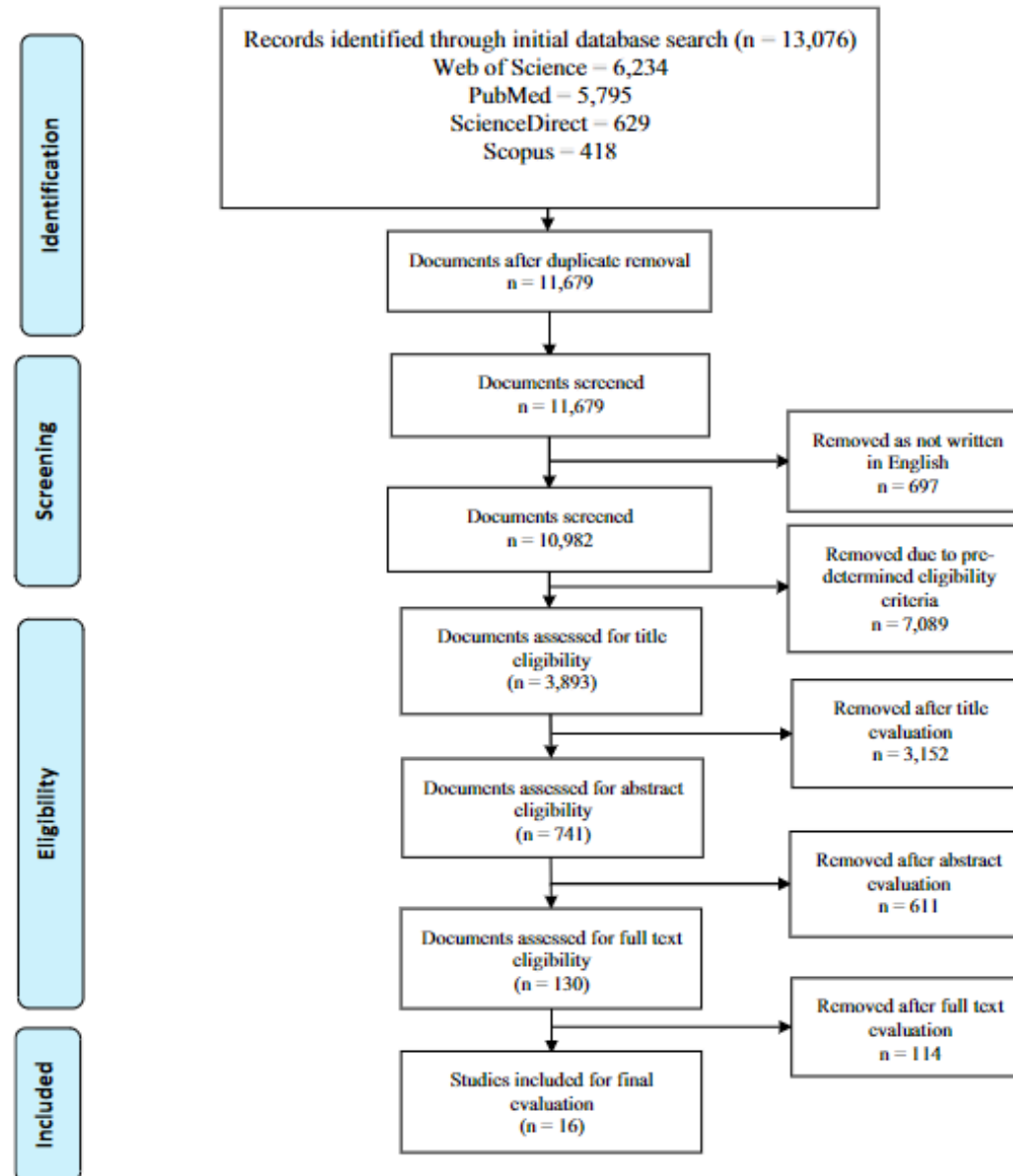
PRISMA-ScR flow diagram

Figure 1. The scoping review consort diagram describes articles' assortment for this review.

The Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) flow diagram for the selection of studies in this review - **PRISMA** [36]

Example of tabular presentation

Table 4 Frequently reported coping strategies in the included studies

Coping strategies	Percentage of the 24 included studies	Studies
Support (social and emotional) seeking	60%	[3, 4, 13, 28–30, 33–36, 39, 44]
Active coping	40%	[3, 4, 13, 26, 30, 31, 34, 42]
Acceptance	40%	[4, 13, 26, 30, 34, 40, 42, 44]
Avoidance/denial	40%	[4, 27, 30, 31, 34, 38, 43, 44]
Substance abuse	35%	[3, 28–30, 34, 36, 42]
Faith/religion	25%	[3, 30, 34, 39, 41]
Sports, leisure, games (mobile device/personal computer)	25%	[3, 28, 35, 36, 44]
Miscellaneous[a]	40%	[4, 13, 28–30, 34, 35, 42]

[a] Miscellaneous includes sleeping, resorting to humour, engaging in self-blame, isolating/distancing oneself from others, venting and distracting oneself

Example of Geographical Map

North America
19
(24.7%)

South America
1
(1.3%)

Europe
27 (35.1%)

Asia
25
(32.5%)

Africa
3
(3.9%)

Oceania
2 (2.6%)

WORLD CONTINENTS - PUBLICATIONS BY CONTINENT
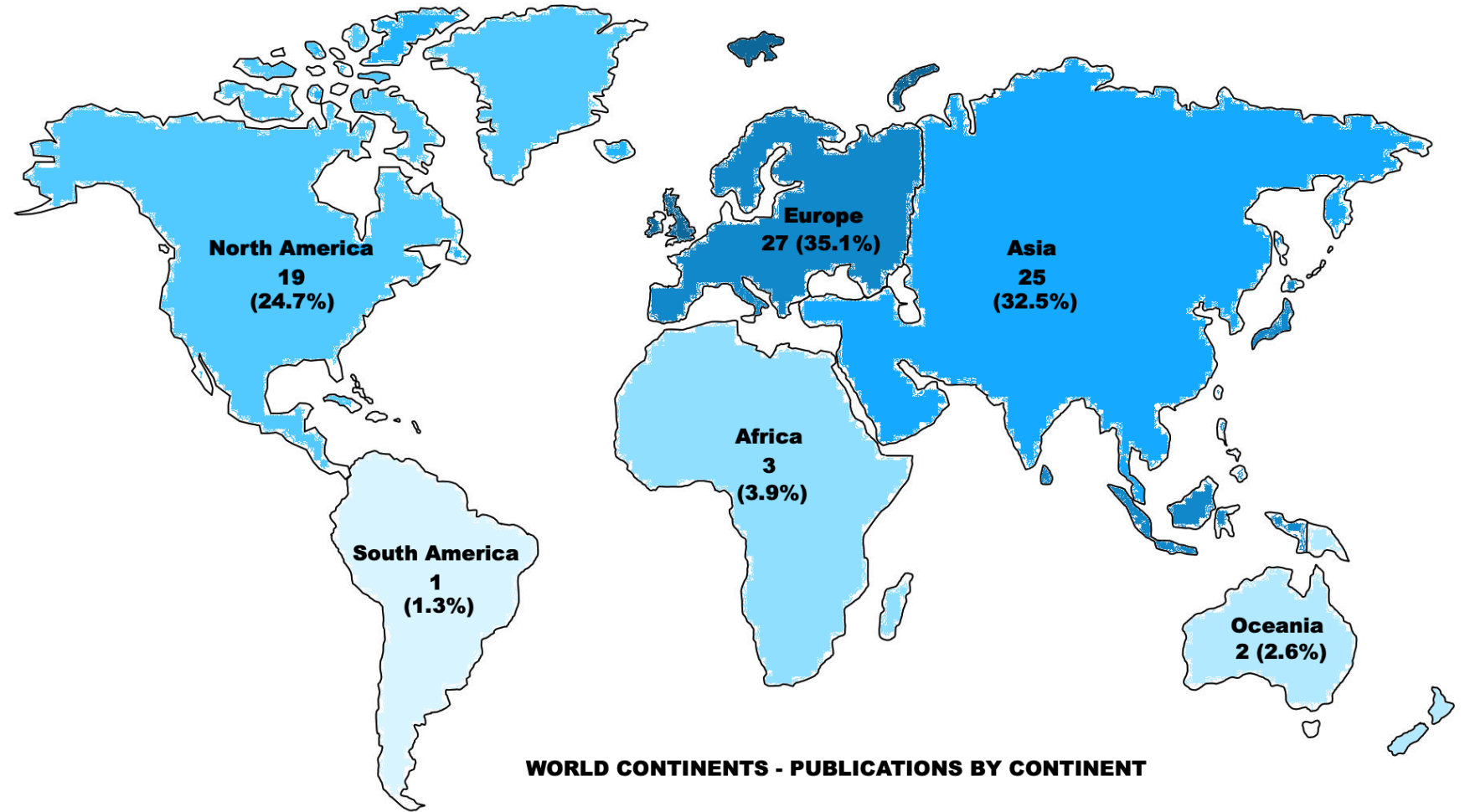
Example of Evidence Gap Map
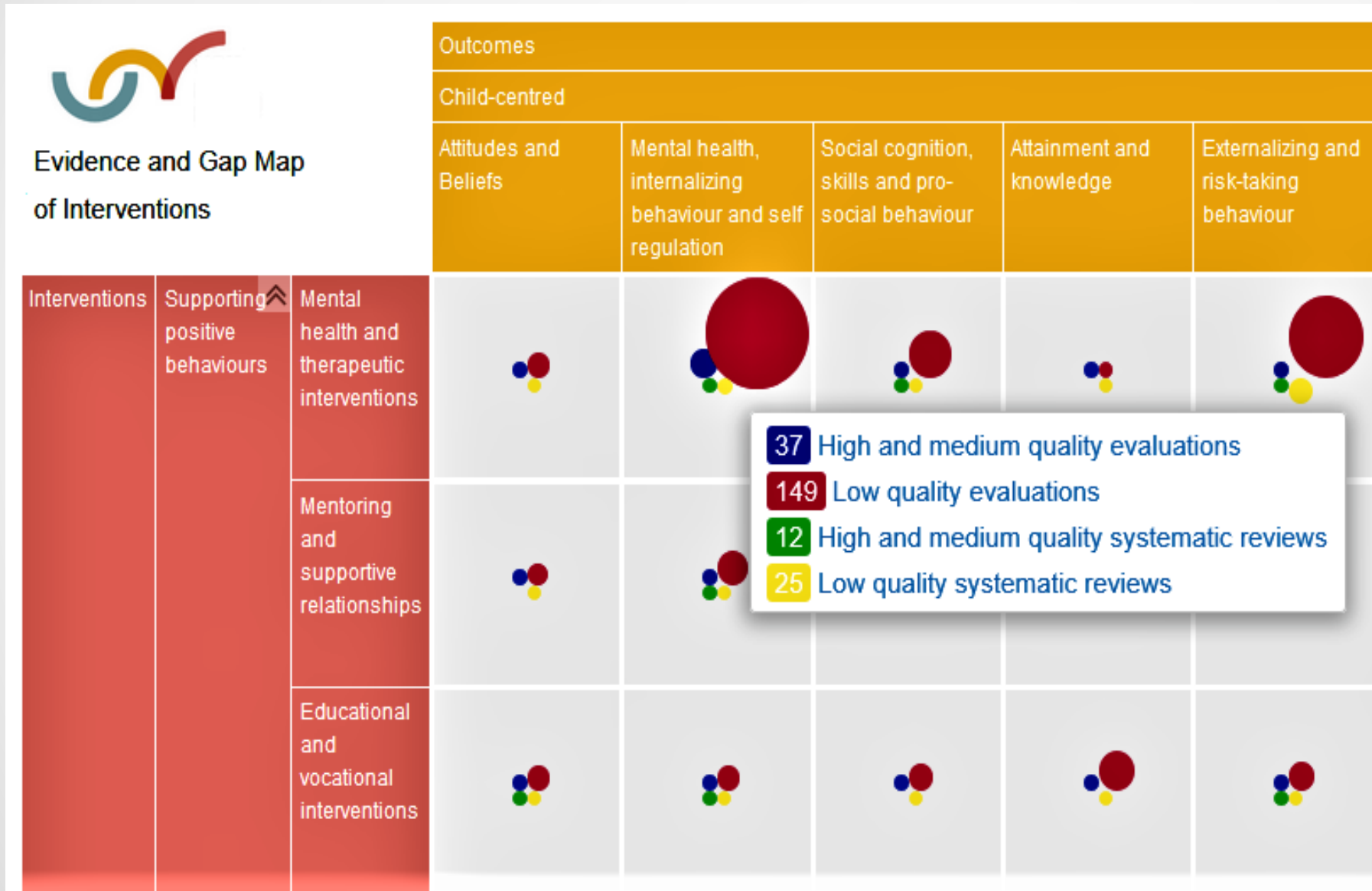
An Evidence Gap Map is a visual tool that provides an overview of the existing evidence on a topic. It highlights gaps in the evidence and shows where evidence is more abundant. The map can be variously used and configured.

Example of Bubble chart

The size of each 'bubble' is representative of the number of sources of evidence published in each year
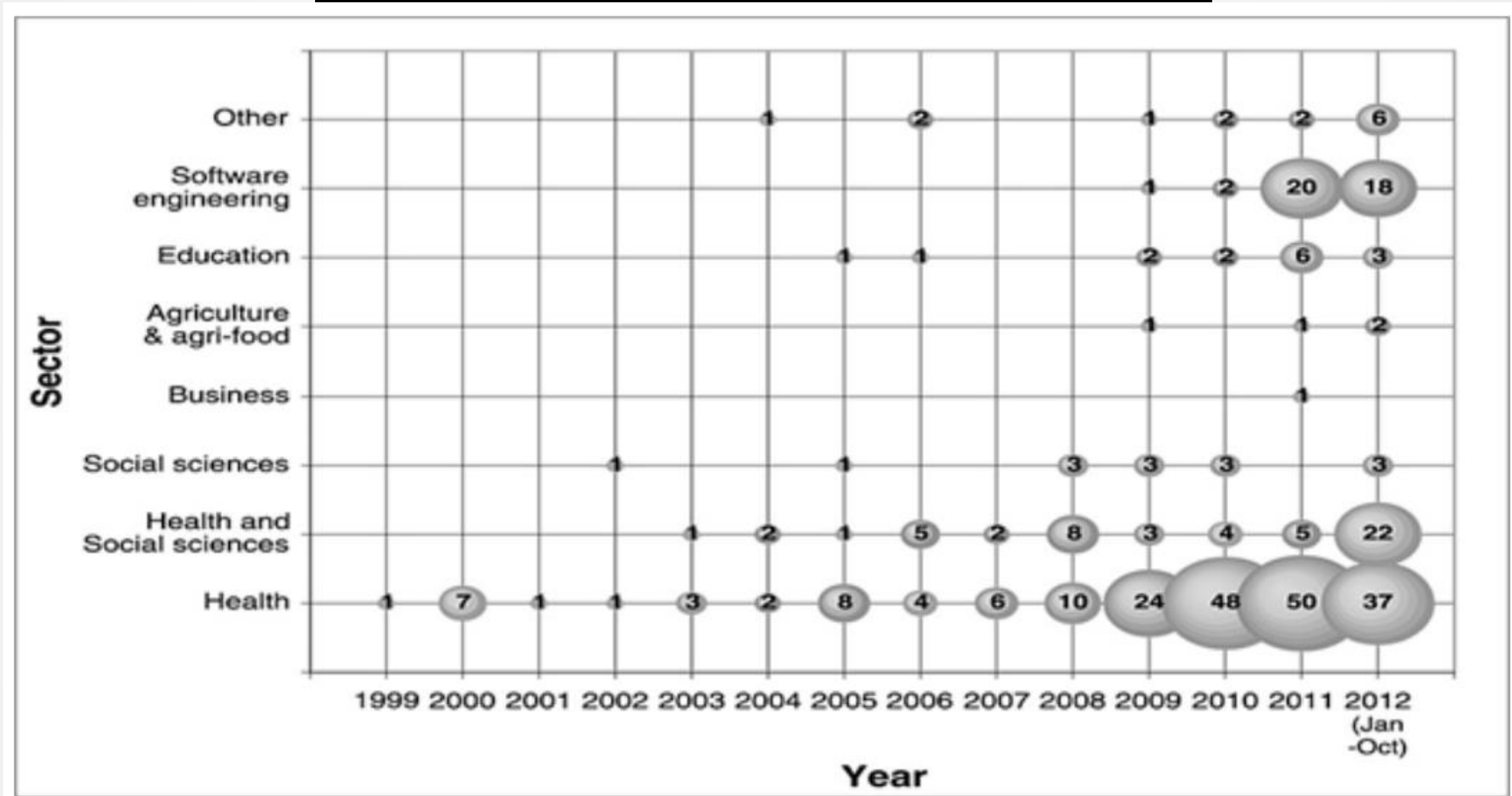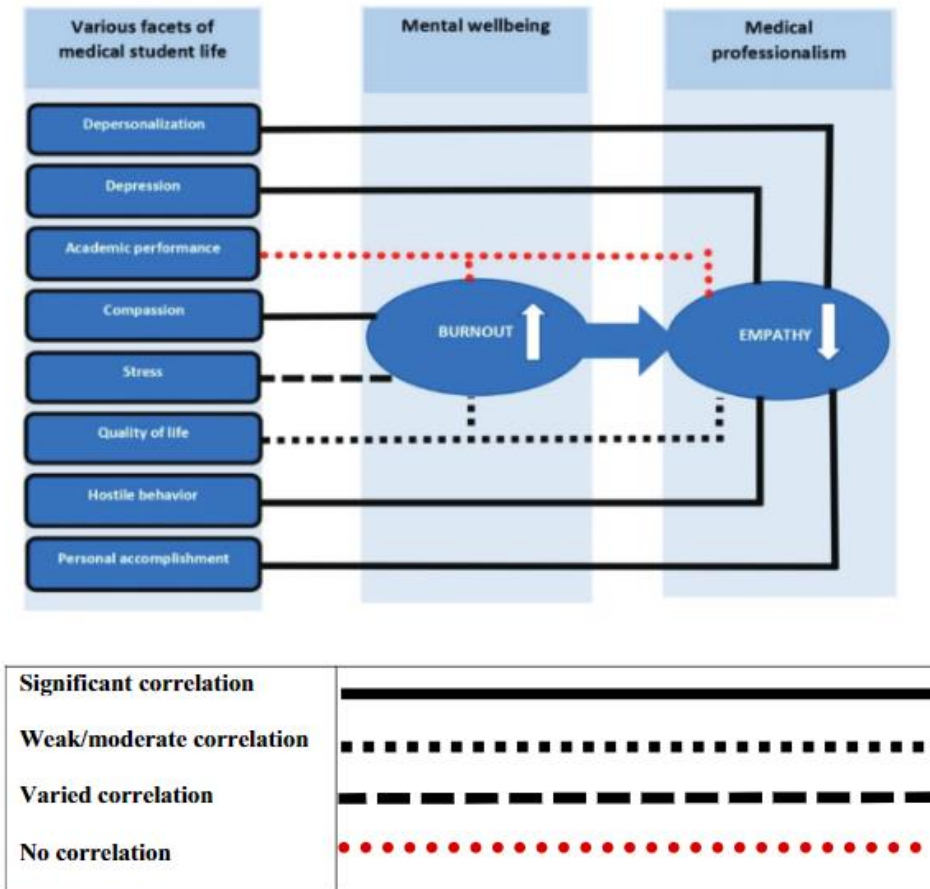
Example of mapping of key concept

Reference	Evidence used — Primary studies						Intense sweeteners considered								Comparator					Outcomes presented						
	Human, observational	Human, experimental	Animal, experimental	Cell-cultures	Other reviews	Unspecified or grouped	Acesulfame K	Aspartame	Cyclamate	Saccharine	Sucralose	Stevia	Other	Sugar, other saccharides	Water	Intake levels	Nothing/placebo	Unclear	Body weight	Clinical outcomes	Energy/food intake	Appetite/hunger	Hormone secretion	Intestinal glucose absorption	Microbiome
Bellisle 2007 [31]	x	x	x			x								x	x	x	x		x		x	x			
Mattes 2009 [3]	x	x	x			x	x	x		x	x			x	x		x		x		x	x	x		
Yang 2010 [2]	x	x	x			x	x	x		x	x			x	x		x		x			x	x		
EFSA 2011 [32]	x	x			x	x		x						x					x						
Pepino 2011 [33]	x	x	x	x		x	x	x		x	x	x		x		x	x	x	x	x	x		x	x	x
Sylvetsky 2011 [34]	x	x	x	x		x		x		x	x			x	x	x			x		x	x	x		
Andersen 2012 [35]	x	x			x	x								x		x		x	x		x				
Brown 2012 [36]	x	x	x			x	x	x		x	x	x	x	x	x	x	x	x					x	x	x
Raben 2012 [37]	x	x			x	x	x	x		x	x	x		x	x				x	x	x	x	x		
Swithers 2013 [38]	x	x				x		x			x	x		x	x				x	x		x			
Araurjo 2014 [39]	x	x	x		x	x	x	x		x	x			x		x	x	x	x	x	x		x	x	x
Ferreira 2014 [40]	x	x	x			x		x						x	x	x	x		x		x	x			
Freswick 2014 [41]	x	x				x	x	x			x			x	x		x		x		x				
Gardner 2014 [42]	x	x				x		x						x	x	x	x	x	x	x	x				
Bellisle 2015 [43]	x	x				x								x	x		x						x		
Bruke 2015 [44]	x	x	x			x	x	x			x		x					x					x	x	x
Fernstrom 2015 [45]	x	x	x			x	x	x		x	x	x		x	x	x	x		x			x			
Pepino 2015 [46]	x	x	x	x	x	x	x	x		x	x	x		x	x	x	x			x			x	x	x
Roberts 2015 [47]	x	x				x								x	x				x	x	x	x	x		
Swithers 2015 [48]	x	x	x		x	x		x		x	x			x	x		x	x	x			x			x
Fowler 2016 [49]	x	x	x			x	x	x	x	x	x			x		x	x		x		x				
Glendinning 2016 [50]			x		x	x		x						x			x		x		x		x		x
Nettleton 2016 [51]	x	x	x			x		x		x	x				x	x	x		x	x	x	x	x	x	x
Peters 2016 [52]	x	x	x		x	x		x						x	x	x			x		x	x			
Shearer 2016 [53]	x	x	x		x	x		x		x	x				x	x	x	x	x				x	x	x
Swithers 2016 [54]	x	x	x		x	x				x				x	x				x			x			x

Example of integrative framework

Figure 3. Illustrative depiction of the interrelationship model of mental well-being and medical professionalism attributes.

Integrative framework integrates the information gathered in a scoping review

Example of analytical framework

Analytical framework illustrates reviewers' thinking in a systematic manner

JBI

JBIMANUAL FOR EVIDENCE SYNTHESIS

April 2021

Table. PRISMA-ScR Checklist

Section	Item	PRISMA-ScR Checklist Item
Title	1	Identify the report as a scoping review.
Abstract		
Structured summary	2	Provide a structured summary that includes (as applicable) background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.
Introduction		
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.
Methods		
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).
Summary measures	13	Not applicable for scoping reviews.
Synthesis of results	14	Describe the methods of handling and summarizing the data that were charted.
Risk of bias across studies	15	Not applicable for scoping reviews.
Additional analyses	16	Not applicable for scoping reviews.
Results		
Selection of sources of evidence	17	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.
Characteristics of sources of evidence	18	For each source of evidence, present characteristics for which data were charted and provide the citations.
Critical appraisal within sources of evidence	19	If done, present data on critical appraisal of included sources of evidence (see item 12).
Results of individual sources of evidence	20	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.
Synthesis of results	21	Summarize and/or present the charting results as they relate to the review questions and objectives.
Risk of bias across studies	22	Not applicable for scoping reviews.
Additional analyses	23	Not applicable for scoping reviews.
Discussion		
Summary of evidence	24	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.
Limitations	25	Discuss the limitations of the scoping review process.
Conclusions	26	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.
Funding	27	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.

Challenges…

- **Large number** of records/sources
- Not knowing **what data to extract** (it is common to extract data that is unrelated to the research question)
- Not knowing **how to synthesize data** (lack of guideline on data synthesis)
- **How to present data effectively** (lengthy)

Publish

Conduct & Reporting

Preparation

- **Poor quality** of published scoping review (lack of prior protocol)
- **Reviewers are not familiar** with scoping review
- **Overstretched conclusion** (authors tend to make recommendation, but results from SR is don't make implication of practice)

- Unsure whether a scoping review is **appropriate or not**
- **Unfamiliar** with scoping review methodology & protocol
- Unsure about **research question**

Take home message

Indication of scoping review
Understand when to use scoping review and familiarize yourself with scoping review method

Plan your scoping
Follow the 5 tips and 7-steps of JBI scoping review

Comply to the latest guideline
Use the JBI Scoping Review protocol (2022) to conduct the review & Use PRISM-ScR to report

Publish your protocol & Scoping Review
Peer-reviewed journal & open access repositories