

REVIEW

## Analysis research public health trends with the RE-AIM model and vosviewer : a literature review

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### Abstract

**Objective:** This study uses the VOSviewer tool to conduct research mapping analysis in order to examine public health research using the RE-AIM Framework. The purpose of this study was to determine the use of RE-AIM shells in public health research. And the Vosviewer application can be used to read the distribution of research evaluated with RE-AIM so that it can be used by researchers to obtain novelty in research.

**Methods:** Descriptive analysis is used with a quantitative bibliometric approach in this research strategy. Based on Web of Science search results, the research data was acquired with the keywords "sanitation, public health, RE-AIM".

**Results:** From the data produced in the last five years (2017–2022), A total of 279 scholarly articles were acquired. The findings demonstrated that each year, more study has been conducted on public health and RE-AIM, and the topic of sanitation or enviromental health and RE-AIM has never been conducted.

**Conclusion:** Currently, research on the subject of public health, environmental health and RE-AIM is worthwhile, and it involves research that is still infrequently done. It is therefore anticipated that this research will serve as a guide for selecting the research topic.

**Keywords:** Bibliometrics, VOSviewer, Public Health, RE-AIM

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## INTRODUCTION

4.5 billion people, or 57% of the world's population, had access to safely managed sanitation services in 2022. Seven of the eight SDG regions and 135 of the countries have national estimates of good sanitation access.<sup>1</sup> The ambitious goal of providing equitable sanitation for all by 2030 is one of the revised Sustainable Development Goals (SDGs).<sup>2</sup> Inadequate WASH (water, sanitation, and hygiene) negatively impacts social and mental health and is a major cause of the spread of infectious diseases.<sup>3</sup> Neglected tropical diseases (NTDs) are largely caused by deficiencies in WASH.<sup>4</sup>

Increasing access to and usage of facilities is necessary to lessen the negative effects of inadequate sanitation and hygiene.<sup>5</sup> The goal of Community Led Total Sanitation (CLTS) is to improve community knowledge and awareness of the dangers by promoting long-term behavioral change via mobilization and motivation.<sup>6</sup>

The Indonesian government is tackling this issue by enforcing the Indonesia Health Ministry Number 3/2014 Regulation for Community-Led Total Sanitation (CLTS) and educating the populace through a campaign about the significance of environmental health and hygiene practices. Every community program should be reviewed, and the sustainability of the program should not be determined only by the operation of the machinery, but also by the administration and the involvement of the community.<sup>7</sup>

RE-AIM framework (Reach, Efficacy, Adoption, Implementation, and Maintenance) to describe the cumulative impact of this health system-led community-partnered effort to promote health. The use of *the RE-*

*AIM framework* in program evaluation can avoid excessive use of resources, program irregularities, and failure to improve the degree of public health.<sup>1</sup> However, previous research has shown a lack of studies mapping the use of the RE-AIM framework to evaluate community-based research in public health research.

RE-AIM has been widely used to evaluate health program interventions, so it needs to be analyzed more deeply whether this framework has been used to evaluate Community Led total Sanitation. The analysis is continued using the VOSviewer application where we will be able to determine a novelty in public health research evaluated using the RE-AIM framework. The focus of this research is the analysis of the RE-AIM framework in sanitation research using mapping analysis with the Vosviewer application. Descriptive analysis and quantitative bibliometric methodologies based on research keywords are combined in this research method.

## METHODS

This research strategy combines a quantitative bibliometric approach with descriptive analysis. Based on search results for the terms public health, sanitation, and RE-AIM using the Web of Science electronic database, research data was acquired.

RE-AIM is an evidence-based evaluation framework commonly used to assess real-world applications and the impact of public health interventions in the community. The RE-AIM (Reach, Effectiveness, Adoption, Implementation, Maintenance) framework offers a comprehensive approach taking into account five dimensions namely reach, effectiveness, adoption, implementation and maintenance. It is important to evaluate the

impact on public health of an intervention.<sup>2</sup>

The RE-AIM framework is an evaluation and planning tool used to understand and improve the effectiveness of public health interventions. It assists researchers and practitioners in planning, evaluating, and deploying health interventions by considering five key dimensions: Reach, Effectiveness, Adoption, Implementation, and Maintenance. Here is a brief description of each dimension:

**Reach:** How many individuals or groups were involved in the intervention? It assesses how well interventions reach the target population and how representative they are.

**Effectiveness:** How well did the intervention work in producing the desired outcome among the target population? It involves measuring the impact of interventions on relevant health outcomes.

**Adoption:** How well did the organization or individual receive and implement the intervention in a real context? It involves assessing the extent to which interventions are adopted by health care organizations or providers.

**Implementation:** To what extent are interventions implemented with consistency and integrity in the workplace or in healthcare settings? It considers how well the intervention was implemented according to the original plan.

**Maintenance:** To what extent can the intervention be maintained over the long term after the original period of the intervention? It considers the sustainability of the effect of the intervention, whether it remains effective after the initial intervention period.

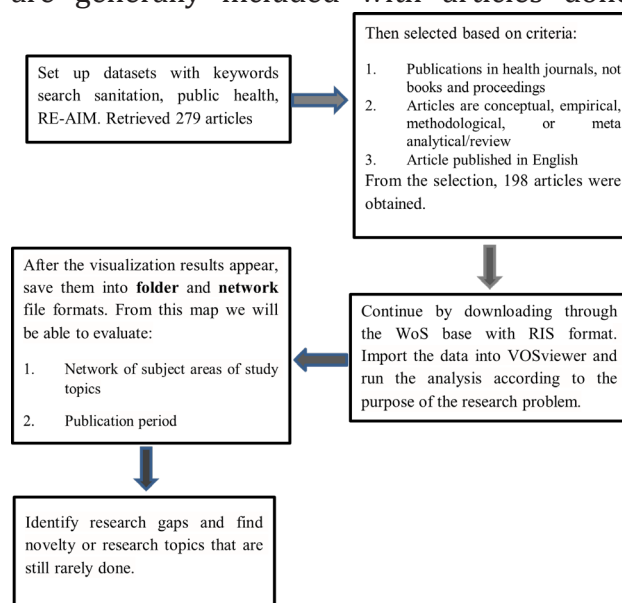
By paying attention to all these dimensions, the RE-AIM framework helps in planning effective interventions, ensuring that they are well implemented and adopted, and

sustainable in the long term. It is also useful in evaluating existing interventions to improve understanding of their feasibility and effectiveness.<sup>3</sup>

Our bibliographic search includes all health articles using the RE-AIM framework in the world published over a 5-year period, from 2017-2022, A total of 279 articles were analyzed. We set three eligibility criteria for selecting articles relevant to our research :

1. Studies are published in public environments in the fields of health, education research, and health policy. Books, monographs, and conferences are not included.
2. The manuscript included in the review must be conceptual, empirical, methodological, or meta-analytical/review with editorial case studies.
3. Due to linguistic constraints, the study was limited to articles published in English.

Many different types of data must be explored in a bibliographic data model. Metadata such as author, publishing data, category, and time are generally included with articles done



using the VOSviewer application.

**Figure 1.** VOSviewer workflow

RE-AIM is a framework to guide program planning and evaluation according to RE-AIM outcomes: Reach, Effectiveness, Adoption, Implementation, and Maintenance

General workings of the VOSviewer application:

**Data Input:** First of all, you need to provide your bibliometric data. This data can be a text file that contains information such as article title, author name, year of publication, and number of citations. File formats supported by VOSviewer include BibTeX format, ris format, and plain text format.

**Data Processing:** Once the data is loaded into VOSviewer, it processes the data. This process involves mapping relationships between articles based on authors' citation or co-citation patterns, as well as calculating bibliometric statistics such as citation count, h index, and others.

**Visualization:** VOSviewer will generate a graphical visualization of your bibliometric data. These visualizations are often networks or maps that display relationships between entities (such as articles or authors). Frequently cited articles or authors who collaborate frequently tend to be placed closer to each other in visualization.

**Analytics:** Once the visualization is created, you can perform different types of analysis of your data. This includes identification of article clusters or groups of authors who collaborate frequently, analysis of distances or similarities between articles, and identification of high-impact articles.

**Visualization Customization:** VOSviewer allows you to customize the visualization according to your needs. You can change the color, size, or layout of entities in visualizations to improve data interpretation.

**Interactive:** VOSviewer also allows direct user

interaction with visualizations. You can click on a specific entity to view detailed information, such as article titles or bibliometric statistics, or to highlight relationships with other entities.

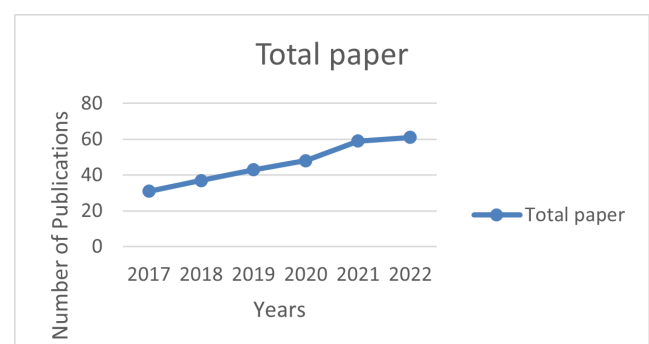
## RESULTS

### Development of sanitation, public health, and RE-AIM framework

Data collection in this study used software by looking at published articles. In searching for data, we use the keywords sanitation, public health, and RE-AIM for the period 2017 to 2022, which have been published on the Web of Science. There are 279 articles that are pertinent to these keywords based on the search results.

From 279 articles selected based on criteria : Publications in health journals, not books and proceedings, Articles are conceptual, empirical, methodological, or meta analytical/ review, Article published in English. From the results of the selection, 198 articles were obtained.

The dynamics of the development of health research using the RE-AIM framework can be seen in figure 2.



**Figure 2.** Graph of scientific articles on the theme of public health and RE-AIM

From the graph, we can see that the use of the RE-AIM framework in health research always increases every year.

## Network visualization of topic subject areas

In network visualization, the topic of study is grouped into 10 clusters. The main areas per cluster are Re-Aim (blue cluster), Public Health (green cluster), Health promotion (yellow cluster), Mental health (red cluster), physical activity (light green cluster), Health impacts (light blue cluster), environment (light yellow cluster), Health policy (pink cluster), Health program effectiveness (purple cluster), disease (orange cluster).

The light color indicates that little research is being done. Environmental health research networks using the RE-AIM framework show a light yellow color, so this research is still rare.

## Publication period Overlay Visualization

Overlay visualization illustrates the mapping of the novelty of the study. There is a section that indicates the color parameters ranging from the darkest (purple) to the lightest (yellow). Darker means that the year of publication of the article discussing the topic is years ago, while the one shown in light

means that the article was published in the new year.

This study selected health articles using the RE-AIM framework in the last 5 years and obtained 21 articles.

Then we show you the 10 articles with the highest number of citations to see the extent of research interest in this topic.

Research using the *RE-AIM Framework* increased annually starting in 2017. The search results that have been carried out on the *Web of Science* get 198 articles that are in accordance with the research topic.

We have selected the top 21 papers from 21 distinct publications based on the data we filtered. Out of the 279 publications that were acquired, Table 1 presents statistics on the 10 articles that have received the most citations. The highest citation in the 2019 article was 278 citations, while the lowest citation was in the 2020 article with 1 citation.

The criteria for selecting articles are from the last 5 years, then articles that use the RE AIM framework to evaluate the impact of health interventions.

No	Author	Title	Cited	Years	Journal
1	Moullin, J C; Dickson, K S; Stadnick, N A; Rabin, B; Aarons, G A	Systematic review of the Exploration, Preparation, Implementation, Sustainment (EPIS) framework(4)	278	2019	Implementation Science
2	Messing, S; Rutten, A; Abu-Omar, K; Ungerer-Rohrich, U; Goodwin, L; Burlacu, I; Gediga, G	How Can Physical Activity Be Promoted Among Children and Adolescents? A Systematic Review of Reviews Across Settings(5)	91	2019	Frontiers In Public Health
3	Harden, S M; Smith, M L; Ory, M G; Smith-Ray, R L; Estabrooks, P A; Glasgow, R E	RE-AIM in Clinical, Community, and Corporate Settings: Perspectives, Strategies, and Recommendations to Enhance Public Health Impact(6)	87	2018	Frontiers In Public Health
4	Indig, D; Lee, K; Grunseit, A; Milat, A; Bauman, A	Pathways for scaling up public health interventions(7)	69	2017	Bmc Public Health
5	McCreight, M S; Rabin, B A; Glasgow, R E; Ayele, R A; Leonard, C A; Gilmartin, H M; Frank, J W; Hess, P L; Burke, R E; Battaglia, C T	Using the Practical, Robust Implementation and Sustainability Model (PRISM) to qualitatively assess multilevel contextual factors to help plan, implement, evaluate, and disseminate health services programs(8)	67	2019	Translational Behavioral Medicine
6	Jones, A; Magnusson, R; Swinburn, B; Webster, J; Wood, A; Sacks, G; Neal, B	Designing a Healthy Food Partnership: lessons from the Australian Food and Health Dialogue(9)the Federal Government established the Food and Health Dialogue (the Dialogue	66	2016	Bmc Public Health
7	Rabin, B A; McCreight, M; Battaglia, C; Ayele, R; Burke, R E; Hess, P L; Frank, J W; Glasgow, R E	Systematic, Multimethod Assessment of Adaptations Across Four Diverse Health Systems Interventions(10)	53	2018	Frontiers In Public Health
8	Asante, K P; Afari-Asiedu, S; Abdulai, M A; Dalaba, M A; Carrion, D; Dickinson, K L; Abeka, A N; Sarpong, K; Jack, D W	Ghana's rural liquefied petroleum gas program scale up: A case study(11)	48	2018	Energy For Sustainable Development
9	King, D K; Shoup, J A; Raebel, M A; Anderson, C B; Wagner, N M; Ritzwoller, D P; Bender, B G	Planning for Implementation Success Using RE-AIM and CFIR Frameworks: A Qualitative Study(12)	46	2020	Frontiers In Public Health
10	Kerkhoff, A D; Sachdev, D; Mizany, S; Rojas, S; Gandhi, M; Peng, J; Black, D; Jones, D; Rojas, S; Jacobo, J; Tulier-Laiwa, V; Petersen, M; Martinez, J; Chamie, G; Havlir, D V; Marquez, C	Evaluation of a novel community-based COVID-19 'Test-to-Care' model for low-income populations(13)	37	2020	Plos One





assess the effectiveness of disease prevention programs<sup>34</sup> and to increase access to primary health care.<sup>35</sup>

Next, we investigated an examination of trends in publications and citations, author affiliations, including their countries and institutions, and the sources in which the study was published. Next, we present an in-depth analysis of the selected articles with the highest number of citations. Based on bibliometric with VOSviewer studies that have potential for future research is the use of the RE-AIM framework to evaluate community-based health programs in the community.<sup>(36)</sup> Research with the bibliometric VOSviewer application can help researchers in planning and strategizing for future research..<sup>37</sup>

This application can be used to search and analyze academic citations. We can find out the number of papers from certain researchers along with their h-index. This can make it easier to see the impact of a study. VOSviewer can also help find research gaps or novelty of a research theme.

The RE-AIM framework has several advantages that make it a useful evaluation tool in the development, evaluation, and deployment of public health interventions. Some of its advantages include:

**Comprehensive:** RE-AIM covers five critical dimensions of health interventions: reach, effectiveness, adoption, implementation, and maintenance. This allows for a more comprehensive assessment of the effectiveness of interventions from start to finish, including deployment and sustainability issues.

**Context Appropriateness:** RE-AIM is designed to be applicable in a variety of contexts, including in clinical research, community settings, or in healthcare settings. This makes it useful for a wide variety of

practitioners and researchers in various fields.

**Focus on Externalities:** One of RE-AIM's key advantages is its emphasis on reach and adoption, which helps ensure that health interventions are not only effective in clinical trials, but can also be widely adopted and used by target populations in the real world.

**Sustainability Orientation:** RE-AIM places special attention on the maintenance of interventions, ensuring that the positive effects of interventions can be maintained in the long term after the original period ends. This is important to ensure a sustainable impact on public health.

**Simple and Easy to Understand:** Although it covers important aspects of health interventions, the RE-AIM framework is relatively simple and easy to understand, making it usable by a wide range of practitioners and researchers without an in-depth statistical or epidemiological background.

With these advantages, RE-AIM becomes a valuable tool in planning, evaluating, and deploying effective and sustainable health interventions to the wider population.

This can be seen in the publication of research results that use RE-AIM to evaluate the impact of health programs in a community. Among them to evaluate management support programs for type 2 diabetes.<sup>(38)</sup> use of RE-AIM to analysis of Clinical Encounters by Emergency Medical Services Physicians.<sup>(39)</sup> To evaluation of the Reaching Out to Kids with Emotional Trauma (ROCKET) intervention in an elementary school.<sup>40</sup> During the COVID pandemic, the RE-AIM framework was also used to evaluate open online course.<sup>41</sup>

Of the 17 community-based programs evaluated, 15 of them used the RE-AIM



dimension. The qualitative results of quantitative states that RE-AIM is stated as a practical implementation science framework. RE-AIM is an efficient framework for clinical and community-based project planning and evaluation. RE-AIM provides a structure for systematically evaluating the impact of health programs.<sup>42</sup>

## CONCLUSION

Mapping with VOSviewer shows that public health and environmental health research using the RE-AIM framework is still rarely carried out. The use of the RE-AIM framework can be a method to evaluate health programs and see the effectiveness of these programs.

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**Ethical Declaration:** Ethics-related difficulties, including as plagiarism, informed consent, misconduct, falsification of data that the authors have fully noticed, duplicate publishing and submission, redundancy, etc. This research has gained ethical approval from the Faculty of Public Health Diponegoro University, and Certificate number 393/EA/KEPK-FKM/2022.

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**Author Contribution:** Conceptualization, design, data collection and entry, literature search (YR); Methodology, Instructor, Equipment (HMD); Analysis and interpretation (SP); Data curation, writing, critical review (YHD)

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