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LETTER TO EDITOR

Commentary: Expanding the horizons of RE-AIM framework in public health research

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Abstract

Objective: This commentary critically examines Yuliawati *et al.*'s 2024 review, "Analysis of research public health trends with the RE-AIM model and VOSviewer: A literature review," which investigates the application of the "Reach, Effectiveness, Adoption, Implementation, Maintenance (RE-AIM)" framework in public health research. The review highlights trends in 279 studies conducted between 2017 and 2022 and draws attention to the insufficient focus on environmental health and sanitation interventions within the RE-AIM framework. The objective is to address these gaps and propose future directions for broadening the framework's application.

Methods: The commentary evaluates the methodology used by Yuliawati *et al.*, with particular attention to their utilization of the VOSviewer tool to map trends in RE-AIM-based research. It also explores the identified research gaps and incorporates insights from existing literature to examine the barriers that limit RE-AIM's application in environmental health and sanitation.

Results: Yuliawati *et al.*'s review demonstrates growing interest in the RE-AIM framework, but points out a notable deficiency in its application to environmental health and sanitation interventions. This commentary identifies potential reasons for this gap, such as limited interdisciplinary collaboration and resource constraints, and suggests that addressing these challenges could improve RE-AIM's effectiveness in these fields.

Conclusion: This commentary advocates for future research to overcome the barriers to RE-AIM's application in environmental health and sanitation. It emphasizes the importance of interdisciplinary approaches and the need for a more adaptable framework to evaluate complex, multi-faceted public health challenges.

Keywords: Public Health Research, Implementation Science, Longitudinal Data, Environmental Health

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ANALYSIS OF RESEARCH PUBLIC HEALTH TRENDS WITH THE RE-AIM MODEL AND VOSVIEWER: A LITERATURE REVIEW

Yuliawati *et al*. 's 2024 review article, "Analysis research public health trends with the RE-AIM model and VOSviewer: A literature review," offers a comprehensive examination of the application of the RE-AIM framework in public health research.[1] "Reach, Effectiveness, Adoption, Implementation, Maintenance (RE-AIM)" is a framework used to evaluate health interventions based on five key dimensions. It aims to assess their impact on health outcomes while also considering scalability, sustainability, and real-world applicability to determine the broader effectiveness and potential of health programs in diverse settings.[2,3] VOSviewer https://www.vosviewer. com/ is a free computer program designed for constructing and visualizing bibliometric maps, with a focus on the graphical representation and easy interpretation of large maps.[4] Through the application of the VOSviewer tool for bibliometric analysis, the authors have identified trends across 279 RE-AIM-based studies published between 2017 and 2022. The review focuses particularly on the lack of research at the intersection of environmental health, sanitation, and the RE-AIM framework, highlighting gaps that open avenues for future exploration. Although their findings are insightful, there are several opportunities to expand on the challenges and potential solutions to integrating RE-AIM into underrepresented areas like environmental health.

The core strength of Yuliawati *et al*. 's review article lies in the application of the VOSviewer tool to visualize public health research trends using RE-AIM. This tool has allowed the authors to categorize and map research articles, offering a clear representation of active research areas and under-explored topics, particularly those related to environmental health and sanitation. The review effectively identifies a clear gap in the application of RE-AIM in sanitation and environmental health interventions, a topic that has not seen much scholarly attention in recent years.[1] As emphasized in a 2019 publication, understanding the reach and sustainability of interventions within these domains requires careful consideration of factors such as community engagement and resource limitations, which are often overlooked by conventional research methodologies.[5] The authors' analysis additionally confirms the growing interest in RE-AIM across public health research. This finding resonates with the increasing emphasis on evaluating not only the efficacy of public health interventions but also their real-world applicability and sustainability across diverse settings.[6] The utility of the framework in assessing the broad and long-term impact of public health interventions is emphasized, especially in terms of scalability and adaptability to different populations.

The limitations and areas for further exploration identified in the current article include the insufficient research on environmental health and sanitation using the RE-AIM framework. This commentary posits that the review would be enhanced by a more comprehensive analysis of the barriers contributing to the existing gap. The authors acknowledge the scarcity of studies in these areas, though further exploration of the underlying reasons for this underrepresentation would provide valuable insight. Factors such

as interdisciplinary collaboration or the lack thereof may contribute to the limited application of RE-AIM in environmental health. As noted in the context of the use of the RE-AIM framework to guide iterative adaptations, addressing complex health challenges requires not only a framework for planning and evaluation but also close collaboration with key implementation partners, including health care providers, local stakeholders, and community representatives, to inform data-driven decisions and ensure successful adaptations throughout program implementation.[2] The absence of such collaborations might explain why interventions in sanitation and environmental health are often complex, multifaceted, and harder to evaluate using traditional public health frameworks. While Yuliawati *et al*.'s review suggests that sanitation and environmental health are underresearched in relation to RE-AIM[1], it would be beneficial to explore the structural challenges that may hinder their effective evaluation. Data availability, for example, may pose a significant barrier, as collecting comprehensive, longitudinal data on the effectiveness of sanitation interventions in diverse contexts can be both costly and time-consuming. The difficulty in measuring long-term impacts, such as improvements in community health over several years, poses an additional challenge to studies using RE-AIM's "Maintenance" dimension. A 2021 publication addressed 13 specific areas where misconceptions have arisen regarding the use of RE-AIM and provided a summary of current guidance on these issues. As emphasized in the evolution of the RE-AIM framework, many implementation science models and frameworks, including RE-AIM, have advanced, been misunderstood, and at times, been misapplied. While some degree of this is inevitable, concrete actions were suggested that reviewers, framework developers, and those selecting or applying frameworks can take to prevent or mitigate these challenges, fostering more accurate and effective use in the future.[3] In light of these ongoing challenges and the need for continued refinement, the 2024 review could also explore ways in which RE-AIM can be adapted to address the unique characteristics of environmental health interventions. Unlike clinical or behavior-based public health interventions, environmental health initiatives often involve multilevel impacts that span across communities, institutions, and ecosystems. As highlighted in 2019, there persists a critical need to adapt the RE-AIM framework to better account for these extensive and interconnected influences.[5] This could involve a more thorough application of the framework, focusing on how environmental health interventions engage various stakeholders, including local governments, health care providers, and community-based organizations.

A call for future research emphasizes the need to prioritize the integration of the RE-AIM framework into environmental health and sanitation studies, as suggested by Yuliawati *et al*..[1] Given the growing significance of these areas, particularly in the context of global health challenges such as water sanitation and climate change, more targeted research is essential to understand how RE-AIM can be effectively applied in low-resource settings. Investigating the "Reach" and "Effectiveness" dimensions of sanitation interventions could yield valuable insights into the factors influencing their adoption and success in

resource-poor communities. Understanding how local populations perceive and engage with these interventions could also help tailor them to meet specific community needs, thereby enhancing their long-term sustainability. An additional critical aspect is the exploration of the role of the RE-AIM framework in evaluating the long-term "Maintenance" of environmental health interventions. As noted in 2022, Iterative RE-AIM has proven feasible in diverse projects, but key questions remain about its strengths, limitations, and effectiveness. To address these, future research should focus on optimizing its frequency, improving data for adaptation decisions, enhancing health equity, and determining the most cost-effective facilitation approach.[2] Research could additionally explore how RE-AIM can be adapted to capture complex, long-term processes, and assess the ongoing effectiveness and feasibility of interventions in various contexts. A particularly exciting avenue for future research involves the potential for interdisciplinary approaches that integrate environmental health, social sciences, and public health. Such collaboration could provide a more holistic framework for evaluating sanitation interventions and understanding how factors like cultural norms, social capital, and local governance structures impact their effectiveness. This approach would align well with the goals of RE-AIM, as it would allow for a more complete assessment of how interventions operate across multiple levels and stakeholders.

This commentary article, in conclusion, remarks that Yuliawati *et al*. 's review article is a timely contribution to the literature on the RE-AIM framework and its application in public health research. Their findings call attention to the growing interest in RE-AIM and its importance in evaluating public health interventions, particularly with regard to ensuring their sustainability and impact over time 1. The review would be further enhanced by exploring the barriers to the application of the RE-AIM framework in underexplored areas, such as environmental health and sanitation, and by providing practical recommendations to overcome these challenges. This would add considerable value to the literature and offer actionable insights for advancing the framework's utility in these critical domains. The authors of the review article could significantly advance future research and enhance the applicability of the RE-AIM framework to complex, multi-level public health challenges by addressing the areas outlined in the present commentary. As the global community faces increasing challenges in sanitation and environmental health, expanding the use of RE-AIM to assess these interventions will be critical for developing effective, scalable, and sustainable solutions. Future research in this area will build on the foundation laid by Yuliawati *et al*., providing valuable insights into how RE-AIM can be tailored to better assess and improve interventions in sanitation and environmental health.

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such as paragraphing, formatting, section partitioning, standardizing the reference list, finding synonyms no more than ten words, and correcting inadvertent typographical errors.

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