Mapping the Environmental Co-Benefits of Reducing Low-Value Care: *A Scoping Review and Bibliometric Analysis*

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1 BACKGROUND

Strategies identified in the literature as critical to ensuring an effective and efficient (sustainable) health system include reducing ***low-value care*** (LVC) [1,2] and reducing the environmental impact of healthcare [3–5]. Low-value care includes care practices (tests, treatments or procedures) that have been identified, using scientific evidence, to be unnecessary, ineffective or harmful in hospital, primary-care, long-term care or public health contexts [6]. Common examples of LVC include antibiotics for viral infections and laboratory testing prior to low-risk surgeries [2]. Reducing LVC offers myriad benefits, including improving patient care and outcomes and freeing resources for expanded coverage [2,7–9]. By definition, LVC generates carbon emissions, waste, and pollution without improving patient or population health [7,10].

Within the climate change literature, ***"co-benefits"*** include the positive environmental impacts that a policy or intervention aimed at one objective might have on other objectives, thereby increasing the total benefit for society [11]. For health systems, addressing the challenge of LVC [12,13] has the potential to be a critically important strategy for securing environmental co-benefits at the frontline of care delivery and at organization and system levels. Co-benefits have been described as "happy accidents" that produce a benefit. There may be potential to deliberately optimize such benefits in healthcare by understanding interdependent relationships, identifying synergies, and addressing potential barriers [14].

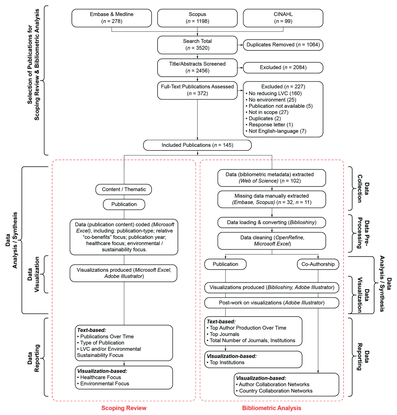
2 OBJECTIVES

The objectives of this study were to identify and characterize a body of literature to build foundational knowledge and advance understanding of this field through a scoping review and bibliometric analysis. Specifically, a goal of this study was to illustrate the trends in the research and practice change literature, and especially to identify emerging areas of interest (focus) in this field. In addition, the study aimed to develop quantitative and visual data on the key authors, countries, networks and international trends advancing work at the intersection of environmental sustainability and reducing low-value care.

3 METHODS

We selected a scoping review and bibliometric analysis as the ideal methods to conduct our inquiry. A scoping review, a literature-synthesis type, is most appropriate when examining emerging and/or broad topics with the aim of characterizing their features [15]. Bibliometric analysis involves descriptive, statistical analysis of aggregated bibliometric metadata associated with relevant publications to provide insights into the key topics and contributors (authors, author institutions and institution countries)—and the relationships between them—within a particular research area (field) [17–20]. We searched four databases, Medline, Embase, Scopus and CINAHL, and followed established scoping review and bibliometric analysis methodology to collect and analyze the data (Figure 1).

Figure 1. Flow diagram outlining the study design.



3 SCOPING REVIEW-SPECIFIC RESULTS

Publication Timeline: The first included paper was published in 2013. The majority of included publications (34%) were published within the first half of 2023, with only 12% of publications produced before 2020 (Figure 2).

Type of Publication: The most prominent publication types were commentaries/opinions/editorials/ viewpoints (51%), followed by reviews (23%) and empirical studies (21%). The remaining 5% of publications included protocols, conference abstracts and position statements.

Healthcare Focus: Healthcare focus was recorded in four categories—'Procedures', 'System organizaion/ design/evaluation', 'Pharmaceuticals' and 'Care Type/Setting' and 15 sub-categories (Figure 3). The first category, 'Procedures', captured the majority of publications (42%). The second category, 'System organization/ design/ evaluation', captured publications (30%) focused on the health system or healthcare generally or publications related to metrics or measurement. The third category, 'Pharmaceuticals', (14%), was split into antibiotics and other pharmaceuticals to demonstrate the amount of work published specific to antibiotics. The fourth category, 'Care Type/Setting', captured publi- cations (14%) focused on care within a particular setting rather than a specific procedure or pharmaceutical. This category included primary care-, hospital-, mental health/psychiatry- and nursing-focused publications.

Environmental Focus: For the 13 empirical studies included in this analysis, we reported results across six categories, 'GHG emissions', 'Pollution', 'Resource use', 'Waste management', 'Supply chain and facility/ service design' and 'Environmental stewardship' and sixteen sub-categories of environmental outcome (Figure 4). Evidence or recommendation data were reported across all 16 sub-categories. The majority were for 'GHG emissions (healthcare general)', 'GHG emissions (specific healthcare practice)' and 'Pollution'. Reported outcomes were present in 11 of the 16 subcategories. Of the thirteen studies that reported outcomes, seven reported outcomes across multiple categories and four reported a single outcome. Eleven of the thirteen studies reported a reduction in 'GHG emissions', followed by outcomes for 'Use less single-use products', then outcomes for 'Use less energy'.

Figure 2. Publications over time.

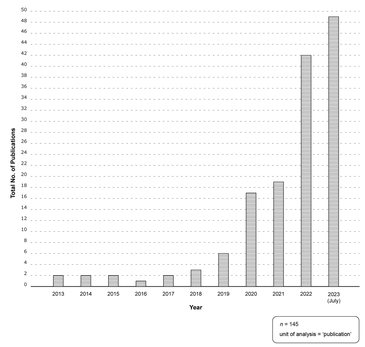


Figure 3. Healthcare focus of publications.

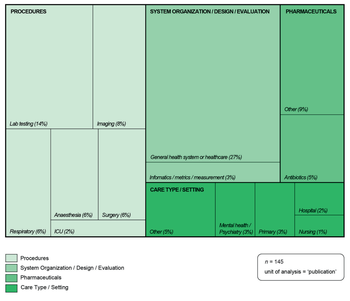
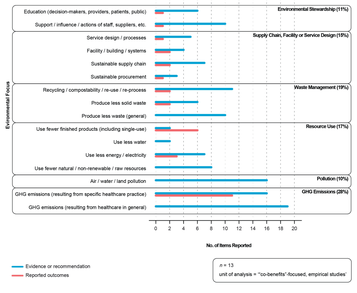


Figure 4. Environmental focus of publications.



4 BIBLIOMETRIC ANALYSIS-SPECIFIC RESULTS

Top Author Production Over Time: Five hundred and eighty-one unique authors contributed to the 145 included publications between 2013 and 2023 (July). There were 19 'top' authors (authors with three or more publications), 14 of whom had already published relevant work in 2023. Most authors began publishing relevant publications from 2020 onwards. Seven of the 'top' authors were from the USA; six from Australia; three from Canada; two from the UK; and one from The Netherlands.

Author Collaboration Networks: The largest networks (Figure 5), by number of collaborators involved (13 each), were centered around Forbes McGain in Australia (whose included publications were published between 2019 and 2023, and who collaborated with all authors in the network) and Jodi Sherman in the USA (whose included publications were published between 2020 and 2023, and who collaborated with all but one author in the network).

Country Collaboration Networks: Two primary networks were identified (blue and red; Figure 6). The largest network by number of countries captured (blue) comprised 17 unique countries, and represented seven publications published between 2019 and 2023 and generated by two or more of the authors within the network (but not exclusively). The second largest, but most productive, network (red) comprised 11 unique countries, and represented 24 publications published between 2019 and 2023 and generated by two or more of the authors within the network (but not exclusively). The remaining networks (purple, green, orange, pink, brown, and grey) each represent one publication (n = 6) published between 2019 and 2023 and generated through collaboration with authors situated within the primary networks (blue and red).

Top Institutions: Three hundred and eighty-seven unique institutions (affiliates) contributed to the 145 included publications. Figure 7 depicts the top institutions (with four or more publications). There were sixteen 'top' institutions: five were from Australia; four from the USA; four from the UK; and three from Canada. The top-producing institution was the University of Sydney, with 18 publications. The majority of top-producing institutions were universities, followed by medical centres or medical organizations.

Figure 5. Author collaboration networks.

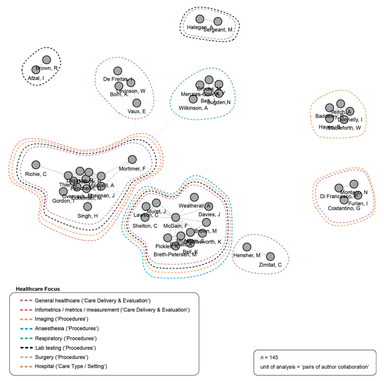
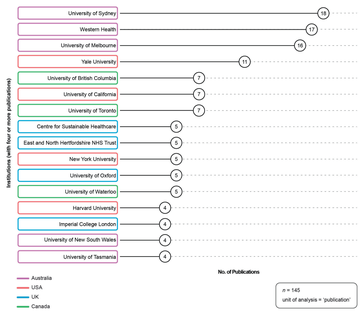


Figure 6. Country collaboration networks.

Figure 7. Top institutions over time.



5 DISCUSSION

The publication trend over time demonstrated that research and evaluation to inform practice changes in this area has dramatically increased over the last three years. The collaboration network analyses revealed that large, international groups of authors are working together to advance this field. These results demonstrate that these author collaboration networks are not necessarily focused on a specific area of healthcare, but rather focused on co-benefits research and/or practice change. In addition, the results show that in recent years, increasingly, a greater number of authors from countries with emerging economies (such as Thailand, India, Jamaica, and Sudan) have been contributing to knowledge production in this field. Our findings also demonstrated that the majority of included publications focused on environmental sustainability while flagging the importance of reducing LVC as a possible strategy. The healthcare focus results highlighted the fact that the included publications covered a broad scope and diverse practices in healthcare. The included empirical publications focused on targeted practice-change interventions for specific healthcare practices, primarily reducing unnecessary laboratory testing and inappropriate inhaler use. These two areas are also significant foci for research strictly focused on reducing environmental harms or reducing LVC, and represent a logical merging of these fields. The analysis of the environmental sustainability focus demonstrated that the included empirical studies cited evidence, made recommendations, and reported outcomes across a broad spectrum of environmental sustainability outcomes.

6 CONCLUSION

The exponential growth in publications demonstrates a growing field of international collaboration and broad engagement across healthcare and environmental-sustainability outcomes. While the environmental focus of the field was predominately carbon-focused, the included publications addressed emerging areas such as composability, reprocessing or reuse, sus- tainable supply chain and procurement, and environmental stewardship. This review also highlights a need for empirical studies to advance practice change in this area. By systematically and comprehensively collecting and analyzing data on this emerging field, our research supports evidence-based health-system improvement work with the potential to increase effectiveness and efficiencies in resource-constrained health systems. Future research should focus on conducting rigorous empirical studies in this area, including the evaluation of and reporting on the broad spectrum of environmental harms.

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