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Mapping the Evolution of Andersen's Behavioural Model in Healthcare: A Bibliometric Analysis

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Abstract

Aim: This study aimed to examine the conceptual, thematic, and temporal evolution of research applying Andersen's Behavioural Model (ABM) in healthcare.

Methods: A bibliometric analysis was conducted using the Scopus database without time or document type restrictions, focusing on English-language publications. A total of 1223 records (1976-2025) were analysed using co-word and thematic mapping with Bibliometrix and VOSviewer software.

Results: A consistent rise in publications was observed after 2008, peaking in 2022. Core study areas regarding healthcare utilisation, mental health, oral health, and access to care were identified by keyword frequency and co-word analyses. Thematic mapping uncovered specialised niches regarding cancer screening, and emerging areas regarding immigrant health, health equity. Cross-

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cutting concepts regarding oral health and socioeconomic status also emerged as significant connecting topics. Analysis of temporal mapping revealed a shifting in focus from issues related to aging to more recent priorities regarding COVID-19 and health disparities.

Conclusion: ABM remains a useful framework for directing equitable, person-centred healthcare research and policy. To improve the model's applicability within global health systems, future research should expand its application through vulnerable populations, structural determinants, qualitative approaches, and emerging public health issues.

Keywords: Andersen behavioural model, bibliometric analysis, healthcare utilisation, health equity

INTRODUCTION

Healthcare access and utilisation serve as critical indicators of a health system's responsiveness and equity (WHO, 2010). In the modern healthcare landscape, which is marked by substantial resource consumption and an emphasis on person-centred care, a needs-based system seeks to meet individuals' health needs as objectively assessed by professionals while also considering their subjective healthcare demands. Achieving this balance can reduce the risks of overutilisation, underutilisation, and inappropriate utilisation of healthcare services. On the other hand, neglecting to properly address needs could endanger personal health and put more burden on the healthcare system. To support effective and equitable service delivery, it is crucial to comprehend healthcare utilisation from the perspectives of both individual and contextual factors (Lederle et al., 2021; Babitsch et al., 2012).

Andersen's Behavioural Model (ABM) is one of the most prevalent conceptual frameworks for thoroughly addressing healthcare utilization (Andersen, 1995). The ABM has significantly shaped the analysis of healthcare disparities, access, and utilization (Alkhawaldeh et al., 2023). Since it offers important insights into shifting research priorities and informs the development of health policy, an understanding of how theoretical models' evolution and are used over time is crucial for advancing health services research (Hanney et al., 2013).

Andersen's Behavioural Model

Ronald M. Andersen, an American medical sociologist and health services researcher, developed the ABM in 1968 (Andersen, 1968). The model offers a fundamental framework for comprehending how social determinants impact individuals' interactions with health services, and it is created to explain the factors influencing healthcare access and utilisation (Andersen and

Newman, 2005). The model's original goal is to investigate ideas like "access" and "accessibility" concerning healthcare systems (Aday and Andersen, 1974; Andersen, 1995).

By conceptualizing and operationalizing access, Aday and Andersen (1974) create a coherent theoretical framework that served as the foundation for the behavioural model of health service utilisation (Andersen and Newman, 2005; Andersen, 1995). Since then, the model identifies factors that explain healthcare utilization and informs public policies that aim to reduce disparities (Holde et al., 2018). In its initial form, ABM suggested that three types of factors, *predisposing, enabling, and need factors,* determine healthcare utilization. These factors work together to affect individuals' decisions to seek and receive care (Andersen, 1968). These factors include:

- Predisposing factors include sociodemographic characteristics, personal beliefs, societal structures, and attitudes that affect an individual's propensity to seek healthcare.
- Enabling factors refer to structural or enabling conditions that affect access to healthcare, including financial resources, health insurance coverage, and the availability of social support networks.
- Need factors refer to the individual's health-related needs, encompassing both clinically assessed conditions and self-perceived health issues.

The relative importance of these factors may differ depending on the type of service; for example, hospital care is primarily determined by need and demographics, whereas dental care is more closely linked to enabling and predisposing factors. Outpatient care tends to involve a balance of all three (Andersen, 1995; Andersen and Davidson, 2013).

Theoretical Development of Andersen's Behavioural Model

The model has evolved to include more expansive dimensions. Later versions cover health system characteristics, patient satisfaction (Andersen and Newman, 2005; Andersen, 2008), personal health behaviours (e.g., smoking, toothbrushing), and health outcomes (Aday and Andersen, 1981). These extensions position health behaviours not only as outcomes but also as mediators in the relationship between service utilisation and health outcomes (Cohen et al., 2011).

To emphasise the dynamic character of healthcare utilisation and the reciprocal relationship between health outcomes and service use, the ABM is further improved to include environmental factors and feedback loops (Andersen, 1995; Andersen and Davidson, 2013). The model's fifth phase, which was created in the early 2000s, revises the delivery of medical care (e.g., provider-

patient communication) as a type of health behaviour and separates contextual factors (e.g., community-level factors, infrastructure, and population indicators) from individual-level determinants. To reflect developments in behavioural genetics and person-centred care, its most recent revisions include genetic predispositions and quality of life (Andersen and Davidson, 2013). In short, the systems-based model provides a way to understand how health outcomes are affected by individual and contextual factors, including personal health habits and service-use patterns (Andersen, 1995; Andersen and Davidson, 2013).

The 1995 revision, also known as the fourth phase, is the most widely used and cited version of the ABM in health services research. Because it covers a broad range of factors under the predisposing, enabling, need, and health behaviour domains, it is regarded as being especially comprehensive (Babitsch et al., 2012; Alkhawaldeh et al., 2023; Holde et al., 2018). However, some conceptual ambiguity persists, as factors like gender, education, and employment status are frequently classified as both predisposing and enabling components (Babitsch et al., 2012; Zardak et al., 2023; Alkhawaldeh et al., 2023). On the other hand, the model's flexible structure has facilitated its application across diverse populations, service types, and geographical contexts, which contributes to its continued relevance as a theoretical framework in health services research (Alkhawaldeh et al., 2023; Bas and Azogui-Lévy, 2022; Başar et al., 2021; Galicia-Diez Barroso et al., 2023; Heider et al., 2014; Pilotto and Celeste, 2022).

Use of Andersen's Behavioural Model in Healthcare Research

In recent years, ABM has been increasingly used beyond traditional access-focused studies. Applications include oral health (Galicia-Diez Barroso et al., 2023; Zardak et al., 2023), mental health care (Roberts et al., 2018), maternal health (Alibhai et al.,2022; Tolossa et al. 2024), immigrant healthcare utilisation (Radhamony et al., 2024; Lin et al., 2022) and changes in service access during the COVID-19 pandemic (Pujolar et al., 2022). The model has also influenced studies on the assessment of hypertension risk (Hirshfield et al., 2018), nutrition program participation (Vega et al., 2017), and healthcare equity analyses (Başar et al., 2021). Cost-related applications include studies on older adults in Germany (Heider et al., 2014), caregiver services in Korea (Kim and Kim, 2021), the impact of family physician contracts (Zhang et al., 2024), and catastrophic health expenditures (Sriram and Albadrani, 2022).

A systematic mapping of the evolution of ABM in the literature is becoming increasingly necessary due to its wide range of applications in chronic care, oral health, mental health, public

health, and health services research. Although ABM applications in specific populations or conditions have been covered in several narrative and scoping reviews (Alkhawaldeh et al., 2023; Zardak et al., 2023; Orji et al., 2020; Adigun et al., 2020; Lin et al., 2021), a comprehensive bibliometric analysis has not yet been conducted to capture the conceptual, thematic, and temporal progression of the model. Therefore, this study aims to provide a comprehensive bibliometric mapping of the conceptual, thematic, and temporal evolution of Andersen's Behavioural Model (ABM) in healthcare research. By doing so, it aims to inform future research and policy development through the identification of dominant themes, emerging areas, and existing knowledge gaps.

1. RESEARCH METHODOLOGY

1.1. Bibliometric Analysis

This study used bibliometric analysis to explore the evolution of Andersen's Behavioural Model in healthcare research. Bibliometrics enables the systematic evaluation of scientific output by mapping important components such as keywords, authors, publication trends, and thematic evolution. It provides insights into the conceptual structure of a field and supports evidence-based policy development, making it a widely used method across disciplines (Cobo et al., 2011; Tripathi et al., 2018; Martínez et al., 2015).

Bibliographic data requires preprocessing before analysis to resolve possible problems like misspellings, duplicate records, and irrelevant records. According to Cobo et al. (2012), this step is crucial for providing the accuracy and reliability of science mapping outcomes. Co-word analysis, widely used in conceptual mapping, examines the co-occurrence of keywords to uncover the conceptual structure of a research field. This method identifies main themes and subtopics by grouping related terms that frequently appear together in the literature (Börner et al., 2003; Martínez et al., 2015). Co-occurrence is the term used in bibliometric studies to describe how frequently two keywords occur together in the same publication. Visualising these relationships using a co-occurrence network allows the discovery of conceptual connections between terms (Tripathi et al., 2018).

In this study, a co-word analysis was conducted using VOSviewer as a free software to map the conceptual structure of healthcare literature related to ABM. In the resulting knowledge map, each keyword is represented by a circle, with its size proportional to the number of publications in which it appears. Keywords are grouped into colour-coded clusters that reflect

thematic proximity. Curved lines connecting the circles indicate the strength of association between keywords, and thicker lines signify stronger links. Accordingly, this visual representation enables the identification of both central, well-developed themes and more specialised, peripheral topics within the ABM research (van Eck and Waltman, 2010).

1.2. Data Extraction Process

The Scopus database was selected as the main data source for a thorough analysis of international research on Andersen's behavioural model in healthcare. While other databases like PubMed and Web of Science (WoS) are frequently used in bibliometric research, each varies in coverage, disciplinary focus, and metadata quality. PubMed lacks thorough bibliographic tagging and concentrates primarily on the life sciences, whereas Scopus and WoS are multidisciplinary scientific literature databases (AlRyalat et al., 2019; Mongeon and Paul-Hus, 2016). Comparative studies have shown that Scopus index covers more journals and includes a greater number of exclusive titles than WoS, whereas WoS is noted for its selectivity (Visser et al., 2021; Singh et al., 2021). The choice of Scopus for this analysis was supported by a preliminary search that produced 1275 publications in Scopus and 1057 publications in WoS using the same query terms. During the data extraction process, no publication year and document type restrictions were applied to comprehensively capture the relationship between ABM and healthcare literature within the Scopus database. The lexical search strategy was developed based on previous studies. The TITLE-ABS-KEY field was utilised to retrieve terms from article titles, abstracts, author keywords, and indexed keywords. Accordingly, in March 2025, the boolean expression (TITLE-ABS-KEY ("Andersen model" OR "Andersen’s Model" OR "Andersen’s behavio*ral model*" OR "Andersen’s behavio*ral model of health serv*" OR "Andersen and Newman behavio*ral model of health serv*" OR "Andersen-Newman Behavio*ral Model of Health Serv*" OR "Andersen’s expanded behavio*ral model*" OR "health behavio*ral model of Andersen" OR "Andersen Behavio*ral Model" OR "Behavio*ral Model of Health Services Use" OR "Andersen Health Behavio*r Model" OR "Andersen Utili?ation Model" OR "Andersen Healthcare Utili?ation Model" OR "Andersen Framework" OR "Andersen Model of Health Service Use") AND TITLE-ABS-KEY ("health service*" OR "healthcare" OR "health care" OR "health service* utili?ation" OR "healthcare utili?ation" OR "access to care" OR "medical service use*" OR "preventive service utili?ation" OR "oral health" OR "Dental care utili?ation" OR "dental serv*" OR "dental visit*" OR "dental care u*" OR "oral health serv*" OR "dentist" OR "barriers to healthcare" OR "health

disparities" OR "healthcare disparities" OR "inequity in access" OR "mental health" OR "maternal health" OR "out-of-pocket payment" OR "out-of-pocket health expenditure" OR "health expenditure" OR "healthcare cost*" OR "health care cost*" OR "health policy" OR "health economics" OR "health planning" OR "health insurance" OR "universal health coverage" OR "health system" OR "psychiatric care" OR "chronic disease*" OR "chronic illness" OR "long-term care" OR "elderly care" OR "elderly patient" OR "geriatric care" OR "primary care" OR "immigrants" OR "vulnerable group*" OR "disabled person*")) was used.

This initial query returned 1275 records covering the period from 1976 to 2025. After limiting the results to English-language publications, 1230 records remained. A manual screening of abstracts was then conducted to exclude studies not aligned with the research scope, resulting in the removal of 7 records. Thus, a total of 1223 articles were included in the final bibliometric analysis. The full process is illustrated in the PRISMA flow diagram (Figure 1). For data processing and visualisation, the select records were subsequently exported in CSV format (with BibTeX metadata).

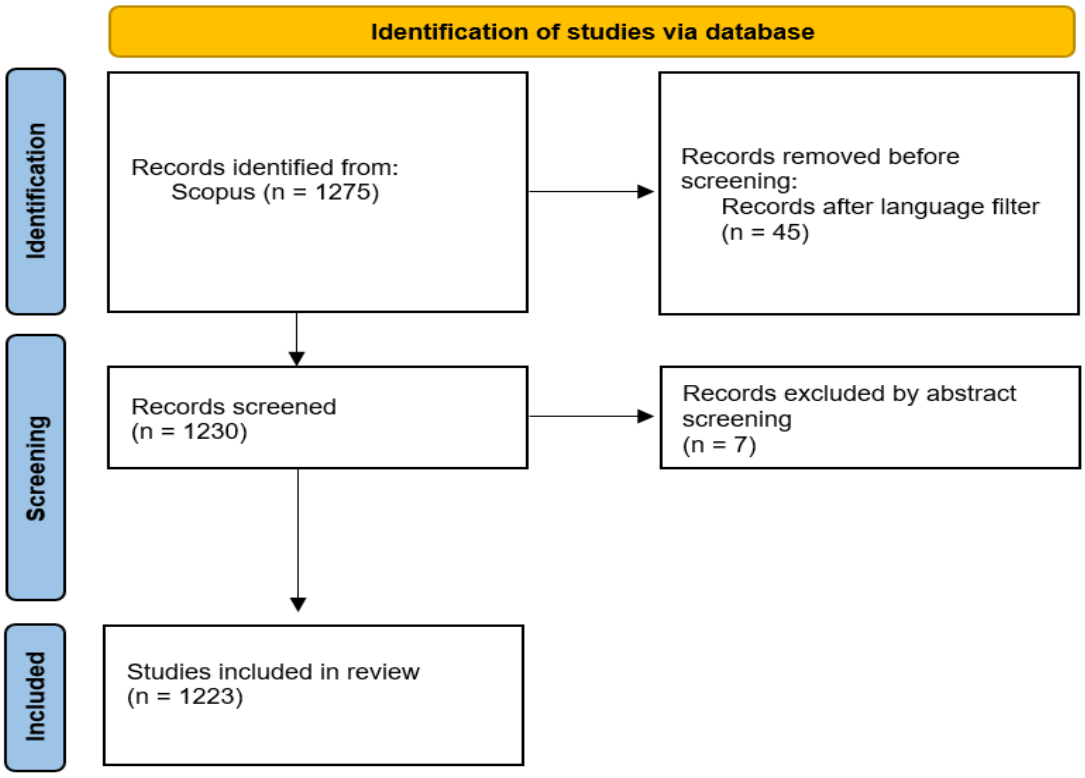

Figure 1. PRISMA Flow Diagram Outlining the Literature Selection Process in the Bibliometric Analysis

Following data collection, a pre-processing phase was conducted to prepare the dataset for co-occurrence analysis using keywords as units of analysis. It was observed that semantically identical terms appeared in varying forms across different records, like "Andersen behavioural model," "Andersen model," and "Andersen health behavioural model." To ensure consistency, such variations were standardised under a single term ("Andersen behavioural model"). Similar consolidation was applied to terms like "access to care" and "healthcare access," as well as "healthcare utilization," "health service use," and "health service utilisation."

There are numerous commercial and free software tools available for scientific mapping. VOSviewer version 1.6.18 (van Eck and Waltman, 2010) and Bibliometrix (Aria and Cuccurullo, 2017) were utilised in this study for data visualisation and analysis. Bibliometrix, implemented in R and accessible via its web interface Biblioshiny, enables comprehensive bibliometric analysis through scientific mapping techniques. VOSviewer, an open-source Java-based tool, was employed to construct and visualise bibliographic networks, including keyword co-occurrence and thematic clusters.

2. ANALYSIS

The findings of the bibliometric analysis of the literature on ABM in healthcare are shown in this section. Four parts comprise the results: (1) general publication trends; (2) prominent topics; (3) networks of keyword co-occurrences; and (4) thematic structure and evolution.

The annual distribution of ABM-related publications in the healthcare literature from 1976 to 2025 is shown in Figure 2.

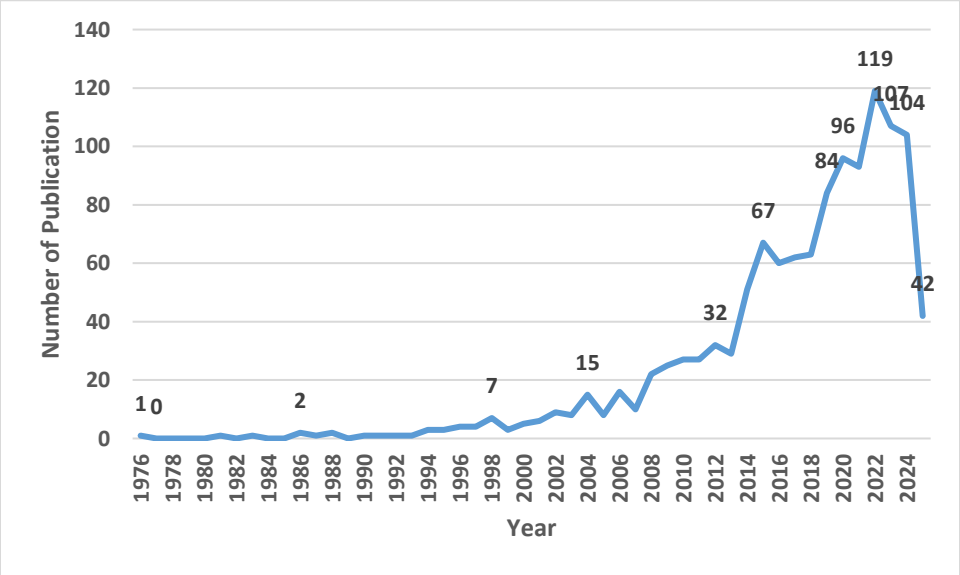

Figure 2. Yearly Distribution of Publications on the Andersen Behavioural Model in Healthcare

Until the early 2000s, the model received limited scholarly interest, with annual publications remaining below 10. After 2008, there was a notable rise, with 32 publications in 2012. This increasing trend persisted, reaching a notable peak of 119 publications in 2022. There was a small decline in 2023 (107) and 2024 (104) after that. The reason for the sharp drop observed in publications is that those in 2025 could not yet been fully indexed (42 publications) (Figure 2).

The overall trend suggested a growing academic interest in the application of ABM, particularly over the last decade. This could be due to the model's growing applicability in addressing health equity, service utilisation, and healthcare access in a variety of contexts.

Prominent Topics Identified Through Author Keyword Frequency

According to Kuhn (2012), scientific fields evolve over time through shifts in theoretical, conceptual, and methodological paradigms. These transitions are often accompanied by changes in the terminology used by scholars to describe emerging phenomena. As a result, lexical shifts are important for indicating paradigm shifts and can provide information about how a discipline's research priorities are changing. Thematic trends and conceptual focus areas can be identified over time by monitoring the frequency and co-occurrence of keywords in the healthcare literature on ABM.

Keywords are defined as useful and efficient way to find and examine the main ideas of scientific publications in bibliometric research. Author keywords, which are terms chosen by authors to represent the primary themes of their research, were used as the unit of analysis in this study (Tripathi et al., 2018). The 25 most-used keywords related to the ABM in the healthcare field were the focus of the analysis (Table 1).

Table 1. Core Concepts in the ABM Healthcare Literature Based on Keyword Frequency

Rank	Keywords	Frequency
1	Andersen behavioural model	324
2	Healthcare utilization	237
3	Access to care	95
4	Older adults	79
5	Oral health	65
6	Mental health	51
7	Immigrants	48
8	Health-seeking behaviour	44
9	Health disparities	44
10	Primary care	40
11	Emergency department use	37
12	China	33
13	Long-term care	33
14	COVID-19	31
15	Barriers	27
16	Depression	27
17	HIV	25
18	Qualitative research	25
19	Health insurance	24
20	Health services	24
21	African-American	23
22	Mental disorders	22
23	Dental care use	20
24	Caregivers	19
25	Mental health services	19

Table 1 shows the 25 most frequently occurring author keywords within the ABM-related healthcare literature. The most common term was “Andersen behavioural model” (n=324), followed by “healthcare utilization” (n=237), which directly reflects the original purpose of model.

The prominence of terms such as “access to care” (n=95), “health disparities” (n=44), and “barriers” (n=27) highlighted the frequent use of the model in examining issues of equity and accessibility in healthcare systems. The list also demonstrated the broad application of the model to specific populations and service areas. For example, keywords such as “older adults” (n=79), “immigrants” (n=48), “African American” (n=23), and “caregivers” (n=19) indicated a focus on vulnerable or underserved groups. In addition, topic-specific keywords such as “oral health” (n=65), “mental health” (n=51), “depression” (n=27), “primary care” (n=40), “long-term care” (n=33), “emergency department use” (n=37), and “HIV” (n=25) demonstrated the wide-ranging application of the model across various healthcare domains and clinical conditions. The appearance of terms like “COVID-19” (n=31) and “qualitative research” (n=25) also reflects a recent shift toward pandemic-related challenges and a diversification in research methodologies.

Although keyword frequency analysis provides insight into the most frequently addressed ideas in the ABM-related healthcare literature, it does not fully capture the underlying relationships among these concepts. Finding research hotspots requires more than simply counting the occurrences of terms, and it also involves investigating how these terms co-occur across publications (Martinez et al., 2015). The co-word analysis was carried out in order to investigate the conceptual relationships among frequently used keywords and to identify thematic clusters that represent the intellectual structure of the field.

Thematic Structure and Evolution of Andersen's Behavioural Model Applications in Healthcare

Conceptual and Thematic Structure of Research Themes

The co-occurrence networks of terms generated with VOSviewer are displayed in Figure 3. A threshold value of at least 7 occurrences of a keyword was selected by the authors. This value indicates that at least seven publications contain each of the 71 keywords shown in Figure 3. Based on these co-occurrence patterns, 8 distinct thematic clusters were identified, each representing a specific research focus within the ABM-related healthcare literature. The full list of clustered keywords and their corresponding theme labels is provided in Table 2.

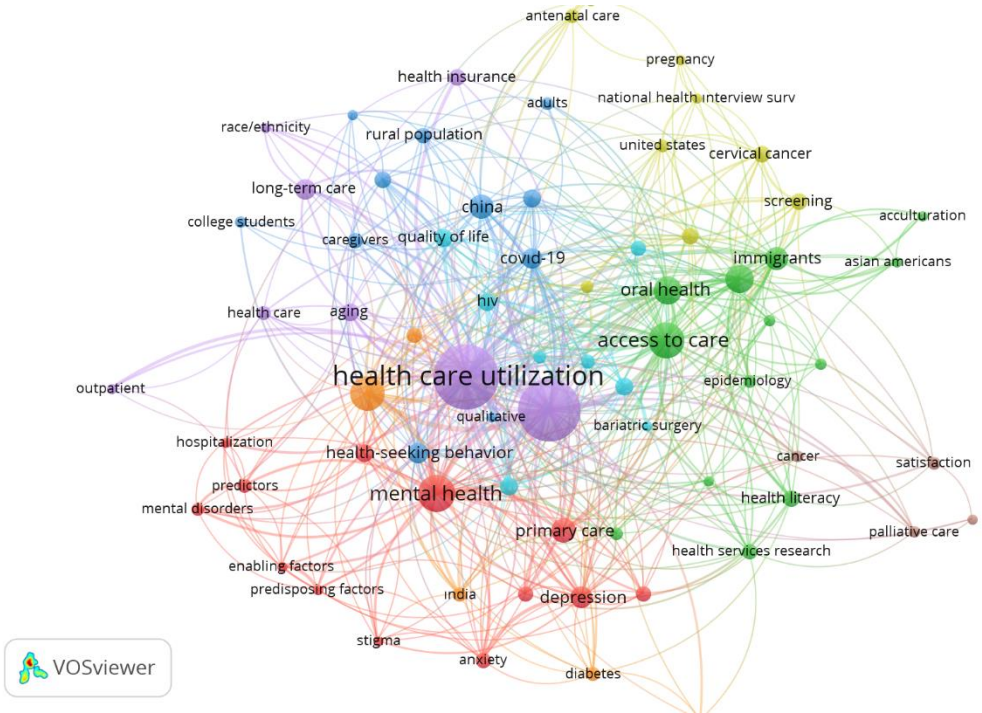

Figure 3. Keyword Co-Occurrence Map in Andersen's Behavioural Model Literature

Cluster 1, represented in red, comprised 13 keywords, with mental health emerging as the most frequently occurring term. In addition to this term, the prominent co-occurrence of "primary care", "emergency departments", and "depression" suggested that the ABM has been widely used to explore the utilisation of mental health services, particularly within primary care and emergency settings. Terms such as anxiety, social support, stigma, predisposing factors, and enabling factors indicated a focus on both individual and contextual determinants influencing healthcare utilisation. Overall, this cluster highlighted the model's relevance for explaining access patterns and psychosocial influences on mental health care utilisation.

Cluster 2, labelled in green, was linked to 13 keywords, with "access to care" emerging as the central node. Keywords such as "access to care", "health disparity", "oral health", and "immigrants" indicated that the ABM has been widely used to investigate healthcare access disparities across these specific domains. While using terms like "health literacy", "gender", "Asian Americans", and "acculturation" highlighted the impact of sociocultural factors, keywords like "health equity", "public health" and "health policy" supported this emphasis on structural inequalities. Overall, this cluster illustrated the application of ABM to investigate healthcare inequities and the sociocultural determinants of healthcare utilisation, particularly in oral health and immigrant populations.

Cluster 3, represented by blue, consisted of 11 keywords. Among the largest nodes were "China", "COVID-19", and "health-seeking behaviour". This relationship underscored the use of ABM in studying service access during pandemic-related disruptions, particularly in the Chinese context. Additionally, the inclusion of "dementia", "caregivers", "rural population" "African American", "women", and "college students" demonstrated a focus on vulnerable groups who faced barriers to healthcare during COVID-19. The inclusion of "qualitative" further emphasised the methodological focus of this study on comprehending complex individual experiences. Overall, this cluster highlighted the importance of focusing on vulnerable or underserved populations' health-seeking behaviours in specific crisis contexts.

Cluster 4, represented in yellow, was composed of 9 keywords. The most frequent and closely related terms were "screening", "breast cancer", and "cervical cancer". These keywords illustrated the use of the ABM to assess participation in cancer screening and other early detection and preventive services. Furthermore, terms like "antenatal care", "maternal health", and "pregnancy" indicated a focus on maternal healthcare utilisation. The inclusion of "adherence"

suggested that several studies examined adherence to recommended services. Many of the research areas within this cluster were population-level and focused on the United States, as evidenced by the inclusion of "United States" and "National Health Interview Survey."

Table 2. Identified Thematic Clusters in ABM-Based Healthcare Literature

Clusters/Colour	Theme Label	Co-keywords
Cluster-1 (red)	Mental Health Service Utilisation in Primary and Emergency Care	mental health, primary care, depression, emergency department, anxiety, systematic review, social support, predictors, mental disorders, predisposing factors, stigma, enabling factors, hospitalization
Cluster-2 (green)	Access Disparities in Oral and Immigrant Health	access to care, oral health, health disparity, immigrants, health services research, health literacy, gender, public health, epidemiology, health policy, health equity, Asian Americans, acculturation
Cluster-3 (blue)	Health-Seeking Behaviour Among Vulnerable Populations During the COVID-19 Pandemic	China, COVID-19, health-seeking behaviour, dementia, rural population, African American, caregivers, qualitative, adults, women, college students
Cluster-4 (yellow)	Preventive and Maternal Health Service Utilisation	screening, breast cancer, cervical cancer, antenatal care, United States, adherence, National Health Interview Survey, pregnancy, maternal health
Cluster-5 (purple)	Foundations of ABM in Aging and Health Care Utilisation	health care utilization, Andersen behavioural model, long-term care, aging, health insurance, health care, race/ethnicity, outpatient
Cluster-6 (aqua)	Barriers to Care in Vulnerable Populations	barriers, quality of life, qualitative research, HIV, socioeconomic factors, adolescents, Canada, bariatric surgery
Cluster-7 (orange)	Chronic Disease and Aging-Related Utilization	elderly, determinants, diabetes, India, chronic disease
Cluster-8 (brown)	Palliative and Cancer Care Access and Satisfaction	cancer, palliative care, satisfaction, Medicaid

Cluster 5, visualised in purple, comprised 8 keywords and was centrally positioned in the co-occurrence network. The most frequently occurring terms were "health care utilization" and "Andersen behavioural model", reflecting the conceptual core of the ABM literature. The co-occurrence of "aging", "long-term care", and "health insurance" highlighted the model's role in examining how insurance coverage shapes service use among older adults and in long-term care

settings. Additionally, the inclusion of “race/ethnicity” pointed to the model’s capacity to assess disparities in access. Terms like “outpatient” and “health care” suggested a broad interest in various delivery settings. Overall, this cluster highlighted ABM’s foundational role in healthcare utilisation research, particularly about aging, equity, and insurance-based access.

Cluster 6, symbolised by light blue, comprised 8 keywords and concentrated on the intersection of social determinants, lived experiences, and healthcare access barriers. The most frequently occurring terms, such as “barriers” and “qualitative research”, highlighted the importance of research investigating structural and perceived barriers to care, especially using qualitative approaches. The prominence of “HIV” pointed to the examination of condition-specific challenges faced by individuals. Additional terms, such as “quality of life”, “socioeconomic factors”, and “adolescents”, indicated a focus on vulnerable populations and how social disadvantage and life quality shape healthcare utilisation. The inclusion of “Canada” (n = 9) suggested region-specific analyses, while “bariatric surgery” (n = 7) reflected interest in barriers unique to particular clinical conditions. Overall, this cluster captured equity-oriented and qualitatively based approaches to understanding healthcare access in vulnerable populations.

Cluster 7, labelled in orange, consisted of 5 keywords, focused on healthcare utilisation among the elderly. The presence of “chronic disease”, “diabetes”, and “determinants”, which are frequently occurring with the term "elderly", indicated that studies have focused on the determinants of service utilisation in ageing populations, especially with chronic diseases such as diabete. The inclusion of “India” drew attention to studies conducted regions, indicating a global interest in the contextual factors that influence non-communicable disease care.

Cluster 8, labelled in brown, consisted of 4 keywords. It focused on healthcare utilisation in the context of serious illnesses and end-of-life care. Terms like “cancer”, “palliative care”, and “satisfaction” suggested a research focus on the quality, accessibility, and outcomes of care for critically ill patients. The inclusion of “Medicaid” highlighted the relevance of insurance coverage and public health financing in shaping service access within these settings. Overall, this cluster reflected ABM’s application in condition-specific and system-level analyses related to cancer care and palliative services.

Temporal Evolution of Research Themes

Based on the average publication year of author keywords, Figure 4 shows the temporal evolution of research topics related to ABM in healthcare. As shown by the timeline colour gradient in the

lower-right corner of the figure, keywords shaded in yellow denoted more recent research focusses, while those shaded in dark blue indicated earlier usage in the literature.

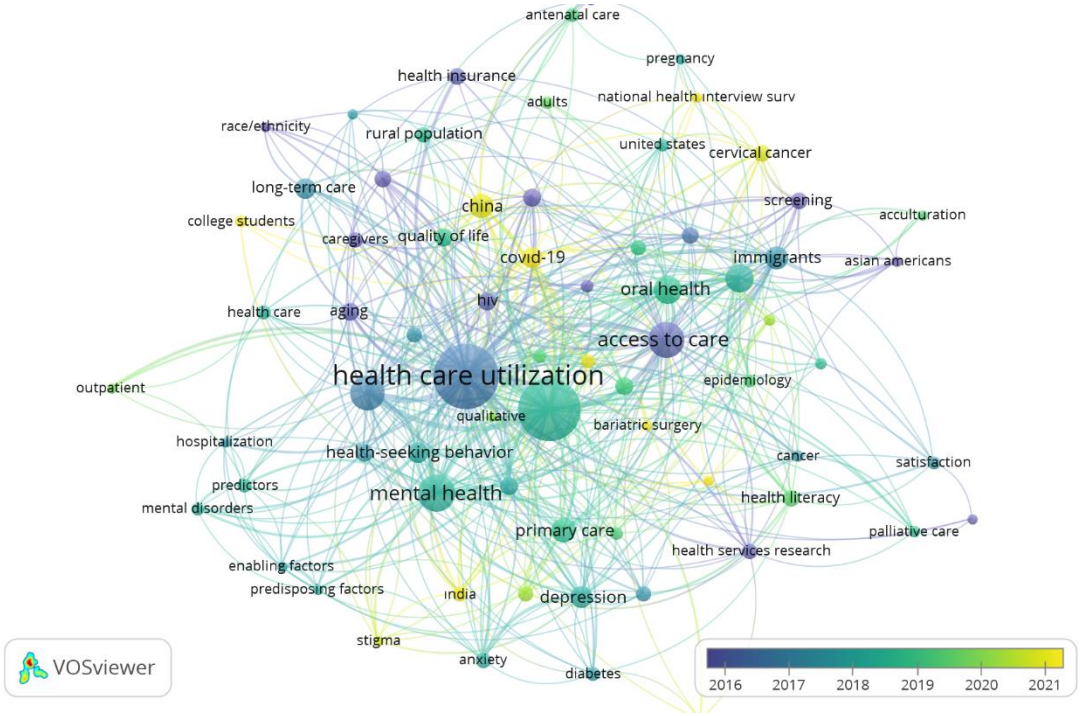

Figure 4. Thematic Evolution Based on Average Publication Year

Previous studies (2016 and earlier) were indicated in dark blue and mostly focused on broad and fundamental topics such as “healthcare utilisation”, “access to care”, “elderly people”, and “aging”, reflecting the model's initial concentration on long-term care and utilisation patterns. Mid-period themes (2017–2019, green), such as “primary care”, “mental health”, “dental health”, and “health-seeking behaviour”, suggested a shift towards behavioural and preventative factors. In recent years, more diverse and contextual topics have gained attention, such as “COVID-19”, “China”, “health equity”, “adolescents”, “college students”, “chronic illness”, and “cervical cancer” (2020–2021, yellow-green). These show an increasing interest in applying the ABM to new public health concerns, under-represented populations, and specific clinical diseases.

Thematic Map Analysis: Relevance and Development of ABM-Related Health Topics

In thematic mapping, themes are evaluated based on two dimensions: *centrality*, reflecting their relevance to the overall research field (horizontal axis), and *density*, indicating the degree of internal development (vertical axis) (Cobo et al., 2011). As illustrated in Figure 5, the analysis resulted in four distinct thematic clusters. *Basic themes* (high centrality but low density) are of

high relevance but exhibit lower internal development, suggesting foundational or emerging areas of study. *Motor themes* (high centrality and density) represent areas that are both well-integrated within the field and conceptually mature. *Niche themes* (low centrality but high density) are well-developed yet narrowly focused, often explored by specialised research groups. *Emerging or declining themes* (low centrality and density) point to underexplored topics that may either be gaining traction or losing relevance within the field.

Thematic map analysis provided insights into the conceptual landscape of the literature on ABM in healthcare (Figure 5).

Basic Themes: Core Underdeveloped Areas in ABM Literature

The basic themes highlighted their pivotal role in the literature by encompassing fundamental topics like "healthcare utilisation", "access to care", and "Andersen behavioural model". Keywords like "older adults", "mental health", "primary care", "long-term care", "emergency department use", "HIV", "caregivers", and "qualitative research" also highlighted how widely the model can be applied to a variety of demographics, healthcare environments, and research methodologies. This group also included emerging issues like "COVID-19", "unmet healthcare needs", and "quality of life", indicating a responsiveness to contemporary global challenges. However, their positioning in this quadrant suggested that these crucial areas are still conceptually or methodologically undeveloped, offering a field for improvement.

Motor Themes: Strongly Developed and Structurally Central Topics

The motor theme quadrant included well-developed and highly relevant themes such as "health-seeking behaviour", "depression", "mental disorders", and "mental health services". The frequent appearance of terms like "mental health service use", "stigma", "anxiety", and "social support" indicated a consolidated research focus on behavioural and psychological determinants of healthcare utilisation. The inclusion of "predictors", "diabetes", and "India" suggested a growing interest in country-specific analyses and comorbidities, making this thematic area both mature and central to the evolution of ABM applications.

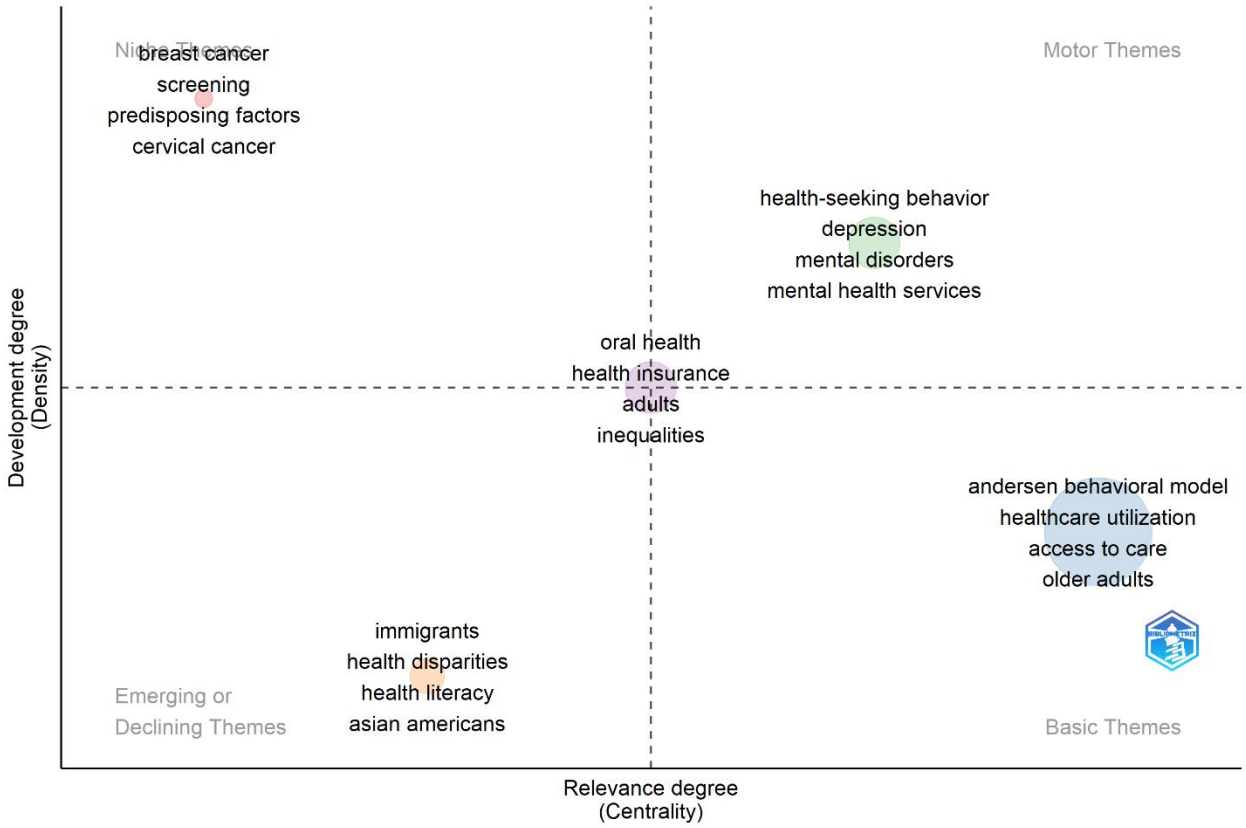

Figure 5. Thematic Map of Keyword Clusters in ABM-Based Healthcare Research

Niche Themes: Well-Developed but Less Central Research Areas

"Breast cancer", "screening", "predisposing factors", "cervical cancer", and "enabling factors" were among the niche topics that the thematic map identified as being in the upper-left quadrant. Particular subfields seemed to have concentrated attention on these themes due to their apparent internal coherence and methodological maturity. However, their relatively low centrality suggested a lack of complete incorporation into the main context of ABM in healthcare. They represented specialised applications rather than the core concepts found in the larger literature, especially in oncology and preventive health.

Emerging or Declining Themes: Peripheral but Socio-culturally Stand-out Topics

In the quadrant of emerging or declining themes, keywords such as "immigrants", "health disparities", "health literacy", and "Asian Americans" were included. These topics demonstrated relatively low centrality and density, indicating that they may be receiving little scholarly attention in the ABM literature or that they have only recently become research interests. Despite their peripheral location on the thematic map, they represented significant sociocultural aspects of

healthcare access and utilisation, especially among underserved or minority populations. These keywords may point to a developing but still undeveloped emphasis on cultural competencies and structural inequality in healthcare delivery frameworks.

Cross-Cutting Themes with Moderate Development and Relevance

Thematic map analysis identified a group of keywords “oral health”, “health insurance”, “adults”, “inequalities”, “dental care use”, “antenatal care”, and “socioeconomic status” positioned near the centre of the strategic diagram. These keywords represented moderately developed and contextually relevant research themes that intersect multiple dimensions of healthcare utilisation. Their centrality implies that they serve as links among the ABM literature's basic and specialised fields. Topics such as “oral health”, “health insurance”, “socioeconomic status”, and “inequalities” are especially notable for connecting clinical, demographic, and socioeconomic aspects of access and service use.

The thematic mapping of keywords provided a multidimensional perspective on the conceptual organisation and development of ABM literature in healthcare. This structure demonstrated both the maturity of current research lines and areas with unrealised potential.

3. DISCUSSION

This study explored the conceptual, thematic, and temporal evolution of research applying ABM in healthcare. The results revealed a varied and dynamic body of literature, reflecting the enduring significance of the model and its enhanced application to a broad range of healthcare issues.

The significant rise in publications following 2008, which peaked in 2022, probably reflects ABM's growing significance in the rapidly evolving healthcare landscape. The model's versatility across various health system contexts and its relevance to global issues like the COVID-19 pandemic, migration, and health equity may be the cause of this upward trend. Because of its conceptual adaptability, scholars can modify the framework to fit populations, service types, and policy contexts, which could sustain scholarly interest over time.

According to the keyword frequency analysis, ABM research is still focused on fundamental topics like healthcare utilisation and access to care, but it is also adapting to new issues like COVID-19, older adults, oral health, mental health, and immigrant populations. These results are consistent with Lederle et al. (2021), who also noted an emphasis on migrant groups,

aging, mental health, and general healthcare. The use of ABM as a broad framework for analysing access and utilisation across various contexts is further supported by the fact that most studies lacked a specific disease focus. Moreover, according to Babitsch et al. (2012), the model is regularly used in studies involving vulnerable groups, especially when studying access inequalities among older adults, immigrants, and other socially disadvantaged groups. This convergence supports the notion that ABM is being used more and more in empirical studies that tackle practical healthcare issues rather than being limited to theoretical discussions of access (Alkhawaldeh et al., 2023).

A broad thematic spectrum in the use of ABM in healthcare research was found by the co-word analysis. Cluster-1 focused on mental health and its psychosocial aspects (e.g., anxiety, social support, stigma) in service utilisation, especially in primary care and emergency services. This result is consistent with Roberts et al. (2018), who conducted a systematic review of the factors influencing service use for common mental disorders. Their analyses present the significance of enabling factors like social support and predisposing factors like age and gender. It also emphasises that stigma is an important but underexplored issue and highlights the importance of incorporating cultural and attitudinal factors into the ABM framework.

The use of the model in addressing social determinants and vulnerable populations was demonstrated by Cluster 2, which includes oral health, immigrant health, and health disparities. This cluster is supported by Hajek et al. (2021), who show that socioeconomic factors like income, education, and insurance status consistently affect access to dental services, and that the ABM is widely used to examine dental service use. Their review highlights structural disparities in oral healthcare, which is consistent with the cluster's focus on vulnerable populations and social determinants, even though immigrant status was less frequently discussed. Likewise, Shahid et al. (2021) support these results by demonstrating how intersecting sociodemographic and psychosocial barriers shape oral health disparities among adults. Parallel to this, Cluster 6 addressed socioeconomic determinants and barriers to service access for adolescents and individuals living with HIV as vulnerable populations. This cluster also emphasises access issues, socioeconomic factors and quality of life which are often explored using qualitative methodologies. In their systematic review, Lederle et al. (2021) drew attention to the limited application of qualitative approaches in ABM-based research and noted that qualitative studies focus on individual characteristics and less on contextual factors and health behaviours. This

finding backs up the idea that qualitative research is still an important but underexplored area, showing that we need to use a wider variety of methods in future applications of the model.

Cluster 3 focused on the application of ABM in understanding health-seeking behaviour during pandemic-induced disruptions, with a particular focus on vulnerable groups such as women, rural populations and ethnic minorities. The central role of COVID-19 and China-related studies suggests that ABM has been adapted to study access challenges in crisis contexts. These findings are in line with Tannor et al. (2024), who detected significant declines in service utilisation in Sub-Saharan Africa during the pandemic, particularly among individuals with chronic and maternal health needs.

The emergence of groups focused on cancer and palliative care (Cluster 8) and maternal health, cancer, and screening (Cluster 4) shows that more researchers are interested in using ABM for specific health conditions. Treanor and Donnelly (2012) state that the United States conducts many ABM-based cancer studies on breast cancer. This result is similar to Clusters 4 and Cluster 8, which emphasise the model's condition- and context-specific applications and have a strong emphasis on cancer-related themes and U.S.-centric studies. Also, Cluster 4 includes terms like maternal health, pregnancy, and National Health Interview Survey, which aligns with studies showing that the ABM originated from large-scale survey research done in the United States (Radhamony et al., 2024). Moreover, Cluster 4 is supported by Alibhai et al. (2022) and Tolossa et al. (2024), who use the ABM to investigate the use of prenatal care and associated obstacles. Their emphasis on pregnancy, adherence issues, and preventive maternal services is in line with the cluster's focus on reproductive health and following recommended care.

The ABM is still a crucial framework in studies on older adults, as evidenced by Clusters 5 and 7, which show the model's fundamental application in studies of aging, chronic illness, and long-term care. Strong empirical support for these clusters is provided by Soleimanvandi-Azar et al. (2020), who demonstrate how the model is still used to direct studies on aging and the use of outpatient services. Their results highlight how well the ABM captures the intricate interactions between need, enabling, and predisposing factors that influence later-life healthcare access. By showing how the model has been used to identify systemic and psychosocial barriers to care for people with diabetes, Paduch et al. (2017) also support Cluster 7. Their results demonstrate the applicability of the ABM in meeting long-term care requirements, especially for populations that are socioeconomically disadvantaged and ethnically diverse.

The global adaptability of the model is further demonstrated by the inclusion of several high-frequency terms linked to various contexts (such as the US, China, India, and Canada). The diversity of the population and themes shows how the ABM evolved from being a framework that only addressed healthcare access to a multifaceted instrument that can be used in various settings, disciplines, and age groups. These results support the ABM's development into a flexible research framework and are in line with the systematic review by Lederle et al. (2021), who also highlighted the model's adaptability across a range of care environments, populations, and health conditions.

Thematic mapping further demonstrates the multifaceted nature of ABM applications. Although they are still fundamental, basic themes like the Andersen behavioural model, utilisation, and access show little internal development, suggesting room for more conceptual improvement. On the other hand, motor themes, such as mental illnesses, depression, and health-seeking behaviour, are essential to current ABM research and have strong methodological foundations. Magaard et al. (2017) offer evidence, highlighting the widespread application of the ABM in studies on depression-related help-seeking behaviour. Their results highlight the importance of fundamental ABM elements, especially need and predisposing factors, while also pointing out little-known elements like stigma and attitudinal barriers. These results support the motor themes' integrative yet dynamic function within the larger ABM framework.

Niche themes, like breast cancer, screening, predisposing factors, and cervical cancer, especially oncology and preventive care, represented specialised but peripheral applications. Orji et al. (2020) provide an example of a specialised use of the ABM, concentrating on African American women's breast cancer screening. Their emphasis on care that is specific to certain conditions and prevention aligns with the results in Clusters 4 and 8, which backs up the model's focused but peripheral application in cancer treatment.

Emerging or declining themes, such as immigrants, health disparities, and health literacy, indicated understudied but socio-politically significant areas. It might be beneficial to incorporate these themes more thoroughly into analyses based on ABM. Lin (2021) strongly supports Cluster 2 and immigrant health as one of the emerging themes. She illustrates how older immigrants' access to healthcare is restricted by intersecting factors, including language, race, and structural policy barriers. Her use of a broader ABM framework that takes power dynamics and social determinants into account underscores the necessity of more theoretical integration in studies on cultural marginalisation and health disparities. The results of Adigun et al. (2020) and Seo et al.

(2016) provide additional support for this. Both studies demonstrate how patterns of access and use are influenced by culturally specific factors, language barriers, and immigration status. Considered as a whole, these studies highlight the need for more complex, equity-focused ABM applications.

Cross-cutting concepts that connect clinical, behavioural, and structural elements and support the interdisciplinary potential of the model were prominent in the strategic map. These included oral health, socioeconomic status, and health insurance. The results show that these factors serve as important determinants of healthcare utilisation, which is in line with Zardak et al. (2023). However, structural and contextual aspects of ABM-based dental care research remain understudied (Galvao et al., 2021; Zardak et al., 2023)

These results were complemented by the temporal co-word analysis, which demonstrates that early ABM research focused on aging populations and utilisation, whereas more recent studies have turned their attention to individual behaviours, psychosocial factors, and new global health issues. This advancement shows how adaptable the model is to deal with both established healthcare priorities and novel challenges like the COVID-19 pandemic. This result is consistent with earlier ABM literature reviews. In the systematic review by Babitsch et al. (2012), it appears that most of the early studies concentrated on healthcare utilisation in older adults and general populations, with a particular focus on enabling and predisposing factors. A more recent study, the systematic review by Alkhawaldeh et al. (2023), demonstrates a clear shift towards the analysis of individual behaviours, psychosocial determinants, and structural inequities, frequently with the use of mixed-methods or qualitative approaches. Their review also highlights the use of ABM in a variety of care settings and a growing interest in vulnerable and marginalised groups, such as immigrants and people with complex or chronic conditions. Overall, these patterns support the current findings about ABM's evolving use in addressing modern healthcare issues.

As a result, the application of ABM has expanded both thematically and methodologically. The growing applications of the model in clinical, behavioural, and equity-focused fields reflects a flexible and dynamic research framework, even though it is still based on its initial emphasis on access and utilisation. Alkhawaldeh et al. (2023) point out that the model's adaptability enables wide-ranging adaptation in a variety of contexts. However, this same flexibility could result in the inconsistent categorisation of important variables, which could compromise theoretical coherence and make cross-study comparability more difficult. Similarly, Zardak et al. (2023) highlight that a

significant portion of the ABM literature still struggles with methodological issues related to capturing all six domains of the model: contextual, predisposing, enabling, need, behaviour, and outcome. Finally, these drawbacks point out the necessity of future research that is more consistently operationalised and conceptually aligned.

4. CONCLUSIONS AND RECOMMENDATIONS

This study provided a comprehensive bibliometric overview of the use of ABM in healthcare research, revealing its conceptual structure, thematic diversity and evolving focus over time. The results showed that the applications of the model have spread to include mental health, oral health, chronic illnesses, and maternal care although fundamental topics like access to care and healthcare utilisation are still important. The increasing focus on equity-oriented and psychosocial themes, as well as the ongoing gaps in addressing sociocultural determinants and vulnerable or under-represented populations, are further highlighted by thematic and temporal analyses.

Future studies could use ABM to examine how access to oral health and mental healthcare is impacted by intersecting factors, especially in underserved areas, such as chronic illness, low socioeconomic background, and immigrant status. Creating context-specific frameworks within ABM could also increase its usefulness in directing the creation of policies related to migrant health and health equity. The use of qualitative or mixed methods designs can help ABM studies better address issues such as migrant health and health literacy by capturing systemic, linguistic, and cultural barriers that traditional quantitative approaches may overlook. Bringing attention back to basic ideas like "access to care" would be helpful, especially by comparing different healthcare systems or looking at changes over time to understand how different factors affect access. By advancing these areas, ABM could continue to be a useful framework for leading person-centred, equitable healthcare policies and interventions.

This study has several limitations. First, the analysis relied solely on the Scopus database and included only English-language publications, potentially excluding relevant studies published elsewhere. Second, the use of specific software tools (VOSviewer and Bibliometrix) may have influenced clustering outcomes due to variations in the underlying algorithms. Third, inconsistencies in author keywords may have limited the comprehensiveness of the results. Finally, indexing delays may result in the under-representation of recent publications.

Consequently, ABM remains a useful framework for directing person-centred healthcare studies and policies. To improve the model's applicability within global health systems, future studies should expand its application through vulnerable populations, structural determinants, qualitative approaches and emerging public health issues.

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