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Application of Andersen's Behavioral Model of Health Services Use – A scoping review with a focus on qualitative health services research

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Keywords

Behavioral Model of Health Services Use, health services utilization, enabling factors, predisposing factors, need factors, scoping review, qualitative research

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Abstract

Introduction: Qualitative methods have become integral in health services research, and Andersen's Behavioral Model of Health Services Use (BMHSU) is one of the most commonly employed models of health service utilization. The model focuses on three core factors to explain health care utilization: predisposing factors, enabling factors, and need factors. A recent overview of application of the BMHSU is lacking, particularly in terms of its application in qualitative research. Therefore, we provide an overview of the application of the BMHSU in health services research and describe the (un)suitability of the model in qualitative research.

Methods: We searched five databases from March to April 2019, and in April 2020. For inclusion, each study had to focus on individuals ≥18 years of age and the studies must have explicitly cited the BMHSU, a modified version of the model, or the three core factors that constitute the model, regardless of study design, or publication type. We used MS Excel® to perform descriptive statistics, and applied MAXQDA 2020® as part of a qualitative content analysis.

Results: From a total of 6,319 results, we identified 1,879 publications dealing with the BMSHU. The main methodological approach was quantitative (89%). Two-thirds of all papers were published since 2010. In studies employing a qualitative design, the BMHSU was applied to justify the theoretical background (62%), structure the data collection (40%), and perform data coding (78%). Various publications highlight the usefulness of the BMHSU for qualitative data, while others criticize the model for several reasons (e.g., it lacks cultural or psychosocial factors).

Conclusions: The application of different – and older – models of health care utilization make it difficult to compare studies in health services research. Future research should consider studies of quantitative or qualitative study designs and account for the most current and comprehensive model of the BMHSU.

Article summary

Strengths and limitations of the study:

- This scoping review is the first which provides an exploration of the application widely adopted Behavioral Model of Health Services Use.
- This paper provides the first-ever overview of the (un)suitability of the Behavioral Model of Health Services Use in qualitative research.
- This paper strengthens the perception of qualitative research by considering the application of a theoretical model in qualitative research.
- The insights into the application of the Behavioral Model of Health Services Use is limited by focusing on qualitative research.

Introduction

Health care utilization refers to the use of the health care system "by persons for the purpose of preventing and curing health problems, promoting maintenance of health and well-being, or obtaining information about one's health status and prognosis" [1]. A needs-based health care system meets the needs of a person objectively identified by (health) professionals and considers the demands of an individual. If this interaction is successful, overuse, underuse, and misuse of health care systems can be avoided. Otherwise, there is the possibility of compromising the health of an individual and placing burden on the health care system [2]. To avoid overuse, underuse, and misuse of the health care system, it is important to consider the (non-)use of health care services, which is determined by a variety of contextual and individual factors [3]. As a measurable construct, health care service utilization is primarily determined through quantitative surveys. To explore individual demands, qualitative methods can provide important and rich information within the field of health services research [4, 5]. Various models have been developed across a variety of disciplines to explore and predict individuals'

intentions and behaviors as they utilize health care services [6]. In health services research, the Behavioral Model of Health Services Use (BMHSU) is the most frequently cited model of health care service utilization [6]. The model was developed by R.M. Andersen in 1968, and was based on a national quantitative survey that aimed to understand families' use of health services [7, 8]. The model focuses on three core factors to explain health care utilization: predisposing factors (e.g., age, education), enabling factors (e.g., income, hospital density), and need factors (e.g., health status) [8].

In recent years, Andersen's initial behavioral model has undergone continuous development, where new focus was placed on various factors [8–10], such as 'consumer satisfaction' in the 1970s [11, 12], and 'health status', 'personal health practice', and 'external environment' in the 1980s [9, 13]. In 1995, Andersen himself reviewed the model and its development and has since included feedback loops to consider how treatment outcomes affect health behavior [8]. Additional 'contextual and individual characteristics' were added to the model in the 2000s [8]. Some of these further developments were carried out in cooperation with other authors, e.g., Andersen and Newman's Framework of Viewing Health Services Utilization [11] or Aday and Andersen's Framework for the Study of Access to Medical Care [12]. The BMHSU was modified for specific settings (e.g., complementary and alternative medicine [14]) and for specific target groups (e.g., the Behavioral Model for Vulnerable Populations for homeless people [15]). Currently, many versions of the model for different settings or target groups are available and applied in health services research. The most current and comprehensive model is the 2013 BMHSU [16] (Figure 1).The main focus of that model is on the factors that facilitate or impede an individual's access to health care services. According to the model, access is determined by contextual characteristics, individual characteristics, health behaviors, and outcomes. Contextual characteristics include circumstances and the environment; individual characteristics are determined by a person's life circumstances including, for example, genetics

and socialization; health behaviors are an individual's personal practices; and outcomes are reflected by an individual's health status and consumer satisfaction.

[Figure 1 about here]

The application of the BMHSU and its different versions has already been examined in several systematic reviews. These are, for example, reviews focusing on specific diseases [17] or settings [18]. The most recent systematic review has examined the application of the BMHSU in general health care, but excludes specific care settings (e.g., maternal health), specific target groups (e.g., veterans), and studies that focus on specific diseases (e.g., HIV) [3]. All of these reviews have only considered quantitative studies and have excluded qualitative studies, although qualitative methods have become an important and integral part of health services research, and are useful for recording detailed descriptions and complex issues in the context of health care utilization and health care services [4, 5]. Even though the BMHSU is the most frequently cited model of access to health care services [6], an overview of the development and application of the BMSHU over the last 50 years is lacking, especially in terms of its application in qualitative research.

The main objective of this review is to provide a qualitative synthesis of qualitative studies that applied the BMHSU. We consider the strengths and limitations described by the study authors and explore whether the BMHSU – a model developed through quantitative data [7] – is useful for qualitative research (qualitative synthesis).

To be able to illustrate the balance between qualitative studies applying the BMHSU and studies employing another methodological design, we identify how the BMHSU is applied in health service research in general, regardless of the methodological approach used (quantitative overview).

Methods

This scoping review follows the PRISMA Extension for scoping reviews (PRISMA-ScR) [19]. It exists no review protocol. For study selection, two researchers (ML, JT) independently screened all selected titles and abstracts for relevance; to extract data from original studies, two researchers (ML, JT) independently extracted half of the studies and the other researcher assessed the data extraction for accuracy. For the qualitative data analysis, two researchers (ML, JT) coded the material together. Discrepancies were discussed and resolved by a team of reviewers (ML, JT, EMB).

Patient and public involvement

No patient involved.

Search strategy

We conducted a systematic literature search in March and April 2019, and performed an updated search in April 2020 using the Embase® via Ovid, Medline® via PubMed, CINAHL® and PsycInfo® via EBSCOhost, and Social Science Citation Index® via Web of Science databases. The search strategy combined MeSH-Terms and keywords pertaining to the BMHSU and its three core factors. The detailed search strategy for one database is identified in the supplementary material (additional file 2). The search was conducted for publications published from 1968 to April 2020. Study selection, extraction, and data analysis were each carried out in two steps, following the research questions. The study selection process is shown in the flow diagram (Figure 2).

Quantitative overview

Study selection

As an initial first step, title-abstract-screening was performed for all search results. We included all publications focused on adult populations that applied either the BMHSU, a modified version of the model, or all three core factors of the model. No limitations were set for language,

study design, or publication type. Studies were excluded if they could not be obtained via electronic access, interlibrary loan, or through contact with the authors.

Data extraction

The following characteristics were extracted from the title and abstract of each included study: publication year, first author, country, methodological approach, target group, care setting, and the applied version of the BMHSU. For abstracts with insufficient information regarding our extraction characteristics, we obtained the full-text version of the publications.

Data analysis

We calculated descriptive statistics with MS Excel® for the overview.

Qualitative synthesis

Study selection

For the qualitative synthesis, the full-text articles of studies with qualitative or mixed-method approaches were screened for their eligibility criteria (i.e., whether they applied the BMHSU in qualitative research). If the publications did not have the full-text article in either English or German, we excluded the studies. We excluded study protocols and conference papers, but searched for corresponding full texts and included them if applicable.

Quality appraisal

The quality of publications adopting a qualitative design was assessed using the "Critical Appraisal Checklist for Qualitative Research" [20]. The checklist contains ten items that assess the methodological quality of the design, data collection, and data analysis of the publications. The tool comprises four answer choices: 'Yes', 'No', 'Unclear', and 'Not Applicable'. If there was insufficient information to answer a given question, the response was recorded as 'Unclear'.

Data analysis

For the qualitative synthesis, MAXQDA 2020® software was used [21]. To answer the research questions, the following deductive codes were coded in the data material: applied version of the BMHSU, the way in which the model is applied in qualitative studies, the potential for and limitations of the BMHSU, and the extensions of the BMHSU described by the authors. In addition, we considered which of the BMHSU factors were examined and which were complemented by inductive factors that emerged from the data material. We distinguished between the three core factors (predisposing factors, enabling factors, and need factors) and the associated factors (e.g., demographics, health policy, and perceived need). We recoded all documents with the final coding frame. In the context of the content-structuring qualitative analysis, the summarizing reduction of the coding followed the approach detailed by other researchers [22]. The presented results are structured based on these main categories.

Results

Quantitative overview of the use of the BMHSU in health services research

We identified a total of 12,493 records. After deleting duplicates, a total of 6,319 records remained (Figure 2). After screening the titles and abstracts, it was found that 1,879 records either applied the BMHSU, the three core factors of the model, or a modified version of the model.

[Figure 2 about here]

Starting with the initial use of the model in 1973, reception toward the model has increased considerably in recent decades (Table 1). Two-thirds of all related papers were published in the last 10 years (i.e., since 2010), and more than 50% of the publications have been published since 2013. Further, 70% of the publications are from the USA or Canada, followed by Asia (13%) and Europe (9%). The majority are quantitative studies (n=1,680; 89%), while 4% of all records are qualitative studies (n=69) and 3% are reviews (n=61). In all, 30 publications are

mixed-methods studies (2%) and 39 publications (2%) are theoretical reflections without empirical data. General health care is the most studied care setting (n=397, n=21%), followed by nursing care (13%, n=237) and mental health services (12%, n=222). About one quarter of all studies deals with individuals aged ≥50 years (n=481). In addition, 17% of the publications focus on migrants (n=322), and 14% on women (n=256) and the general population (n=255). Half of the publications (n=936) do not account for a specific disease; for 12% (n=229) of all publications, mental disorders represent the most frequently examined diseases of interest.

Table 1: Quantitative description of publications using the Behavioral Model of Health Services Use in health services research

	Quantitative overview (n=1,879) *(based on title & abstract)*	**Qualitative synthesis (n=77)** *(based on full text version)*
	n (%)*	**n (%)***
Year		
1968-1979	9 (0)	0 (0)
1980-1989	38 (2)	0 (0)
1990-1999	168 (9)	0 (0)
2000-2009	440 (23)	7 9)
2010-2019	1,224 (65)	70 (91)
Region		
North-America	**1,275 (70)**[1]	**43 (56)**
Asia	**244 (13)**	6 8)
Europe	**163 9)**	**14 (18)**
Africa	68 (4)	**12 (16)**
South America	49 (3)	2 (3)
Oceania	29 (2)	5 (6)
Methodological approach		
Quantitative	**1,680 (89)**	/
Qualitative	**69 (4)**	58 (75)
Review	**61 (3)**	/
Theoretical	39 (2)	/
Mixed-Method	30 (2)	19 (25)
Care Setting		
General health care	**397 (21)**	**12 (16)**
Nursing care[2]	**237 (13)**	5 (6)
Mental health services	**222 (12)**	6 (8)
Screening	107 (6)	**7 (9)**
Perinatal care[3]	77 (4)	**7 (9)**
HIV services	35 (2)	6 (8)
Target group		
Individuals ≥50 years	**481 (26)**	**11 (14)**
Migrants	**322 (17)**	**23 (30)**
Women	**256 (14)**	**16 (21)**
General population	**255 (14)**	3 (3)
Men	203 (11)	9 (12)
Disease of interest		
No specific disease	**936 (50)**	**27 (35)**
Mental disorders	**229 (12)**	7 (9)
Cancer	**134 (7)**	**9 (12)**
HIV	96 (5)	**11 (14)**

[1] The ones in bold are the three most frequent

[2] Nursing consist of homecare, long-term care, formal care, care facility, informal care, respite care, institutionalized care & transportation services
[3] Perinatal care also includes midwifery services
* Since some publications included multiple care settings, target groups etc. the sum is greater than 100%

Qualitative synthesis of the use of the BMHSU in qualitative health services research

After excluding studies without a qualitative or mixed-methods approach (n=1,780), those without a full text available (n=10), those without a corresponding full text to a conference paper (n=7), and those that were not at all related to the BMHSU (n=5), a total of 77 studies remained and were included in the qualitative synthesis of qualitative studies applying the BMHSU (see Figure 2).

Although the first known application of the BMHSU in a qualitative study was from 2002, most of the qualitative records were identified in 2010 and later (91%; n=70; Table 1). Most publications are from the USA and Canada (n=43, 56%), 18% (n=14) are from Europe and 16% (n=12) are from Africa. General health care is the care setting that was explored most often in publications adopting a qualitative study design (n=12, 16%), followed by screening and perinatal care (n=7 each, 9%). Qualitative research applying the BMHSU primarily targets migrants (n=23, 30%), women (n=16, 21%), and individuals aged ≥50 years (n=11, 14%). Further, 35% of qualitative publications (n=27) address no specific disease; if a particular disease was of interest, it is most often HIV (n=11, 14%) or cancer (n=9, 12%).

Two-thirds of the qualitative studies use personal interviews as a data collection method (n=51, 81%). The sample size varies between five and 470 participants. Most of the qualitative studies interview the target group directly (n=65, 84%). Health professionals and/or next of kin assessments are the sole source of information in 12 studies (16%). In addition, 18 of the 65 qualitative studies that approached the target group obtained further information from health professionals (n=13), next of kin (n=1), or both (n=4; for further details, see additional file 3).

Application of the different versions of the Andersen model

The BMHSU is applied in the various studies to justify the theoretical background (62%), structure the data collection (40%) (such as aiding in the development of the interview guide),

and for data coding (78%). More than half of the studies (n=42) [23–62] are based on the BMHSU from 1995 [9]. Multiple studies (n=11) use the Behavioral Model for Vulnerable Populations [63–72]. Twelve studies [31, 42, 55, 61, 73–80] employ Andersen and Newman's Framework of Viewing Health Services Utilization, eight studies [42, 43, 81–86] apply Aday and Andersen's Framework for the Study of Access to Medical Care, and seven studies [42, 48, 52, 55, 59, 61, 87] are based on the original Behavioral Model of Families' Use of Health Services from 1968. Individual studies use other models, such as the expanded model from Bradley et al. [29] (additional file 3).

(Un)Suitability of the Andersen model from the authors' perspective

Overall, 29 publications [23, 31–33, 35, 36, 40, 42, 43, 45, 46, 48, 49, 51, 53, 55, 56, 69, 72, 73, 78–80, 83, 88–92] described that the model was useful in their work, e.g., to obtain and evaluate qualitative data. Of these, 17 publications [35, 36, 40, 43, 45, 46, 49, 51, 53, 73, 78–80, 83, 88, 89, 92] highlight the general usefulness of the BMSHU for qualitative data: "Andersen's framework provides a valid, consistent, and unbiased manner in which to code and classify qualitative data" [89]. Various publications [35, 40, 43, 45, 46, 49, 51, 53, 55, 58, 73, 78–80, 88, 89, 93] describe how their data can be applied very well to the BMHSU and its factors. Others described that the strength of the model lies in its consideration of both patient-related and environmental factors [40, 51, 91], and that the model allows for "a more transparent comparison with findings emerging from other studies" [88].

Some studies describe the usefulness of the BMHSU and additionally critique some parts of the model [23, 32, 36, 40, 49, 53, 55, 90, 92–94]. For instance, there are authors who criticize the model, but do not propose changes to its structure [23, 26, 36, 49, 90, 92–94]. Some studies [23, 26] describe that cultural factors are not adequately represented in the model: "the model has been noted not to be sensitive to the diverse cultural and structural barriers in healthcare among minority groups" [26]. According to the authors of some publications [36, 49], the models would need to further elaborate upon the relationship between the three core factors of

the BMHSU and the relevance of each. Other authors claim that the model does not cover all factors of health care utilization, such as psychosocial factors [23], and would be less suitable for studies on HIV [90] or health care coverage [94].

Not all critics proposed model modifications, but some of the identified limitations may lead to modifications of or additions to the BMHSU. Based on their findings, some authors identified additional factors not covered by the model that impact health care utilization [24, 29, 32, 37, 38, 40, 55, 58, 75, 81, 86, 91], such as health literacy [40, 55, 91], or competing priorities [24, 40] (Table 2). The basic structure of the BMHSU is retained as part of these expansions.

Other studies fundamentally change the original structure of the BMHSU, both in terms of the factors [25, 39, 75] and the feedback loops provided [40, 53, 63], ultimately impacting the influence between each of the factors in the model. Some studies emphasize the distinction between the three core factors as predisposing and inhibiting factors, and as enabling and impeding factors [25, 27, 63], while others combine the model with another model [62].

Table 2: Additions to the Behavioral Model of Health Services Use from qualitative health services research

<table>
<tr><th rowspan="2">Contextual characteristics</th><th colspan="3">Individual characteristics</th><th rowspan="2">Health Behaviors</th><th rowspan="2">Outcome</th><th rowspan="2">Further additions</th></tr>
<tr><th>Predisposing factors</th><th>Enabling factors</th><th>Need factors</th></tr>
<tr><td>Intake & engagement [37]</td><td>Competing priorities [24, 40]</td><td>Medication characteristics [40]</td><td rowspan="4">Unmet need [32]</td><td>Distinction between problem recognition, decision to seek help and decision to use health care system [75]</td><td>Dental service use & dental experiences [58]</td><td>Psychosocial factors [29]</td></tr>
<tr><td>Patient & transition [37]</td><td>Fear [24]</td><td>Reminder strategies [40]</td></tr>
<tr><td>Medication adherence strategies [37]</td><td>(Mis)trust [24, 91]</td><td>Personal emergency alarm system [32]</td></tr>
<tr><td>Billing [37]</td><td>Previous experiences [24, 91]</td><td>Informal care system [32]</td><td rowspan="2">Avoidant strategies [55]</td><td rowspan="2">Intended & actual use [29, 58]</td><td rowspan="2">Situation and satisfaction of the next of kin [81]</td></tr>
<tr><td>Specific program for support [37]</td><td>Contingency plans for future falls [32]</td><td rowspan="6">Characteristics at the level of informal caregivers [38]: Physician referral, knowledge about the services, acculturation</td><td rowspan="6">Mental health [86]</td></tr>
<tr><td>Health Literacy [37]</td><td>Health literacy [40, 55, 91]</td><td rowspan="2">Spirituality [55]</td><td rowspan="2">Service experience [58]</td><td rowspan="2">Vulnerability factors [72]</td></tr>
<tr><td>Individualized care [37]</td><td rowspan="3">Characteristics at the level of informal caregivers [38]: Familism, perception about services, religiosity, gender roles</td></tr>
<tr><td>Philosophical approaches [37]</td></tr>
<tr><td>Pharmacy services [40]</td></tr>
<tr><td>Rheumatologist [91]</td><td>Conscientiousness [91]</td><td colspan="3"></td></tr>
</table>

The table shows the variables as the authors of the original studies assigned them to BMHSU core factors

Factors of the BMHSU emerging from qualitative health services research

Individual characteristics are considered much more frequently than contextual characteristics, health behaviors, or health outcomes in publications that adopt a qualitative design. Table 3 lists all factors of the BMHSU with the number of publications that used each factor. Although the qualitative studies explored in our research consider a wide range of factors, there are still some other factors of the BMHSU that have not been considered in any of the included publications that featured a qualitative study design (e.g., quality of life as an outcome factor or some predisposing factors as contextual characteristics).

Contextual characteristics: A total of 63 qualitative studies (82%) mention contextual characteristics, of which enabling factors are most frequently included, such as health professional factors (n=22, 29%) – e.g., soft skills or availability (n=21, 27%).

Individual characteristics: The most frequently researched factors pertain to individual characteristics, especially predisposing factors such as social network (n=41, 53%), attitude towards health care services (n=33, 43%), and values (n=28, 36%). Nearly half of all studies consider accessibility of health care services as an enabling factor (n=34, 44%). The most common need factor is perceived symptoms (n=45, 58%).

Health Behavior: In terms of health behavior, the relationship between the patient and provider (n=21, 27%), as well as alternative medicine (n=13, 17%) and self-care (n=11, 14%) were most often analyzed in publications adopting a qualitative design.

Outcomes: Overall, about half of the qualitative studies (n=37) mention health outcomes in their analyses. Satisfaction with providers (n=18, 23%) and prior experience (n=17, 22%) are the most considered aspects.

During our qualitative syntheses of qualitative health services research studies, health literacy emerged as a inductive category, separated into individual [95] and organizational health literacy [96]. We identified associations with organizational health literacy in 25 studies (32%)

and individual health literacy in 52 studies (68%; Table 3). In the context of organizational health literacy, the focus is on access to health information: "share health risk information while empowering patients to make their own health decisions" [37]. The most frequently mentioned factors among individual health literacy are knowledge (n=39, 51%) and competences (n=22, 29%), as exemplified by the following statement: "knowledge was empowering to make own choices and feel in control of their care decisions" [28].

Table 3: Factors examined in publications

	Factors	N	References
Contextual characteristics	**Predisposing factors**		
	Demographic	1	[92]
	Social	/	/
	Beliefs		
	Stigma*	14	[34, 45, 46, 53, 61, 65, 67, 72, 78, 85, 86, 89, 90, 97]
	Culture*	5	[24, 41, 45, 47, 78]
	Social norms*	5	[35, 41, 77, 78, 88]
	Gender roles*	3	[28, 67, 97]
	Enabling factors		
	Health Policy	7	[43, 58, 62, 84, 85, 92, 98]
	Financing	12	[35, 37, 42, 51, 62, 65, 84, 89, 91, 92, 99, 100]
	Organization		
	Health professional factors*	22	[25, 32, 35, 37, 40, 43, 44, 51, 54, 59, 62, 70, 80, 82, 83, 85, 89, 91–93, 98, 101]
	Availability*	21	[24, 25, 29, 34, 40, 42, 43, 48, 51, 54, 60, 62, 65, 75, 81, 88, 91, 93, 98, 100, 102]
	Additional health care services*	12	[27, 37, 53, 73, 76, 77, 81, 82, 89, 91, 98, 101]
	Cultural/linguistic suitable services*	9	[24, 32, 38, 41, 63, 67, 72, 85, 86]
	Cooperation*	5	[24, 78, 81, 82, 98]
	System complexity*	6	[35, 65, 81, 83, 85, 102]
	Quality of care*	6	[27, 35, 43, 60, 81, 91]
	Interpreters*	2	[24, 70]
	Need factors		
	Environmental	3	[51, 90, 92]
	Population health indices	/	/
Individual characteristics	**Predisposing factors**		
	Demographic		
	Immigration status*	7	[32, 54, 57, 58, 71, 72, 102]
	Gender	2	[63, 65]
	Age	13	[25, 26, 45, 51, 54, 58, 59, 62, 63, 79, 80, 94, 102]
	Genetic	2	[47, 98]
	Social		
	Social network	41	[26, 27, 29–32, 34, 36, 40–43, 48–51, 55, 57–59, 61, 63, 65, 67, 68, 76, 78–83, 85, 86, 88, 90, 93, 94, 100, 102, 103]
	Personal skills*	16	[27, 30, 40, 44, 46, 52, 66–68, 70–72, 76, 78, 82, 86]
	Competing priorities*	12	[23–25, 31, 35, 40, 51, 67, 78, 82, 88, 94]
	Living conditions*	10	[40, 42, 48, 50, 66, 67, 71, 81, 89, 90]
	Education*	5	[48, 58, 62, 88, 91]
	Beliefs		
	Attitude towards health care services	33	[24, 27–30, 32, 35, 41–43, 46, 48–51, 53, 60, 62, 64, 75, 78–81, 86, 88, 89, 91, 93, 99, 100, 102, 103]
	Fear*	27	[23–25, 35, 36, 40, 41, 47, 50, 51, 53, 57, 61–63, 65, 68, 71, 75, 77–79, 85, 88, 89, 101, 102]
	Values	28	[24, 26, 27, 30, 32, 34, 35, 41, 47, 49, 54, 55, 57, 58, 61, 63, 67, 68, 71, 72, 75, 82, 85, 87, 88, 93, 100, 103]

	Attitude towards health professionals	12	[28, 33, 38, 44, 46, 48, 49, 61, 77, 88, 99, 102]
	Enabling factors		
	Financing		
	Financial resources	25	[23, 26, 29, 42, 43, 49–54, 58, 63, 66, 68, 71, 72, 78, 79, 88, 91, 94, 99, 100]
	Insurance	18	[23, 30, 35, 40, 44, 46, 52, 54, 64, 65, 71, 72, 88, 91, 93, 94, 102, 103]
	Income	8	[29, 30, 54, 65, 71, 88, 93, 103]
	Organization		
	Accessibility*	34	[23–26, 30, 35, 40, 42, 43, 45, 48, 49, 51, 53, 58, 62, 65, 66, 72, 75, 78, 79, 82, 83, 88–91, 93, 99–103]
	Stable routine*	6	[65, 75, 76, 89, 90, 100]
	Reminder strategies*	3	[40, 51, 53]
	Social Support		
	General*	12	[48, 49, 51, 64, 67, 76, 78, 80, 83, 88, 90, 100]
	Tangible	18	[27, 32, 34, 40, 42, 50, 51, 65, 67, 76, 79, 81, 87, 91, 93, 94, 102, 103]
	Emotional/affectionate	15	[23, 25, 26, 30, 36, 50, 51, 55, 63, 65, 67, 76, 78, 81, 83]
	Informational	11	[23, 26, 41, 43, 68, 76, 79, 82, 87, 90, 93, 100, 103]
	Need factors		
	Perceived		
	General*	10	[31, 32, 34, 59, 65, 74, 79, 87, 93, 103]
	Symptoms	45	[23–27, 31, 36, 40, 42–44, 47–51, 54, 55, 58–61, 63, 65, 67, 68, 71, 75, 76, 78, 79, 81, 86, 88, 91, 94, 97, 99–101, 103]
	Evaluated	20	[26, 31, 34, 36, 42, 56, 59, 60, 63, 76, 79–81, 83, 86, 91–93, 100, 103]
	Health Behaviors		
	Personal health practice		
	Alternative medicine*	13	[26, 30, 45, 54, 55, 58, 65, 78, 79, 87, 88, 91, 99]
	Self-care	11	[25, 30, 47, 49, 65, 75, 87, 88, 90, 99, 100]
	Adherence	8	[37, 40, 51, 64, 66, 91, 100, 102]
	Diet	4	[48, 49, 65, 87]
	Process of medical care		
	Relationship patient-provider	21	[24, 27, 28, 40, 51, 53, 61, 67, 68, 71, 73, 75, 76, 78, 83, 85, 89–92, 100]
	Second medical opinion*	1	[51]
	Use of personal health services	77	[23–55, 57–68, 70–94, 97–103]
	Outcomes		
	Perceived health status	5	[42, 49, 78, 91, 92]
	Evaluated health status	1	[65]
	Consumer satisfaction		
	General*	2	[83, 92]
	Prior experiences*	17	[23, 24, 26, 28, 46, 48, 52, 56, 58, 68, 72, 75, 81, 83, 97, 99, 100]
	Waiting time	5	[23, 43, 46, 83, 88]
	Satisfaction with providers*	18	[23, 27, 35, 36, 46, 48, 49, 56, 72, 73, 76, 77, 81, 83, 85, 88, 99, 100]
	Satisfaction with care facility*	8	[30, 38, 42, 60, 79, 83, 94, 100]
	Quality of life	/	/
Health Literacy	**Organizational Health Literacy***		
	Access to Health Information*	25	[23–25, 28, 31, 33, 37, 40, 41, 47–50, 70, 75–77, 84, 85, 91, 93, 94, 100]
	Individual Health literacy*	1	[70]
	Literacy*	2	[62, 100]
	Knowledge*	39	[24, 27–29, 31–38, 41, 43, 45, 47–53, 55, 58, 63, 68, 70, 74–79, 85, 88, 91, 93, 101, 102]
	Motivation*	4	[35, 76, 78, 99]
	Competences*	22	[23, 24, 28, 30, 33, 38, 40, 49, 51, 53, 57, 62, 64, 65, 68, 71, 75, 76, 83, 90, 102, 103]

*These factors were inductive codes, developed along the data material

Quality assessment of publications with a qualitative study design

Of the 77 qualitative studies, four (5%) reported all ten aspects of the critical appraisal checklist for qualitative research [20]. Most qualitative studies (n=69, 90%) reported between five and nine criteria from the checklist, and four studies (5%) reported fewer than five criteria. The two quality criteria that were most frequently fulfilled with 95% each (n=73) are the "congruity between the stated philosophical perspective and the research methodology" and the "congruity between the research methodology and the methods used to collect data" [20]. In contrast, the "influence of the researcher on the research, and vice-versa" [20] is only addressed in nine publications (12%).

Discussion

This scoping review provides a recent overview of the development and application of the BMHSU in very different care settings, across different diseases, and among publications examining different target groups. The BMHSU is mainly used in quantitative studies, but our review also shows the usefulness of the model in qualitative research.

Quantitative overview of the use of the BMHSU in health services research

The general reception toward the BMHSU has increased considerably in recent years, as has the number of publications adopting this model, with most (70%) of all related publications stemming from the USA and Canada. This is in line with another review [3], which excluded specific care settings and diseases. The dominance of research projects adopting quantitative design [104] is reflected in this scoping review, as 89% of the identified publications used quantitative methods.

The BMHSU is mainly used for research examining health care in general, without focusing on specific diseases. This is not surprising, as the recent BMHSU was not developed for any specific care setting or disease [16]. Still, a wide range of publications have focused on specific care settings (e.g., nursing, mental health services) and diseases (e.g., mental disorders). Individuals aged ≥50 years are the largest target group represented in this overview. Possible

explanations for this finding include the fact that this population represents the largest, and fastest growing cohort in the broader population [105]. Further, this group uses health care services most frequently [106].

Qualitative synthesis on the use of the BMHSU in qualitative health services research

The relevance of the BMHSU for qualitative projects within health services research is demonstrated by our results. Still, there are some limitations within the BMHSU, which should be critically considered depending on the research question.

The publications featuring a qualitative design mainly consider the individual characteristics within the BMHSU. Since the primary interest of qualitative research is the subjective experience of individuals, this result is not surprising [107]. In addition, it was noted that people from the target group were primarily interviewed in these studies, while there were fewer next of kin or health professionals interviewed. Experts may wish to consider obtaining more information about contextual characteristics in their research. Since the data extraction within the quantitative overview was carried out at the level of titles and abstracts, it is not possible to determine whether contextual characteristics in publications featuring a quantitative study design are more strongly represented in this review.

Although over half of all publications that adopted a qualitative design had been published since 2013, most of them considered the Andersen model of 1995, which is also a result of the review by Babitsch et al. (2012) [3]. Only one of the publications with a qualitative design [55] adopted the most current and comprehensive BMHSU from the year 2013 [16]. This is interesting, as some authors expanded upon an older version of the BMHSU and justified various missing factors (e.g., provider negligence and dissatisfaction, location of a clinic), although these factors are actually included in the most current version of the BMHSU from 2013 [16].

One new factor that has been discussed in some of the considered studies is health literacy. Health literacy relates to many parts of the Andersen model and cannot be assigned to a specific

level or factor. We recommend integrating health literacy as an additional factor in the BMHSU, as an individual's health literacy and health-literate organizations are important foundations for the (non-)use of health care services, and consequently for health care research [95, 96].

Strengths and limitations

When interpreting the results, it should be noted that although we performed systematic searches, some publications might have been missed. For example, articles that did not mention the BMHSU, or the three core factors in the title and abstract were not included; further, articles may have been excluded given that we restricted our search to five databases. Another limitation is that the extraction of publication characteristics was divided between the first authors (ML, JT) and were not extracted twice. We considered the general utilization of the BMHSU in health services research (as identified in the quantitative overview) at the title and abstract level, and not at the full-text level. An analysis of the full texts could provide further information about – and more detailed insights into – the application of the BMHSU. When coding the results based on the various model factors, one challenge faced by our team was appropriately assigning the factors, as the assignment of the factors was not always clear. Also, our comparison of the various studies that adopted a qualitative design is limited by the fact that very different versions of the model were used.

It should be noted that this scoping review is the first to explore the application of the widely adopted BMHSU without limiting our search based on target group, care setting, or disease since the model was initially published in 1968. Further, this review examined publications adopting qualitative study designs, strengthening the perceptions of qualitative methods in health care research. This review provides the first-ever overview of the (un)suitability of the BMHSU in qualitative research.

Conclusion

This scoping review reveals that the BMHSU, which is one of the main models in health care services research, has broad applications in very different care settings and across various

diseases, and it focuses on a wide range of target groups. The BMHSU is mainly used in quantitative studies, but our review also shows the usefulness of the model for qualitative research. As health literacy in particular plays an increasingly important role in health care utilization [95], we think it is important to take this factor into account in the BMHSU. In further research, it would be interesting to examine this relationship more thoroughly. Additionally, it might be interesting to compare the application of the BMHSU in quantitative and qualitative research. The application of so many different (and older) models of health care utilization makes it difficult to compare the individual studies with one another. However, such a comparison would be particularly important in the context of health services research. For future health services research, the current and most comprehensive version of the BMHSU [16] should always be considered.

Competing interests
The authors declare that they have no competing interests.

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ML, JT built the search strategy, screened the search results, and extracted the data. ML, JT, and EMB interpreted the findings and wrote the manuscript. All authors read and approved the final manuscript.

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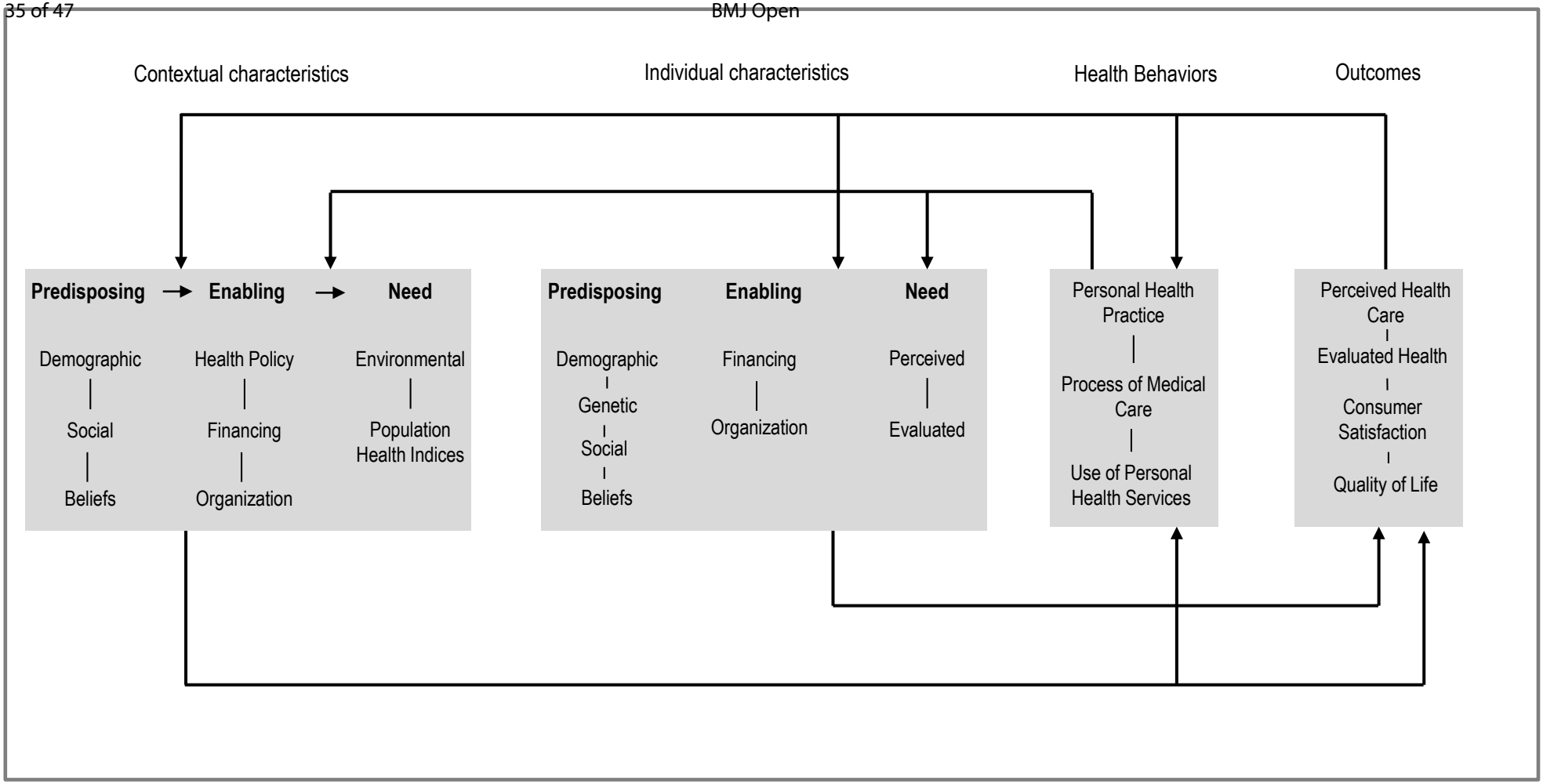
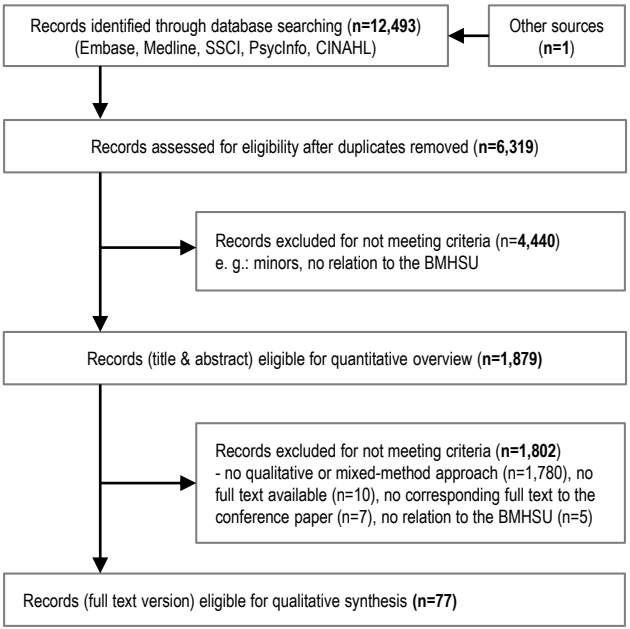

Contextual characteristics
Individual characteristics
Health Behaviors
Outcomes
Predisposing
Enabling
Need
Demographic
Social
Beliefs
Health Policy
Financing
Organization
Environmental
Population Health Indices
Predisposing
Enabling
Need
Demographic
Genetic
Social
Beliefs
Financing
Organization
Perceived
Evaluated
Personal Health Practice
Process of Medical Care
Use of Personal Health Services
Perceived Health Care
Evaluated Health
Consumer Satisfaction
Quality of Life



Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	1
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	3-5
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	5
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	6
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	7
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	6
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	Additional file 2
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	6,7
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	7,8
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	6,7
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	7

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	8
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	8,9 and figure 2
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	9
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	17
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	13; 15-16
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	8-17
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	17
Limitations	20	Discuss the limitations of the scoping review process.	19
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	19, 20
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	20

JBI = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).

‡ The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.

§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

From: Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMAScR): Checklist and Explanation. Ann Intern Med. 2018;169:467–473. doi: 10.7326/M18-0850.

Additional file 1: Exemplary search strategy

Exemplary search strategy – Medline via Pubmed	
#1	"Andersen RM" [Author]
#2	"Andersen R" [Author]
#3	#1 OR #2
#4	"Andersen model"
#5	"Andersen's model"
#6	#4 OR #5
#7	"Behavioral Model of Health Services Use"
#8	"Behavioural Model of Health Services Use"
#9	#7 OR #8
#10	andersen*
#11	"behavior model"
#12	"behaviour model"
#13	"behavioral model"
#14	"behavioural model"
#15	(#11 OR #12 OR #13 OR #14) AND #10
#16	"health model"
#17	#16 AND #10
#18	utilization
#19	utilisation
#20	"Facilities and Services Utilization"[Mesh]
#21	"Patient Acceptance of Health Care"[Mesh]
#22	model
#23	(#18 OR #19 OR #20 OR #21) AND #22 AND #10
#24	aday*
#25	davidson*
#26	newman*
#27	gelberg*
#28	(#22 OR #23 OR #24 OR #25) AND #10
#29	predisposing
#30	enabling
#31	need
#32	#27 AND #28 AND #29
#33	(#27 OR #28 OR #29) AND #10
#34	"andersen framework"
#35	"Behavioral Model for Vulnerable Populations"
#36	#3 OR #6 OR #9 OR #15 OR #17 OR #23 OR #28 OR #32 OR #33 OR #34 OR #35
#37	animals
#38	#36 NOT #37
#39	#36 NOT #37 Filters: Publication date from 1968/01/01 to 2019/04/09

Additional file 3: Characteristics of publications with qualitative study design

Author & year of publication	Country	Method		Care Setting	Target group of interest	Disease of interest	Document type	Survey	Respon-dents	N	Application of the Andersen model	
Chao et al. 2020 [1]	USA	mm	CA	Mental health services	Migrants; elderly individuals	Mental disorder	A	I	TG	14	A&A1974	DC; DA
Due et al. 2020 [2]	Australia	ql	CA	Oral health services	Migrants	No specific disease	A	I	TG, HP	26	R-BMHSU1995	Theo; DC; DA
Isaak et al. 2020 [3]	Canada	ql	GT	Mental health services	Racial and ethnic minorities	Mental disorder	A	I, FG	TG	115	BMHSU, R-BMHSU1995, A&N1973, A&D&B 2013	Theo; DA
Shewamene et al. 2020 [4]	Australia	mm	CA	Complementary and alternative medicine	Women; migrants	Maternal and perinatal health	A	I	TG	15	BMHSU	Theo
Travers et al. 2020 [5]	USA	ql	CA	Long-term care	Elderly individuals	No specific disease	A	I	TG	470	Ex-BMPF2002	Theo; DA
Bascur-Castillo et al. 2019 [6]	Chile	ql	P	Urologic disease treatment	Women	Urologic diseases	A	I	TG	10	R-BMHSU1995	Theo; DA
Briones-Vozmediano et al. 2019 [7]	Spain	ql	CA	General health care	Migrants	Violence experience	A	I	HP	28	A&A1974	DA
Coleman 2019 [8]	USA	ql	P	Mental health services	Migrants; men; individuals with mental disorder	Mental disorder	D	I	TG	66	BMHSU, R-BMHSU1995, A&N1973	Theo
Fleury et al. 2019 [9]	Canada	mm	-	Mental health services	Individuals with mental disorder	Mental disorder	A	I	TG	328	R-BMHSU1995	Theo; DC; DA
Green et al. 2019 [10]	USA	ql	CA	General health care	Men; individuals with HIV	HIV	A	I	TG	10	BMHSU, R-BMHSU1995	DA
Heidari et al. [11]	Iran	ql	CA	Medication use	Individuals with arthritis	Arthritis	A	I	HP	47	BMHSU2008	DC; DA
Koce et al. 2019 [12]	Nigeria	ql	-	General health care	General population	No specific disease	A	I	TG	24	R-BMHSU1995, A&A1974, A&D2001, A&N2005	DA
Navarro-Millan et al. 2019 [13]	UK	ql	-	E-health	Individuals with specific disease	Rheumatoid arthritis	A	FG	TG	31	A&N1973	DC; DA
Opoku et al. 2019 [14]	Ghana	ql	CA	E-health	Individuals with non-communicable disease	Non-communicable disease	A	I	HP	13	mhealth PNE	DA
Perry et al. 2019 [15]	USA	ql	TA	Preventive services	Individuals with low socio-economic status	No specific disease	A	FG	TG	235	A&A1974	Theo; DC; DA
Roberson et al. 2019 [16]	USA	ql	GT	Natal care	Women; migrants, pregnant women	Maternal and perinatal health	A	I	TG	12	R-BMHSU1995	Theo; DC
Robinson et al. 2019 [17]	UK	ql	FA	Oral health services	General population	Oral diseases	A	FG; I	TG, HP	34	A&D1997	DA

Schatz et al. 2019 [18]	Uganda	ql	CA	STD treatment	Individuals living in rural areas; elderly individuals	HIV	A	I	TG, HP	40	R-BMHSU1995	DA
Gill et al. 2018 [19]	UK	ql	P	Urologic disease treatment	Individuals with specific disease	Urologic diseases	A	I	TG	12	R-BMHSU1995	DA
Grodensky et al. 2018 [20]	USA	ql	TA	Health insurance	Men; individuals with incaceration	No specific disease	A	I	TG	20	BMVP2007	Theo; DC; DA
Ko et al. 2018 [21]	USA	ql	CA	Preventive services	Women; mothers	Viral Hepatitis	A	FG	TG	30	R-BMHSU1995	DC; DA
Lor et al. 2018 [22]	USA	ql	-	Screening	Migrants; women	No specific disease	A	FG	TG	58	BMVP2000	DA
Mago et al. 2018 [23]	Canada	ql	P, E	Dental care	Homeless	No specific disease	A	I	TG	25	BMVP2000	Theo; DA
Riang'a et al. 2018 [24]	Kenya	mm	-	Natal care	(Pregnant) Women; individuals living in rural areas	No specific disease	A	I	TG, HP	64	A&N1973	DA
Victor et al. 2018 [25]	UK	ql	CA	General health care	Elderly individuals; residents in care homes	No specific disease	A	I	TG	35	A&N1973	DC; DA
Bayuo 2017 [26]	Ghana	ql	CA	Outpatient care	Elderly individuals	No specific disease	A	I	TG	16	R-BMHSU1995	Theo; DA
Hawk et al. 2017 [27]	USA	ql	CA	STD treatment	Individuals with specific disease	HIV	A	I	TG, HP	40	R-BMHSU1995	Theo; DC; DA
Herrmann et al. 2017 [28]	Norway; Germany	ql	GT	General health care	General population	No specific disease	A	I; O	TG	40	R-BMHSU1995	Theo
Lee 2017 [29]	USA	mm	GT	Screening	Migrants, women	cancer	D	I	TG	30	R-BMHSU1995	Theo
Levison et al. 2017 [30]	USA	ql	E	STD treatment	Migrants	HIV	A	I	TG, HP	51	BMVP2000	DC
Parkman et al. 2017 [31]	UK	ql	I	Emergency department	Individuals with specific disease	Addiction	A	I	TG	30	R-BMHSU1995, BMHSU	Theo; DA
Rice 2017 [32]	USA	ql	P	Health insurance	Individuals with incaceration	No specific disease	D	I	TG	11	BMVP2000	Theo; DC
Rodriguez et al. 2017 [33]	USA	ql	-	STD treatment	Individuals living in rural areas	HIV	A	I	HP	36	A&D2001	DA
Tewari et al. 2017 [34]	India	mm	GT	Mental health care	Individuals living in rural areas	Mental disorders	A	FG; I	HP	78	R-BMHSU1995	DA
Velez et al. 2017 [35]	USA	ql	GT	Dental care	Migrants; women	No specific disease	A	FG	TG, HP	103	BMVP2000	Theo; DA
White 2017 [36]	USA	ql		Preventive services	Men; migrants; young individuals	Cancer; CD	D	I	TG	12	R-BMHSU1995	Theo; DA
Henson et al. 2016 [37]	UK	ql	CA	Emergency department	Individuals with specific disease	Cancer	A	I	TG, NK	24	A&N1973	Theo; DC; DA

Kohno et al. 2016 [38]	Malaysia	ql	CA	General health care	Migrants; elderly individuals	No specific disease	A	FG; I	TG	38	R-BMHSU1995	Theo; DA
Maulik et al. 2016 [39]	India	mm	TA	Mental health care	Individuals living in rural areas	Mental disorders	A	FG; I	TG, HP	31	R-BMHSU1995	DA
Mukasa 2016 [40]	USA	ql	P	Natal care	Migrants; women; mothers	No specific disease	D	I	TG	11	R-BMHSU1995	Theo; DA
Obikunle 2016 [41]	USA	ql	P	Prevention, Screening	Women; migrants	Cancer	D	I	TG	14	R-BMHSU1995	Theo; DA
Rachlis et al. 2016 [42]	Kenya	ql	-	Chronic care	Individuals with specific disease	HIV; TB; CD	A	FG; I	TG, HP, NK	207	A&N1973	DA
Rachlis et al. 2016 [43]	Kenya	ql	CA	Chronic care	Individuals with specific disease	HIV; TB; CD	A	FG; I	TG, HP	235	A&N1973	DA
Sperber et al. 2016 [44]	USA	ql	CA	Cancer care, health insurance, genomic services	Veterans	Cancer	A	I	HP	58	Ex-BMPF2002, UM1998	DC; DA
Thiessen et al. 2016 [45]	Canada	ql	CA	Natal care	(H)P	No specific disease	A	I	HP	24	A&A1974	DC; DA
Blanas et al. 2015 [46]	USA	ql	GT	Screening	Migrants	Viral Hepatitis	A	FG	TG	39	BMVP2000	Theo; DC; DA
Bradbury-Jones et al. 2015a [47]	UK	mm	TA	Natal care	Women	No specific disease	A	FG	HP	45	Ex-BMPF2002, A&D2001	Theo; DA
Bradbury-Jones et al. 2015b [48]	Scotland	ql	R&S	Natal care	Women; victims of violence	No specific disease	A	I	TG	5	R-BMHSU1995, Ex-BMPF2002, A&D2001	Theo; DA
Coe et al. 2015 [49]	USA	ql	CA	Medication use	Homeless	No specific disease	A	DocA	TG	426	BMVP2000	Theo
Condelius et al. 2015 [50]	Sweden	ql	CA	General health care	Elderly individuals	No specific disease	A	I	NK	14	A&A1974	Theo; DC; DA
Conner et al. 2015 [51]	USA	ql	P	End-of-life care	Informal caregivers; (H)P	No specific disease	A	FG	TG, HP	53	R-BMHSU1995	Theo
Holtzman et al. 2015 [52]	USA	ql	GT	STD treatment	Individuals with specific disease	HIV	A	I	TG	51	R-BMHSU1995	Theo; DA
Nowgesic 2015 [53]	Canada	ql	E	STD treatment	Indigenous people	HIV	D	I; O	TG, HP	41	BMHSU2008	DC; DA
Porteous et al. 2015 [54]	Scotland	ql	TA	Self-care	Individuals with specific disease	No specific disease	A	I	TG	24	R-BMHSU1995, BMHSU2008	Theo; DC; DA
Richards 2015 [55]	Grenada	ql	P	Screening	Women	Cancer	D	I	TG	8	BMHSU2008	Theo; DC; DA
Cathers 2014 [56]	USA	ql	P	Outpatient care	(Health) professionals	Addiction	D	I	TG	5	BMVP2000	Theo; DA
Serna 2014 [57]	USA	mm	CA	Dental care	Migrants	Oral diseases	D	I	TG	14	R-BMHSU1995, BMHSU	Theo; DC
Artuso et al. 2013[58]	Australia	ql	TCM	General health care	Migrants	CD	A	FG; I	TG, HP, NK	21	R-BMHSU1995	Theo

Doshi et al. 2013 [59]	USA	ql	GT	Screening	Men; migrants	HIV	A	I	TG	78	R-BMHSU1995	DC; DA
Han et al. 2013 [60]	USA	ql	GT	Prevention, Screening	Individuals with specific disease	Viral Hepatitis	A	I	HP	20	A&A1974	Theo; DC; DA
Majaj et al. 2013 [61]	Palestine	ql	-	General health care	Women; individuals living in rural areas	No specific disease	A	I	TG, HP	37	R-BMHSU1995	DC; DA
Noh 2013 [62]	USA	ql	CA	End-of-life-care	Elderly individuals; migrants	No specific disease	A	I	TG	28	BMVP2000	Theo; DC; DA
Scott 2013 [63]	USA	mm	CA	Cancer care	Migrants	Cancer	D	FG; I	TG, HP, NK	29	BMVP2000	Theo
Boateng et al. 2012 [64]	Netherlands	ql	CA	General health care	Migrants	No specific disease	A	FG	TG	51	R-BMHSU1995	DC; DA
Callahan 2012 [65]	USA	mm	CA	Cancer care	Individuals with specific disease	Cancer	D	I	TG	7	BMVP2000	Theo
Dergal 2012 [66]	Canada	mm	GT	Nursing	Caregivers	No specific disease	D	I	TG	10	A&N1973	Theo; DA
Chiu 2011 [67]	USA	ql	E	General health care	Migrants, elderly individuals	No specific disease	D	I	TG	18	R-BMHSU1995	Theo; DC
Corboy et al. 2011 [68]	Australia	mm	A&S	Mental health care	Men; individuals living in rural areas	Cancer	A	I	TG, HP	12	R-BMHSU1995	DA
Goh 2011 [69]	Singapore	mm	P	Post-acute care services	Elderly individuals	No specific disease	A	I	TG, HP, NK	29	R-BMHSU1995, A&N1973, A&A1974, BMHSU	DA
Chiu 2010 [70]	USA	ql	E	E-health	Migrants; caregivers	Dementia	D	I	TG	14	R-BMHSU1995, A&N1973	Theo; DC
Gräßel et al. 2010 [71]	Germany	mm	CA	Caregiver counselling	Informal caregiver	No specific disease	A	Q	NK	306	A&N1973	Theo; DC; DA
Röösst et al. 2009 [72]	Bolivia	ql	AI	Natal care	Women; survivors of a severe pregnancy complication	No specific disease	A	I	TG	30	R-BMHSU1995	Theo
Andrasik et al. 2008 [73]	USA	ql	CA	Screening	Women; individuals with low socio-economic status	HIV	A	I	TG	35	R-BMHSU1995	Theo; DA
Butler et al. 2008 [74]	USA	ql	-	General health care	Women; individuals living in rural area	No specific disease	A	I	TG	8	R-BMHSU1995	Theo; DA
Herrera et al. 2008 [75]	USA	mm	-	Longterm care	Migrants	No specific disease	A	I	NK	66	R-BMHSU1995	Theo; DC; DA
Bradley et al. 2002 [76]	USA	ql	GT	Longterm care	Women; migrants; elderly individuals	Mental disorders	A	FG	TG	96	R-BMHSU1995	Theo
Go et al. 2002 [77]	Vietnam	ql	-	STD treatment	Women	STD	A	I	TG	36	R-BMHSU1995	DC; DA

Country – UK: United Kingdom, USA: United States of America
Methods – mm: mixed-method study; ql: qualitative study
Methodolgical orientation: CA: Content analysis; E: Ethnography; GT: Groundd Theory; P: Phenomenology; I: Iterative Categorisation; TA: Thematic analysis; AI: Analytic induction; A&S: Coding & Analysis Auerbach & Silverstein; TCM: Miles and Huberman`s conceptual matrix (TCM); R&S: Framework analysis of Ritchie and Spencer; FA: Framework analysis
Disease of interest – TB: tuberculosis; STD: Sexually transmitted diseases
Data collection – I: Interview, FG: Focus group, O: Oberservation, DocA: Document analysis, Q: Questionnaire
Respondents – TG: target group, HP: Health professionals, NK: next of kin
Document type – A: Article, D: Dissertation
Model – BMHSU: Andersen 1968 [78]; A&N1973: Andersen and Newman's Framework of Viewing Health Services Utilization [79]; A&A1974: Aday and Andersen's Framework for the study of access to medical care [80]; R-BMHSU1995: Andersen 1995 [81]; A&D1997: Ethnicity, aging, and oral health outcomes: a conceptual framework [82]; UM1998: Phillips, Morrison, Andersen & Aday – Utilization Model [83]; BMVP2000: Behavioral Model for Vulnerable Populations [84]; A&D2001: Behavioral Model of Health Services Use including contextual and individual characteristics [85]; Ex-BMPF2002: expanded Andersen model with psychosocial factors in Long-Term Care [76]; A&N2005: Andersen & Newman Individual Determinants of Health Service Utilization; BMVP2007: Stein, Andersen & Gelberg [86]; BMHSU2008 Andersen 2008 [87]; A&D&B 2013: A behavioral model of health services use including contextual and individual characteristics [88]; mhealth PNE framework [89]
Theo: Theoretical background, DC: Data collection, DA: Data analysis

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Application of Andersen's Behavioral Model of Health Services Use – A scoping review with a focus on qualitative health services research

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Abstract

Introduction: Qualitative methods have become integral in health services research, and Andersen's Behavioral Model of Health Services Use (BMHSU) is one of the most commonly employed models of health service utilization. The model focuses on three core factors to explain health care utilization: predisposing, enabling, and need factors. A recent overview of the application of the BMHSU is lacking, particularly regarding its application in qualitative research. Therefore, we provide a) a descriptive overview of the application of the BMHSU in health services research in general and b) a qualitative synthesis on the (un)suitability of the model in qualitative health services research.

Methods: We searched five databases from March to April 2019, and in April 2020. For inclusion, each study had to focus on individuals ≥18 years of age and to cite the BMHSU, a modified version of the model, or the three core factors that constitute the model, regardless of study design, or publication type. We used MS Excel® to perform descriptive statistics, and applied MAXQDA 2020® as part of a qualitative content analysis.

Results: From a total of 6,319 results, we identified 1,879 publications dealing with the BMSHU. The main methodological approach was quantitative (89%). More than half of the studies are based on the BMHSU from 1995. 77 studies employed a qualitative design, the BMHSU was applied to justify the theoretical background (62%), structure the data collection (40%), and perform data coding (78%). Various publications highlight the usefulness of the BMHSU for qualitative data, while others criticize the model for several reasons (e.g. its lack of cultural or psychosocial factors).

Conclusions: The application of different and older models of health care utilization hinders comparative health services research. Future research should consider quantitative or qualitative study designs and account for the most current and comprehensive model of the BMHSU.

Article summary

Strengths and limitations of the study:

This review

- explores the application of the widely adopted Behavioral Model of Health Services Use without limiting the search on target group, care setting, or disease.
- might have missed studies that did not mention the Behavioral Model of Health Services Use, or the three core factors in the title and abstract of the publications.
- gives insights to the application of the Behavioral Model of Health Services Use in qualitative research which have received little attention so far.

Introduction

Health care utilization refers to the use of the health care system "by persons for the purpose of preventing and curing health problems, promoting maintenance of health and well-being, or obtaining information about one's health status and prognosis" [1]. A needs-based health care system meets the needs of a person objectively identified by (health) professionals and considers the demands of an individual. If this interaction is successful, overuse, underuse, and misuse of health care systems can be avoided. Otherwise, there is the possibility of compromising the health of an individual and placing burden on the health care system [2]. To avoid overuse, underuse, and misuse of the health care system, it is important to consider the (non-)use of health care services, which is determined by a variety of contextual and individual factors [3]. As a measurable construct, health care service utilization is primarily determined through quantitative surveys. To explore individual demands, qualitative methods can provide important and rich information within the field of health services research [4, 5]. Various models have been developed across a variety of disciplines to explore and predict individuals' intentions and behaviors as they utilize health care services [6]. In health services research, the

Behavioral Model of Health Services Use (BMHSU) is the most frequently cited model of health care service utilization [6]. The model was developed by R.M. Andersen in 1968, and was based on a national quantitative survey that aimed to understand families' use of health services [7, 8]. The model focuses on three core factors to explain health care utilization: predisposing factors (e.g., age, education), enabling factors (e.g., income, hospital density), and need factors (e.g., health status) [8].

In recent years, Andersen's initial behavioral model has undergone continuous development, where new focus was placed on various factors [8–10], such as 'consumer satisfaction' in the 1970s [11, 12], and 'health status', 'personal health practice', and 'external environment' in the 1980s [9, 13]. In 1995, Andersen himself reviewed the model and its development and has since included feedback loops to consider how treatment outcomes affect health behavior [8]. Additional 'contextual and individual characteristics' were added to the model in the 2000s [8]. Some of these further developments were carried out in cooperation with other authors, e.g., Andersen and Newman's Framework of Viewing Health Services Utilization [11] or Aday and Andersen's Framework for the Study of Access to Medical Care [12]. The BMHSU was modified for specific settings (e.g., complementary and alternative medicine [14]) and for specific target groups (e.g., the Behavioral Model for Vulnerable Populations for homeless people [15]). Currently, many versions of the model for different settings or target groups are available and applied in health services research. The most current and comprehensive model is the BMHSU of the year 2013 [16] (Figure 1).The main focus of that model is on the factors that facilitate or impede an individual's access to health care services. According to the model, access is determined by contextual characteristics, individual characteristics, health behaviors, and outcomes. Contextual characteristics include circumstances and the environment; individual characteristics are determined by a person's life circumstances including, for example, genetics and socialization; health behaviors are an individual's personal practices; and outcomes are reflected by an individual's health status and consumer satisfaction.

[Figure 1 about here]

The application of the BMHSU and its different versions has already been examined in several systematic reviews. These are, for example, reviews focusing on specific diseases [17] or settings [18]. The most recent systematic review from Babitsch et al. [3] has examined the application of the BMHSU in general health care, but excludes specific care settings (e.g., maternal health), specific target groups (e.g., veterans), and studies that focus on specific diseases (e.g., HIV) [3]. These reviews considered quantitative studies only, and excluded qualitative studies, although qualitative methods have become an important and integral part of health services research, and are useful for recording detailed descriptions and complex issues in the context of health care utilization and health care services [4, 5]. Even though the BMHSU is the most frequently cited model of access to health care services [6], an overview of the development and application of the BMSHU over the last 50 years is lacking, especially in terms of its application in qualitative research.

Primarily we aimed at a review of qualitative applications of the BMHSU. We learned from exploratory searches that its application in qualitative research will be difficult to find. That was when we decided to undertake a meticulous screening of titles and abstracts of publications dealing with the BMHSU, to provide a descriptive overview on study characteristics as a first step, to learn about the application of the model in general which would help to put the qualitative findings into perspective. In a second step, we focus on a qualitative synthesis of the application of the BMHSU in qualitative health service research. Here, we synthesize (1) the application of different versions of the BMHSU, (2) the (un)suitability of the BMHSU from the authors' perspective and (3) which factors of the BMHSU were analyzed in publications with qualitative approach. Further analyses, e.g., the synthesis of the quantitative studies is object of future publications.

Methods

This scoping review follows the PRISMA Extension for scoping reviews (PRISMA-ScR) [19] (additional file 1). It exists no review protocol. For study selection, two researchers (ML, JT) independently screened all selected titles and abstracts for relevance. Data extraction from title and abstract was divided between two researchers (ML, JT). One researcher's extraction was verified by the other researcher with extracting data of a 25% random sample and discrepancies were resolved through discussion. For the qualitative synthesis, a 25% random sample from the total number of full-texts was screened and extracted independently by the two researchers (ML, JT), agreement was examined and in case of ambiguity discussed. For the remaining publications, the data extraction was divided between two researchers (ML, JT). Two researchers (ML, JT) coded the material together. Through all these processes, discrepancies were discussed and resolved by a team of reviewers (ML, JT, EMB).

Patient and public involvement

No patient involved.

Search strategy

We conducted a systematic literature search in March and April 2019, and performed an updated search in April 2020 using the Embase® via Ovid, Medline® via PubMed, CINAHL® and PsycInfo® via EBSCOhost, and Social Science Citation Index® via Web of Science databases.

We expanded the search strategy of Babitsch et al. [3] inter alia without limitation on the target groups, care settings, and diseases of interest. We adjusted the search terms to the particular databases and combined thesaurus and keywords pertaining to the BMHSU and its three core factors. The detailed search strategy for one database is identified in the supplementary material (additional file 2). The search was conducted for publications published from 1968 to April 2020. Figure 2 shows the study selection process according to the PRISMA statement.

Descriptive overview

Study selection

As an initial first step, title-abstract-screening was performed for all search results. We included all publications focused on adult populations that applied either the BMHSU, a modified version of the model, or all three core factors of the model. No limitations were set for language, study design, or publication type. Studies were excluded if they could not be obtained via electronic access, interlibrary loan, or through contact with the authors.

Data extraction

The following inductively formed characteristics were extracted from the title and abstract of each included study: publication year, first author, region, methodological approach, target group, care setting, and the applied version of the BMHSU. Beyond labelling included studies as quantitative, qualitative, or mixed-methods we undertook no attempt to specify details of the study design, quantify reporting quality or risk of bias. Such a strategy is consistent with scoping reviews *[19]*. For abstracts with insufficient information regarding our extraction characteristics, we obtained the full-text version of the publications.

Data analysis

We calculated descriptive statistics with MS Excel® for the descriptive overview.

Qualitative synthesis

Based on the data extraction of the descriptive overview, we obtained the full-texts of all publications with a qualitative approach, either specifically or as part of a mixed-method design. Finally, we screened the full-texts of the remaining results and excluded publications with no relation to the BMHSU in the qualitative part (Figure 2).

Quality appraisal

The quality of the qualitative studies and the qualitative part of studies with a mixed-method design was assessed (ML, JT) using the "Critical Appraisal Checklist for Qualitative Research"

[20]. The checklist contains ten items that assess the methodological quality of the design, data collection, and data analysis of the publications. The tool comprises four answer choices: 'Yes', 'No', 'Unclear', and 'Not Applicable'. If there was insufficient information to answer a given question, the response was recorded as 'Unclear'. We included all studies with qualitative and mixed-method approach in the qualitative synthesis regardless of the analyzed quality of the studies.

Data analysis

For the qualitative synthesis, MAXQDA 2020® software was used [21]. To answer the research questions, the following deductive codes were coded in the data material: applied version of the BMHSU, the way in which the model is applied in qualitative studies, the potential for and limitations of the BMHSU, and the extensions of the BMHSU described by the authors. The subcode 'potential and limitations of the BMHSU' is based solely on descriptions and conclusions of the authors of the individual publications. In addition, we considered which of the BMHSU factors were examined and which were complemented by inductive factors that emerged from the data material. We distinguished between the three core factors (predisposing factors, enabling factors, and need factors) and the associated factors (e.g., demographics, health policy, and perceived need). We recoded all documents with the final coding frame. In the context of the content-structuring qualitative analysis, the summarizing reduction of the coding followed the approach detailed by other researchers [22]. The presented results are structured based on these main categories.

Results

Descriptive overview of the use of the BMHSU in health services research

After removal of duplicates 6,319 records remained of which 1,879 dealt with the BMHSU, with its three core factors, or a modified version of the model (Figure 2).

[Figure 2 about here]

Starting with the initial use of the model in 1973, reception toward the model has increased considerably in recent decades (Table 1). Two-thirds of all identified publications were published in the last ten years (i.e., since 2010), and more than 50% of the publications have been published since 2013. Further, 70% of the publications are from North-America (USA or Canada), followed by Asia (13%) and Europe (9%). The majority are quantitative studies (n=1,680; 89%), while 4% of all records are qualitative studies (n=69) and 3% are reviews (n=61). In all, 30 publications are mixed-method studies (2%) and 39 publications (2%) are theoretical reflections without empirical data. As there are numerous diverse care settings, target groups and diseases of interests, Table 1 presents the three most frequent categories. An overview of the broad range of the characteristics can be found in additional file 3. General health care, as care provided by general practitioners, is the most studied care setting (n=471, n=25%), followed by nursing care (13%, n=237) and mental health services (12%, n=222). About one quarter of all studies deals with individuals aged ≥50 years (n=481). In addition, 17% of the publications focus on migrants (n=322), and 14% on women (n=256). Half of the publications (n=936) do not account for a specific disease; for 12% (n=229) of all publications, mental disorders represent the most frequently examined diseases of interest.

Table 1: Quantitative description of publications using the Behavioral Model of Health Services Use in health services research

	Descriptive overview (n=1,879) *(based on title & abstract)*	**Qualitative synthesis (n=77)** *(based on full text version)*
	n (%)*	**n (%)***
Year		
1968-1979	9 (0)	0 (0)
1980-1989	38 (2)	0 (0)
1990-1999	**168 (9)**	0 (0)
2000-2009	**440 (23)**	**7 9)**
2010-2019	**1,224 (65)**	**70 (91)**
Region		
North-America	**1,275 (70)**	**43 (56)**
Asia	**244 (13)**	6 (8)
Europe	**163 9)**	**14 (18)**
Africa	68 (4)	**12 (16)**
South America	49 (3)	2 (3)
Oceania	29 (2)	5 (6)
Methodological approach		
Quantitative	**1,680 (89)**	/
Qualitative	**69 (4)**	58 (75)
Review	**61 (3)**	/

Theoretical	39 (2)	/
Mixed-Method	30 (2)	19 (25)
Care Setting[1]		
General health care[2]	**471 (25)**	**12 (16)**
Nursing care[3]	**237 (13)**	5 (6)
Mental health services	**222 (12)**	6 (8)
Screening	107 (6)	**7 (9)**
Perinatal care[4]	77 (4)	**7 (9)**
Target group[1]		
Individuals ≥50 years	**481 (26)**	**11 (14)**
Migrants	**322 (17)**	**23 (30)**
Women	**256 (14)**	**16 (21)**
Disease of interest[1]		
No specific disease	**936 (50)**	**27 (35)**
Mental disorders	**229 (12)**	7 (9)
Cancer	**134 (7)**	**9 (12)**
HIV	96 (5)	**11 (14)**

[1] Bold: three most frequent categories
[2] General health care: care provided by general practitioners
[3] Nursing: homecare, long-term care, formal care, care facility, informal care, respite care, institutionalized care & transportation services
[4] Perinatal care: including midwifery services
* The sum might be less than 100% as only the three most frequent categories are represented in this table. Additional file 3 shows all characteristics.

Qualitative synthesis of the use of the BMHSU in qualitative health services research

After excluding publications without a qualitative or mixed-method approach (n=1,780), those without a full text available (n=10), those without a corresponding full text to a conference paper (n=7), and those that were not at all related to the BMHSU in the qualitative part (n=5), a total of 77 studies remained and were included in the qualitative synthesis of qualitative studies applying the BMHSU (Figure 2).

Although the first known application of the BMHSU in a qualitative study was from 2002, most of the qualitative records were identified in 2010 and later (91%; n=70; Table 1). Most publications are from North-America, USA or Canada (n=43, 56%), 18% (n=14) are from Europe and 16% (n=12) are from Africa. General health care is the care setting that was explored most often in publications adopting a qualitative study design (n=12, 16%), followed by screening and perinatal care (n=7 each, 9%). Qualitative research applying the BMHSU primarily targets migrants (n=23, 30%), women (n=16, 21%), and individuals aged ≥50 years (n=11, 14%). Further, 35% of qualitative publications (n=27) address no specific disease; if a particular disease was of interest, it is most often HIV (n=11, 14%) or cancer (n=9, 12%).

Two-thirds of the qualitative studies use personal interviews as a data collection method (n=51, 81%). The sample size varies between five and 470 participants. Most of the qualitative studies interview the target group directly (n=65, 84%). Health professionals and/or next of kin assessments are the sole source of information in 12 studies (16%). In addition, 18 of the 65 qualitative studies that approached the target group obtained further information from health professionals (n=13), next of kin (n=1), or both (n=4; for further details; additional file 4).

Application of the different versions of the Andersen model

The BMHSU is applied in the various studies to justify the theoretical background (62%), structure the data collection (40%), e.g. such as aiding in the development of the interview guide, and for data coding (78%). More than half of the studies (n=42) [23–62] are based on the BMHSU from 1995 [9]. Multiple studies (n=11) use the Behavioral Model for Vulnerable Populations [63–72]. Twelve studies [31, 42, 55, 61, 73–80] employ Andersen and Newman's Framework of Viewing Health Services Utilization, eight studies [42, 43, 81–86] apply Aday and Andersen's Framework for the Study of Access to Medical Care, and seven studies [42, 48, 52, 55, 59, 61, 87] are based on the original Behavioral Model of Families' Use of Health Services from 1968. Individual studies use other models, such as the expanded model from Bradley et al. [29] (additional file 4).

(Un)Suitability of the Andersen model from the authors' perspective

Overall, 29 publications [23, 31–33, 35, 36, 40, 42, 43, 45, 46, 48, 49, 51, 53, 55, 56, 69, 72, 73, 78–80, 83, 88–92] described that the model was suitable in their work, e.g., to obtain and evaluate qualitative data. Of these, 17 publications [35, 36, 40, 43, 45, 46, 49, 51, 53, 73, 78–80, 83, 88, 89, 92] highlight the general suitability of the BMSHU for qualitative data: "Andersen's framework provides a valid, consistent, and unbiased manner in which to code and classify qualitative data" [89]. Various publications (n=17) [35, 40, 43, 45, 46, 49, 51, 53, 55, 58, 73, 78–80, 88, 89, 93] described how their data can be applied very well to the BMHSU and its factors. Others described that the strength of the model lies in its consideration of both

patient-related and environmental factors [40, 51, 91], and that the model allows for "a more transparent comparison with findings emerging from other studies" [88].

Some studies (n=11) described the suitability of the BMHSU and additionally criticized some parts of the model [23, 32, 36, 40, 49, 53, 55, 90, 92–94]. For instance, there are authors (n=8) who criticized the model, but did not propose changes to its structure [23, 26, 36, 49, 90, 92–94]. Some studies [23, 26] described that cultural factors are not adequately represented in the model: "the model has been noted not to be sensitive to the diverse cultural and structural barriers in healthcare among minority groups" [26]. According to the authors of some publications [36, 49], the models would need to further elaborate upon the relationship between the three core factors of the BMHSU and the relevance of each. Other authors claimed that the model does not cover all factors of health care utilization, such as psychosocial factors [23], and would be less suitable for studies on HIV [90] or health care coverage [94].

Not all critics proposed model modifications, but some of the identified limitations may lead to modifications of or additions to the BMHSU. Based on their findings, some authors (n=12) identified additional factors not covered by the model that impact health care utilization [24, 29, 32, 37, 38, 40, 55, 58, 75, 81, 86, 91], such as health literacy [40, 55, 91], or competing priorities [24, 40] (Table 2). The basic structure of the BMHSU is retained as part of these expansions.

Other studies fundamentally changed the original structure of the BMHSU, both in terms of the factors [25, 39, 75] and the feedback loops provided [40, 53, 63], ultimately impacting the influence between each of the factors in the model. Some studies emphasized the distinction between the three core factors as predisposing and inhibiting factors, and as enabling and impeding factors [25, 27, 63], while others combined the model with another model [62].

Table 2: Additions to the Behavioral Model of Health Services Use from qualitative health services research

<table>
<tr><th rowspan="2">Contextual characteristics</th><th colspan="3">Individual characteristics</th><th rowspan="2">Health Behaviors</th><th rowspan="2">Outcome</th><th rowspan="2">Further additions</th></tr>
<tr><th>Predisposing factors</th><th>Enabling factors</th><th>Need factors</th></tr>
<tr><td>Intake & engagement [37]</td><td>Competing priorities [24, 40]</td><td>Medication characteristics [40]</td><td rowspan="5">Unmet need [32]</td><td>Distinction between problem recognition, decision to seek help and decision to use health care system [75]</td><td>Dental service use & dental experiences [58]</td><td>Psychosocial factors [29]</td></tr>
<tr><td>Patient & transition [37]</td><td>Fear [24]</td><td>Reminder strategies [40]</td></tr>
<tr><td>Medication adherence strategies [37]</td><td>(Mis)trust [24, 91]</td><td>Personal emergency alarm system [32]</td></tr>
<tr><td>Billing [37]</td><td>Previous experiences [24, 91]</td><td>Informal care system [32]</td><td rowspan="3">Avoidant strategies [55]</td><td rowspan="3">Intended & actual use [29, 58]</td><td rowspan="3">Situation and satisfaction of the next of kin [81]</td></tr>
<tr><td>Specific program for support [37]</td><td>Contingency plans for future falls [32]</td><td rowspan="6">Characteristics at the level of informal caregivers [38]: Physician referral, knowledge about the services, acculturation</td></tr>
<tr><td>Health Literacy [37]</td><td>Health literacy [40, 55, 91]</td><td rowspan="5">Mental health [86]</td></tr>
<tr><td>Individualized care [37]</td><td rowspan="3">Characteristics at the level of informal caregivers [38]: Familism, perception about services, religiosity, gender roles</td><td rowspan="4">Spirituality [55]</td><td rowspan="4">Service experience [58]</td><td rowspan="4">Vulnerability factors [72]</td></tr>
<tr><td>Philosophical approaches [37]</td></tr>
<tr><td>Pharmacy services [40]</td></tr>
<tr><td>Rheumatologist [91]</td><td>Conscientiousness [91]</td></tr>
</table>

The table shows the variables as the authors of the original studies assigned them to BMHSU core factors

Factors of the BMHSU emerging from qualitative health services research

Individual characteristics are considered much more frequently than contextual characteristics, health behaviors, or health outcomes in publications that adopted a qualitative design. Table 3 lists all factors of the BMHSU with the number of publications that used each factor. Although the qualitative studies explored in our research considered a wide range of factors, there are still some other factors of the BMHSU that have not been considered in any of the included publications that featured a qualitative study design (e.g., quality of life as an outcome factor or some predisposing factors as contextual characteristics).

Contextual characteristics: A total of 63 qualitative studies (82%) mentioned contextual characteristics, of which enabling factors are most frequently included, such as health professional factors, e.g. soft skills (n=22, 29%) or availability (n=21, 27%).

Individual characteristics: The most frequently researched factors pertain to individual characteristics, especially predisposing factors such as social networks (n=41, 53%), attitude towards health care services (n=33, 43%), and values (n=28, 36%). Nearly half of all studies considered accessibility of health care services as an enabling factor (n=34, 44%). The most common need factor was perceived symptoms (n=45, 58%).

Health Behavior: In terms of health behavior, the relationship between the patient and provider (n=21, 27%), as well as alternative medicine (n=13, 17%) and self-care (n=11, 14%) were most often analyzed in publications adopting a qualitative design.

Outcomes: Overall, about half of the qualitative studies (n=37) mentioned health outcomes in their analyses. Satisfaction with providers (n=18, 23%) and prior experience (n=17, 22%) were the most considered aspects.

During our qualitative syntheses of qualitative health services research studies, health literacy emerged as a inductive category, separated into individual [95] and organizational health literacy [96]. We identified associations with organizational health literacy in 25 studies (32%)

and individual health literacy in 52 studies (68%; Table 3). In the context of organizational health literacy, the focus was on access to health information: "share health risk information while empowering patients to make their own health decisions" [37]. The most frequently mentioned factors among individual health literacy were knowledge (n=39, 51%) and competences (n=22, 29%), as exemplified by the following statement: "knowledge was empowering to make own choices and feel in control of their care decisions" [28].

Table 3: Factors examined in publications

	Factors	N	References
Contextual characteristics	**Predisposing factors**		
	Demographic	1	[92]
	Social	/	/
	Beliefs		
	Stigma*	14	[34, 45, 46, 53, 61, 65, 67, 72, 78, 85, 86, 89, 90, 97]
	Culture*	5	[24, 41, 45, 47, 78]
	Social norms*	5	[35, 41, 77, 78, 88]
	Gender roles*	3	[28, 67, 97]
	Enabling factors		
	Health Policy	7	[43, 58, 62, 84, 85, 92, 98]
	Financing	12	[35, 37, 42, 51, 62, 65, 84, 89, 91, 92, 99, 100]
	Organization		
	Health professional factors*	22	[25, 32, 35, 37, 40, 43, 44, 51, 54, 59, 62, 70, 80, 82, 83, 85, 89, 91–93, 98, 101]
	Availability*	21	[24, 25, 29, 34, 40, 42, 43, 48, 51, 54, 60, 62, 65, 75, 81, 88, 91, 93, 98, 100, 102]
	Additional health care services*	12	[27, 37, 53, 73, 76, 77, 81, 82, 89, 91, 98, 101]
	Cultural/linguistic suitable services*	9	[24, 32, 38, 41, 63, 67, 72, 85, 86]
	Cooperation*	5	[24, 78, 81, 82, 98]
	System complexity*	6	[35, 65, 81, 83, 85, 102]
	Quality of care*	6	[27, 35, 43, 60, 81, 91]
	Interpreters*	2	[24, 70]
	Need factors		
	Environmental	3	[51, 90, 92]
	Population health indices	/	/
Individual characteristics	**Predisposing factors**		
	Demographic		
	Immigration status*	7	[32, 54, 57, 58, 71, 72, 102]
	Gender	2	[63, 65]
	Age	13	[25, 26, 45, 51, 54, 58, 59, 62, 63, 79, 80, 94, 102]
	Genetic	2	[47, 98]
	Social		
	Social network	41	[26, 27, 29–32, 34, 36, 40–43, 48–51, 55, 57–59, 61, 63, 65, 67, 68, 76, 78–83, 85, 86, 88, 90, 93, 94, 100, 102, 103]
	Personal skills*	16	[27, 30, 40, 44, 46, 52, 66–68, 70–72, 76, 78, 82, 86]
	Competing priorities*	12	[23–25, 31, 35, 40, 51, 67, 78, 82, 88, 94]
	Living conditions*	10	[40, 42, 48, 50, 66, 67, 71, 81, 89, 90]
	Education*	5	[48, 58, 62, 88, 91]
	Beliefs		
	Attitude towards health care services	33	[24, 27–30, 32, 35, 41–43, 46, 48–51, 53, 60, 62, 64, 75, 78–81, 86, 88, 89, 91, 93, 99, 100, 102, 103]
	Fear*	27	[23–25, 35, 36, 40, 41, 47, 50, 51, 53, 57, 61–63, 65, 68, 71, 75, 77–79, 85, 88, 89, 101, 102]
	Values	28	[24, 26, 27, 30, 32, 34, 35, 41, 47, 49, 54, 55, 57, 58, 61, 63, 67, 68, 71, 72, 75, 82, 85, 87, 88, 93, 100, 103]

	Attitude towards health professionals	12	[28, 33, 38, 44, 46, 48, 49, 61, 77, 88, 99, 102]
	Enabling factors		
	Financing		
	Financial resources	25	[23, 26, 29, 42, 43, 49–54, 58, 63, 66, 68, 71, 72, 78, 79, 88, 91, 94, 99, 100]
	Insurance	18	[23, 30, 35, 40, 44, 46, 52, 54, 64, 65, 71, 72, 88, 91, 93, 94, 102, 103]
	Income	8	[29, 30, 54, 65, 71, 88, 93, 103]
	Organization		
	Accessibility*	34	[23–26, 30, 35, 40, 42, 43, 45, 48, 49, 51, 53, 58, 62, 65, 66, 72, 75, 78, 79, 82, 83, 88–91, 93, 99–103]
	Stable routine*	6	[65, 75, 76, 89, 90, 100]
	Reminder strategies*	3	[40, 51, 53]
	Social Support		
	General*	12	[48, 49, 51, 64, 67, 76, 78, 80, 83, 88, 90, 100]
	Tangible	18	[27, 32, 34, 40, 42, 50, 51, 65, 67, 76, 79, 81, 87, 91, 93, 94, 102, 103]
	Emotional/affectionate	15	[23, 25, 26, 30, 36, 50, 51, 55, 63, 65, 67, 76, 78, 81, 83]
	Informational	11	[23, 26, 41, 43, 68, 76, 79, 82, 87, 90, 93, 100, 103]
	Need factors		
	Perceived		
	General*	10	[31, 32, 34, 59, 65, 74, 79, 87, 93, 103]
	Symptoms	45	[23–27, 31, 36, 40, 42–44, 47–51, 54, 55, 58–61, 63, 65, 67, 68, 71, 75, 76, 78, 79, 81, 86, 88, 91, 94, 97, 99–101, 103]
	Evaluated	20	[26, 31, 34, 36, 42, 56, 59, 60, 63, 76, 79–81, 83, 86, 91–93, 100, 103]
	Health Behaviors		
	Personal health practice		
	Alternative medicine*	13	[26, 30, 45, 54, 55, 58, 65, 78, 79, 87, 88, 91, 99]
	Self-care	11	[25, 30, 47, 49, 65, 75, 87, 88, 90, 99, 100]
	Adherence	8	[37, 40, 51, 64, 66, 91, 100, 102]
	Diet	4	[48, 49, 65, 87]
	Process of medical care		
	Relationship patient-provider	21	[24, 27, 28, 40, 51, 53, 61, 67, 68, 71, 73, 75, 76, 78, 83, 85, 89–92, 100]
	Second medical opinion*	1	[51]
	Use of personal health services	77	[23–55, 57–68, 70–94, 97–103]
	Outcomes		
	Perceived health status	5	[42, 49, 78, 91, 92]
	Evaluated health status	1	[65]
	Consumer satisfaction		
	General*	2	[83, 92]
	Prior experiences*	17	[23, 24, 26, 28, 46, 48, 52, 56, 58, 68, 72, 75, 81, 83, 97, 99, 100]
	Waiting time	5	[23, 43, 46, 83, 88]
	Satisfaction with providers*	18	[23, 27, 35, 36, 46, 48, 49, 56, 72, 73, 76, 77, 81, 83, 85, 88, 99, 100]
	Satisfaction with care facility*	8	[30, 38, 42, 60, 79, 83, 94, 100]
	Quality of life	/	/
Health Literacy	**Organizational Health Literacy***		
	Access to Health Information*	25	[23–25, 28, 31, 33, 37, 40, 41, 47–50, 70, 75–77, 84, 85, 91, 93, 94, 100]
	Individual Health literacy*	1	[70]
	Literacy*	2	[62, 100]
	Knowledge*	39	[24, 27–29, 31–38, 41, 43, 45, 47–53, 55, 58, 63, 68, 70, 74–79, 85, 88, 91, 93, 101, 102]
	Motivation*	4	[35, 76, 78, 99]
	Competences*	22	[23, 24, 28, 30, 33, 38, 40, 49, 51, 53, 57, 62, 64, 65, 68, 71, 75, 76, 83, 90, 102, 103]

*These factors were inductive codes, developed along the data material

Quality assessment of publications with a qualitative study design

Of the 77 qualitative studies, four (5%) reported all ten aspects of the critical appraisal checklist for qualitative research [20]. Most qualitative studies (n=69, 90%) reported between five and nine criteria from the checklist, and four studies (5%) reported fewer than five criteria. The two quality criteria that were most frequently fulfilled with 95% each (n=73) are the "congruity between the stated philosophical perspective and the research methodology" and the "congruity between the research methodology and the methods used to collect data" [20]. In contrast, the "influence of the researcher on the research, and vice-versa" [20] is only addressed in nine publications (12%).

Discussion

This scoping review provides a recent overview of the development and application of the BMHSU in very different care settings, across different diseases, and among publications examining different target groups. The BMHSU is mainly used in quantitative studies, but our review also shows the suitability of the model in qualitative research.

Descriptive overview of the use of the BMHSU in health services research

The general reception toward the BMHSU has increased considerably in recent years, as has the number of publications adopting this model, with most (70%) of all related publications stemming from North-America. This is in line with another review [3], which excluded specific care settings and diseases. The dominance of research projects adopting quantitative design [104] is reflected in this scoping review, as 89% of the identified publications used quantitative methods.

The BMHSU is mainly used for research examining health care in general, without focusing on specific diseases. This is not surprising, as the recent BMHSU was not developed for any specific care setting or disease [16]. Still, a wide range of publications have focused on specific care settings (e.g., nursing, mental health services) and diseases (e.g., mental disorders). Individuals aged ≥50 years are the largest target group represented in this overview. Possible

explanations for this finding include the fact that this population represents the largest, and fastest growing cohort in the broader population [105]. Further, this group uses health care services most frequently [106].

Qualitative synthesis on the use of the BMHSU in qualitative health services research

The relevance of the BMHSU for qualitative projects within health services research is demonstrated by our results. Still, there are some limitations within the BMHSU, which should be critically considered depending on the research question.

The publications featuring a qualitative design mainly consider the individual characteristics within the BMHSU. Since the primary interest of qualitative research is the subjective experience of individuals, this result is not surprising [107]. In addition, it was noted that people from the target group were primarily interviewed in these studies, while there were fewer next of kin or health professionals interviewed. Experts may wish to consider obtaining more information about contextual characteristics in their research. Since the data extraction within the descriptive overview was carried out at the level of titles and abstracts, it is not possible to determine whether contextual characteristics in publications featuring a quantitative study design are more strongly represented in this review.

Although over half of all publications that adopted a qualitative design had been published since 2013, most of them considered the Andersen model of 1995, which is also a result of the review by Babitsch et al. [3]. Only one of the publications with a qualitative design [55] adopted the most current and comprehensive BMHSU from the year 2013 [16]. This is interesting, as some authors expanded upon an older version of the BMHSU and justified various missing factors (e.g., provider negligence and dissatisfaction, location of a clinic), although these factors are actually included in the most current version of the BMHSU from 2013 [16]. It is important to consider that even R.M. Andersen himself had additional thoughts on the model [9]. For example, he co-authored a publication [29] with the aim to expand the view from the original model on psychosocial factors.

One new factor that has been discussed in some of the considered studies is health literacy. Health literacy relates to many parts of the Andersen model and cannot be assigned to a specific level or factor. We recommend integrating health literacy as an additional factor in the BMHSU, as an individual's health literacy and health-literate organizations are important foundations for the (non-)use of health care services, and consequently for health care research [95, 96].

Strengths and limitations

When interpreting the results, it should be noted that although we performed systematic searches, some publications might have been missed. For example, articles that did not mention the BMHSU, or the three core factors in the title and abstract were not included. Further, articles may have been excluded given that we restricted our search to five databases. However, it became apparent, that all previously known key publications have been identified through our search strategy [3, 8, 9, 11, 12, 15]. Another limitation is that the extraction of publication characteristics was divided between the first authors (ML, JT) and were not extracted twice. Also, the quality of this scoping review is based on the quality of the information contained in the included publications. We considered the general utilization of the BMHSU in health services research (as identified in the descriptive overview) at the title and abstract level, and not at the full-text level. An analysis of the full-texts could provide further information about – and more detailed insights into – the application of the BMHSU. When coding the results based on the various model factors, one challenge faced by our team was appropriately assigning the factors, as the assignment of the factors was not always clear. The detailed description of the current BMHSU by Andersen et al. [16] served us substantially for the assignment of the factors. Any uncertainties were discussed in the review team. Also, our comparison of the various studies that adopted a qualitative design is limited by the fact that very different versions of the model were used.

Regarding the influence of the reviewers on the review, it should be mentioned that the review team was composed of individuals with experience in systematic reviews, health services

research and qualitative methods, had no affiliation with the research and no funding for the review. It should be noted that this scoping review is the first to explore the application of the widely adopted BMHSU without limiting our search based on target group, care setting, or disease since the model was initially published in 1968. Further, this review examined publications adopting qualitative study designs, strengthening the perceptions of qualitative methods in health care research. This review provides the first-ever overview of the (un)suitability of the BMHSU in qualitative research.

Conclusion

This scoping review reveals that the BMHSU, which is one of the main models in health care services research, has broad applications in very different care settings, across various diseases, and focuses on a wide range of target groups. The BMHSU is mainly used in quantitative studies, but our review also shows the suitability of the model for qualitative research. As health literacy in particular plays an increasingly important role in health care utilization [95], we think it is important to take this factor into account in the BMHSU. In further research, it would be interesting to examine this relationship more thoroughly. Additionally, it might be interesting to compare the application of the BMHSU in quantitative and qualitative research. The application of so many different (and older) models of health care utilization makes it difficult to compare the individual studies with one another. However, such a comparison would be particularly important in the context of health services research. For future health services research, the current and most comprehensive version of the BMHSU [16] should always be considered.

Author contributions

ML, JT and EMB conceived the idea of the scoping review. ML, JT built the search strategy, screened the search results, and extracted the data. ML, JT, and EMB interpreted the findings and wrote the manuscript. All authors read and approved the final manuscript.

Competing interests
The authors declare that they have no competing interests.

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Ethics approval
This scoping review was based on published data. As researchers did not access any information that could lead to the identification of an individual patient, no concerning ethical issue was raised in this research. Therefore, obtaining ethical approval and consent of participants was waived.

Data availability statement
All data relevant to the study are included in the article or uploaded as supplementary information.

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Figure 1: Andersen's Behavioral Model of Health Services Use

Figure 2: Flowdiagram based on PRISMA

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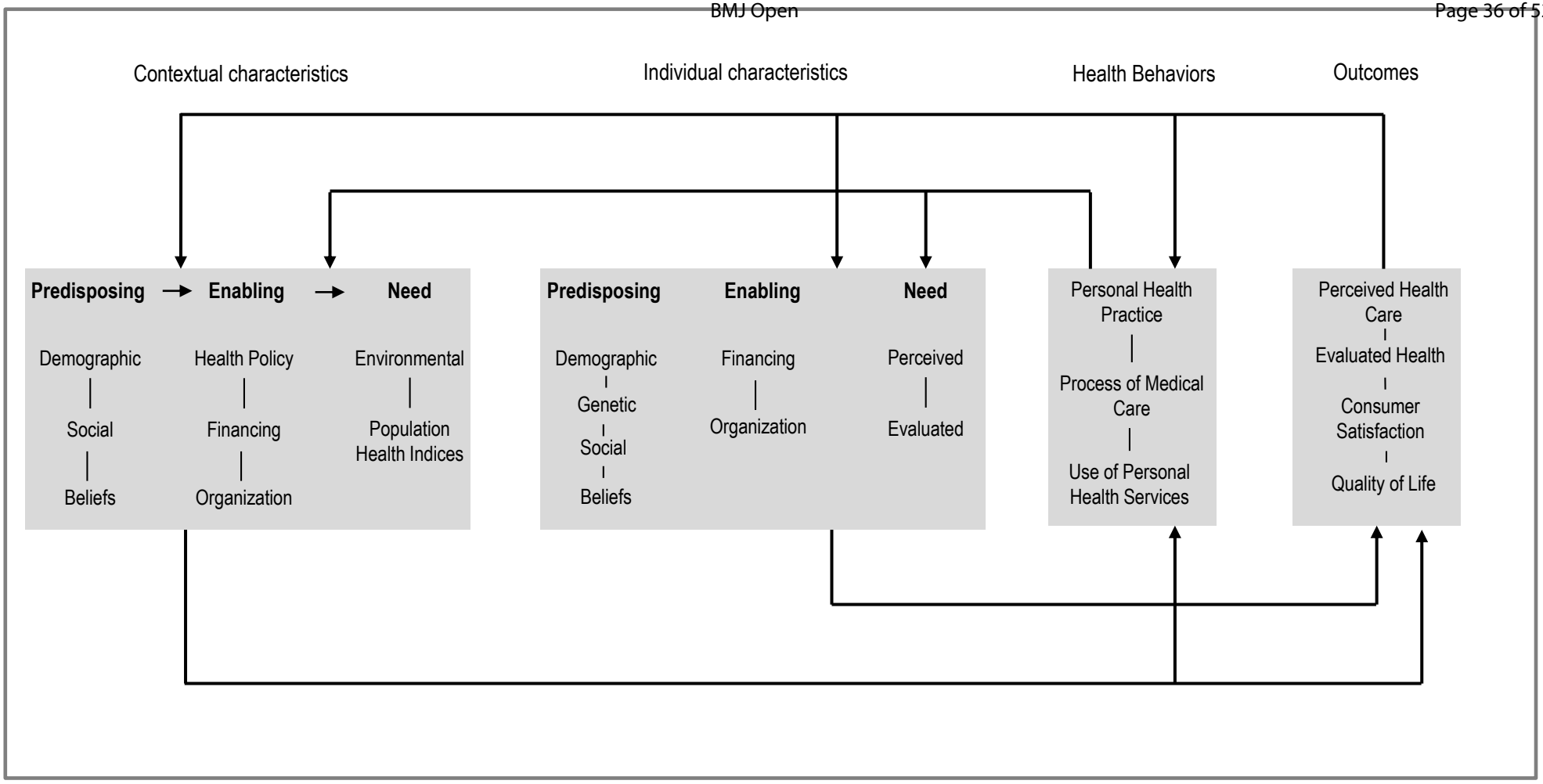
Contextual characteristics
Individual characteristics
Health Behaviors
Outcomes
Predisposing
Enabling
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Demographic
Social
Beliefs
Health Policy
Financing
Organization
Environmental
Population Health Indices
Predisposing
Enabling
Need
Demographic
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Personal Health Practice
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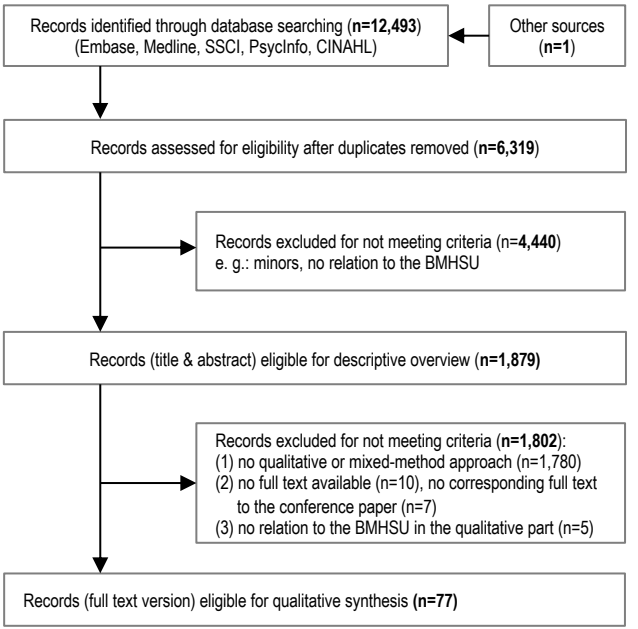
Use of Personal Health Services
Perceived Health Care
Evaluated Health
Consumer Satisfaction
Quality of Life



Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	1
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	3-5
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	5
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	6
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	7
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	6
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	Additional file 2
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	6,7
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	7,8
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	6,7
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	7

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	8
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	8,9 and figure 2
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	9
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	17
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	13; 15-16
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	8-17
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	17
Limitations	20	Discuss the limitations of the scoping review process.	19
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	19, 20
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	20

JBI = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.
* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.
† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).
‡ The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.
§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

From: Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMAScR): Checklist and Explanation. Ann Intern Med. 2018;169:467–473. doi: 10.7326/M18-0850.

Additional file 2: Exemplary search strategy

Exemplary search strategy – Medline via Pubmed	
#1	"Andersen RM" [Author]
#2	"Andersen R" [Author]
#3	#1 OR #2
#4	"Andersen model"
#5	"Andersen's model"
#6	#4 OR #5
#7	"Behavioral Model of Health Services Use"
#8	"Behavioural Model of Health Services Use"
#9	#7 OR #8
#10	andersen*
#11	"behavior model"
#12	"behaviour model"
#13	"behavioral model"
#14	"behavioural model"
#15	(#11 OR #12 OR #13 OR #14) AND #10
#16	"health model"
#17	#16 AND #10
#18	utilization
#19	utilisation
#20	"Facilities and Services Utilization"[Mesh]
#21	"Patient Acceptance of Health Care"[Mesh]
#22	model
#23	(#18 OR #19 OR #20 OR #21) AND #22 AND #10
#24	aday*
#25	davidson*
#26	newman*
#27	gelberg*
#28	(#22 OR #23 OR #24 OR #25) AND #10
#29	predisposing
#30	enabling
#31	need
#32	#27 AND #28 AND #29
#33	(#27 OR #28 OR #29) AND #10
#34	"andersen framework"
#35	"Behavioral Model for Vulnerable Populations"
#36	#3 OR #6 OR #9 OR #15 OR #17 OR #23 OR #28 OR #32 OR #33 OR #34 OR #35
#37	animals
#38	#36 NOT #37
#39	#36 NOT #37 Filters: Publication date from 1968/01/01 to 2019/04/09

Additional file 3: All characteristics and categories

Diseases of interest	Total n=1,879	
	n[1]	%
no specific disease	936	50
mental disorder	229	12
cancer	134	7
HIV	96	5
addiction	82	4
diabetes	43	2
cardiovascular disease	42	2
dementia	39	2
oral diseases	28	1
chronic disease in general	25	1
arthritis	20	1
maternal and perinatal health	17	1
disability	16	1
violence experience	13	1
alzheimer's disease	12	1
asthma	11	1
brain injury	10	1
flu	7	0
stroke	7	0
urologic diseases	7	0
multiple sclerosis	7	0
pulmonary disease	7	0
osteoporosis	6	0
hepatitis B or C	5	0
influenza	5	0
tuberculosis	5	0
parkinson's disease	5	0
trauma	4	0
epilepsy	4	0
gastrointestinal diseases	4	0
back pain	4	0
eye problems	4	0
autism spectrum disorder	3	0
chronic pain	3	0
hearing loss	3	0
HPV	3	0
spinal cord injury	3	0
hip or knee arthroplasty	3	0
suicidal ideation or suicide	3	0
others	44	2

Legend:
[1] Since some publications included multiple care settings, target groups etc. the sum might be greater than 100%

Additional file 3: All characteristics and categories

Target groups	Total n=1,879	
	n[1]	%
elderly individuals	481	26
migrants	322	17
females	256	14
general population	255	14
men	203	11
individuals with mental disorder	127	7
community-dwelling individuals	74	4
caregivers	71	4
individuals with low socio-economic status	69	4
individuals living in rural areas	68	4
individuals with HIV	65	3
young individuals	56	3
soldiers or veterans	56	3
individuals with cancer	50	3
insured individuals	39	2
mothers	36	2
individuals with diabetes	33	2
individuals living in urban areas	31	2
individuals with cardiovascular disease	29	2
individuals with disabilities	25	1
patients	21	1
individuals with dementia	20	1
LSBTTIQ*	20	1
people of color	18	1
individuals with arthritis	17	1
individuals with chronic disease	17	1
employed individuals	15	1
vulnerable individuals	15	1
individuals with incarceration experience	13	1
students	13	1
health care providers	12	1
individuals with asthma	11	1
inpatients	11	1
nursing home residents	10	1
individuals with brain injury	10	1
care-dependent individuals	10	1
victims of violence	9	0
no specific population	8	0
uninsured individuals	8	0
individuals with cognitive impairment	7	0
ethnic minorities	7	0
high-risk individuals	5	0
individuals at the end of life	5	0
individuals in the emergency department	5	0
individuals with stroke	5	0
married individuals	5	0
individuals with chronic pain	5	0

Additional file 3: All characteristics and categories

Target groups	Total n=1,879	
	n[1]	%
individuals with parkinson's disease	5	0
individuals with multiple sclerosis	5	0
complementary medicine clients	4	0
discharged individuals	4	0
frail individuals	4	0
individuals with epilepsy	4	0
individuals with oral diseases	4	0
outpatients	4	0
primary care patients	4	0
parents	4	0
individuals with experienced trauma	4	0
border residents	3	0
individuals with alzheimer's disease	3	0
individuals with back pain	3	0
individuals with hearing loss	3	0
individuals with osteoporosis	3	0
individuals with pulmonary disease	3	0
individuals with spinal cord injury	3	0
individuals with tuberculosis	3	0
individuals with a hip or knee arthroplasty	3	0
individuals with obesity	3	0
sex workers	3	0
addictive individuals	3	0
others	50	3

Legend:
[1] Since some publications included multiple care settings, target groups etc. the sum might be greater than 100%.

Additional file 3: All characteristics and categories

Care settings	Total n=1,879	
	n[1]	%
general health care	471	25
nursing	237	13
mental health services	222	12
medication use	115	6
Screening	107	6
oral health services	104	6
inpatient care	99	5
natal care	77	4
emergency care	73	4
addiction services	56	3
health expenditure	44	2
social services	43	2
community-based services	43	2
preventive services	43	2
complementary and alternative medicine	41	2
outpatient care	41	2
HIV treatment services	35	2
cancer care	27	1
end-of-life care	24	1
e-health	20	1
vaccination	19	1
rehabilitation services	17	1
patient satisfaction	16	1
health-related quality of life	14	1
health insurance	13	1
health literacy	12	1
veterans health administration	9	0
eye care	8	0
physical therapy	8	0
health behavior	7	0
self care	6	0
health information	5	0
chronic pain treatment	5	0
chronic care in general	4	0
hyperlipidemia treatment	4	0
health situation	4	0
case management	3	0
osteoporosis treatment	3	0
services for caregivers	3	0
medical assistive devices	3	0
physician trust	3	0
diabetes treatment	3	0
others	36	2

Legend:
[1] Since some publications included multiple care settings, target groups etc. the sum might be greater than 100%.

Additional file 4: Characteristics of publications with qualitative study design

Author & year of publication	Country	Method		Care Setting	Target group of interest	Disease of interest	Document type	Survey	Respon-dents	N	Application of the Andersen model	
Chao et al. 2020 [1]	USA	mm	CA	Mental health services	Migrants; elderly individuals	Mental disorder	A	I	TG	14	A&A1974	DC; DA
Due et al. 2020 [2]	Australia	ql	CA	Oral health services	Migrants	No specific disease	A	I	TG, HP	26	R-BMHSU1995	Theo; DC; DA
Isaak et al. 2020 [3]	Canada	ql	GT	Mental health services	Racial and ethnic minorities	Mental disorder	A	I, FG	TG	115	BMHSU, R-BMHSU1995, A&N1973, A&D&B 2013	Theo; DA
Shewamene et al. 2020 [4]	Australia	mm	CA	Complementary and alternative medicine	Women; migrants	Maternal and perinatal health	A	I	TG	15	BMHSU	Theo
Travers et al. 2020 [5]	USA	ql	CA	Long-term care	Elderly individuals	No specific disease	A	I	TG	470	Ex-BMPF2002	Theo; DA
Bascur-Castillo et al. 2019 [6]	Chile	ql	P	Urologic disease treatment	Women	Urologic diseases	A	I	TG	10	R-BMHSU1995	Theo; DA
Briones-Vozmediano et al. 2019 [7]	Spain	ql	CA	General health care	Migrants	Violence experience	A	I	HP	28	A&A1974	DA
Coleman 2019 [8]	USA	ql	P	Mental health services	Migrants; men; individuals with mental disorder	Mental disorder	D	I	TG	66	BMHSU, R-BMHSU1995, A&N1973	Theo
Fleury et al. 2019 [9]	Canada	mm	-	Mental health services	Individuals with mental disorder	Mental disorder	A	I	TG	328	R-BMHSU1995	Theo; DC; DA
Green et al. 2019 [10]	USA	ql	CA	General health care	Men; individuals with HIV	HIV	A	I	TG	10	BMHSU, R-BMHSU1995	DA
Heidari et al. [11]	Iran	ql	CA	Medication use	Individuals with arthritis	Arthritis	A	I	HP	47	BMHSU2008	DC; DA
Koce et al. 2019 [12]	Nigeria	ql	-	General health care	General population	No specific disease	A	I	TG	24	R-BMHSU1995, A&A1974, A&D2001, A&N2005	DA
Navarro-Millan et al. 2019 [13]	UK	ql	-	E-health	Individuals with specific disease	Rheumatoid arthritis	A	FG	TG	31	A&N1973	DC; DA
Opoku et al. 2019 [14]	Ghana	ql	CA	E-health	Individuals with non-communicable disease	Non-communicable disease	A	I	HP	13	mhealth PNE	DA
Perry et al. 2019 [15]	USA	ql	TA	Preventive services	Individuals with low socio-economic status	No specific disease	A	FG	TG	235	A&A1974	Theo; DC; DA
Roberson et al. 2019 [16]	USA	ql	GT	Natal care	Women; migrants, pregnant women	Maternal and perinatal health	A	I	TG	12	R-BMHSU1995	Theo; DC
Robinson et al. 2019 [17]	UK	ql	FA	Oral health services	General population	Oral diseases	A	FG; I	TG, HP	34	A&D1997	DA

Schatz et al. 2019 [18]	Uganda	ql	CA	STD treatment	Individuals living in rural areas; elderly individuals	HIV	A	I	TG, HP	40	R-BMHSU1995	DA
Gill et al. 2018 [19]	UK	ql	P	Urologic disease treatment	Individuals with specific disease	Urologic diseases	A	I	TG	12	R-BMHSU1995	DA
Grodensky et al. 2018 [20]	USA	ql	TA	Health insurance	Men; individuals with incaceration	No specific disease	A	I	TG	20	BMVP2007	Theo; DC; DA
Ko et al. 2018 [21]	USA	ql	CA	Preventive services	Women; mothers	Viral Hepatitis	A	FG	TG	30	R-BMHSU1995	DC; DA
Lor et al. 2018 [22]	USA	ql	-	Screening	Migrants; women	No specific disease	A	FG	TG	58	BMVP2000	DA
Mago et al. 2018 [23]	Canada	ql	P, E	Dental care	Homeless	No specific disease	A	I	TG	25	BMVP2000	Theo; DA
Riang'a et al. 2018 [24]	Kenya	mm	-	Natal care	(Pregnant) Women; individuals living in rural areas	No specific disease	A	I	TG, HP	64	A&N1973	DA
Victor et al. 2018 [25]	UK	ql	CA	General health care	Elderly individuals; residents in care homes	No specific disease	A	I	TG	35	A&N1973	DC; DA
Bayuo 2017 [26]	Ghana	ql	CA	Outpatient care	Elderly individuals	No specific disease	A	I	TG	16	R-BMHSU1995	Theo; DA
Hawk et al. 2017 [27]	USA	ql	CA	STD treatment	Individuals with specific disease	HIV	A	I	TG, HP	40	R-BMHSU1995	Theo; DC; DA
Herrmann et al. 2017 [28]	Norway; Germany	ql	GT	General health care	General population	No specific disease	A	I; O	TG	40	R-BMHSU1995	Theo
Lee 2017 [29]	USA	mm	GT	Screening	Migrants, women	cancer	D	I	TG	30	R-BMHSU1995	Theo
Levison et al. 2017 [30]	USA	ql	E	STD treatment	Migrants	HIV	A	I	TG, HP	51	BMVP2000	DC
Parkman et al. 2017 [31]	UK	ql	I	Emergency department	Individuals with specific disease	Addiction	A	I	TG	30	R-BMHSU1995, BMHSU	Theo; DA
Rice 2017 [32]	USA	ql	P	Health insurance	Individuals with incaceration	No specific disease	D	I	TG	11	BMVP2000	Theo; DC
Rodriguez et al. 2017 [33]	USA	ql	-	STD treatment	Individuals living in rural areas	HIV	A	I	HP	36	A&D2001	DA
Tewari et al. 2017 [34]	India	mm	GT	Mental health care	Individuals living in rural areas	Mental disorders	A	FG; I	HP	78	R-BMHSU1995	DA
Velez et al. 2017 [35]	USA	ql	GT	Dental care	Migrants; women	No specific disease	A	FG	TG, HP	103	BMVP2000	Theo; DA
White 2017 [36]	USA	ql		Preventive services	Men; migrants; young individuals	Cancer; CD	D	I	TG	12	R-BMHSU1995	Theo; DA
Henson et al. 2016 [37]	UK	ql	CA	Emergency department	Individuals with specific disease	Cancer	A	I	TG, NK	24	A&N1973	Theo; DC; DA

Kohno et al. 2016 [38]	Malaysia	ql	CA	General health care	Migrants; elderly individuals	No specific disease	A	FG; I	TG	38	R-BMHSU1995	Theo; DA
Maulik et al. 2016 [39]	India	mm	TA	Mental health care	Individuals living in rural areas	Mental disorders	A	FG; I	TG, HP	31	R-BMHSU1995	DA
Mukasa 2016 [40]	USA	ql	P	Natal care	Migrants; women; mothers	No specific disease	D	I	TG	11	R-BMHSU1995	Theo; DA
Obikunle 2016 [41]	USA	ql	P	Prevention, Screening	Women; migrants	Cancer	D	I	TG	14	R-BMHSU1995	Theo; DA
Rachlis et al. 2016 [42]	Kenya	ql	-	Chronic care	Individuals with specific disease	HIV; TB; CD	A	FG; I	TG, HP, NK	207	A&N1973	DA
Rachlis et al. 2016 [43]	Kenya	ql	CA	Chronic care	Individuals with specific disease	HIV; TB; CD	A	FG; I	TG, HP	235	A&N1973	DA
Sperber et al. 2016 [44]	USA	ql	CA	Cancer care, health insurance, genomic services	Veterans	Cancer	A	I	HP	58	Ex-BMPF2002, UM1998	DC; DA
Thiessen et al. 2016 [45]	Canada	ql	CA	Natal care	(H)P	No specific disease	A	I	HP	24	A&A1974	DC; DA
Blanas et al. 2015 [46]	USA	ql	GT	Screening	Migrants	Viral Hepatitis	A	FG	TG	39	BMVP2000	Theo; DC; DA
Bradbury-Jones et al. 2015a [47]	UK	mm	TA	Natal care	Women	No specific disease	A	FG	HP	45	Ex-BMPF2002, A&D2001	Theo; DA
Bradbury-Jones et al. 2015b [48]	Scotland	ql	R&S	Natal care	Women; victims of violence	No specific disease	A	I	TG	5	R-BMHSU1995, Ex-BMPF2002, A&D2001	Theo; DA
Coe et al. 2015 [49]	USA	ql	CA	Medication use	Homeless	No specific disease	A	DocA	TG	426	BMVP2000	Theo
Condelius et al. 2015 [50]	Sweden	ql	CA	General health care	Elderly individuals	No specific disease	A	I	NK	14	A&A1974	Theo; DC; DA
Conner et al. 2015 [51]	USA	ql	P	End-of-life care	Informal caregivers; (H)P	No specific disease	A	FG	TG, HP	53	R-BMHSU1995	Theo
Holtzman et al. 2015 [52]	USA	ql	GT	STD treatment	Individuals with specific disease	HIV	A	I	TG	51	R-BMHSU1995	Theo; DA
Nowgesic 2015 [53]	Canada	ql	E	STD treatment	Indigenous people	HIV	D	I; O	TG, HP	41	BMHSU2008	DC; DA
Porteous et al. 2015 [54]	Scotland	ql	TA	Self-care	Individuals with specific disease	No specific disease	A	I	TG	24	R-BMHSU1995, BMHSU2008	Theo; DC; DA
Richards 2015 [55]	Grenada	ql	P	Screening	Women	Cancer	D	I	TG	8	BMHSU2008	Theo; DC; DA
Cathers 2014 [56]	USA	ql	P	Outpatient care	(Health) professionals	Addiction	D	I	TG	5	BMVP2000	Theo; DA
Serna 2014 [57]	USA	mm	CA	Dental care	Migrants	Oral diseases	D	I	TG	14	R-BMHSU1995, BMHSU	Theo; DC
Artuso et al. 2013[58]	Australia	ql	TCM	General health care	Migrants	CD	A	FG; I	TG, HP, NK	21	R-BMHSU1995	Theo

Doshi et al. 2013 [59]	USA	ql	GT	Screening	Men; migrants	HIV	A	I	TG	78	R-BMHSU1995	DC; DA
Han et al. 2013 [60]	USA	ql	GT	Prevention, Screening	Individuals with specific disease	Viral Hepatitis	A	I	HP	20	A&A1974	Theo; DC; DA
Majaj et al. 2013 [61]	Palestine	ql	-	General health care	Women; individuals living in rural areas	No specific disease	A	I	TG, HP	37	R-BMHSU1995	DC; DA
Noh 2013 [62]	USA	ql	CA	End-of-life-care	Elderly individuals; migrants	No specific disease	A	I	TG	28	BMVP2000	Theo; DC; DA
Scott 2013 [63]	USA	mm	CA	Cancer care	Migrants	Cancer	D	FG; I	TG, HP, NK	29	BMVP2000	Theo
Boateng et al. 2012 [64]	Netherlands	ql	CA	General health care	Migrants	No specific disease	A	FG	TG	51	R-BMHSU1995	DC; DA
Callahan 2012 [65]	USA	mm	CA	Cancer care	Individuals with specific disease	Cancer	D	I	TG	7	BMVP2000	Theo
Dergal 2012 [66]	Canada	mm	GT	Nursing	Caregivers	No specific disease	D	I	TG	10	A&N1973	Theo; DA
Chiu 2011 [67]	USA	ql	E	General health care	Migrants, elderly individuals	No specific disease	D	I	TG	18	R-BMHSU1995	Theo; DC
Corboy et al. 2011 [68]	Australia	mm	A&S	Mental health care	Men; individuals living in rural areas	Cancer	A	I	TG, HP	12	R-BMHSU1995	DA
Goh 2011 [69]	Singapore	mm	P	Post-acute care services	Elderly individuals	No specific disease	A	I	TG, HP, NK	29	R-BMHSU1995, A&N1973, A&A1974, BMHSU	DA
Chiu 2010 [70]	USA	ql	E	E-health	Migrants; caregivers	Dementia	D	I	TG	14	R-BMHSU1995, A&N1973	Theo; DC
Gräßel et al. 2010 [71]	Germany	mm	CA	Caregiver counselling	Informal caregiver	No specific disease	A	Q	NK	306	A&N1973	Theo; DC; DA
Röösst et al. 2009 [72]	Bolivia	ql	AI	Natal care	Women; survivors of a severe pregnancy complication	No specific disease	A	I	TG	30	R-BMHSU1995	Theo
Andrasik et al. 2008 [73]	USA	ql	CA	Screening	Women; individuals with low socio-economic status	HIV	A	I	TG	35	R-BMHSU1995	Theo; DA
Butler et al. 2008 [74]	USA	ql	-	General health care	Women; individuals living in rural area	No specific disease	A	I	TG	8	R-BMHSU1995	Theo; DA
Herrera et al. 2008 [75]	USA	mm	-	Longterm care	Migrants	No specific disease	A	I	NK	66	R-BMHSU1995	Theo; DC; DA
Bradley et al. 2002 [76]	USA	ql	GT	Longterm care	Women; migrants; elderly individuals	Mental disorders	A	FG	TG	96	R-BMHSU1995	Theo
Go et al. 2002 [77]	Vietnam	ql	-	STD treatment	Women	STD	A	I	TG	36	R-BMHSU1995	DC; DA

Country – UK: United Kingdom, USA: United States of America
Methods – mm: mixed-method study; ql: qualitative study
Methodolgical orientation: CA: Content analysis; E: Ethnography; GT: Groundd Theory; P: Phenomenology; I: Iterative Categorisation; TA: Thematic analysis; AI: Analytic induction; A&S: Coding & Analysis Auerbach & Silverstein; TCM: Miles and Huberman`s conceptual matrix (TCM); R&S: Framework analysis of Ritchie and Spencer; FA: Framework analysis
Disease of interest – TB: tuberculosis; STD: Sexually transmitted diseases
Data collection – I: Interview, FG: Focus group, O: Oberservation, DocA: Document analysis, Q: Questionnaire
Respondents – TG: target group, HP: Health professionals, NK: next of kin
Document type – A: Article, D: Dissertation
Model – BMHSU: Andersen 1968 [78]; A&N1973: Andersen and Newman's Framework of Viewing Health Services Utilization [79]; A&A1974: Aday and Andersen's Framework for the study of access to medical care [80]; R-BMHSU1995: Andersen 1995 [81]; A&D1997: Ethnicity, aging, and oral health outcomes: a conceptual framework [82]; UM1998: Phillips, Morrison, Andersen & Aday – Utilization Model [83]; BMVP2000: Behavioral Model for Vulnerable Populations [84]; A&D2001: Behavioral Model of Health Services Use including contextual and individual characteristics [85]; Ex-BMPF2002: expanded Andersen model with psychosocial factors in Long-Term Care [76]; A&N2005: Andersen & Newman Individual Determinants of Health Service Utilization; BMVP2007: Stein, Andersen & Gelberg [86]; BMHSU2008 Andersen 2008 [87]; A&D&B 2013: A behavioral model of health services use including contextual and individual characteristics [88]; mhealth PNE framework [89]
Theo: Theoretical background, DC: Data collection, DA: Data analysis

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Application of Andersen's Behavioral Model of Health Services Use – A scoping review with a focus on qualitative health services research

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Abstract

Introduction: Qualitative methods have become integral in health services research, and Andersen's Behavioral Model of Health Services Use (BMHSU) is one of the most commonly employed models of health service utilization. The model focuses on three core factors to explain health care utilization: predisposing, enabling, and need factors. A recent overview of the application of the BMHSU is lacking, particularly regarding its application in qualitative research. Therefore, we provide a) a descriptive overview of the application of the BMHSU in health services research in general and b) a qualitative synthesis on the (un)suitability of the model in qualitative health services research.

Methods: We searched five databases from March to April 2019, and in April 2020. For inclusion, each study had to focus on individuals ≥18 years of age and to cite the BMHSU, a modified version of the model, or the three core factors that constitute the model, regardless of study design, or publication type. We used MS Excel® to perform descriptive statistics, and applied MAXQDA 2020® as part of a qualitative content analysis.

Results: From a total of 6,319 results, we identified 1,879 publications dealing with the BMSHU. The main methodological approach was quantitative (89%). More than half of the studies are based on the BMHSU from 1995. 77 studies employed a qualitative design, the BMHSU was applied to justify the theoretical background (62%), structure the data collection (40%), and perform data coding (78%). Various publications highlight the usefulness of the BMHSU for qualitative data, while others criticize the model for several reasons (e.g. its lack of cultural or psychosocial factors).

Conclusions: The application of different and older models of health care utilization hinders comparative health services research. Future research should consider quantitative or qualitative study designs and account for the most current and comprehensive model of the BMHSU.

Article summary

Strengths and limitations of the study:

This review

- explores the application of the widely adopted Behavioral Model of Health Services Use without limiting the search on target group, care setting, or disease.
- might have missed studies that did not mention the Behavioral Model of Health Services Use, or the three core factors in the title and abstract of the publications.
- gives insights to the application of the Behavioral Model of Health Services Use in qualitative research which have received little attention so far.

Introduction

Health care utilization refers to the use of the health care system "by persons for the purpose of preventing and curing health problems, promoting maintenance of health and well-being, or obtaining information about one's health status and prognosis" [1]. A needs-based health care system meets the needs of a person objectively identified by (health) professionals and considers the demands of an individual. If this interaction is successful, overuse, underuse, and misuse of health care systems can be avoided. Otherwise, there is the possibility of compromising the health of an individual and placing burden on the health care system [2]. To avoid overuse, underuse, and misuse of the health care system, it is important to consider the (non-)use of health care services, which is determined by a variety of contextual and individual factors [3]. As a measurable construct, health care service utilization is primarily determined through quantitative surveys. To explore individual demands, qualitative methods can provide important and rich information within the field of health services research [4, 5]. Various models have been developed across a variety of disciplines to explore and predict individuals' intentions and behaviors as they utilize health care services [6]. In health services

research, the Behavioral Model of Health Services Use (BMHSU) is the most frequently cited model of health care service utilization [6]. The model was developed by R.M. Andersen in 1968, and was based on a national quantitative survey that aimed to understand families' use of health services [7, 8]. The model focuses on three core factors to explain health care utilization: predisposing factors (e.g., age, education), enabling factors (e.g., income, hospital density), and need factors (e.g., health status) [8].

In recent years, Andersen's initial behavioral model has undergone continuous development, where new focus was placed on various factors [8–10], such as 'consumer satisfaction' in the 1970s [11, 12], and 'health status', 'personal health practice', and 'external environment' in the 1980s [9, 13]. In 1995, Andersen himself reviewed the model and its development and has since included feedback loops to consider how treatment outcomes affect health behavior [8]. Additional 'contextual and individual characteristics' were added to the model in the 2000s [8]. Some of these further developments were carried out in cooperation with other authors, e.g., Andersen and Newman's Framework of Viewing Health Services Utilization [11] or Aday and Andersen's Framework for the Study of Access to Medical Care [12]. The BMHSU was modified for specific settings (e.g., complementary and alternative medicine [14]) and for specific target groups (e.g., the Behavioral Model for Vulnerable Populations for homeless people [15]). Currently, many versions of the model for different settings or target groups are available and applied in health services research. The most current and comprehensive model is the BMHSU of the year 2013 [16] (Figure 1).The main focus of that model is on the factors that facilitate or impede an individual's access to health care services. According to the model, access is determined by contextual characteristics, individual characteristics, health behaviors, and outcomes. Contextual characteristics include circumstances and the environment; individual characteristics are determined by a person's life circumstances including, for example, genetics and socialization; health behaviors are an individual's

personal practices; and outcomes are reflected by an individual's health status and consumer satisfaction.

[Figure 1 about here]

The application of the BMHSU and its different versions has already been examined in several systematic reviews. These are, for example, reviews focusing on specific diseases [17] or settings [18]. The most recent systematic review from Babitsch et al. [3] has examined the application of the BMHSU in general health care, but excludes specific care settings (e.g., maternal health), specific target groups (e.g., veterans), and studies that focus on specific diseases (e.g., HIV) [3]. These reviews considered quantitative studies only, and excluded qualitative studies, although qualitative methods have become an important and integral part of health services research, and are useful for recording detailed descriptions and complex issues in the context of health care utilization and health care services [4, 5]. Even though the BMHSU is the most frequently cited model of access to health care services [6], an overview of the development and application of the BMSHU over the last 50 years is lacking, especially in terms of its application in qualitative research.

Primarily we aimed at a review of qualitative applications of the BMHSU. We learned from exploratory searches that its application in qualitative research will be difficult to find. That was when we decided to undertake a meticulous screening of titles and abstracts of publications dealing with the BMHSU, to provide a descriptive overview on study characteristics as a first step, to learn about the application of the model in general which would help to put the qualitative findings into perspective. In a second step, we focus on a qualitative synthesis of the application of the BMHSU in qualitative health service research. Here, we synthesize (1) the application of different versions of the BMHSU, (2) the (un)suitability of the BMHSU from the authors' perspective and (3) which factors of the

BMHSU were analyzed in publications with qualitative approach. Further analyses, e.g., the synthesis of the quantitative studies is object of future publications.

Methods

This scoping review follows the PRISMA Extension for scoping reviews (PRISMA-ScR) [19] (additional file 1). It exists no review protocol. For study selection, two researchers (ML, JT) independently screened all selected titles and abstracts for relevance. For the descriptive overview, data extraction from title and abstract was divided between two researchers (ML, JT). One researcher's extraction was verified by the other researcher with extracting data of a 25% random sample and discrepancies were resolved through discussion. For the qualitative synthesis, the full-texts were independently screened for eligibility and the data were independently extracted by two researchers (ML, JT). Two researchers (ML, JT) coded the material together. Through all these processes, discrepancies were discussed and resolved by a team of reviewers (ML, JT, EMB).

Patient and public involvement

No patient involved.

Search strategy

We conducted a systematic literature search in March and April 2019, and performed an updated search in April 2020 using the Embase® via Ovid, Medline® via PubMed, CINAHL® and PsycInfo® via EBSCOhost, and Social Science Citation Index® via Web of Science databases.

We expanded the search strategy of Babitsch et al. [3] inter alia without limitation on the target groups, care settings, and diseases of interest. We adjusted the search terms to the particular databases and combined thesaurus and keywords pertaining to the BMHSU and its three core factors. The detailed search strategy for one database is identified in the

supplementary material (additional file 2). The search was conducted for publications published from 1968 to April 2020. Figure 2 shows the study selection process according to the PRISMA statement.

Descriptive overview

Study selection

As an initial first step, title-abstract-screening was performed for all search results. We included all publications focused on adult populations that applied either the BMHSU, a modified version of the model, or all three core factors of the model. No limitations were set for language, study design, or publication type. Studies were excluded if they could not be obtained via electronic access, interlibrary loan, or through contact with the authors.

Data extraction

The following inductively formed characteristics were extracted from the title and abstract of each included study: publication year, first author, region, methodological approach, target group, care setting, and the applied version of the BMHSU. Beyond labelling included studies as quantitative, qualitative, or mixed-methods we undertook no attempt to specify details of the study design, quantify reporting quality or risk of bias. Such a strategy is consistent with scoping reviews *[19]*. For abstracts with insufficient information regarding our extraction characteristics, we obtained the full-text version of the publications.

Data analysis

We calculated descriptive statistics with MS Excel® for the descriptive overview.

Qualitative synthesis

Based on the data extraction of the descriptive overview, we obtained the full-texts of all publications with a qualitative approach, either specifically or as part of a mixed-method design. Finally, we screened the full-texts of the remaining results and excluded publications with no relation to the BMHSU in the qualitative part (Figure 2).

Quality appraisal

The quality of the qualitative studies and the qualitative part of studies with a mixed-method design was assessed independently by two researchers (ML, JT) using the "Critical Appraisal Checklist for Qualitative Research" [20]. Authors resolved disagreement by discussion. The checklist contains ten items that assess the methodological quality of the design, data collection, and data analysis of the publications. The tool comprises four answer choices: 'Yes', 'No', 'Unclear', and 'Not Applicable'. If there was insufficient information to answer a given question, the response was recorded as 'Unclear'. We included all studies with qualitative and mixed-method approach in the qualitative synthesis regardless of the analyzed quality of the studies.

Data analysis

For the qualitative synthesis, MAXQDA 2020® software was used [21]. To answer the research questions, the following deductive codes were coded in the data material: applied version of the BMHSU, the way in which the model is applied in qualitative studies, the potential for and limitations of the BMHSU, and the extensions of the BMHSU described by the authors. The subcode 'potential and limitations of the BMHSU' is based solely on descriptions and conclusions of the authors of the individual publications. In addition, we considered which of the BMHSU factors were examined and which were complemented by inductive factors that emerged from the data material. We distinguished between the three core factors (predisposing factors, enabling factors, and need factors) and the associated factors (e.g., demographics, health policy, and perceived need). We recoded all documents with the final coding frame. In the context of the content-structuring qualitative analysis, the summarizing reduction of the coding followed the approach detailed by other researchers [22]. The presented results are structured based on these main categories.

Results

Descriptive overview of the use of the BMHSU in health services research

After removal of duplicates 6,319 records remained of which 1,879 dealt with the BMHSU, with its three core factors, or a modified version of the model (Figure 2).

[Figure 2 about here]

Starting with the initial use of the model in 1973, reception toward the model has increased considerably in recent decades (Table 1). Two-thirds of all identified publications were published in the last ten years (i.e., since 2010), and more than 50% of the publications have been published since 2013. Further, 70% of the publications are from North-America (USA or Canada), followed by Asia (13%) and Europe (9%). The majority are quantitative studies (n=1,680; 89%), while 4% of all records are qualitative studies (n=69) and 3% are reviews (n=61). In all, 30 publications are mixed-method studies (2%) and 39 publications (2%) are theoretical reflections without empirical data. As there are numerous diverse care settings, target groups and diseases of interests, Table 1 presents the three most frequent categories. An overview of the broad range of the characteristics can be found in additional file 3. General health care, as care provided by general practitioners, is the most studied care setting (n=471, n=25%), followed by nursing care (13%, n=237) and mental health services (12%, n=222). About one quarter of all studies deals with individuals aged ≥50 years (n=481). In addition, 17% of the publications focus on migrants (n=322), and 14% on women (n=256). Half of the publications (n=936) do not account for a specific disease; for 12% (n=229) of all publications, mental disorders represent the most frequently examined diseases of interest.

Table 1: Quantitative description of publications using the Behavioral Model of Health Services Use in health services research

	Descriptive overview (n=1,879) *(based on title & abstract)*	**Qualitative synthesis (n=77)** *(based on full text version)*
	n (%)*	**n (%)***
Year		
1968-1979	9 (0)	0 (0)
1980-1989	38 (2)	0 (0)

1990-1999	**168 (9)**	0 (0)
2000-2009	**440 (23)**	**7 9)**
2010-2019	**1,224 (65)**	**70 (91)**
Region		
North-America	**1,275 (70)**	**43 (56)**
Asia	**244 (13)**	6 (8)
Europe	**163 9)**	**14 (18)**
Africa	68 (4)	**12 (16)**
South America	49 (3)	2 (3)
Oceania	29 (2)	5 (6)
Methodological approach		
Quantitative	**1,680 (89)**	/
Qualitative	**69 (4)**	58 (75)
Review	**61 (3)**	/
Theoretical	39 (2)	/
Mixed-Method	30 (2)	19 (25)
Care Setting[1]		
General health care[2]	**471 (25)**	**12 (16)**
Nursing care[3]	**237 (13)**	5 (6)
Mental health services	**222 (12)**	6 (8)
Screening	107 (6)	**7 (9)**
Perinatal care[4]	77 (4)	**7 (9)**
Target group[1]		
Individuals ≥50 years	**481 (26)**	**11 (14)**
Migrants	**322 (17)**	**23 (30)**
Women	**256 (14)**	**16 (21)**
Disease of interest[1]		
No specific disease	**936 (50)**	**27 (35)**
Mental disorders	**229 (12)**	7 (9)
Cancer	**134 (7)**	**9 (12)**
HIV	96 (5)	**11 (14)**

[1] Bold: three most frequent categories
[2] General health care: care provided by general practitioners
[3] Nursing: homecare, long-term care, formal care, care facility, informal care, respite care, institutionalized care & transportation services
[4] Perinatal care: including midwifery services
* The sum might be less than 100% as only the three most frequent categories are represented in this table. Additional file 3 shows all characteristics.

Qualitative synthesis of the use of the BMHSU in qualitative health services research

After excluding publications without a qualitative or mixed-method approach (n=1,780), those without a full text available (n=10), those without a corresponding full text to a conference paper (n=7), and those that were not at all related to the BMHSU in the qualitative part (n=5), a total of 77 studies remained and were included in the qualitative synthesis of qualitative studies applying the BMHSU (Figure 2).

Although the first known application of the BMHSU in a qualitative study was from 2002, most of the qualitative records were identified in 2010 and later (91%; n=70; Table 1). Most publications are from North-America, USA or Canada (n=43, 56%), 18% (n=14) are from Europe and 16% (n=12) are from Africa. General health care is the care setting that was explored most often in publications adopting a qualitative study design (n=12, 16%), followed

by screening and perinatal care (n=7 each, 9%). Qualitative research applying the BMHSU primarily targets migrants (n=23, 30%), women (n=16, 21%), and individuals aged ≥50 years (n=11, 14%). Further, 35% of qualitative publications (n=27) address no specific disease; if a particular disease was of interest, it is most often HIV (n=11, 14%) or cancer (n=9, 12%).

Two-thirds of the qualitative studies use personal interviews as a data collection method (n=51, 81%). The sample size varies between five and 470 participants. Most of the qualitative studies interview the target group directly (n=65, 84%). Health professionals and/or next of kin assessments are the sole source of information in 12 studies (16%). In addition, 18 of the 65 qualitative studies that approached the target group obtained further information from health professionals (n=13), next of kin (n=1), or both (n=4; for further details; additional file 4).

Application of the different versions of the Andersen model

The BMHSU is applied in the various studies to justify the theoretical background (62%), structure the data collection (40%), e.g. such as aiding in the development of the interview guide, and for data coding (78%). More than half of the studies (n=42) [23–62] are based on the BMHSU from 1995 [9]. Multiple studies (n=11) use the Behavioral Model for Vulnerable Populations [63–72]. Twelve studies [31, 42, 55, 61, 73–80] employ Andersen and Newman's Framework of Viewing Health Services Utilization, eight studies [42, 43, 81–86] apply Aday and Andersen's Framework for the Study of Access to Medical Care, and seven studies [42, 48, 52, 55, 59, 61, 87] are based on the original Behavioral Model of Families' Use of Health Services from 1968. Individual studies use other models, such as the expanded model from Bradley et al. [29] (additional file 4).

(Un)Suitability of the Andersen model from the authors' perspective

Overall, 29 publications [23, 31–33, 35, 36, 40, 42, 43, 45, 46, 48, 49, 51, 53, 55, 56, 69, 72, 73, 78–80, 83, 88–92] described that the model was suitable in their work, e.g., to obtain and evaluate qualitative data. Of these, 17 publications [35, 36, 40, 43, 45, 46, 49, 51, 53, 73, 78–

80, 83, 88, 89, 92] highlight the general suitability of the BMSHU for qualitative data: "Andersen's framework provides a valid, consistent, and unbiased manner in which to code and classify qualitative data" [89]. Various publications (n=17) [35, 40, 43, 45, 46, 49, 51, 53, 55, 58, 73, 78–80, 88, 89, 93] described how their data can be applied very well to the BMHSU and its factors. Others described that the strength of the model lies in its consideration of both patient-related and environmental factors [40, 51, 91], and that the model allows for "a more transparent comparison with findings emerging from other studies" [88].

Some studies (n=11) described the suitability of the BMHSU and additionally criticized some parts of the model [23, 32, 36, 40, 49, 53, 55, 90, 92–94]. For instance, there are authors (n=8) who criticized the model, but did not propose changes to its structure [23, 26, 36, 49, 90, 92–94]. Some studies [23, 26] described that cultural factors are not adequately represented in the model: "the model has been noted not to be sensitive to the diverse cultural and structural barriers in healthcare among minority groups" [26]. According to the authors of some publications [36, 49], the models would need to further elaborate upon the relationship between the three core factors of the BMHSU and the relevance of each. Other authors claimed that the model does not cover all factors of health care utilization, such as psychosocial factors [23], and would be less suitable for studies on HIV [90] or health care coverage [94].

Not all critics proposed model modifications, but some of the identified limitations may lead to modifications of or additions to the BMHSU. Based on their findings, some authors (n=12) identified additional factors not covered by the model that impact health care utilization [24, 29, 32, 37, 38, 40, 55, 58, 75, 81, 86, 91], such as health literacy [40, 55, 91], or competing priorities [24, 40] (Table 2). The basic structure of the BMHSU is retained as part of these expansions.

Other studies fundamentally changed the original structure of the BMHSU, both in terms of the factors [25, 39, 75] and the feedback loops provided [40, 53, 63], ultimately impacting the influence between each of the factors in the model. Some studies emphasized the distinction between the three core factors as predisposing and inhibiting factors, and as enabling and impeding factors [25, 27, 63], while others combined the model with another model [62].

Table 2: Additions to the Behavioral Model of Health Services Use from qualitative health services research

<table>
<tr><th rowspan="2">Contextual characteristics</th><th colspan="3">Individual characteristics</th><th rowspan="2">Health Behaviors</th><th rowspan="2">Outcome</th><th rowspan="2">Further additions</th></tr>
<tr><th>Predisposing factors</th><th>Enabling factors</th><th>Need factors</th></tr>
<tr><td>Intake & engagement [37]</td><td>Competing priorities [24, 40]</td><td>Medication characteristics [40]</td><td rowspan="5">Unmet need [32]</td><td rowspan="2">Distinction between problem recognition, decision to seek help and decision to use health care system [75]</td><td rowspan="2">Dental service use & dental experiences [58]</td><td rowspan="2">Psychosocial factors [29]</td></tr>
<tr><td>Patient & transition [37]</td><td>Fear [24]</td><td>Reminder strategies [40]</td></tr>
<tr><td>Medication adherence strategies [37]</td><td>(Mis)trust [24, 91]</td><td>Personal emergency alarm system [32]</td><td rowspan="3">Avoidant strategies [55]</td><td rowspan="3">Intended & actual use [29, 58]</td><td rowspan="3">Situation and satisfaction of the next of kin [81]</td></tr>
<tr><td>Billing [37]</td><td>Previous experiences [24, 91]</td><td>Informal care system [32]</td></tr>
<tr><td>Specific program for support [37]</td><td>Contingency plans for future falls [32]</td><td rowspan="6">Characteristics at the level of informal caregivers [38]: Physician referral, knowledge about the services, acculturation</td></tr>
<tr><td>Health Literacy [37]</td><td>Health literacy [40, 55, 91]</td><td rowspan="6">Mental health [86]</td></tr>
<tr><td>Individualized care [37]</td><td rowspan="3">Characteristics at the level of informal caregivers [38]: Familism, perception about services, religiosity, gender roles</td><td rowspan="3">Spirituality [55]</td><td rowspan="3">Service experience [58]</td><td rowspan="3">Vulnerability factors [72]</td></tr>
<tr><td>Philosophical approaches [37]</td></tr>
<tr><td>Pharmacy services [40]</td></tr>
<tr><td>Rheumatologist [91]</td><td>Conscientiousness [91]</td></tr>
</table>

The table shows the variables as the authors of the original studies assigned them to BMHSU core factors

Factors of the BMHSU emerging from qualitative health services research

Individual characteristics are considered much more frequently than contextual characteristics, health behaviors, or health outcomes in publications that adopted a qualitative design. Table 3 lists all factors of the BMHSU with the number of publications that used each factor. Although the qualitative studies explored in our research considered a wide range of factors, there are still some other factors of the BMHSU that have not been considered in any of the included publications that featured a qualitative study design (e.g., quality of life as an outcome factor or some predisposing factors as contextual characteristics).

Contextual characteristics: A total of 63 qualitative studies (82%) mentioned contextual characteristics, of which enabling factors are most frequently included, such as health professional factors, e.g. soft skills (n=22, 29%) or availability (n=21, 27%).

Individual characteristics: The most frequently researched factors pertain to individual characteristics, especially predisposing factors such as social networks (n=41, 53%), attitude towards health care services (n=33, 43%), and values (n=28, 36%). Nearly half of all studies considered accessibility of health care services as an enabling factor (n=34, 44%). The most common need factor was perceived symptoms (n=45, 58%).

Health Behavior: In terms of health behavior, the relationship between the patient and provider (n=21, 27%), as well as alternative medicine (n=13, 17%) and self-care (n=11, 14%) were most often analyzed in publications adopting a qualitative design.

Outcomes: Overall, about half of the qualitative studies (n=37) mentioned health outcomes in their analyses. Satisfaction with providers (n=18, 23%) and prior experience (n=17, 22%) were the most considered aspects.

During our qualitative syntheses of qualitative health services research studies, health literacy emerged as a inductive category, separated into individual [95] and organizational health literacy [96]. We identified associations with organizational health literacy in 25 studies

(32%) and individual health literacy in 52 studies (68%; Table 3). In the context of organizational health literacy, the focus was on access to health information: "share health risk information while empowering patients to make their own health decisions" [37]. The most frequently mentioned factors among individual health literacy were knowledge (n=39, 51%) and competences (n=22, 29%), as exemplified by the following statement: "knowledge was empowering to make own choices and feel in control of their care decisions" [28].

Table 3: Factors examined in publications

	Factors	N	References
Contextual characteristics	**Predisposing factors**		
	Demographic	1	[92]
	Social	/	/
	Beliefs		
	Stigma*	14	[34, 45, 46, 53, 61, 65, 67, 72, 78, 85, 86, 89, 90, 97]
	Culture*	5	[24, 41, 45, 47, 78]
	Social norms*	5	[35, 41, 77, 78, 88]
	Gender roles*	3	[28, 67, 97]
	Enabling factors		
	Health Policy	7	[43, 58, 62, 84, 85, 92, 98]
	Financing	12	[35, 37, 42, 51, 62, 65, 84, 89, 91, 92, 99, 100]
	Organization		
	Health professional factors*	22	[25, 32, 35, 37, 40, 43, 44, 51, 54, 59, 62, 70, 80, 82, 83, 85, 89, 91–93, 98, 101]
	Availability*	21	[24, 25, 29, 34, 40, 42, 43, 48, 51, 54, 60, 62, 65, 75, 81, 88, 91, 93, 98, 100, 102]
	Additional health care services*	12	[27, 37, 53, 73, 76, 77, 81, 82, 89, 91, 98, 101]
	Cultural/linguistic suitable services*	9	[24, 32, 38, 41, 63, 67, 72, 85, 86]
	Cooperation*	5	[24, 78, 81, 82, 98]
	System complexity*	6	[35, 65, 81, 83, 85, 102]
	Quality of care*	6	[27, 35, 43, 60, 81, 91]
	Interpreters*	2	[24, 70]
	Need factors		
	Environmental	3	[51, 90, 92]
	Population health indices	/	/
Individual characteristics	**Predisposing factors**		
	Demographic		
	Immigration status*	7	[32, 54, 57, 58, 71, 72, 102]
	Gender	2	[63, 65]
	Age	13	[25, 26, 45, 51, 54, 58, 59, 62, 63, 79, 80, 94, 102]
	Genetic	2	[47, 98]
	Social		
	Social network	41	[26, 27, 29–32, 34, 36, 40–43, 48–51, 55, 57–59, 61, 63, 65, 67, 68, 76, 78–83, 85, 86, 88, 90, 93, 94, 100, 102, 103]
	Personal skills*	16	[27, 30, 40, 44, 46, 52, 66–68, 70–72, 76, 78, 82, 86]
	Competing priorities*	12	[23–25, 31, 35, 40, 51, 67, 78, 82, 88, 94]
	Living conditions*	10	[40, 42, 48, 50, 66, 67, 71, 81, 89, 90]
	Education*	5	[48, 58, 62, 88, 91]
	Beliefs		
	Attitude towards health care services	33	[24, 27–30, 32, 35, 41–43, 46, 48–51, 53, 60, 62, 64, 75, 78–81, 86, 88, 89, 91, 93, 99, 100, 102, 103]
	Fear*	27	[23–25, 35, 36, 40, 41, 47, 50, 51, 53, 57, 61–63, 65, 68, 71, 75, 77–79, 85, 88, 89, 101, 102]
	Values	28	[24, 26, 27, 30, 32, 34, 35, 41, 47, 49, 54, 55, 57, 58, 61, 63, 67, 68, 71, 72, 75, 82, 85, 87, 88, 93, 100, 103]
	Attitude towards health	12	[28, 33, 38, 44, 46, 48, 49, 61, 77, 88, 99, 102]

	professionals		
	Enabling factors		
	Financing		
	Financial resources	25	[23, 26, 29, 42, 43, 49–54, 58, 63, 66, 68, 71, 72, 78, 79, 88, 91, 94, 99, 100]
	Insurance	18	[23, 30, 35, 40, 44, 46, 52, 54, 64, 65, 71, 72, 88, 91, 93, 94, 102, 103]
	Income	8	[29, 30, 54, 65, 71, 88, 93, 103]
	Organization		
	Accessibility*	34	[23–26, 30, 35, 40, 42, 43, 45, 48, 49, 51, 53, 58, 62, 65, 66, 72, 75, 78, 79, 82, 83, 88–91, 93, 99–103]
	Stable routine*	6	[65, 75, 76, 89, 90, 100]
	Reminder strategies*	3	[40, 51, 53]
	Social Support		
	General*	12	[48, 49, 51, 64, 67, 76, 78, 80, 83, 88, 90, 100]
	Tangible	18	[27, 32, 34, 40, 42, 50, 51, 65, 67, 76, 79, 81, 87, 91, 93, 94, 102, 103]
	Emotional/affectionate	15	[23, 25, 26, 30, 36, 50, 51, 55, 63, 65, 67, 76, 78, 81, 83]
	Informational	11	[23, 26, 41, 43, 68, 76, 79, 82, 87, 90, 93, 100, 103]
	Need factors		
	Perceived		
	General*	10	[31, 32, 34, 59, 65, 74, 79, 87, 93, 103]
	Symptoms	45	[23–27, 31, 36, 40, 42–44, 47–51, 54, 55, 58–61, 63, 65, 67, 68, 71, 75, 76, 78, 79, 81, 86, 88, 91, 94, 97, 99–101, 103]
	Evaluated	20	[26, 31, 34, 36, 42, 56, 59, 60, 63, 76, 79–81, 83, 86, 91–93, 100, 103]
	Health Behaviors		
	Personal health practice		
	Alternative medicine*	13	[26, 30, 45, 54, 55, 58, 65, 78, 79, 87, 88, 91, 99]
	Self-care	11	[25, 30, 47, 49, 65, 75, 87, 88, 90, 99, 100]
	Adherence	8	[37, 40, 51, 64, 66, 91, 100, 102]
	Diet	4	[48, 49, 65, 87]
	Process of medical care		
	Relationship patient-provider	21	[24, 27, 28, 40, 51, 53, 61, 67, 68, 71, 73, 75, 76, 78, 83, 85, 89–92, 100]
	Second medical opinion*	1	[51]
	Use of personal health services	77	[23–55, 57–68, 70–94, 97–103]
	Outcomes		
	Perceived health status	5	[42, 49, 78, 91, 92]
	Evaluated health status	1	[65]
	Consumer satisfaction		
	General*	2	[83, 92]
	Prior experiences*	17	[23, 24, 26, 28, 46, 48, 52, 56, 58, 68, 72, 75, 81, 83, 97, 99, 100]
	Waiting time	5	[23, 43, 46, 83, 88]
	Satisfaction with providers*	18	[23, 27, 35, 36, 46, 48, 49, 56, 72, 73, 76, 77, 81, 83, 85, 88, 99, 100]
	Satisfaction with care facility*	8	[30, 38, 42, 60, 79, 83, 94, 100]
	Quality of life	/	/
Health Literacy	**Organizational Health Literacy***		
	Access to Health Information*	25	[23–25, 28, 31, 33, 37, 40, 41, 47–50, 70, 75–77, 84, 85, 91, 93, 94, 100]
	Individual Health literacy*	1	[70]
	Literacy*	2	[62, 100]
	Knowledge*	39	[24, 27–29, 31–38, 41, 43, 45, 47–53, 55, 58, 63, 68, 70, 74–79, 85, 88, 91, 93, 101, 102]
	Motivation*	4	[35, 76, 78, 99]
	Competences*	22	[23, 24, 28, 30, 33, 38, 40, 49, 51, 53, 57, 62, 64, 65, 68, 71, 75, 76, 83, 90, 102, 103]

*These factors were inductive codes, developed along the data material

Quality assessment of publications with a qualitative study design

Of the 77 qualitative studies, four (5%) reported all ten aspects of the critical appraisal checklist for qualitative research [20]. Most qualitative studies (n=69, 90%) reported between five and nine criteria from the checklist, and four studies (5%) reported fewer than five criteria. The two quality criteria that were most frequently fulfilled with 95% each (n=73) are the "congruity between the stated philosophical perspective and the research methodology" and the "congruity between the research methodology and the methods used to collect data" [20]. In contrast, the "influence of the researcher on the research, and vice-versa" [20] is only addressed in nine publications (12%).

Discussion

This scoping review provides a recent overview of the development and application of the BMHSU in very different care settings, across different diseases, and among publications examining different target groups. The BMHSU is mainly used in quantitative studies, but our review also shows the suitability of the model in qualitative research.

Descriptive overview of the use of the BMHSU in health services research

The general reception toward the BMHSU has increased considerably in recent years, as has the number of publications adopting this model, with most (70%) of all related publications stemming from North-America. This is in line with another review [3], which excluded specific care settings and diseases. The dominance of research projects adopting quantitative design [104] is reflected in this scoping review, as 89% of the identified publications used quantitative methods.

The BMHSU is mainly used for research examining health care in general, without focusing on specific diseases. This is not surprising, as the recent BMHSU was not developed for any specific care setting or disease [16]. Still, a wide range of publications have focused on specific care settings (e.g., nursing, mental health services) and diseases (e.g., mental disorders). Individuals aged ≥50 years are the largest target group represented in this

overview. Possible explanations for this finding include the fact that this population represents the largest, and fastest growing cohort in the broader population [105]. Further, this group uses health care services most frequently [106].

Qualitative synthesis on the use of the BMHSU in qualitative health services research

The relevance of the BMHSU for qualitative projects within health services research is demonstrated by our results. Still, there are some limitations within the BMHSU, which should be critically considered depending on the research question.

The publications featuring a qualitative design mainly consider the individual characteristics within the BMHSU. Since the primary interest of qualitative research is the subjective experience of individuals, this result is not surprising [107]. In addition, it was noted that people from the target group were primarily interviewed in these studies, while there were fewer next of kin or health professionals interviewed. Experts may wish to consider obtaining more information about contextual characteristics in their research. Since the data extraction within the descriptive overview was carried out at the level of titles and abstracts, it is not possible to determine whether contextual characteristics in publications featuring a quantitative study design are more strongly represented in this review.

Although over half of all publications that adopted a qualitative design had been published since 2013, most of them considered the Andersen model of 1995, which is also a result of the review by Babitsch et al. [3]. Only one of the publications with a qualitative design [55] adopted the most current and comprehensive BMHSU from the year 2013 [16]. This is interesting, as some authors expanded upon an older version of the BMHSU and justified various missing factors (e.g., provider negligence and dissatisfaction, location of a clinic), although these factors are actually included in the most current version of the BMHSU from 2013 [16]. It is important to consider that even R.M. Andersen himself had additional thoughts on the model [9]. For example, he co-authored a publication [29] with the aim to expand the view from the original model on psychosocial factors.

One new factor that has been discussed in some of the considered studies is health literacy. Health literacy relates to many parts of the Andersen model and cannot be assigned to a specific level or factor. We recommend integrating health literacy as an additional factor in the BMHSU, as an individual's health literacy and health-literate organizations are important foundations for the (non-)use of health care services, and consequently for health care research [95, 96].

Strengths and limitations

When interpreting the results, it should be noted that although we performed systematic searches, some publications might have been missed. For example, articles that did not mention the BMHSU, or the three core factors in the title and abstract were not included. Further, articles may have been excluded given that we restricted our search to five databases. However, it became apparent, that all previously known key publications have been identified through our search strategy [3, 8, 9, 11, 12, 15]. Another limitation is that the extraction of publication characteristics for descriptive overview was divided between the first authors (ML, JT) and were not extracted twice. For the qualitative synthesis, the data extraction was performed on full-texts independently by two researchers. Also, the quality of this scoping review is based on the quality of the information contained in the included publications. We considered the general utilization of the BMHSU in health services research (as identified in the descriptive overview) at the title and abstract level, and not at the full-text level. An analysis of the full-texts could provide further information about – and more detailed insights into – the application of the BMHSU. When coding the results based on the various model factors, one challenge faced by our team was appropriately assigning the factors, as the assignment of the factors was not always clear. The detailed description of the current BMHSU by Andersen et al. [16] served us substantially for the assignment of the factors. Any uncertainties were discussed in the review team. Also, our comparison of the various studies

that adopted a qualitative design is limited by the fact that very different versions of the model were used.

Regarding the influence of the reviewers on the review, it should be mentioned that the review team was composed of individuals with experience in systematic reviews, health services research and qualitative methods, had no affiliation with the research and no funding for the review. It should be noted that this scoping review is the first to explore the application of the widely adopted BMHSU without limiting our search based on target group, care setting, or disease since the model was initially published in 1968. Further, this review examined publications adopting qualitative study designs, strengthening the perceptions of qualitative methods in health care research. This review provides the first-ever overview of the (un)suitability of the BMHSU in qualitative research.

Conclusion

This scoping review reveals that the BMHSU, which is one of the main models in health care services research, has broad applications in very different care settings, across various diseases, and focuses on a wide range of target groups. The BMHSU is mainly used in quantitative studies, but our review also shows the suitability of the model for qualitative research. As health literacy in particular plays an increasingly important role in health care utilization [95], we think it is important to take this factor into account in the BMHSU. In further research, it would be interesting to examine this relationship more thoroughly. Additionally, it might be interesting to compare the application of the BMHSU in quantitative and qualitative research. The application of so many different (and older) models of health care utilization makes it difficult to compare the individual studies with one another. However, such a comparison would be particularly important in the context of health services research. For future health services research, the current and most comprehensive version of the BMHSU [16] should always be considered.

Author contributions

ML, JT and EMB conceived the idea of the scoping review. ML, JT built the search strategy, screened the search results, and extracted the data. ML, JT, and EMB interpreted the findings and wrote the manuscript. All authors read and approved the final manuscript.

Competing interests

The authors declare that they have no competing interests.

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Ethics approval

This scoping review was based on published data. As researchers did not access any information that could lead to the identification of an individual patient, no concerning ethical issue was raised in this research. Therefore, obtaining ethical approval and consent of participants was waived.

Data availability statement

All data relevant to the study are included in the article or uploaded as supplementary information.

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Figure 1: Andersen's Behavioral Model of Health Services Use

Figure 2: Flowdiagram based on PRISMA

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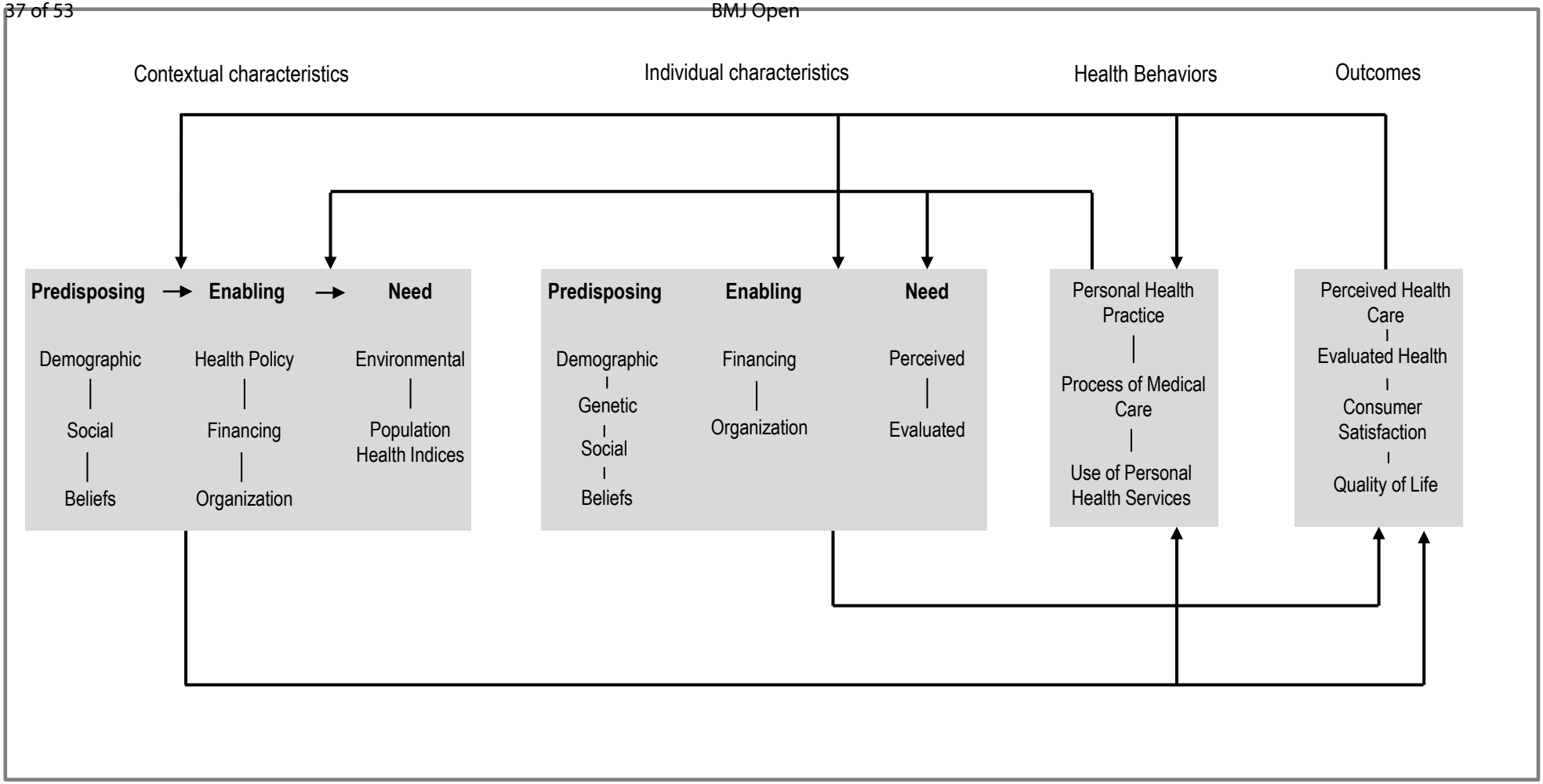
Contextual characteristics
Individual characteristics
Health Behaviors
Outcomes
Predisposing
Enabling
Need
Demographic
Social
Beliefs
Health Policy
Financing
Organization
Environmental
Population Health Indices
Predisposing
Enabling
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Genetic
Social
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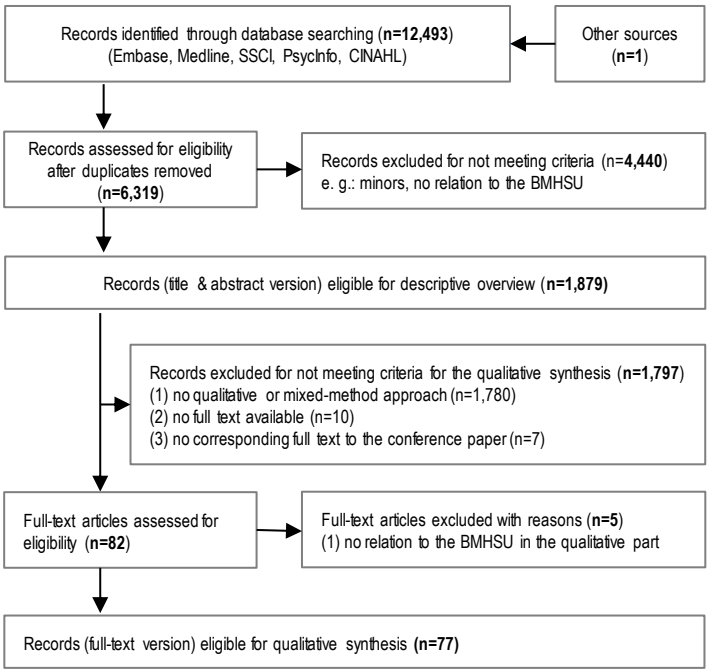
Personal Health Practice
Process of Medical Care
Use of Personal Health Services
Perceived Health Care
Evaluated Health
Consumer Satisfaction
Quality of Life



Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	1
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	3-5
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	5
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	6
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	7
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	6
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	Additional file 2
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	6,7
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	7,8
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	6,7
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	7

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	8
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	8,9 and figure 2
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	9
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	17
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	13; 15-16
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	8-17
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	17
Limitations	20	Discuss the limitations of the scoping review process.	19
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	19, 20
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	20

JBI = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).

‡ The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.

§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

From: Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMAScR): Checklist and Explanation. Ann Intern Med. 2018;169:467–473. doi: 10.7326/M18-0850.

Additional file 2: Exemplary search strategy

Exemplary search strategy – Medline via Pubmed	
#1	"Andersen RM" [Author]
#2	"Andersen R" [Author]
#3	#1 OR #2
#4	"Andersen model"
#5	"Andersen's model"
#6	#4 OR #5
#7	"Behavioral Model of Health Services Use"
#8	"Behavioural Model of Health Services Use"
#9	#7 OR #8
#10	andersen*
#11	"behavior model"
#12	"behaviour model"
#13	"behavioral model"
#14	"behavioural model"
#15	(#11 OR #12 OR #13 OR #14) AND #10
#16	"health model"
#17	#16 AND #10
#18	utilization
#19	utilisation
#20	"Facilities and Services Utilization"[Mesh]
#21	"Patient Acceptance of Health Care"[Mesh]
#22	model
#23	(#18 OR #19 OR #20 OR #21) AND #22 AND #10
#24	aday*
#25	davidson*
#26	newman*
#27	gelberg*
#28	(#22 OR #23 OR #24 OR #25) AND #10
#29	predisposing
#30	enabling
#31	need
#32	#27 AND #28 AND #29
#33	(#27 OR #28 OR #29) AND #10
#34	"andersen framework"
#35	"Behavioral Model for Vulnerable Populations"
#36	#3 OR #6 OR #9 OR #15 OR #17 OR #23 OR #28 OR #32 OR #33 OR #34 OR #35
#37	animals
#38	#36 NOT #37
#39	#36 NOT #37 Filters: Publication date from 1968/01/01 to 2019/04/09

Additional file 3: All characteristics and categories

Diseases of interest	**Total n=1,879**	
	n[1]	**%**
no specific disease	936	50
mental disorder	229	12
cancer	134	7
HIV	96	5
addiction	82	4
diabetes	43	2
cardiovascular disease	42	2
dementia	39	2
oral diseases	28	1
chronic disease in general	25	1
arthritis	20	1
maternal and perinatal health	17	1
disability	16	1
violence experience	13	1
alzheimer's disease	12	1
asthma	11	1
brain injury	10	1
flu	7	0
stroke	7	0
urologic diseases	7	0
multiple sclerosis	7	0
pulmonary disease	7	0
osteoporosis	6	0
hepatitis B or C	5	0
influenza	5	0
tuberculosis	5	0
parkinson's disease	5	0
trauma	4	0
epilepsy	4	0
gastrointestinal diseases	4	0
back pain	4	0
eye problems	4	0
autism spectrum disorder	3	0
chronic pain	3	0
hearing loss	3	0
HPV	3	0
spinal cord injury	3	0
hip or knee arthroplasty	3	0
suicidal ideation or suicide	3	0
others	44	2

Legend:
[1] Since some publications included multiple care settings, target groups etc. the sum might be greater than 100%

Additional file 3: All characteristics and categories

Target groups	Total n=1,879	
	n[1]	%
elderly individuals	481	26
migrants	322	17
females	256	14
general population	255	14
men	203	11
individuals with mental disorder	127	7
community-dwelling individuals	74	4
caregivers	71	4
individuals with low socio-economic status	69	4
individuals living in rural areas	68	4
individuals with HIV	65	3
young individuals	56	3
soldiers or veterans	56	3
individuals with cancer	50	3
insured individuals	39	2
mothers	36	2
individuals with diabetes	33	2
individuals living in urban areas	31	2
individuals with cardiovascular disease	29	2
individuals with disabilities	25	1
patients	21	1
individuals with dementia	20	1
LSBTTIQ*	20	1
people of color	18	1
individuals with arthritis	17	1
individuals with chronic disease	17	1
employed individuals	15	1
vulnerable individuals	15	1
individuals with incarceration experience	13	1
students	13	1
health care providers	12	1
individuals with asthma	11	1
inpatients	11	1
nursing home residents	10	1
individuals with brain injury	10	1
care-dependent individuals	10	1
victims of violence	9	0
no specific population	8	0
uninsured individuals	8	0
individuals with cognitive impairment	7	0
ethnic minorities	7	0
high-risk individuals	5	0
individuals at the end of life	5	0
individuals in the emergency department	5	0
individuals with stroke	5	0
married individuals	5	0
individuals with chronic pain	5	0

Additional file 3: All characteristics and categories

Target groups	Total n=1,879	
	n[1]	%
individuals with parkinson's disease	5	0
individuals with multiple sclerosis	5	0
complementary medicine clients	4	0
discharged individuals	4	0
frail individuals	4	0
individuals with epilepsy	4	0
individuals with oral diseases	4	0
outpatients	4	0
primary care patients	4	0
parents	4	0
individuals with experienced trauma	4	0
border residents	3	0
individuals with alzheimer's disease	3	0
individuals with back pain	3	0
individuals with hearing loss	3	0
individuals with osteoporosis	3	0
individuals with pulmonary disease	3	0
individuals with spinal cord injury	3	0
individuals with tuberculosis	3	0
individuals with a hip or knee arthroplasty	3	0
individuals with obesity	3	0
sex workers	3	0
addictive individuals	3	0
others	50	3

Legend:
[1] Since some publications included multiple care settings, target groups etc. the sum might be greater than 100%.

Additional file 3: All characteristics and categories

Care settings	Total n=1,879	
	n[1]	%
general health care	471	25
nursing	237	13
mental health services	222	12
medication use	115	6
Screening	107	6
oral health services	104	6
inpatient care	99	5
natal care	77	4
emergency care	73	4
addiction services	56	3
health expenditure	44	2
social services	43	2
community-based services	43	2
preventive services	43	2
complementary and alternative medicine	41	2
outpatient care	41	2
HIV treatment services	35	2
cancer care	27	1
end-of-life care	24	1
e-health	20	1
vaccination	19	1
rehabilitation services	17	1
patient satisfaction	16	1
health-related quality of life	14	1
health insurance	13	1
health literacy	12	1
veterans health administration	9	0
eye care	8	0
physical therapy	8	0
health behavior	7	0
self care	6	0
health information	5	0
chronic pain treatment	5	0
chronic care in general	4	0
hyperlipidemia treatment	4	0
health situation	4	0
case management	3	0
osteoporosis treatment	3	0
services for caregivers	3	0
medical assistive devices	3	0
physician trust	3	0
diabetes treatment	3	0
others	36	2

Legend:
[1] Since some publications included multiple care settings, target groups etc. the sum might be greater than 100%.

Additional file 4: Characteristics of publications with qualitative study design

Author & year of publication	Country	Method		Care Setting	Target group of interest	Disease of interest	Document type	Survey	Respon-dents	N	Application of the Andersen model	
Chao et al. 2020 [1]	USA	mm	CA	Mental health services	Migrants; elderly individuals	Mental disorder	A	I	TG	14	A&A1974	DC; DA
Due et al. 2020 [2]	Australia	ql	CA	Oral health services	Migrants	No specific disease	A	I	TG, HP	26	R-BMHSU1995	Theo; DC; DA
Isaak et al. 2020 [3]	Canada	ql	GT	Mental health services	Racial and ethnic minorities	Mental disorder	A	I, FG	TG	115	BMHSU, R-BMHSU1995, A&N1973, A&D&B 2013	Theo; DA
Shewamene et al. 2020 [4]	Australia	mm	CA	Complementary and alternative medicine	Women; migrants	Maternal and perinatal health	A	I	TG	15	BMHSU	Theo
Travers et al. 2020 [5]	USA	ql	CA	Long-term care	Elderly individuals	No specific disease	A	I	TG	470	Ex-BMPF2002	Theo; DA
Bascur-Castillo et al. 2019 [6]	Chile	ql	P	Urologic disease treatment	Women	Urologic diseases	A	I	TG	10	R-BMHSU1995	Theo; DA
Briones-Vozmediano et al. 2019 [7]	Spain	ql	CA	General health care	Migrants	Violence experience	A	I	HP	28	A&A1974	DA
Coleman 2019 [8]	USA	ql	P	Mental health services	Migrants; men; individuals with mental disorder	Mental disorder	D	I	TG	66	BMHSU, R-BMHSU1995, A&N1973	Theo
Fleury et al. 2019 [9]	Canada	mm	-	Mental health services	Individuals with mental disorder	Mental disorder	A	I	TG	328	R-BMHSU1995	Theo; DC; DA
Green et al. 2019 [10]	USA	ql	CA	General health care	Men; individuals with HIV	HIV	A	I	TG	10	BMHSU, R-BMHSU1995	DA
Heidari et al. [11]	Iran	ql	CA	Medication use	Individuals with arthritis	Arthritis	A	I	HP	47	BMHSU2008	DC; DA
Koce et al. 2019 [12]	Nigeria	ql	-	General health care	General population	No specific disease	A	I	TG	24	R-BMHSU1995, A&A1974, A&D2001, A&N2005	DA
Navarro-Millan et al. 2019 [13]	UK	ql	-	E-health	Individuals with specific disease	Rheumatoid arthritis	A	FG	TG	31	A&N1973	DC; DA
Opoku et al. 2019 [14]	Ghana	ql	CA	E-health	Individuals with non-communicable disease	Non-communicable disease	A	I	HP	13	mhealth PNE	DA
Perry et al. 2019 [15]	USA	ql	TA	Preventive services	Individuals with low socio-economic status	No specific disease	A	FG	TG	235	A&A1974	Theo; DC; DA
Roberson et al. 2019 [16]	USA	ql	GT	Natal care	Women; migrants, pregnant women	Maternal and perinatal health	A	I	TG	12	R-BMHSU1995	Theo; DC
Robinson et al. 2019 [17]	UK	ql	FA	Oral health services	General population	Oral diseases	A	FG; I	TG, HP	34	A&D1997	DA

Schatz et al. 2019 [18]	Uganda	ql	CA	STD treatment	Individuals living in rural areas; elderly individuals	HIV	A	I	TG, HP	40	R-BMHSU1995	DA
Gill et al. 2018 [19]	UK	ql	P	Urologic disease treatment	Individuals with specific disease	Urologic diseases	A	I	TG	12	R-BMHSU1995	DA
Grodensky et al. 2018 [20]	USA	ql	TA	Health insurance	Men; individuals with incaceration	No specific disease	A	I	TG	20	BMVP2007	Theo; DC; DA
Ko et al. 2018 [21]	USA	ql	CA	Preventive services	Women; mothers	Viral Hepatitis	A	FG	TG	30	R-BMHSU1995	DC; DA
Lor et al. 2018 [22]	USA	ql	-	Screening	Migrants; women	No specific disease	A	FG	TG	58	BMVP2000	DA
Mago et al. 2018 [23]	Canada	ql	P, E	Dental care	Homeless	No specific disease	A	I	TG	25	BMVP2000	Theo; DA
Riang'a et al. 2018 [24]	Kenya	mm	-	Natal care	(Pregnant) Women; individuals living in rural areas	No specific disease	A	I	TG, HP	64	A&N1973	DA
Victor et al. 2018 [25]	UK	ql	CA	General health care	Elderly individuals; residents in care homes	No specific disease	A	I	TG	35	A&N1973	DC; DA
Bayuo 2017 [26]	Ghana	ql	CA	Outpatient care	Elderly individuals	No specific disease	A	I	TG	16	R-BMHSU1995	Theo; DA
Hawk et al. 2017 [27]	USA	ql	CA	STD treatment	Individuals with specific disease	HIV	A	I	TG, HP	40	R-BMHSU1995	Theo; DC; DA
Herrmann et al. 2017 [28]	Norway; Germany	ql	GT	General health care	General population	No specific disease	A	I; O	TG	40	R-BMHSU1995	Theo
Lee 2017 [29]	USA	mm	GT	Screening	Migrants, women	cancer	D	I	TG	30	R-BMHSU1995	Theo
Levison et al. 2017 [30]	USA	ql	E	STD treatment	Migrants	HIV	A	I	TG, HP	51	BMVP2000	DC
Parkman et al. 2017 [31]	UK	ql	I	Emergency department	Individuals with specific disease	Addiction	A	I	TG	30	R-BMHSU1995, BMHSU	Theo; DA
Rice 2017 [32]	USA	ql	P	Health insurance	Individuals with incaceration	No specific disease	D	I	TG	11	BMVP2000	Theo; DC
Rodriguez et al. 2017 [33]	USA	ql	-	STD treatment	Individuals living in rural areas	HIV	A	I	HP	36	A&D2001	DA
Tewari et al. 2017 [34]	India	mm	GT	Mental health care	Individuals living in rural areas	Mental disorders	A	FG; I	HP	78	R-BMHSU1995	DA
Velez et al. 2017 [35]	USA	ql	GT	Dental care	Migrants; women	No specific disease	A	FG	TG, HP	103	BMVP2000	Theo; DA
White 2017 [36]	USA	ql		Preventive services	Men; migrants; young individuals	Cancer; CD	D	I	TG	12	R-BMHSU1995	Theo; DA
Henson et al. 2016 [37]	UK	ql	CA	Emergency department	Individuals with specific disease	Cancer	A	I	TG, NK	24	A&N1973	Theo; DC; DA

Kohno et al. 2016 [38]	Malaysia	ql	CA	General health care	Migrants; elderly individuals	No specific disease	A	FG; I	TG	38	R-BMHSU1995	Theo; DA
Maulik et al. 2016 [39]	India	mm	TA	Mental health care	Individuals living in rural areas	Mental disorders	A	FG; I	TG, HP	31	R-BMHSU1995	DA
Mukasa 2016 [40]	USA	ql	P	Natal care	Migrants; women; mothers	No specific disease	D	I	TG	11	R-BMHSU1995	Theo; DA
Obikunle 2016 [41]	USA	ql	P	Prevention, Screening	Women; migrants	Cancer	D	I	TG	14	R-BMHSU1995	Theo; DA
Rachlis et al. 2016 [42]	Kenya	ql	-	Chronic care	Individuals with specific disease	HIV; TB; CD	A	FG; I	TG, HP, NK	207	A&N1973	DA
Rachlis et al. 2016 [43]	Kenya	ql	CA	Chronic care	Individuals with specific disease	HIV; TB; CD	A	FG; I	TG, HP	235	A&N1973	DA
Sperber et al. 2016 [44]	USA	ql	CA	Cancer care, health insurance, genomic services	Veterans	Cancer	A	I	HP	58	Ex-BMPF2002, UM1998	DC; DA
Thiessen et al. 2016 [45]	Canada	ql	CA	Natal care	(H)P	No specific disease	A	I	HP	24	A&A1974	DC; DA
Blanas et al. 2015 [46]	USA	ql	GT	Screening	Migrants	Viral Hepatitis	A	FG	TG	39	BMVP2000	Theo; DC; DA
Bradbury-Jones et al. 2015a [47]	UK	mm	TA	Natal care	Women	No specific disease	A	FG	HP	45	Ex-BMPF2002, A&D2001	Theo; DA
Bradbury-Jones et al. 2015b [48]	Scotland	ql	R&S	Natal care	Women; victims of violence	No specific disease	A	I	TG	5	R-BMHSU1995, Ex-BMPF2002, A&D2001	Theo; DA
Coe et al. 2015 [49]	USA	ql	CA	Medication use	Homeless	No specific disease	A	DocA	TG	426	BMVP2000	Theo
Condelius et al. 2015 [50]	Sweden	ql	CA	General health care	Elderly individuals	No specific disease	A	I	NK	14	A&A1974	Theo; DC; DA
Conner et al. 2015 [51]	USA	ql	P	End-of-life care	Informal caregivers; (H)P	No specific disease	A	FG	TG, HP	53	R-BMHSU1995	Theo
Holtzman et al. 2015 [52]	USA	ql	GT	STD treatment	Individuals with specific disease	HIV	A	I	TG	51	R-BMHSU1995	Theo; DA
Nowgesic 2015 [53]	Canada	ql	E	STD treatment	Indigenous people	HIV	D	I; O	TG, HP	41	BMHSU2008	DC; DA
Porteous et al. 2015 [54]	Scotland	ql	TA	Self-care	Individuals with specific disease	No specific disease	A	I	TG	24	R-BMHSU1995, BMHSU2008	Theo; DC; DA
Richards 2015 [55]	Grenada	ql	P	Screening	Women	Cancer	D	I	TG	8	BMHSU2008	Theo; DC; DA
Cathers 2014 [56]	USA	ql	P	Outpatient care	(Health) professionals	Addiction	D	I	TG	5	BMVP2000	Theo; DA
Serna 2014 [57]	USA	mm	CA	Dental care	Migrants	Oral diseases	D	I	TG	14	R-BMHSU1995, BMHSU	Theo; DC
Artuso et al. 2013[58]	Australia	ql	TCM	General health care	Migrants	CD	A	FG; I	TG, HP, NK	21	R-BMHSU1995	Theo

Doshi et al. 2013 [59]	USA	ql	GT	Screening	Men; migrants	HIV	A	I	TG	78	R-BMHSU1995	DC; DA
Han et al. 2013 [60]	USA	ql	GT	Prevention, Screening	Individuals with specific disease	Viral Hepatitis	A	I	HP	20	A&A1974	Theo; DC; DA
Majaj et al. 2013 [61]	Palestine	ql	-	General health care	Women; individuals living in rural areas	No specific disease	A	I	TG, HP	37	R-BMHSU1995	DC; DA
Noh 2013 [62]	USA	ql	CA	End-of-life-care	Elderly individuals; migrants	No specific disease	A	I	TG	28	BMVP2000	Theo; DC; DA
Scott 2013 [63]	USA	mm	CA	Cancer care	Migrants	Cancer	D	FG; I	TG, HP, NK	29	BMVP2000	Theo
Boateng et al. 2012 [64]	Netherlands	ql	CA	General health care	Migrants	No specific disease	A	FG	TG	51	R-BMHSU1995	DC; DA
Callahan 2012 [65]	USA	mm	CA	Cancer care	Individuals with specific disease	Cancer	D	I	TG	7	BMVP2000	Theo
Dergal 2012 [66]	Canada	mm	GT	Nursing	Caregivers	No specific disease	D	I	TG	10	A&N1973	Theo; DA
Chiu 2011 [67]	USA	ql	E	General health care	Migrants, elderly individuals	No specific disease	D	I	TG	18	R-BMHSU1995	Theo; DC
Corboy et al. 2011 [68]	Australia	mm	A&S	Mental health care	Men; individuals living in rural areas	Cancer	A	I	TG, HP	12	R-BMHSU1995	DA
Goh 2011 [69]	Singapore	mm	P	Post-acute care services	Elderly individuals	No specific disease	A	I	TG, HP, NK	29	R-BMHSU1995, A&N1973, A&A1974, BMHSU	DA
Chiu 2010 [70]	USA	ql	E	E-health	Migrants; caregivers	Dementia	D	I	TG	14	R-BMHSU1995, A&N1973	Theo; DC
Gräßel et al. 2010 [71]	Germany	mm	CA	Caregiver counselling	Informal caregiver	No specific disease	A	Q	NK	306	A&N1973	Theo; DC; DA
Röösst et al. 2009 [72]	Bolivia	ql	AI	Natal care	Women; survivors of a severe pregnancy complication	No specific disease	A	I	TG	30	R-BMHSU1995	Theo
Andrasik et al. 2008 [73]	USA	ql	CA	Screening	Women; individuals with low socio-economic status	HIV	A	I	TG	35	R-BMHSU1995	Theo; DA
Butler et al. 2008 [74]	USA	ql	-	General health care	Women; individuals living in rural area	No specific disease	A	I	TG	8	R-BMHSU1995	Theo; DA
Herrera et al. 2008 [75]	USA	mm	-	Longterm care	Migrants	No specific disease	A	I	NK	66	R-BMHSU1995	Theo; DC; DA
Bradley et al. 2002 [76]	USA	ql	GT	Longterm care	Women; migrants; elderly individuals	Mental disorders	A	FG	TG	96	R-BMHSU1995	Theo
Go et al. 2002 [77]	Vietnam	ql	-	STD treatment	Women	STD	A	I	TG	36	R-BMHSU1995	DC; DA

Country – UK: United Kingdom, USA: United States of America
Methods – mm: mixed-method study; ql: qualitative study
Methodolgical orientation: CA: Content analysis; E: Ethnography; GT: Groundd Theory; P: Phenomenology; I: Iterative Categorisation; TA: Thematic analysis; AI: Analytic induction; A&S: Coding & Analysis Auerbach & Silverstein; TCM: Miles and Huberman`s conceptual matrix (TCM); R&S: Framework analysis of Ritchie and Spencer; FA: Framework analysis
Disease of interest – TB: tuberculosis; STD: Sexually transmitted diseases
Data collection – I: Interview, FG: Focus group, O: Oberservation, DocA: Document analysis, Q: Questionnaire
Respondents – TG: target group, HP: Health professionals, NK: next of kin
Document type – A: Article, D: Dissertation
Model – BMHSU: Andersen 1968 [78]; A&N1973: Andersen and Newman's Framework of Viewing Health Services Utilization [79]; A&A1974: Aday and Andersen's Framework for the study of access to medical care [80]; R-BMHSU1995: Andersen 1995 [81]; A&D1997: Ethnicity, aging, and oral health outcomes: a conceptual framework [82]; UM1998: Phillips, Morrison, Andersen & Aday – Utilization Model [83]; BMVP2000: Behavioral Model for Vulnerable Populations [84]; A&D2001: Behavioral Model of Health Services Use including contextual and individual characteristics [85]; Ex-BMPF2002: expanded Andersen model with psychosocial factors in Long-Term Care [76]; A&N2005: Andersen & Newman Individual Determinants of Health Service Utilization; BMVP2007: Stein, Andersen & Gelberg [86]; BMHSU2008 Andersen 2008 [87]; A&D&B 2013: A behavioral model of health services use including contextual and individual characteristics [88]; mhealth PNE framework [89]
Theo: Theoretical background, DC: Data collection, DA: Data analysis

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