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How Area Health Management Leads to Improved Equity in Health: A Scoping Review

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Abstract

Background: The scoping review of published studies aims to explore what practices and processes can improve equity (horizontal and vertical) in countries that adopted Area Health Management (AHM) utilizing the “Six Building Blocks Plus” (SBBP) concept.

Method: An electronic search was conducted from the inception to January 27, 2021, from 6 databases (Embase, Social Sciences, Web of Science, PubMed, CINAHL, and WHO) and the gray literature. The inclusion criteria were AH, SBBP, and equity. Data extraction was using a standardized data collection form.

Results: This scoping review includes 63 full-text studies. SBBP are identical in the horizontal and vertical equity. However, the majority of SBBP were health service delivery, leadership & governance, and health workforce. The result showed the practice and process to improve health equity were related to a health service delivery (HSD).

Conclusion: The included study showed horizontal and vertical equity. The equity measurement focused on utilization. AHM utilizing SBBP was mostly showed in HSD, HWF, leadership & governance. This review indicates that HSD could improve equity or cooperate with other SBBP by increasing healthcare accessibility and utilization. The demographic factor that affected equity is ethnicity. Therefore, HSD in area health was crucial in enhancing health promotion equity in different areas, specific diseases, and target patients.

Keywords: Area health, Equity, Health service delivery, People participation, Six building blocks

1. Introduction

A health system (HS) refers to the healthcare provider organizations that furnish services to meet the health needs of populations. A HS drives necessary actions to achieve health equity [1]. Establishing effective HS management can improve healthcare accessibility, quality of health service delivery, and efficiency in allocating scarce resources. In this review, health management refers to the planning and developing process of health services in a HS. Area Health Management (AHM) can be separated into ‘centralized’ and ‘decentralized’ models. The main difference between these models

is the authority to decide planning, delivering, and monitoring processes in HS.

The advantages of decentralization are: 1) the local authority to implement local data for flexibility in making decisions that lead to achieving equity [2,3], 2) the ability to strengthen participation by encouraging local organizations and people [4], and 3) recommending local alternatives for service delivery to foster a sense of ownership through participation [5].

The goal of a healthcare system is to improve equity, especially at the population level. Enhancing health outcomes and organizing activities that reduce health disparities among subgroups can improve equity [6]. Health equity is a fundamental

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human right. So effective area health management is essential for enhancing equity [1,7,8]. The dimensions of equity can be categorized into horizontal and vertical equity. Horizontal equity refers to people with the same healthcare needs receiving equal healthcare treatment, regardless of socioeconomic factors. Vertical equity refers to people with unequal needs receiving different treatments [9,10]. Reducing socioeconomic inequalities and increasing the participation of stakeholders and people is a way to improve equity in a HS. Therefore, AHM is a key factor in considering the performance of a HS under decentralization on either central or local levels.

The World Health Organization (WHO) created a framework for monitoring and evaluating health management with Six Building Blocks (SBBs): 1) health service delivery, 2) health workforce, 3) health information systems, 4) essential medication accessibility, 5) health system financing, and 6) leadership & governance. The SBBs provide the key indicators and monitoring factors for health systems management. The SBB concepts can inform the decisions made to achieve more equitable and sustainable improvements across health services and health outcomes [11]. The Thai Ministry of Health describes the various areas to achieve effective health management as the “Six Building Blocks Plus” (SBBP) [12]. SBBP stands for the SBBs outlined by the WHO plus people participation. People participation under the decentralized model involves cooperation between people and health providers for essential decision-making processes, such as planning, managing, and budgeting [13].

This scoping review of published studies aims to explore what practices and processes of AHM utilizing SBBP can improve equity in countries that have adopted these concepts, thereby furthering the mission of promotion, prevention, treatment, and rehabilitation in healthcare.

2. Method

We investigated the published evidence in order to: 1) determine the characteristics of AHM utilizing SBBP to achieve horizontal or vertical health equity, 2) assess how AHM utilizing SBBP leads to improvement of health equity. This scoping review adhered to the PRISMA statement for maintaining the criteria of the review pattern [14]. The method covers the stages of identification, screening, eligibility, and inclusion of identified studies.

2.1. Identification

The search was performed from the inception of each database (Table A1 in Appendix A) to January 27, 2021, by using six databases (PubMed, EMBASE, Social Sciences, Web of Science, CINAHL, World Health Organization (WHO)), gray literature (from gray literature reports), and the equity conference of the WHO to identify research focusing on area health, SBBP, and health equity. The search terms included equity, area health, and the allowed synonyms of area health (including primary care trust, district health authority, district health board, region health board, area health board, and regional health authority). The number of results for each database is shown in Fig. 1

2.2. Screening, eligibility, and inclusion of studies

We included original studies that focused on AHM utilizing SBBP and reported the data related to equity as either horizontal, vertical, or both. We excluded studies that focused on non-clinical issues that were not related to health care professions. In the initial screening, we reviewed the titles and abstracts related to the inclusion criteria. Two reviewers (MI and JW) reviewed the full text of potential studies. A third reviewer (NU) resolved any disagreements in study selection.

2.3. Data extraction

We extracted data using data charting and an adapted version of a standardized data collection form [15]. We used PROGRESS PLUS to identify, extract, and analyze predefined concepts relevant to health equity. There are ten equity aspects identified in the PROGRESS Plus framework: 1) Place of residence, 2) Race/ethnicity/culture/language, 3) Occupation, 4) Gender/Sex, 5) Religion, 6) Education, 7) Socioeconomic status, 8, 9, 10) Social capital with a) personal characteristics associated with discrimination, b) features of relationships, and c) time-dependent relationships [16]. Two independent reviewers extracted the relevant data from included studies including key characteristics (authors, country, year of publication, and study design), SBBP, and health equity (horizontal or vertical equity). A third reviewer resolved any disagreement between the other two reviewers.

We interpreted the results by reporting a top three most frequent SBBP components in our findings.

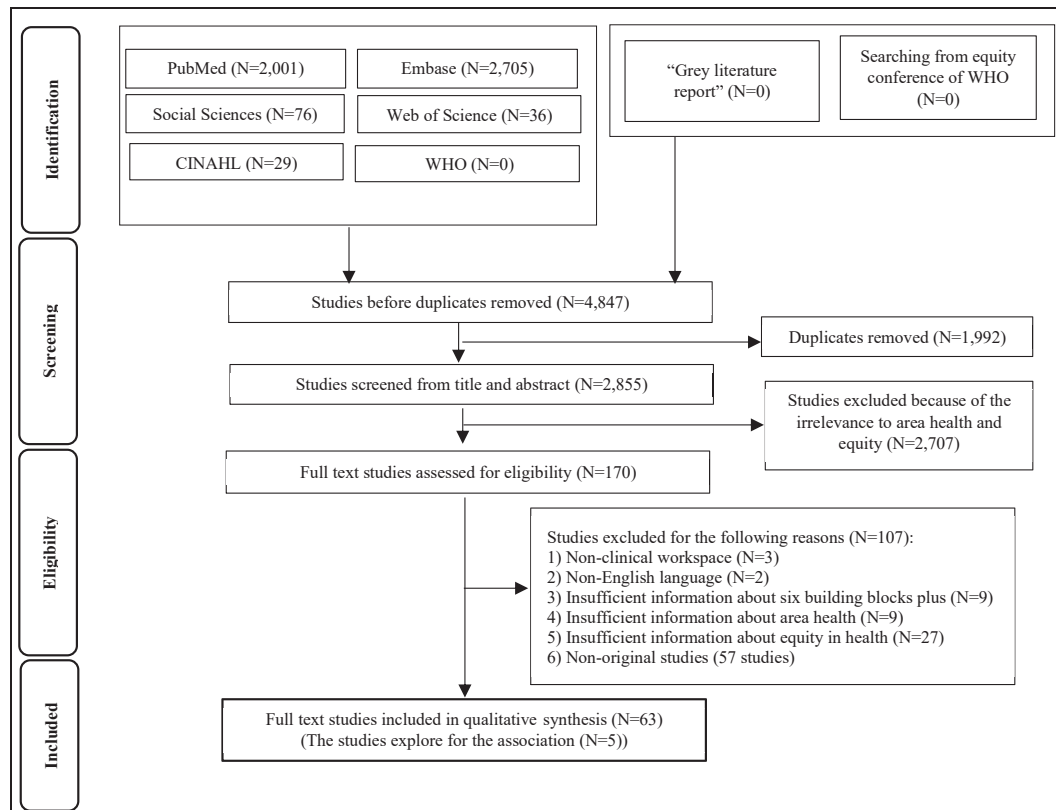


Fig. 1. A PRISMA flow diagram describing study selection process

We explored which activities led to improved equity by using the SBBP framework.

2.4. Data coding and analysis

We synthesized the findings from the included studies by using a content analysis approach [17,18]. The content analysis consisted of three main stages as follows:

Stage 1: We prepared the selection data from the included studies.

Stage 2: We generated preliminary coding to categorize the manifest content. We grouped the findings into two components: measurements (financing and service delivery) [19] and outcomes (health, financing, and responsiveness) [20]. Details of the findings are shown in Appendix A2.

Stage 3: We applied a descriptive approach to analyze the findings. Then we explored the results concerning the impact of AHM utilizing SBBP on equity. Two reviewers (MI and NU) made all decisions regarding data interpretation in this study. The agreement of these reviewers' preliminary, independently generated decisions was measured by the Kappa value [21]. The average Kappa value

was 1.0. When preliminary differed, a third reviewer (TD) made the final decision.

We included studies that showed or defined any terms related to the process of SBBP, the practice that showed the activity intervention, the measurement of horizontal or vertical equity in healthcare services, and other factors related to equity (PROGRESS-PLUS). We recorded the details of studies that matched the inclusion criteria, as shown in Appendix B. We applied a descriptive approach to analyze the findings. In addition, we explored the results concerning the impact of AHM utilizing SBBP on equity. We interpreted the results by reporting the top three most frequent SBBP components in our identified articles to answer the first objective. Finally, we explored what practices and processes led to improving health equity (horizontal or vertical) using the SBBP framework to answer the second objective.

2.5. Quality assessment

This review classified the included studies into three types: qualitative, quantitative, and mixed-method research, based on various data characteristics in the collecting and analyzing process [22].

We conducted a quality assessment when quantitative studies showed the impact of investigation of AHM and equity. We used the Newcastle–Ottawa Quality Assessment Scale (NOS) [23] and Cochrane Effective Practice and Organization of Care (EPOC) [24] in the quality assessment of the quantitative studies in this review. The NOS is for non-experimental studies, while EPOC is for experimental studies. NOS's criteria emphasize the quality of selection, comparability, and outcomes. We assessed the risk of bias by using the modified Cochrane Collaboration tool. We evaluated the bias to three levels (high, low, or unclear). The individual components consisted of 5 parts (selection, performance, attrition, reporting, and others).

We did not assess the quality of the qualitative study included in this review. However, we did achieve a concise methodology in the agreement of all decision processes.

We performed a quality assessment of an included observation and intervention study by using NOS and EPOC. We utilized the NOS for four cohort studies with a non-experimental (observation) study design. We employed the EPOC for one randomized controlled trial (RCT) with an experimental (intervention) study design. The included studies are shown in [Appendix B](#).

3. Results

3.1. Study selection

The initial search yielded 2855 studies, after the removal of 1992 duplications. We further excluded 2707 studies, after screening the titles and abstracts. After a full-text review of the remaining 170 studies, 107 studies were excluded for the reasons outlined in [Fig. 1](#). This scoping review aims to explore what practices and processes can improve equity in countries that adopted AHM utilizing the SBBP concepts. We conducted content analysis on all the included 63 studies that involved AHM utilizing SBBP. Only 5 studies (1 RCT and 4 cohorts) were selected to determine the effect of AHM utilizing SBBP on health equity. A PRISMA diagram of the study selection and process of the search is shown in [Fig. 1](#).

3.2. Characteristics of included studies

These studies (N = 63) were published between 1980 and 2021. We found that most countries were considered high-income: England, Australia, and New Zealand.

We observed differences in the types of studies between the income levels. We found horizontal equity among all levels, but vertical equity only in high-income countries. In addition, more than half of the studies focused on primary care rather than secondary and tertiary healthcare settings. Regarding the factors that affected equity, most studies focused on three aspects of PROGRESS PLUS: a place of residence, personal characteristics, and socioeconomic status. We found all methods in the included studies for quality assessment. The details of these characteristics are shown in [Appendix B](#).

3.3. Quality assessment

This review comprised of qualitative, quantitative, and mixed-method research studies. Most of the studies were conducted with a quantitative study design (N = 38), followed by qualitative (N = 18) and mixed-method research (N = 7).

We aimed to assess how AHM utilizing SBBP leads to improvement of equity. Thus, we conducted content analysis to determine the impact of intervention or observation (practices and processes) that affect AHM utilizing SBBP on the outcome (equity, accessibility, or utilization) on patients and comparable groups. We found 5 (out of 63 studies) utilized objective measures to quantify the impact of SBBP on equity. The overall quality of the four cohort studies was good (8/9 [25–27] and 9/9 [28]). In addition, the quality assessment of the one RCT included in our review showed a low risk of bias [29].

3.4. Findings

1) characteristics of AHM utilizing SBBP and equity

Considering all included studies in which AHM utilized SBBP, the top three most popular SBBP concepts included in the studies were health service delivery, leadership & governance, and health workforce. Similarly, these three SBBP concepts were also observed among studies on horizontal and vertical equity. The top three components of PROGRESS PLUS among studies with horizontal equity included residence, socioeconomic status, and social capital. In comparison, the top three components of PROGRESS PLUS in studies with vertical equity included place of residence, personal characteristics associated with discrimination, and socioeconomic status. The studies measured health equity by assessing service delivery (accessibility and utilization measurement) and financing. The

characteristics of included studies in this review and their relevance to SBBP, equity, and PROGRESS PLUS are shown in [Appendix B](#).

2) how AHM utilizing SBBP leads to improve equity

We found evidence that AHM aimed to improve equity. Five studies met these criteria. A summary of the intervention and observational studies is shown below.

3.4.1. *The association of AHM utilizing SBBP and equity*

The designs of the included studies were cohort [25–28] and RCT [29]. Health equity was shown to be horizontal [25,26,28,29] and vertical [27]. Participation focused on vulnerable populations including pregnant women, minority or marginalized ethnic groups, children, adolescent, and the elderly. We measured the outcomes from the frequency of hospital visits and utilization of health-care services. We found that AHM utilizing SBBP emphasized health service delivery and health workforce.

3.4.2. *The impact of AHM utilizing SBBP to equity*

Both New Zealand and Canada have a long history of area health management that aimed to improve health equity. We categorized their health care management using SBBP criteria. Most studies focused on Health Service Delivery (HSD). In Canada, local organizations were Regional Health Authorities. The healthcare responsibilities of this organization were to regulate and manage the processes related to policy requirements. They applied the benefits of local information for improving efficiency [30,31]. In New Zealand, the local organizations provided primary healthcare. The National Health Service (NHS) provided free secondary healthcare services [32,33]. The responsibility of the local organizations was the same in both Canada and New Zealand. They provided services for specific purposes in their areas.

We found that all 5 studies included measures to improve horizontal equity by focusing on providing health services and basic health promotion for all ages. AHM utilizing SBBP consists of 7 components: 1) health service delivery (HSD), 2) health workforce (HWF), 3) health information systems (HIS), 4) access to essential medicines, 5) health systems financing, 6) leadership & governance, and 7) population participation. The Health Service Delivery (HSD) of SBBP showed the greatest impact on health care management by to increasing health

care accessibility and utilization. Nevertheless, the others are also essential, such as the health workforce (HWF). Such evidence is shown in [Fig. 2](#), [Table 1](#), and [Table 2](#). The studies we examined provided interventions to engage patients with health care providers in healthcare services to increase health care utilization. We describe the details of practices and processes of HSD which increase utilization and accessibility as follows. A coordinator provided more information by telephone than the usual care of reminding letters for all participants, who were of Maori, Pacific, and Asian ethnicity. The active telephone follow-up led to higher bowel screening than usual care [29]. Many maternal or childbirth programs were available for mothers choose to participate themselves. An example is the Lead Maternity Carer (LMC) program, which was an LMC program that promoted a healthy pregnancy for pregnant women and their babies. The participants' perception, ethnicity, education, well-being, and age affected program selection. The variety of programs benefited different pregnant women [25]. A school vaccination program for girls showed that vaccine services in schools could improve equity among different ethnicities [25–28]. The vaccination program involved nurses recommending that female teenagers in the community get the human papillomavirus (HPV) vaccine. Researchers found that there were differing rates of human papillomavirus (HPV) vaccination completion among various service delivery models [28].

Our findings showed that HSD is a key practice and process to improve equity. For example, HSD practices included a vaccination program for a target population and a disease-specific early detection screenings for a specific group. The HSD process by itself or in collaboration with other SBBPs led to improved health outputs (such as accessibility or utilization). These processes did not necessarily lead to better equity. However, programs that focused on specific ethnic groups may have improved health equity because ethnicity may be a factor in economic disparities, and may interact with cultural, political, and external influence factors.

Improving HSD and HWF together resulted in an increase in the amount or rate of health care utilization. In addition, when the process incorporated HWF, we found that programs using a payment incentive in the HSD improved participation. An example of a payment incentive is the Pay-For-Performance (P4P) program in healthcare service to motivate healthcare providers.

One study measured the impact of a P4P on reducing inequity in childhood vaccination rates among different income groups. Researchers used

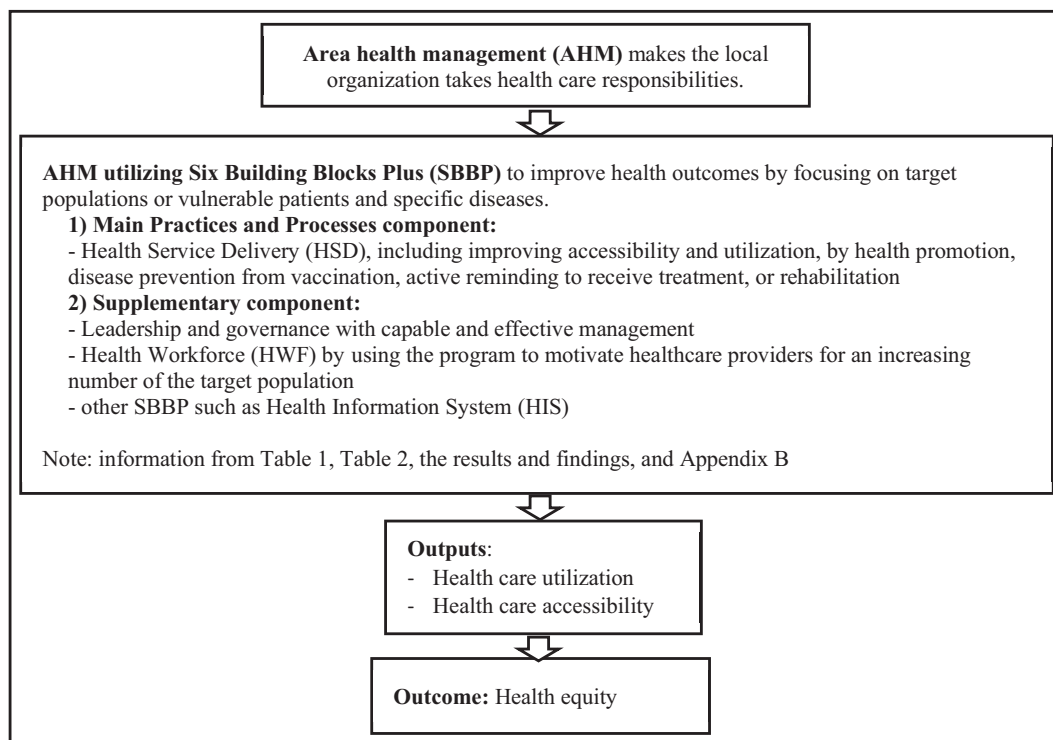


Fig. 2. Synthesis diagram describing how AHM utilizing SBBP improves health equity.

income quintiles as a proxy of socioeconomic status (SES). They found a SES-related inequity in vaccination completion, in which vaccine completion was higher among high-income groups. The P4P had no impact on increasing equity in vaccination completion among different income groups. The difference in concentration index was 0.006 after the P4P was completed, which indicated that the higher vaccine completion rate among wealthier income groups persisted [26].

The benefit of cooperation between HSD and health information systems (HIS) processes was an increase in the number of target patients that received healthcare services, according studies examining the implementation of the related health care database in information systems [25,26,28]. HIS referred to the use of health data standards, validation process, sharing, visualization, analysis, peer-to-peer networks, knowledge sharing, and technical assistance.

Two studies explored the effect of HSD on equity [25,26,28,29]. However, the studies found that HSD and other SBBP factors were not sufficient to achieve health equity. Other factors, such as ethnicity, were significant barriers to achieving health equity. However, the results of 5 studies we examined showed that HSD improved health equity by increasing health care utilization and

accessibility. Specifically, we found the following examples: 1) Utilization rate of bowel screening process increased 2.0% among intervention compared to control groups [29], 2) different utilization rates of maternity care among women who had experience for maternity care (88%) compared to no experience for any maternity care (12%) [25]; 2) Accessibility rate increased to 71.5% coverage in a school-based vaccination service [27], 3) Vaccination rate was higher for an in-school based program (75%) compared with the community (36%) [28], and 4) there was a different in vaccination completion among different SES groups (difference in concentration index = 0.037, 95% CI: 0.013–0.060). The result showed the vaccination completion was greater in high-income groups [26].

4. Discussion

This review of published studies aimed to explore what practices and processes can improve equity in countries that adopted the “AHM utilizing the SBBP” concept. The included studies showed horizontal and vertical health equity. We found that horizontal equity among countries of all income levels, while vertical equity appeared only in high-income countries. In addition, the included studies evaluated the patients' health care utilization and

Table 1. Descriptive summary of key characteristics of Area Health Management (AHM) studies.

Studies	Study design	Setting	Country	Population details	Intervention/Exposure details (Process of health promotion in different age populations)
Poole 2012 [27]	Cohort	Auckland District Health Board (ADHB) catchment area (Primary and secondary care)	New Zealand	- N = 8665 - Target group: female students from secondary schools - Population: 8665 of girls and young women in ADHB	HSD (in vaccination program) - intervention group: school-based vaccination system (SBVS) - control group: not vaccinated in the SBVS
Musto 2013 [28]	Cohort	Alberta is a western Canadian province with over 3.7 million residents. (Primary and secondary care)	Canada	- N = 36,545 - Target group: female teenagers - Population: Public health database of grades 5 and 9 for school years: 2009–2010, 2010–2011 and grade 5 only for 2008–2009	HSD collaboration with HWF (in the vaccination program) - intervention group: in-school service delivery model - control group: community service delivery model
Bartholomew 2015 [25]	Cohort	Auckland is a region of the north Island that is covered by three contiguous District Health Boards (DHBs) in the counties of Manukau and Waikato. (Secondary care)	New Zealand	- N = 6822 - Target group: maternal women - Population: the enrolled women during 2009 and 2010 into a longitudinal cohort study Growing Up in New Zealand compared to European, Maori, Pacific, and Asian women	HSD (in specific program for maternal care) - intervention group: engaged in LMC (Lead Maternity Carer) program for maternal women - control group: not engaged in this program
Katz 2015 [26]	Cohort	Twelve clinics were distributed throughout the regional health authorities in Manitoba. (Primary care)	Canada	- N = 114,378 - Target group: children - Population: Children born between 2003 and 2010 that were continuously registered with Manitoba Health up to their second birthday	HSD collaboration with HWF (in vaccination program) - intervention group: = The Physician Integrated Network (PIN) clinic - control group: non-PIN clinic
Sandiford 2018 [29]	RCT	Auckland and Waitemata District Health Board (Tertiary care)	New Zealand	- N = 7601 - Target group: Maori, Pacific, and Asian ethnicity - Population: 7601 subjects who failed to return for a bowel screening	HSD (in screening program by active reminder) - intervention group: received telephone calls from coordinators - control group: received the reminder letter

* HSD = health service delivery, HWF = health workforce, RCT = randomized control trial, N = total number of population or sample, PIN = The Physician Integrated Network.

Table 2. Results of area health management (AHM) in health service delivery (HSD) of included studies.

Studies	Participants		Duration	Measures	Outcomes	Results and Implications (Practice)
	AHM	Control				
Poole 2012 [27]	5233	1098	1 year (2019)	Horizontal (Accessibility)	AHM group 82.66%, control group 17.34% (p-value <0.0001)	School-based vaccination service targeted at subpopulations provided equity for a different ethnicity.
Musto 2013 [28]	26,304	9288	4 years (2008–2011)	Horizontal (Accessibility)	AHM group 75% (95% CI 74.7–75.8%), control group 36% (95% CI 35.3–37.2%)	Service delivery models make a difference in HPV vaccination completion rates and identifies inequities for health protection and disease prevention based on socioeconomic status.
Bartholomew 2015 [25]	6422	145	2 years (2009–2010)	Horizontal (Utilization)	AHM group 88%, control group 12% (p-value <0.0001)	The maternity care choice-based models were different among women depending on their type of maternity care received ethnicity, education, place of residence, and age.
Katz 2015 [26]	6185	6185	2 years (2007–2008)	Horizontal (Accessibility)	AHM and control group difference 0.037 (95% CI 0.013, 0.060)	The pay-for-performance (P4P) program, that was called PIN, had a limited impact on vaccination rates.
Sandiford 2018 [29]	3828	3773	12 weeks	Horizontal (Utilization)	AHM group 22.6%, control group 19.9%, RD 2.7% (95% CI 0.6–3.4%)	Active follow-up led to higher bowel screening rates than usual care.

* AHM = area health management, HSD = health service delivery, RD = risk difference, CI = confidence interval, SES = socioeconomic status.

health status. Therefore, the equity measurement focused on health care utilization, and the equity outcomes focused on health status and clinical outcomes. The factors that affected health equity, access to care, amount of healthcare utilization, and frequency of healthcare use included a place of residence, socioeconomic status, personal characteristics (such as age, disability), and social capital according to the restricted patients' capacity to obtain healthcare. These factors represented patients' perspectives on health outcomes, needs, and finance. Evidence from the included studies showed the attempt to increase accessibility and utilization by managing the proper budget under the authorities and responsibilities of healthcare providers.

“AHM utilizing SBBP” was mostly shown in HSD, HWF, leadership & governance of the SBBPs because this review retrieved original studies collected from the first period of equity in healthcare. Therefore, objective measurement and internal management was derived from the practices and processes in health management. Furthermore, during this period, we could not identify any studies illustrating health information technology. Equity focused on horizontal equity in health service delivery (accessibility and utilization), while vertical equity focused on financing. Our results correlated with a study by Manyazewal and colleagues. HSD was the primary SBB for allocating healthcare services for vulnerable patients to gain health promotion in primary health care (vaccine and maternal care) or disease prevention (severe disease screening) [34].

This review consists of 5 (out of 63 studies) intervention or observation studies that were measured objectively and showed the impact of “AHM utilizing SBBP” on equity. The evidence showed that the included studies focus on HSD. HSD might improve equity by providing healthcare treatment in response to patient needs [25–29]. Another reason was the direct measurement from the healthcare provider, which is assumed to reflect the results of accessibility and utilization by patients. The other “AHM utilizing SBBP” did not show effects because their outcomes were not objective measurements. Besides, some “AHM utilizing SBBP” were complex measurements that caused took time to evaluate. For example, one HWF measurement demonstrated the impact of an integrated P4P for childhood immunization. However, the collaboration did not show any effect on other conditions such as cancer screening. Vaccination studies in Canada and New Zealand showed that the vaccine target risk group was adolescent girls. Researchers have also assessed how P4P incorporating HWF could diminish the equity gap. One such

study examined whether clinics receiving P4P had reductions in inequity in childhood immunization completion rates among different income groups over the study time period. Though the P4P was not associated with a decline in inequity, researchers found that the inequity remained stable. This finding contrasted with increasing inequity among clinics that did not have the P4P program [26].

In our review, evidence only from the healthcare providers' perspectives might be biased from the perception of their services. Hence, expanding the sources of the study data to be obtained from patients is necessary for future studies. On the other hand, despite our review's limited available studies, we identified several approaches that proved the benefit of “AHM utilizing SBBP” in improving health equity. The included studies were limited to studies published between 1980 and 2019. Therefore, this review gathered studies that showed the variation of the health system spanning more than 30 years. As a result, we found some changes to the healthcare system in some countries that could affect health outcomes. However, our review may lack information about other comprehensive “AHM utilizing SBBP” approaches through efficient management processes, including human resources, medicines and supplies, data information and technology, financial management, people participation, and most importantly, the implementation of the health service plans under governance.

The concept of SBBP has been relatively new and has existed for less than a decade. Based on our review, we found that the current evidence focused mainly on HSD. We expect that other SBBP, such as health workforce, leadership and governance, and health information system, will be implemented in AHM shortly.

We assessed the quality of the observational and intervention studies (cohort and RCT). We also found that the cohort studies were of good quality, and the one RCT study we reviewed showed a low risk of bias. The cohort studies we reviewed had good control for the most important confounding factors, while RCT showed a well-controlled selection process. To the best of our knowledge, this is the first study that aims to explore the practice and process of “AHM utilizing SBBP” for improving equity in health. We searched also unpublished literature from different sources including gray literature reports and conferences of the WHO.

The results were consistent between horizontal and vertical equity. The evidence focused on the allocation and distribution of healthcare services with management processes. Under a decentralized

model, AHM enabled workplace organizations to be more efficient by accessing information and providing services that meet patient needs, resulting in increasing the utilization and accessibility of various health services. The collaboration of targeted people's participation and cooperation with the target community was also beneficial to achieving healthcare equity in Canada and New Zealand. Five studies showed the same target and specific people participating in healthcare services, such as vaccination, screening, and maternal care services in horizontal and vertical equity.

Nevertheless, the risk was the administration of the distribution of limited resources such as the budget. Recent studies show that the HSD includes inputs and processes to the health system. The healthcare service measurement of HSD comes from the rate or amount of accessibility and utilization to patients. In this review, HSD showed an impact on intervention from providers to patients, resulting in increased healthcare consumption. For example, HWF might increase vaccination rates in the target population. Thus, the implementation of HSD, the comprehensiveness management on leadership & governance, and the collaboration of HWF were the management processes in the current literature. From providers' perspectives, these implemented “processes” created benefits for healthcare services in health promotion and disease prevention to patients who differ in age, sex, ethnicity, and socioeconomic status. The results of only HSD or integrated into other “AHM utilizing SBBP” showed that HSD could not accomplish the outcomes to achieve equity because of certain factors, such as ethnicity. However, the results of the included studies showed that health care utilization and accessibility increased.

5. Conclusion

This scoping review identified 63 published studies that explored the issues related to “AHM utilizing SBBP.” Under decentralization, the area health system's benefit was that the local organization took a vital role in health services for specific purposes in their area health. The area of health varied in each country because of differences in the transfer of authority and responsibility from the central to local governments. However, the practices and processes of “AHM utilizing SBBP” appeared similar between countries. We found HSD or cooperation with others leads to improved equity. In addition, health promotion and disease prevention lead to enhancing equity. We found that HSD or cooperation with others could improve equity by increasing healthcare accessibility and utilization for health

promotion in different areas (urban or rural), specific diseases (communicable or non-communicable disease), and targeted patients (such as the elderly or pregnant).

Conflict of interest

There is no conflict of interest.

Approval number for ethics in human research

None (Scoping review of data from research did not require human subjects ethical review.)

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Appendix A

A1: Search terms and results of searching in each database.

A2: The details of synonym term of “Area health”.

A3: The details of measurements and outcomes in stage 2 of data coding and analysis.

Table A1. Search terms and results of searching in each database

Pubmed (Since 1968 to January 27, 2021)		
No	Keyword	Found
1	Equity	17,780
2	“area health” OR “primary care trust” OR “district health authority” OR “district health board” OR “region health board” OR “area health board” OR “regional health authority”	3274
3	1 AND 2 (search filter: advance search in title and abstract)	2001
Embase (Since 1975 to January 27, 2021)		
No	Keyword	Found
1	Equity	18,700
2	“area health” OR “primary care trust” OR “district health authority” OR “district health board” OR “region health board” OR “area health board” OR “regional health authority”	4302
3	1 AND 2 (search filter: advance search in title and abstract)	2705
Social Sciences (Since 1977 to January 27, 2021)		
No	Keyword	Found
1	Equity	653,435
2	“area health” OR “primary care trust” OR “district health authority” OR “district health board” OR “region health board” OR “area health board” OR “regional health authority”	15,086
3	1 AND 2 (search filter: advance search in title and abstract)	76
Web of Science (Since 2001 to January 27, 2021)		
No	Keyword	Found
1	Equity	46,316
2	“area health” OR “primary care trust” OR “district health authority” OR “district health board” OR “region health board” OR “area health board” OR “regional health authority”	1648
3	1 AND 2 (search filter: advance search in title and abstract)	36
CINAHL (Cumulated Index to Nursing and Allied Health Literature) (Since 1968 to January 27, 2021)		
No	Keyword	Found
1	Equity	9712
2	“area health” OR “primary care trust” OR “district health authority” OR “district health board” OR “region health board” OR “area health board” OR “regional health authority”	2048
3	1 AND 2 (search filter: advance search in title and abstract)	29
WHO (Global Index Medicus) (Since 1974 to January 27, 2021)		
No	Keyword	Found
1	Equity	2013
2	area health OR primary care trust OR district health authority OR district health board OR region health board OR area health board OR regional health authority	17
3	1 AND 2 (search filter: advance search in title and abstract)	0
Grey Literature Report (greylit.org)		

No	Keyword (Since 2000 to January 27, 2021)	Found
1	Equity	222
2	area health OR primary care trust OR district health authority OR district health board OR region health board OR area health board OR regional health authority	0
3	1 AND 2 (search filter: full text)	0
Equity conference of WHO (Since 1999 to January 27, 2021)		
No	Keyword	Found
1	Equity	3863
2	area health OR primary care trust OR district health authority OR district health board OR region health board OR area health board OR regional health authority	27
3	1 AND 2 (search filter: all indexes, all information search)	0

A2: The details of synonym term of “Area health”.

The term “area health” [35] refers to the geographically decentralized health care systems. Any given country has a specific equivalent name to area health, such as primary care trust, district health authority, district health board, region health board, area health board, and regional health authority. The countries that adopt the idea of “area health” are Australia, Canada, Denmark, England, New Zealand, Sweden, Wales, South Africa, and Tanzania. The examples of activities and responsibility organizations in each country are as follows.

The federal government of Australia funded the establishment of a Primary Health Care (PHC). The PHC organization takes a role in oversee urban-rural areas and support the foundation of a regional PHC [36]. In Canada, there are some arguments about the pattern and management of each area that is very independent. In addition, there are service privileges defined between different territories [30,31]. However, the similarities between Canada and Australia are that local organizations take responsibility and apply local information to improve service efficiency.

The area health system of Sweden is called the Regional Health Area. The administration of this organization locates in the county to meet their patient's needs. Applying providers-purchasers split for efficiency in health management [37].

There was an administrative reform in Denmark in 2001. In 2012 and 2013, the Danish National Board of Health authorized the municipalities to take responsibility for disease prevention and health promotion for their people, such as school health services [38]. The similarity of Denmark and Wales is national health organization takes responsibility to health care service. National Health Service (NHS) is the pattern of area health in Wales [39]. The benefit of cooperation in services by centralization of health care is to achieve equity for accessibility. However, the quality of some

expertise may decrease, and financial management may be less effective.

There was a long-standing background about changes and developments of the area health system in England. In April 2013, the clinical commissioning groups (CCGs) replaced a role from the primary care trusts (PCTs). CCGs conducted the statutory of NHS to the clinical taskings, planning, and commissioning of healthcare services in their local area [40–44]. The consistency of England and New Zealand is that NHS is the origin of the autonomous body pattern. In New Zealand, the Regional Health Board developed to the District Health Board (DHB). Government supports the funds for total fundamental healthcare, whereas the NHS provides secondary healthcare for all residents [32,33].

The National Health Insurance (NHI) reform in South Africa intended to achieve and cover universal health coverage (UHC) by implementing the Patients’ Rights Charter (PRC) policies for health equity. NHI operates by promoting actions on equity, removing access barriers, and strengthening the motivation of health workers [45]. Tanzania set the District Health System (DHS) in 1990. DHS is a decentralized structure from a centralized to local governments. This major transformation is for changing the policy in the administrative system [46].

A3: The details of measurements and outcomes in stage 2 of data coding and analysis

The details of equity measurements as follows:

A. The measurement of service delivery classified into.

- 1) **Accessibility** which referred to the process or measurement for accessibility to service place such as spatial, geography, geo-spatial, geography information system (GIS), rural or remote, distance, time to service
- 2) **Utilization** was a proxy of accessibility which presented by frequency and/or amount in healthcare consumption such as vaccination.

B. The measurement of Financing addresses the management of financing, funding, budgeting.

The details of equity outcomes classified into:

- 1) Health status of clinical outcomes
- 2) Financing outcomes
- 3) Responsiveness referred to providers' roles that concerned to patients under equity concept. The proxy of responsiveness were patient satisfaction and quality of care as follows.

- Patient satisfaction showed content related to perceived needs, expectations, experience of care.

- Quality of care showed content related to interaction between provider and patient, continuity of care, cost, accommodation, and accessibility process [47].

Appendix B

Table B1 - Characteristics of included studies.

Table B1. Characteristics of included studies

No	Author(s)	Country	Setting*	Study design
1	Javanparast 2019 [36]	Australia	1°	Mixed method: case studies, cross sectional survey
2	Tin 2018 [33]	New Zealand	1°	Quantitative: cohort
3	Sandiford 2018 [29]	New Zealand	3°	Quantitative: randomized controlled trial
4	Woodgate 2017 [48]	Canada	1°	Qualitative: case studies
5	Rolfe 2017 [49]	Australia	1°	Quantitative: ecological
6	Erasmus 2017 [45]	South Africa	2°	Mixed method: case studies, cross sectional survey
7	Salway 2016 [44]	England	3°	Qualitative: case studies, focus group, action research
8	Lao 2016 [50]	New Zealand	2°	Quantitative: cohort
9	Zidar 2015 [51]	Sweden	2°	Quantitative: cross sectional survey
10	Shiikha 2015 [52]	Australia	1°	Quantitative: ecological
11	Seneviratne 2015 [53]	New Zealand	2°	Quantitative: cohort
12	Robertson 2015 [54]	New Zealand	1°	Qualitative: case studies, focus group
13	McGrail 2015 [55]	Australia	1°	Quantitative: ecological
14	Katz 2015 [26]	Canada	1°	Quantitative: cohort
15	Hudon 2015 [30]	Canada	2°	Qualitative: focus group
16	Bergh 2015 [56]	South Africa	2°	Qualitative: case studies
17	Bartholomew 2015 [25]	New Zealand	2°	Quantitative: cohort
18	Vallgarda 2014 [38]	Denmark	2°	Qualitative: case studies
19	Calder 2014 [57]	New Zealand	2°	Mixed method: case studies, focus group, cross sectional analysis
20	Nakaima 2013 [31]	Canada	2°	Qualitative: case studies
21	Musto 2013 [28]	Canada	1°, 2°	Quantitative: cohort
22	Maluka 2013 [46]	Tanzania	1°, 2°	Qualitative: case studies
23	Brownhill 2013 [58]	Australia	1°	Qualitative: case studies
24	Boyd 2013 [59]	Scotland	3°	Quantitative: cohort
25	Wilson 2012 [60]	New Zealand	3°	Quantitative: cohort
26	Sandiford 2012 [61]	New Zealand	3°	Quantitative: cohort
27	Poole 2012 [27]	New Zealand	1°, 2°	Quantitative: cohort
28	Holman 2012 [62]	Norway	3°	Quantitative: ecological
29	Putland 2011 [63]	Australia	1°, 2°	Mixed method: case studies, cross sectional analysis
30	Woodland 2010 [64]	Australia	1°, 2°	Qualitative: case studies
31	Roeger 2010 [65]	Australia	1°	Quantitative: ecological
32	Galleo 2009 [66]	Australia	2°, 3°	Qualitative: case studies
33	Ringback 2008 [67]	Sweden	3°	Quantitative: cross sectional analysis
34	Mindell 2008 [68]	England	3°	Quantitative: ecological
35	Baeza 2008 [69]	England	1°	Qualitative: case studies
36	West 2007 [70]	England	2°, 3°	Quantitative: cross sectional analysis
37	Laporte 2007 [71]	Canada	2°	Quantitative: ecological
38	Strong 2006 [72]	England	1°	Quantitative: ecological
39	Sigfrid 2006 [73]	England	1°	Mixed method: case studies, cross sectional analysis
40	Morris 2006 [74]	UK	1°	Quantitative: ecological
41	Mansell 2006 [75]	England	1°	Qualitative: case studies
42	Lyon 2006 [76]	England	1°, 2°	Quantitative: cross sectional analysis
43	Kildea 2006 [77]	Australia	1°	Qualitative: case studies, focus group, action research
44	Brown 2006 [41]	England	1°	Quantitative: cross sectional analysis
45	Thalanay 2005 [78]	England	1°	Quantitative: cohort
46	Dyas 2005 [42]	England	1°	Qualitative: case studies
47	Abbott 2005 [40]	England	1°	Qualitative: case studies

(continued on next page)

Table B1. (continued)

No	Author(s)	Country	Setting*	Study design
48	McDonald 2004 [43]	England	1°	Qualitative: case studies
49	Barriball 2004 [79]	England	1°	Mixed method: case studies, cross sectional analysis
50	McCarthy 2003 [80]	Australia	1°	Mixed method: case studies, cross sectional analysis
51	Low 2003 [81]	Namibia	1°, 2°, 3°	Quantitative: ecological
52	Lindström 2003 [82]	Sweden	1°, 2°	Quantitative: ecological
53	Denley 2003 [83]	England	1°	Qualitative: case studies
54	Christie 2003 [39]	Wales	3°	Quantitative: ecological
55	Tran 2002 [84]	Australia	1°	Quantitative: cross sectional analysis
56	Kemp 2002 [85]	Australia	1°, 2°	Quantitative: cross sectional analysis
57	Johnston 2001 [86]	Australia	1°	Quantitative: cross sectional analysis
58	Jackson 2001 [32]	New Zealand	2°	Quantitative: cross sectional analysis
59	Hjern 2001 [37]	Sweden	1°	Quantitative: cross sectional analysis
60	Russell-Weisz 2000 [87]	Australia	1°, 2°	Quantitative: cross sectional analysis
61	Metcalfe 1999 [88]	Scotland	3°	Quantitative: ecological
62	Manson-Siddle 1998 [89]	England	3°	Quantitative: ecological
63	Stone [90]	Scotland	1°, 2°, 3°	Quantitative: cross sectional analysis

Note.

1) * Showed the level of healthcare setting as follows.

- 1° = Primary care is often the first point of contact for people in need of healthcare, and may be provided by professionals such as GPs, dentists, and pharmacists.
- 2° = Secondary care, which is sometimes referred to as 'hospital and community care', can either be planned (elective) care such as a cataract operation, or urgent and emergency care such as treatment for a fracture.
- 3° = Tertiary care refers to highly specialized treatment such as neurosurgery, transplants, and secure forensic mental health services.

More than half of the studies pointed to primary care (N = 38), comparing to secondary (N = 25) and tertiary (N = 15).

2) The number of studies from England (N = 16), Australia (N = 15), New Zealand (N = 11), Canada (N = 6), Sweden (N = 4), Scotland (N = 3), South Africa (N = 2), Denmark (N = 1), Namibia (N = 1), Norway (N = 1), Tanzania (N = 1), UK (N = 1), and Wales (N = 1).

3) Ecological study or Correlational study (a descriptive study of an observational study of the epidemiological research).

4) Qualitative research is composed of case studies, focus groups, and action research designs. Most qualitative research is a case study design. Some studies comprise more than one pattern.

5) The quantitative research is composed of cohort (N = 11), RCT (N = 1), ecological (correlational study) (N = 14), cross-sectional survey (N = 1), and cross-sectional analysis (N = 11).

Table B2. The details of sub-topics of factors affecting equity utilizing PROGRESS PLUS, management in area health utilizing SBBP, equity dimension, equity measurement, and equity outcomes of included studies.

No	Author(s)	PROGRESS PLUS*							SBBP**						Equity dimension		Equity measurement***			Equity outcomes****						
		P	R	O	G	R	E	S1	S2	PLUS	1	2	3	4	5	6	P	H	V	A	U	F	H	F	R	
1	Javanparast 2019 [36]	/					/	/					/	/		/	/		/				/			
2	Tin 2018 [33]		/						/			/						/		/			/			/
3	Sandiford 2018 [29]		/						/			/						/		/			/			/
4	Woodgate 2017 [48]		/				/	/			/		/			/	/		/			/			/	
5	Rolfe 2017 [49]	/			/		/	/	/		/		/			/	/		/			/			/	
6	Erasmus 2017 [45]	/									/	/	/			/	/	/	/			/			/	
7	Salway 2016 [44]		/					/								/		/				/			/	
8	Lao 2016 [50]		/								/	/	/			/	/	/	/			/			/	
9	Zidar 2015 [51]	/			/		/		/		/		/			/		/		/		/			/	
10	Shiikha 2015 [52]	/					/		/		/		/			/		/		/		/			/	
11	Seneviratne 2015 [53]	/	/		/			/	/	/	/		/			/		/		/		/			/	
12	Robertson 2015 [54]	/					/		/		/	/	/			/		/		/		/			/	
13	McGrail 2015 [55]	/					/		/		/	/				/		/		/		/			/	
14	Katz 2015 [26]						/	/	/		/		/			/	/	/	/			/			/	
15	Hudon 2015 [30]	/		/			/	/	/		/	/	/		/	/	/	/	/		/		/		/	
16	Bergh 2015 [56]						/	/	/		/	/	/			/	/	/	/			/			/	
17	Bartholomew 2015 [25]						/	/	/		/	/	/			/		/		/		/			/	
18	Vallgarda 2014 [38]	/	/								/		/			/		/		/		/			/	
19	Calder 2014 [57]	/	/			/		/	/		/		/			/		/		/		/			/	
20	Nakaima 2013 [31]	/					/	/	/		/	/	/			/	/	/	/			/			/	
21	Musto 2013 [28]	/					/	/	/		/	/	/			/	/	/	/			/			/	
22	Maluka 2013 [46]	/					/	/	/		/	/	/			/	/	/	/			/			/	
23	Brownhill 2013 [58]	/							/		/	/	/			/		/		/		/			/	
24	Boyd 2013 [59]	/					/	/	/		/	/	/			/		/		/		/			/	
25	Wilson 2012 [60]	/	/				/	/	/		/	/	/			/		/		/		/			/	
26	Sandiford 2012 [61]	/	/				/	/	/		/	/	/			/		/		/		/			/	
27	Poole 2012 [27]	/	/				/	/	/		/	/	/			/	/	/	/			/			/	
28	Holman 2012 [62]						/	/	/		/	/	/			/		/		/		/			/	
29	Putland 2011 [63]	/			/	/	/	/	/		/	/	/		/	/	/	/	/			/			/	
30	Woodland 2010 [64]	/					/	/	/		/	/	/			/		/		/		/			/	
31	Roeger 2010 [65]	/					/	/	/		/	/	/			/	/	/	/			/			/	
32	Gallego 2009 [66]						/	/	/		/	/	/			/	/	/	/			/			/	
33	Ringback 2008 [67]	/		/		/	/	/	/		/	/	/		/	/	/	/	/			/			/	
34	Mindell 2008 [68]	/					/	/	/		/	/	/			/	/	/	/			/			/	
35	Baeza 2008 [69]	/					/	/	/		/	/	/			/		/		/		/			/	
36	West 2007 [70]	/					/	/	/		/	/	/			/		/		/		/			/	
37	Laporte 2007 [71]	/				/	/	/	/		/	/	/		/	/	/	/	/			/			/	
38	Strong 2006 [72]	/				/	/	/	/		/	/	/		/	/	/	/	/			/			/	
39	Sigfrid 2006 [73]	/				/	/	/	/		/	/	/		/	/	/	/	/			/			/	
40	Morris 2006 [74]	/				/	/	/	/		/	/	/		/	/	/	/	/			/			/	
41	Mansell 2006 [75]	/			/	/	/	/	/		/	/	/		/	/	/	/	/			/			/	

42	Lyon 2006 [76]	/						/		/								/		/							
43	Kildea 2006 [77]	/			/	/		/	/	/					/			/		/	/						
44	Brown 2006 [41]	/			/								/					/		/							
45	Thalanay 2005 [78]	/		/		/	/	/	/	/			/	/				/		/	/						
46	Dyas 2005 [42]	/	/		/			/	/	/	/	/	/	/				/		/							
47	Abbott 2005 [40]	/	/		/	/	/	/	/	/	/	/	/	/				/		/							
48	McDonald 2004 [43]	/			/			/	/	/			/					/		/							
49	Barriball 2004 [79]	/			/			/	/	/			/					/		/							
50	McCarthy 2003 [80]	/			/	/		/	/	/	/		/					/		/	/						
51	Low 2003 [81]	/			/			/	/	/	/	/	/	/				/		/	/						
52	Lindström 2003 [82]	/			/		/	/	/	/	/	/	/	/				/		/	/						
53	Denley 2003 [83]	/			/			/	/	/	/	/	/	/				/		/	/						
54	Christie 2003 [39]	/			/		/	/	/	/			/					/		/							
55	Tran 2002 [84]	/	/	/		/		/	/				/					/		/	/						
56	Kemp 2002 [85]	/			/			/	/	/	/	/	/	/				/		/	/						
57	Johnston 2001 [86]	/			/	/		/	/	/			/					/		/	/						
58	Jackson 2001 [32]	/	/	/	/	/	/	/	/	/	/	/	/	/				/		/	/						
59	Hjern 2001 [37]	/	/	/	/	/	/	/	/	/	/	/	/	/				/		/	/						
60	Russell-Weisz 2000 [87]	/	/	/	/	/	/	/	/	/	/	/	/	/				/		/	/						
61	Metcalfe 1999 [88]	/			/	/	/	/	/	/	/	/	/	/				/		/	/						
62	Manson-Siddle 1998 [89]	/			/	/	/	/	/	/	/	/	/	/				/		/	/						
63	Stone [90]	/			/			/	/	/	/	/	/	/				/		/	/						
Total (63)		51	17	1	8	0	5	31	25	33	1	19	55	33	26	12	24	38	10	46	17	16	47	1	36	0	8
Percent		80.95	26.98	1.59	12.70	0.00	7.94	49.21	39.68	52.38	1.59	30.16	87.30	52.38	41.67	19.05	38.10	60.32	15.87	73.02	26.98	25.40	74.60	1.59	57.14	0.00	12.70

Note:

1. * abbreviation PROGRESS PLUS means: P = place of residence, R = race/ethnicity/culture/language, O = occupation, G = gender/sex, R = religion, E = education, S1 = socioeconomic status, S2 = social capital, PLUS 1) personal characteristics associated with discrimination (e.g., age, disability), 2) features of relationships (e.g., smoking parents, excluded from school), 3) time-dependent relationships (e.g., leaving the hospital, respite care, other instances where a person may be temporarily at a disadvantage).
2. ** SBBP stands for six building blocks plus, which compose of: 1 = health service delivery (includes comprehensiveness, accessibility, coverage, continuity, quality, person-centeredness, coordination, and accountability/efficiency), 2 = health workforce (sufficient, competent, responsive, and adequately supported to meet the population needs), 3 = health information systems (use of health data standards, validation process, sharing, visualization, analysis, peer-to-peer networks, knowledge sharing, and technical assistance), 4 = access to essential medicines (available at all times, in adequate amounts, in the appropriate dosages, and at a price that individuals and systems can afford), 5 = health systems financing (analysis of health policy, source of funds, and effectiveness of health services delivered to the population), 6 = leadership and governance (ensuring strategic policy frameworks exist and are combined with effective oversight, coalition-building, the provision of appropriate regulations and incentives, attention of system-design, and accountability), P = participation (people participation).
3. *** Effect to equity measurements: A = accessibility, U = utilization, F = financing.
 - 1) Equity measurements were service delivery (accessibility measurement (N = 16), and utilization measurement (N = 47)), and financing measurement (N = 1).
4. **** Effect to equity outcomes: H = health status or clinical outcomes, F = financing outcomes, R = responsiveness (patient satisfaction or quality of care).
 - 1) Equity outcomes showed health (N = 36), responsiveness (N = 8), but no study measured health financing outcomes.
 5. The equity dimension consisted of horizontal equity (N = 46) and vertical equity (N = 17).
 6. The income classification of the studies falls into other high-income countries (Wale, Scotland, UK, Canada, Sweden, Denmark, Norway), middle-income countries (South Africa, Namibia), and low-income countries (Tanzania).
 - 1) The difference observed between horizontal equity (HE) and vertical equity (VE) in the income setting as follows.
 - a. HE 66.67% (42 out of 63), and VE 26.98% (17 out of 63) in high-income countries.
 - b. HE 4.76% (3 out of 63) but not found VE in middle-income countries.
 - c. HE 1.59% (1 of 63) but not found VE in low-income countries.
 7. Most of the studies focused on three aspects of PROGRESS PLUS included a place of residence (N = 51), personal characteristics (N = 33), and socioeconomic status (N = 31).
 - 1) The top three reports about PROGRESS PLUS in horizontal dimension were: place of residence (78.26%), socioeconomic status (47.83%), and social capital (47.83%).
 - 2) While vertical equity dimensions were place of residence (94.12%), personal characteristics associated with discrimination such as age and disability (76.47%), and socioeconomic status (52.94%).
 8. The top three reports of AHM utilizing SBBP of overall included studies were health service delivery (N = 55), leadership and governance (N = 38), and health workforce (N = 33).
 9. These reports of each horizontal and vertical equity dimension corresponding to the above sequences.

Table B3 - Quality assessment of included studies.

Table B3.1. Cohort study (applied NOS criteria for evaluation)

Domain/Studies	Bartholomew 2015 [25]	Katz 2015 [26]	Musto 2013 [28]	Poole 2012 [27]
Selection (maximum 4)	4	4	4	3
1. Representativeness of the exposed cohort	1	1	1	1
2. Selection of the non-exposed cohort	1	1	1	1
3. Ascertainment of exposure	1	1	1	1
4. Demonstration that outcome of interest was not present at start of study	1	1	1	0
Comparability (maximum 2)	2	2	2	2
1. Comparability of cohorts because of the design or analysis	2	2	2	2
Outcome (maximum 3)	2	2	3	3
1. Assessment of outcome	1	1	1	1
2. Was follow-up long enough for outcomes to occur	1	1	1	1
3. Adequacy of follow up of cohorts	0	0	1	1
Total number of stars	8/9	8/9	9/9	8/9
Quality rating according to guideline	good*	good*	good*	good*

Notes:

- A study can be awarded a maximum of one star for each numbered item within the Selection and Outcome categories. A maximum of two stars can be given for Comparability.
- *Thresholds for converting the NOS rating to Agency for Healthcare Research and Quality (AHRQ) standards (good, fair, and poor) [91].
- Good quality: 3 or 4 stars in selection domain AND 1 or 2 stars in comparability domain AND 2 or 3 stars in outcome/exposure domain.
- Fair quality: two stars in selection domain AND 1 or 2 stars in comparability domain AND 2 or 3 stars in outcome/exposure domain.
- Poor quality: 0 or 1 star in selection domain OR 0 stars in comparability domain OR 0 or 1 stars in outcome/exposure domain.
- NOS = Newcastle–Ottawa Quality Assessment Scale.

Table B3.2. RCT (applied EPOC criteria for evaluation). Study of Sandiford 2018 [29]

Domain	Risk of bias	Support for judgement
Was the allocation sequence adequately generated?	Low	The principal investigator (who was not involved in the allocation process) used a predefine simple random series generated from Excel. They performed group allocation of the sample in batches 2–3 times per week.
Was the allocation adequately concealed?	Low	The specific person (who responsible for the randomization process) conducted this process from allocation concealment and sequence generation. They confirmed that no possible of selection bias, no stratification or blocking in this process.
Were baseline outcome measurements similar?	Unclear	No baseline measure of outcomes since they were related to receiving intervention.
Were baseline characteristics similar?	Unclear	No details given
Were incomplete outcome data adequately addressed?	Unclear	No reference to missing data or how it might be handled
Was knowledge of the allocated interventions adequately prevented during the study?	Low	Outcome measures was objective
Was the study adequately protected against contamination?	Low	Intervention and control were delivered in different locations
Was the study free from selective outcome reporting?	Low	All outcome measures described in methods section were reported in results section
Was the study free from other risks of bias?	Unclear	There was a limitation about the selection bias, the description of the analysis, and reporting of the results e.g., differences in baseline characteristics of each provider.
Overall assessment of bias within a study	Low	From all reasons above

*EPOC = Cochrane Effective Practice and Organization of Care.

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