REVIEW ARTICLE

Effectiveness of behavioural change interventions to influence maternal and child healthcare-seeking behaviour in low and lower-middle-income countries: A systematic review of literature

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Abstract

While behavioural change interventions are utilized in low- and lower-middle-income countries and may be essential in reducing maternal and child mortality, evidence on the effectiveness of such interventions is lacking. This review provides evidence on the effectiveness of behavioural change interventions designed to improve maternal and child healthcare-seeking behaviour in low- and lower-middle-income countries. We searched three electronic databases (PUBMED, EMBASE, and PsycINFO) for articles published in English and French between January 2013 and December 2022. Studies that evaluated interventions to increase maternal and child healthcare utilization, including antenatal care, skilled birth care, postnatal care, immunization uptake, and medication or referral compliance, were included. We identified and included 17 articles in the review. Overall, 11 studies found significant effects of the behavioural change interventions on the desired healthcare outcomes, 3 found partially significant effects, and 3 did not observe any significant impact. A major gap identified in the literature was the lack of studies reporting the effect of behavioural change interventions on women's non-cognitive and personality characteristics, as recent evidence suggests the importance of these factors in maternal and child healthcare-seeking behaviour in low-resource settings. This review highlights some intervention areas that show encouraging trends in maternal and child healthcare-seeking behaviours, including social influence, health education, and nudging through text message reminders. *(Afr J Reprod Health 2024; 28 [4]: 127-148)*

Keywords: Behavioural insights, behavioural change techniques, behavioural change interventions, behavioural change communications, maternal and child healthcare-seeking behaviour

Résumé

Bien que les interventions visant à modifier les comportements soient utilisées dans les pays à faibles et moyens revenus et qu'elles pourraient être essentielles pour réduire la mortalité maternelle et infantile, les preuves de l'efficacité de telles interventions font défaut. Cette revue synthétise les preuves de l'efficacité des interventions de changement de comportement conçues pour améliorer le recours aux soins maternels et infantiles dans les pays à faibles et moyens revenus. Nous avons identifiés dans trois bases de données électroniques (PUBMED, EMBASE et PsycINFO) les articles publiés en anglais et en français entre janvier 2013 et décembre 2022. Les études qui évaluaient les interventions visant à accroître l'utilisation des soins de santé maternelle et infantile, y compris les soins prénatals, les soins d'accouchement par du personnel qualifié, les soins postnatals, la vaccination et l'observance des traitements médicamenteux ou de référence, ont été incluses. Nous avons identifié et inclus 17 articles dans la revue. Dans l'ensemble, 11 études mettent en évidence des effets significatifs des interventions visant à modifier les comportements en matière de soins de santé, 3 mettent en évidence des effets partiellement significatifs et 3 n'observent pas d'impact significatif. Une lacune majeure dans la littérature est le manque d'études rapportant l'effet des interventions de changement de comportement sur les caractéristiques non cognitives et de personnalité des femmes, alors que des travaux récents suggèrent l'importance de ces facteurs pour le recours aux soins de santé pour la mère et l'enfant dans les environnements à faibles ressources. Cette étude met en lumière certains domaines d'interventions qui encourageraient les comportements de recours aux soins des mères et des enfants, notamment l'influence sociale, l'éducation à la santé et l'incitation par le biais de rappels par SMS. *(Afr J Reprod Health 2024; 28 [4]: 127-148).*

Mots-clés: Perspectives comportementales, techniques de changement de comportement, interventions de changement de comportement, communications de changement de comportement, recours aux soins pour la mère et l'enfant

Introduction

While not recognized as diseases, pregnancy and childbirth are the major contributors to morbidity and mortality among childbearing women in low-resource settings[1]. Improving women's health and well-being during pregnancy and after birth is a significant goal in healthcare worldwide, as women experience various physical and psychological changes during pregnancy that might influence their intentions to engage in healthy healthcare-seeking behaviours[2]. These intentions can also be determined by their attitude towards the behaviour, the perceived ability to perform a behaviour, and the prevailing normative and subjective beliefs regarding such behaviour within the larger cultural or social context.

Healthcare-seeking behaviour refers to any action or inaction undertaken by individuals who perceive themselves to have a health problem or to be ill to find an appropriate remedy[3]. Within the context of maternal health, these behaviours include timely and adequate utilization of antenatal care, ensuring skilled birth attendance during childbirth, and adequate postnatal care. Delayed healthcare-seeking contributes much to maternal and child mortalities because most maternal and child deaths in low-resource settings occur outside healthcare facilities[4]. An understanding of healthcare-seeking is essential to minimize potential delays that contribute to maternal and child mortalities.

Much research has been conducted on the problem of maternal and child healthcare-seeking delays. Still, the evidence needs to be more conclusive regarding which factors are most important in reducing delay or increasing early response[5]. Socioeconomic, demographic, environmental, systemic, cultural, and psychological factors have all been implicated. Many beliefs and misconceptions about pregnancy and childbirth influence women's birth choices, which in turn affect the health outcomes of both mother and child, with risks increasing in lower-resourced settings, where birth preparedness and infection prevention are not paramount[6]. Research has found that maternal and child healthcare-seeking behaviour is often preceded by a decision-making process further enhanced by individual and household behaviour and community norms and expectations. For example, Ntoimo *et al*. found a significant link between women's decision-making ability and their utilization of skilled maternity care in rural Nigeria[7].

Recent empirical evidence links maternal and child healthcare-seeking behaviours and other intrinsic non-cognitive and personality characteristics. For example, Triandis' theory of behaviour, explains that the probability of engaging in healthcare-seeking behaviour is a function of psychosocial variables (affect, expectation, and values about outcomes, habit, and norms) and facilitating conditions regarding the behaviour[8]. Similarly, Aikpitanyi *et al*. found correlations between women's locus of control, self-esteem, and utilization of maternal and child healthcare services in Nigeria[9]. Understanding how these factors interplay to determine maternal and child healthcare-seeking behaviour will be beneficial in designing interventions to improve maternal and child health outcomes.

Many demand-side and supply-side interventions have been used to promote increased access and uptake of maternal and child healthcare services in low- and lower-middle-income countries. Interventions that increase antenatal care visits before childbirth and skilled birth attendance are widely known to improve maternal health outcomes[10]. These interventions are intended to promote health literacy and lifestyle changes that will positively affect the health outcomes of mothers and babies during childbirth and throughout their lives.

Recently, the World Health Organization (WHO) advocated using behavioural science to achieve better health outcomes as part of renewed efforts to improve healthcare-seeking behaviour[11]. Several researchers have also demonstrated the effectiveness of behavioural change interventions in influencing health-seeking behaviours[12]. Behavioural change interventions are increasingly used in high-income and low-resource settings to affect government policies. These interventions encourage preferred behaviours by subtly shaping choices, applying incentives, or employing punitive measures[11].

Behavioural change interventions generate a change in behaviour without fundamentally changing the normative structure of the context in which decisions are made[12]. Behavioural change interventions can be used in healthcare to promote health and well-being; for example, they can be

Table 1: Behavioural insights: description and application in healthcare

Behavioural insights	Description	Examples of application in maternal healthcare in LMICs
Nudges/Reminders	Nudging refers to the concept of generating enabling conditions to aid the decision maker in making the best decision that is of benefit[17, 18].	Text messages remind pregnant women about their antenatal care appointments, tetanus toxoid injections, or scheduled child vaccinations[19].
Framing effect	The framing effect refers to the fact that individuals' choices often depend on how the choices are described or framed and that these choices are usually affected by whether the possible outcomes are portrayed as either gains or losses[20].	Health education or counselling information could be varied to present antenatal check-ups and skilled birth attendants during childbirth as gains versus avoided losses[21].
Social influence	Social influence is how others' presence or actions modify a person's attitudes, beliefs, or behaviour[22].	Providing information about what other women do, such as that most women make financial savings towards childbirth or use antenatal clinics for preventive check-ups, could be an effective strategy to promote good maternal healthcare-seeking behaviour[23].
Incentives	Incentives are anything that persuades a person to alter their behaviour in the desired manner. When the incentive is small compared with the intended behaviour change, or there is insufficient money to relieve an actual financial constraint or market failure, it is classified as behaviourally motivated[24].	Pregnant women receive conditional economic incentives, such as childcare packages, baby blankets, vouchers, or gifts, during antenatal care clinics[24-26].
Labelling	Labelling is a technique that encourages spending on health investment goods with long-term benefits[27].	Conditional cash transfers (CCTs) are given to pregnant women or encourage voluntary savings, explicitly labelled for childbirth expenses[27].
Commitment devices	A commitment device is a mechanism that helps individuals carry out plans by imposing negative consequences, such as social or financial sanctions if they do not adhere to them[28].	It encourages women's participation in "locked" savings programs that tie money to specific maternal or child health outcomes[28].
Timing and salience of information	The salience of information refers to the perceived importance of the content of dispersed information. How complex data are presented can help us understand them more effectively[29].	Provide information through trusted sources. Correcting incorrect beliefs, which represent one of the primary challenges in maternal and child healthcare in low-resource settings, can correct false expectations or judgments[29].
Identity priming	Identity priming, which increases the saliency of an individual's gender or race (or another group identity), causes individual behaviour to conform more closely to the norms of the primed identity[30].	They are appealing to women as mothers, rather than as wives, on the impact of utilization of skilled maternity care on their health and the health of their unborn child[30].
Simplification	Simplification is about making salient and clear information visible to individuals around the moment of decision. It can help decision-makers overcome limited attention and status quo bias by lowering the cognitive costs of adopting new information[31].	Simplifying, streamlining, and removing unnecessary steps and requirements during antenatal clinics and childbirth registration can increase the likelihood of women making a healthy decision[31].

helpful in the promotion of healthy lifestyles and improved health outcomes[13]. These behavioural change interventions use insights from behavioural economics, which has gained much momentum among scholars due to its innovative and controversial features in explaining human behaviour. Table 1 lists some behavioural insights in healthcare and brief explanations of their application in maternal healthcare.

Behavioural change interventions affect the design of healthcare interventions in three steps. First, it changes how problems are diagnosed. For example, when parents fail to vaccinate their children, one may be tempted to conclude that these parents do not understand the value of vaccination. They also enable us to consider another possibility or scenario: parents want to vaccinate, and they know the benefits but do not get around to doing it[14]. Second, behavioural change interventions change how solutions to problems are designed. Sometimes, it may suggest that something as simple as a reminder can have an unreasonable impact on behaviour. It suggests a different way to offset one's tendency to plan spending poorly[15].

Finally, it changes how the scope of the problem is defined, as previously overlooked problems may suddenly become interesting ones to solve. For example, Trujillo et al. (2015), in an experiment to gauge policy response to applying behavioural economics to health policy in low and middle-income countries, found a zeal among participants to utilize insights from behavioural economics in designing healthcare policies[16]. Behavioural insights allow describing individual behaviour more realistically by acknowledging the systematic influence that context and cognitive biases have on decisions, and policymakers can also leverage them to address the behavioural drivers of healthcare services utilization.

Several reviews have summarized the evidence on the effectiveness of various forms of interventions to improve maternal and child healthcare in low and lower-middle-income countries. These reviews range in scope and setting and have focused on community-based strategies, integrated primary care, and urban settings. However, most of these reviews were not targeted at behavioural change interventions[32-34]. Given the role of behaviour in utilizing maternal and child healthcare services, it becomes essential to know the effectiveness of behavioural change interventions designed to improve maternal and child healthcare-seeking behaviour in low and lower-middle-income countries[35-37].

This systematic review aims to identify the extent to which behavioural insights have been used in behavioural change interventions designed to improve maternal and child health in low and lower-middle-income countries and to examine the effectiveness of these interventions. It also seeks to identify how non-cognitive and personality characteristics have been implicated in maternal and child healthcare-seeking behaviour in low-resource settings. Finally, we aim to develop a set of practical strategies that could be used to guide future interventions to improve maternal and child health outcomes in low and lower-middle-income countries.

The rest of the paper proceeds as follows: In section 2, we describe the methods, including the eligibility criteria, search strategy, data extraction, and quality assessment of included studies, our study design, empirical strategy, key features of the chosen outcome, explanatory and control variables, along with their measurements; In section 3, we present the findings from the review; In section 4, we discuss the findings more extensively and conclude with some policy recommendations.

Methods

Search strategy

We used the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) methodology for the systematic review[38]. We registered the protocol details for this systematic review on the Prospective Register of Systematic Reviews (PROSPERO-CRD 42020209488). The Problem/Patient/Population, Intervention/Indicator, Comparison, Outcome (PICO) framework was used to define the theme and guide the systematic review of prospective studies examining the effect of behavioural change interventions on maternal and child health-seeking behaviours in low and lower-middle-income countries. From September to December 2022, the research team (JA and FY) reviewed the published studies in peer-reviewed journals on the influence of behavioural change interventions on maternal and child health-seeking behaviour change in low and lower-middle-income

countries. Databases subject to the search included PubMed, Embase, and PsycINFO.

Eligibility criteria

The review was restricted to studies that (i) included pregnant women of childbearing age; (ii) had evaluated interventions related to healthcare-seeking behaviour change; (iii) reported at least one outcome of skilled maternal and child healthcare (e.g., utilization of antenatal care, skilled birth care, postnatal care, neonatal care and vaccination or a combination of any); (iv) published in English and French between 2013 and 2022; (v) conducted in low and lower-middle-income countries (LMICs) following the United Nations classification of countries[39]. Primary empirical studies were included if they related to behavioural change interventions to improve maternal and child health outcomes. Studies that did not separately report outcome data for pregnant women and were conducted in high-income countries, including women from low and lower-middle-income countries, were excluded.

Data source

A baseline search was conducted on Google Scholar to test the sensitivity of preliminarily identified search terms that could be subsequently used to identify relevant papers for the review. Following this, the preselected databases were searched for relevant peer-reviewed papers. Electronic databases, including PUBMED, Embase, and PsycInfo, were systematically searched for journal articles published between January 2013 and December 2022. These databases were chosen for their completeness in health-related research areas. The choice of these ten years from 2013 to 2022 allowed for the inclusion of more recent publications in the review.

With the help of information resource specialists, the search details were designed according to the specifications of each database. Four key concepts, including "maternal health", "behaviour change", "behavioural intervention", and "low resource settings", were combined, and Medical Subject Headings (MeSH), controlled vocabulary, and keywords were used to make the search queries exhaustive. The reference lists of the included studies were cross-checked to identify additional papers of interest. The initial search was conducted between September and December 2022, with an updated search run in October 2023.

Screening

The screening/filtering process involved three stages. These were the screening, data extraction, and data synthesis stages. The articles were first screened by their titles and abstracts. EndNote was used to manage all search results and facilitate the screening process. The research team managed this process. Upon concluding the search of the listed databases, we removed duplicates, and a preliminary sample of 5 percent was drawn out of the publications and screened independently using titles and abstracts only. We did this to assess the convergence of choice of publications for inclusion or exclusion in the review. Using this method, we found convergence in the selection of articles, as there were no discrepancies in the articles drawn from the publication.

We then proceeded to independently select other articles for possible inclusion in the review and held regular discussions to assess the review process. Authors of papers were contacted for further information on methodology and data if their study met the eligibility criteria but needed to give more detail. For this systematic review, empirical studies that assessed the effectiveness of behavioural change interventions for improving maternal and child health and outcomes were included; the intervention itself did not have to focus on both outcomes, but the inclusion of either was required.

Data extraction and synthesis

A purpose-designed Microsoft Excel spreadsheet was used to extract and record data. The research team independently tested the data extraction sheet using a preliminary sample of 10 publications and compared the level of extracted information from the publication. Any discrepancy in extracted data was discussed and resolved by consensus. After that, we completed the data extraction forms for the publications included in the review. The following data points were extracted from each article: author(s), year of publication, study setting, study design, intervention(s), and outcome(s). The information extracted from the studies was qualitatively analyzed and organized into thematic areas on types of behavioural interventions or

strategies used to influence women's behaviour, as presented in Table 2.

Quality assessment

The quality of evidence of included studies was assessed using the Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) approach[40]. The quality of evidence was classified into high, moderate, and low. In the GRADE approach, high quality means that further research is improbable to change the confidence in the estimate of effect; moderate quality indicates that additional research is likely to impact our confidence in the estimation of effect significantly and may change the estimate. Low quality entails further study and is likely to substantially impact our confidence in the effect estimate, which is expected to change the forecast.

Studies were ranked on eight criteria: study design, an adequate description of the intervention, sufficient description of the outcome measures before and after the intervention, a period between the intervention and outcome of more than one year, analysis involving inferential statistics and control of potential confounders, reporting of results, reported positive results, and noted limitations/biases.

The cumulative quality score of each study was converted to a percentage. Scores above 70% were classified as high quality, moderate quality scores were from 50% to 70%, and low-quality scores were below 50%. For the study design, randomized control trials were rated as high quality except where there were inconsistencies in the results and reporting bias; case-control studies, pre-post or before and after without control, were rated moderate; cross-sectional studies using descriptive analyses were rated low. The quality assessment of the reviewed literature is presented in Table 3.

Results

The included studies differed in study design, methods of data collection, type of data collected, and analytical strategies. Thus, the articles were grouped according to similar behavioural change techniques used.

Study selection

The structured literature search resulted in 2131 records in total. After removing duplicates and screening for relevance in the title and abstract, 95 English full-text articles remain. The full texts of these screened records were assessed for their eligibility. Additional records were identified through reference list screening, after which 17 articles were included in the final analysis (Figure 1).

Characteristics of included studies

The 17 studies included were published between 2013 and 2022. Of these, six were conducted in South Asia, six in East Africa, two in Southern Africa, two in West Africa, and one in Western Asia. The three most frequent study designs were randomized controlled trials (RCT), applied in six studies, and quasi-experimental study design, applied in five studies. Other studies used repeated cross-sectional study design (3) and pre- and post-intervention design (3). Improvement in the utilization of maternal and child healthcare services was our primary outcome of interest.

Thus, interventions, strategies, and approaches were assessed to be effective if the reported outcome was statistically significant and resulted in quantified or self-reported improvement in utilizing maternal and child healthcare services. Eleven studies found a significant effect of the behavioural intervention on the desired outcome, three found partially substantial effects, and three did not observe a significant impact. A partial effect was seen in studies in which several behavioural insights or different scenarios were examined, and only one or a few resulted in a significant impact. Within each section of Table 2, publications were organized according to the timing of the intervention (e.g., pregnancy, around the time of childbirth, and after birth). Sample characteristics that were not reported (NR) were indicated. The effectiveness or success of the individual program is listed in the column headed "maternity-related outcomes. There were various focus behaviours across studies, including utilization of antenatal care, knowledge of danger signs during pregnancy, skilled birth care utilization, and neonatal care.

Multiple behavioural insights were used as behavioural change interventions in the identified studies, as shown in Table 3. However, the majority involved timing and salience of information (n = 11), social influences and norms (n = 7), simplification (n = 7), reminders (n = 5), incentives (n = 6), framing (n = 4), and identity priming (n = 3).

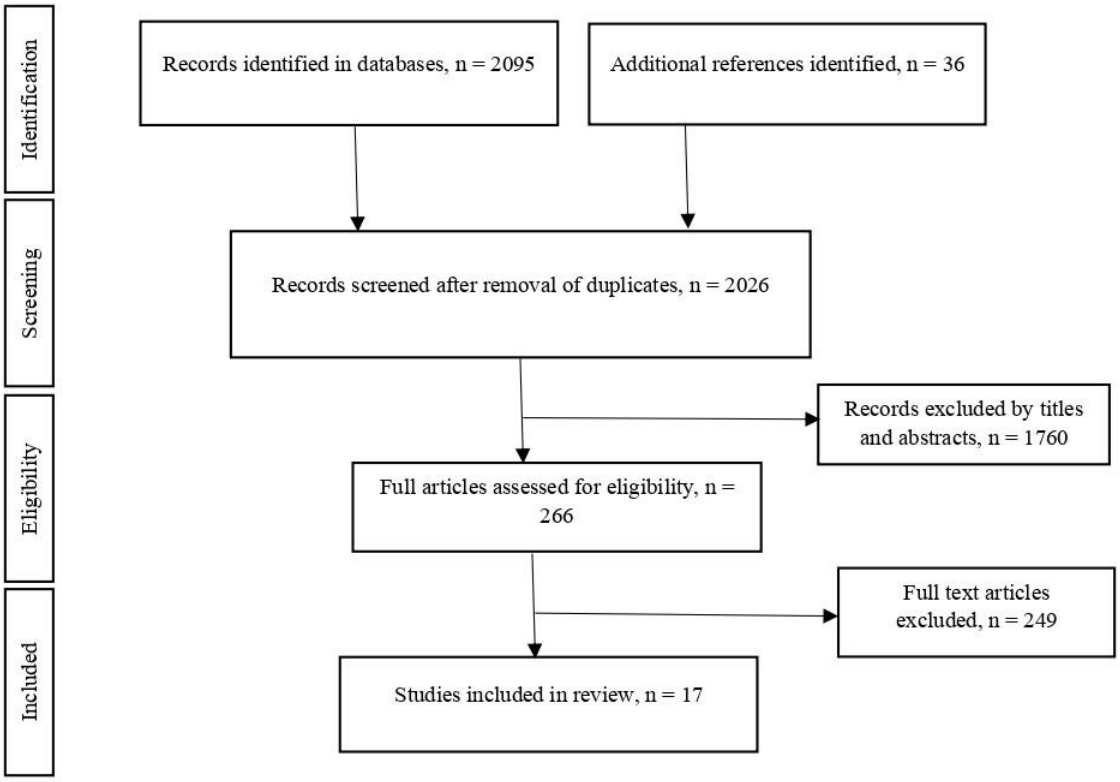


Figure 1: PRISMA flowchart of included studies

Evidence from behavioural change interventions

This review included studies that examined behavioural change interventions and strategies implemented to improve maternal and child healthcare services utilization in low—and lower-middle-income countries. We grouped the studies based on the identified behavioural insights defined earlier in Table 1. The results are presented qualitatively using themes that describe the types of intervention. The interventions and strategies and their outcomes are described under each theme.

Reminders as nudges

Five reviewed studies used reminders as the behaviour change interventions in the targeted population[41-46]. These reminders were short message services (SMS), WhatsApp chats, and telephone calls. These reminders were meant to nudge women in the targeted populations on their healthcare needs or utilize the required healthcare service. Omole *et al*. and Lau *et al*. reported using SMSs tailored to women's pregnancy needs. These SMSs were sent to pregnant women registered at antenatal clinics from the first trimester until six weeks after childbirth[46]. However, while Omole *et al*. reported significant differences between women in the intervention and control groups, Lau *et al*. reported no significant difference between women in the intervention and control groups[43].

Framing effect

Four reviewed studies used the framing effect as the behaviour change intervention[41,47-49]. These involved framing health education messages around the dangers of not using skilled maternity care. Rather than informing women of the benefits of using skilled maternity care, the facilitators of the various intervention projects informed women about the dangers of not using professional care and recognizing danger signs during pregnancy and newborn care. These studies reported significant effects on maternal and child healthcare-seeking behaviour in the targeted populations[47].

References	Population	Study design (sample size)	Target behaviour	Behavioural change technique	Monitoring frequency	Method of intervention delivery	Health-related outcomes
Ardiyanti et al., 2020 (Indonesia)	Pregnant women who had a WhatsApp application, were able to use WhatsApp well and were willing to become respondents.	Quasi-experimental study (n=62)	To improve antenatal visits.	Health promotion messages and materials can be distributed using a WhatsApp group.	Every month, from pregnancy to childbirth.	This material was uploaded to a WhatsApp group. After that, the researcher uploaded a video about the mother's needs during pregnancy.	The highest frequency distribution was from the group that received on-schedule health promotion, as many as 17 (27,4) respondents, and those who were not on schedule, 15 (24,2%) of respondents. The intervention group, with a 36.68 mean rank, was higher than the control group at 26.32.
Ayiasi et al., 2016 (Uganda)	Pregnant women (<28 weeks of gestation) originating from selected villages.	RCT (n=1385)	Health facility delivery, antenatal attendance, birth preparedness, cord and thermal care, and breastfeeding practices.	Intervention package visits by Village Health Teams (VHTs), Organized women's groups, Phone consultations, Health education messages.	Three home visits were planned: The first was conducted soon after enrolment, the second was four weeks late, and the third was scheduled within three days of the baby's delivery.	Village health teams discussed two topics: general care and facility-based childbirth. The second visit required VHTs to discuss birth preparation.	Attending four antenatal care visits was similar in the control and intervention arms (39% and 37%, respectively). Facility-based childbirth was three times higher among interventions compared with the control arm (87% and 28%, respectively)
Baba-Ari et al., (2017). (Nigeria)	Pregnant women.	Qualitative study (n=12)	Utilization of antenatal care, skilled birth attendants (SBA), postnatal and newborn care.	Conditional cash transfers.	NR	Monthly financial incentives to encourage women to receive maternal, newborn, and child healthcare services, from antenatal care to skilled birth care and postnatal care for mothers and newborns.	Cash transfers needed to be a sufficient incentive for the project's non-beneficiaries to use maternal and child healthcare services.
Cohen et al., 2017 (Kenya)	Pregnant women that were within	RCT (n=418)	Utilization of skilled birth care.	Labelled cash transfers.	NR	Pregnant women in the intervention group were	Labelled cash transfers had fewer measured

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	5 and 7 months of gestation.					given 1,000 Kenyan shillings labelled with the message, "*This is intended to help you deliver in the facility where you want to deliver*".	benefits. Even with cash transfers, many women still used poor-quality healthcare facilities.
Dhital et al., 2019 (Nepal)	Women who had a child in the previous 12 months.	Quasi-experimental study (n=364)	Awareness of danger signs during pregnancy, childbirth, and newborns. Healthcare-seeking behaviours such as attending at least four ANC sessions and having an institutional delivery were also included.	Rebuilding the health system and improving healthcare-seeking behaviours through a participatory approach involving the local community stakeholders and resources.	They held monthly mothers' group meetings and made follow-up visits to households to discuss maternal, newborn, and child health (MNCH)- related health-seeking behaviour with mothers and support them in accessing the recommended services.	One local health promoter (a nurse, health assistant, or auxiliary nursing midwife) for each village development committee trained them and built their capacity as health educators to empower the mothers' groups in the community. These meetings aimed to improve the knowledge and behaviours of mothers to embrace seeking timely care during pregnancy and childbirth.	The post-intervention group was more likely to know at least three danger signs in pregnancy, at least three in childbirth, and at least five in newborns than the pre-intervention group. Childbearing women in the post-intervention group were also more likely ever to attend ANC, attend a minimum of four ANC sessions, and have institutional deliveries.
Hazra et al., 2020 (India)	Women who were currently married, 15– 49 years of age, had given birth in the 12 months before the survey.	Quasi-experimental study (n=8865)	Improving the utilization of antenatal care, skilled birth care, postnatal care, contraceptive use, cord care, skin-to-skin care, and breastfeeding practices.	Dissemination of maternal and child health information in self-help group (SHG) meetings by trained educators to encourage building community norms for behaviour change through a set of community-building activities, including	Meetings were held on weekly and monthly basis.	SHGs selected one member as a community health volunteer to work as a peer educator. The chosen members (Swasthya Sakhi) were trained on critical maternal and newborn health behaviour. Each Swasthya Sakhi, in a weekly monthly	The net improvements (5–11 percentage points) in correct MNCH practices were significant in the intervention areas.

References	Population	Study design (sample size)	Target behaviour	Behavioural change technique	Monitoring frequency	Method of intervention delivery	Health-related outcomes
				home visits, community events with active facilitation and arrangement by volunteers, and the use of audiovisual aids such as health videos.		meeting, provided information on healthy practices, encouraged SHG members to participate in the discussion, and stressed the importance of those correct practices to save mothers and children.	
Yitayal et al., (2014). (Ethiopia)	Women between the ages of 15 and 49 had at least one child under five.	Community-based cross-sectional study (n=1320)	Improving the utilization of family planning, antenatal care (ANC), skilled birth attendant (SBA), postnatal care (PNC), and child healthcare services.	Health education programs, family health card pictorial education booklet, and training in health lifestyles and recognition of "model" families.	Frequent visits by health education workers and health extension workers (HEW).	Participatory community quality improvement, a community solutions fund, and non-financial incentives for health programs. The 'model family' training includes more in-depth information on maternal, newborn, and child health care practice. Families or households that adopted 75% of the healthy practices are said to 'graduate' as a 'model family' household.	Mothers who had frequent household visits by HEW were 1.3 times more likely to visit the health posts than mothers who did not get frequent visits. Mothers from model households were 2.4 times more likely to visit health posts than mothers from non-model households. Mothers who felt they understood the Health Extension Program packages were 1.6 times more likely to visit the health posts than mothers who did not feel they understood them.
Kaufman et al., (2017). (Tanzania)	ANC and postnatal care attendees who were at least 18 years old and pregnant or delivered a baby within the past	Post-hoc evaluation (n=1708)	Individual birth planning, timely attendance, and giving birth in a healthcare facility	Media (News and Print) Messages were communicated through radio and television (TV) spots, billboards, magazine articles and advertisements, and various health facilities	TV slots were aired on six stations with a frequency of three television spots per station per day. Radio spots were aired on nineteen national and regional radio	Interventions were depicted in scenarios where characters representative of the target audience—and their larger communities—engaged in the health behaviours	Over one-third of the women interviewed reported an awareness of the campaign last month. The more varied the sources from which women reportedly heard the Wazazi Nipendeni

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	six months of the study.			and promotional material. TV spots focused on malaria prevention in pregnancy.	stations with a frequency of 4 to 12 per day. Branded materials with Wazazi Nipendeni messages, such as T-shirts, bags, and bumper stickers, were distributed at community events in each region. All materials also promoted a short message service (SMS) platform that allowed women, birth supporters, and others interested in safe motherhood practices to receive complimentary text messages with information and reminders.	of interest, thereby increasing their self- and collective efficacy in performing these actions.	message, the more they planned toward the birth of their child. More significant exposure to the Wazazi Nipendeni message was associated with increased ANC visits. Being exposed to the intervention did not significantly predict the timing of the first antenatal care visit or HIV testing. However, findings showed that awareness of the intervention did predict whether women had facility-based childbirth and whether they tested for HIV with their partner.
Khan et al., 2015 (Uganda)	Pregnant women over eighteen from selected villages were enrolled in the study when they presented for antenatal care.	RCT (n=676)	Three or more antenatal care visits (versus less than three visits) and delivery in a health facility (yes or no).	Cash transfers.	NR	6-8 visits of 30 minutes each	The number of women with three or more antenatal care visits was 23%, which differed across randomization groups. Overall, the % of women with facility-based childbirths was 70%, which differed across randomization groups in unadjusted analysis.

References	Population	Study design (sample size)	Target behaviour	Behavioural change technique	Monitoring frequency	Method of intervention delivery	Health-related outcomes
Lau et al., 2014 (South Africa)	Pregnant women: (i) having their first antenatal clinic visit at the healthcare facility, (ii) being over 18 years old, (iii) having access to a cellphone with a registered SIM card.	Controlled clinical trial (n=206)	To increase knowledge of antenatal care, short text messages will be sent to explain clinic procedures during antenatal visits and how to remain healthy during pregnancy.	Short message service.	SMSs were sent three to four times a week.	During the recruitment phase, trained fieldworkers handed out an information pamphlet explaining the purpose of the study in the three local languages: Xhosa, English, and Afrikaans. Based on the ascertained information, a list of SMSs was created in English. As health information needed by pregnant women differs by trimester, the SMSs were also tailored according to trimester.	There was no significant difference between the control and intervention groups in the nine knowledge questions at the exit.
McConnell et al., 2018 (Kenya)	Pregnant women between 18 and 40 years old who attend antenatal care and can provide a valid phone number for contact.	RCT (n=686)	Use of modern contraceptive methods at nearly three months and six months after the expected delivery date.	Vouchers, short message services, counselling, and educational materials.	Follow-up surveys were conducted by phone at various intervals during pregnancy and after childbirth.	Participants received varied educational materials on family planning, pregnancy, birth, and postpartum. Women also received counselling on newborns and were given family planning vouchers.	Combining the standard voucher with an SMS reminder resulted in a 25% increase in the probability of reporting the utilization of a modern contraceptive method by women in the intervention group.
Omole et al., 2016 (Nigeria)	Pregnant women who owned mobile phones and attended antenatal clinics in healthcare facilities were randomly selected.	Experimental study (n=508)	Antenatal care and skilled delivery care.	Short message services.	From pregnancy up to 6 weeks after delivery.	SMSs were sent to study participants at different stages of their pregnancy (from the first to the third trimester). Messages for the intervention group included pregnancy-related information such as birth preparedness,	Between the index pregnancy and their last pregnancies, both groups recorded an increase in the rates of facility-based childbirths, with a higher percentage increase in the intervention group

References	Population	Study design (sample size)	Target behaviour	Behavioural change technique	Monitoring frequency	Method of intervention delivery	Health-related outcomes
						complication readiness, and reminders of antenatal visits.	compared to the control group (29% and 13%, respectively).
Rasouli et al., 2016 (Iran)	First-time pregnant women.	RCT (n=230)	Skilled birth care.	Motivational interviews, lectures.	There were eight sessions of a childbirth preparation class. Each session lasted 120 minutes and was conducted by the researcher once a week.	Qualified midwives asked the participants to complete the questionnaire. The women in the motivational interview group consisted of eight groups of eight to twelve individuals, and each group received two sessions of group motivational interviewing.	More than 90% of women in the motivational interviewing group attended the childbirth preparatory classes. Participation in the lecture and the control groups were 59.7% and 27.3%, respectively. The intervention groups had the probability of natural delivery compared with the control group.
Mozumdar et al., 2018 (India)	Ever-married women (15 – 49 years).	Quasi-experimental panel study (n=470)	Knowledge of modern methods of contraceptives, facility-based childbirth, and encouraging the breastfeeding of newborns.	Women self-help groups.	Members of the SHGs usually met four times a month.	The intervention comprised approximately 30 minutes of discussion on having a healthy family, and related behavioural change messaging was planned for one or two monthly meetings. SHG members were encouraged to share maternal and newborn caregiving information with other household members.	Women in the intervention arm showed a significant increase in their level of awareness over time for the following indicators: the importance of antenatal care check-ups, danger signs during pregnancy, danger signs for a newborn child, delayed bathing of more than 48 hours after delivery, kangaroo mother or skin-to-skin care, and return of fertility after childbirth.

References	Population	Study design (sample size)	Target behaviour	Behavioural change technique	Monitoring frequency	Method of intervention delivery	Health-related outcomes
Sharma et al., 2016 (Nepal)	Women of childbearing age who had their last child within two years of the study.	Repeated cross-sectional study (n=1,236)	Antenatal care visits, skilled birth attendance, and facility-based childbirth.	Participatory activities, such as role-playing and visual cards, were conducted on antenatal care utilization, awareness of danger signs in pregnancy, facility-based childbirth, and postnatal care.	The intervention consisted of twenty-four sessions of health promotion, each one lasting one hour.	Two health promotors, an auxiliary nurse midwife and a community health assistant, established and facilitated the women's group. Once the intervention was implemented, its groups met regularly (monthly) for health promotion activities.	The intervention increased women's likelihood of attending antenatal care clinics at least once during pregnancy by seven times and of seeking four or more antenatal care visits two times, although not significantly.
Villadsen et al., 2016 (Ethiopia)	All women who had given birth within the previous 12 months	Effectiveness study (n=1,357)	Antenatal care, improved breastfeeding practices, and child health checks.	Health education, pamphlets, pictorial representation.	NR	Health education materials were initially a folder based on seminars with health professionals. Health professionals used the folder to aid in structuring the topic and gave the folders to the women at the first ANC visit. The intention was to facilitate communication between women and their network at home regarding health behaviours and healthcare seeking.	The intervention had positive effects on breastfeeding practices and preventive infant health checks. It did not affect infant immunization coverage and negatively impacted several antenatal visits. Women's education modified the effect on various health outcomes, and the results indicate increased facility-based childbirth and breastfeeding practices among women with no education.
Zamawe et al., 2016 (Malawi)	Women of reproductive age (15–49 years) who gave birth or were pregnant within 12 months	Cross-sectional study (n=3,825)	Utilization of maternal health care services (antenatal care services, use of mosquito bed nets	Mass media campaign (Radio).	NR	Discussions with selected panel members, community discussions, drama/role-play, and folklore songs. Selected members of the	The probability of using contraceptives, sleeping under mosquito bed nets, utilizing antenatal care services, and utilizing postnatal care

References	Population	Study design (sample size)	Target behaviour	Behavioural change technique	Monitoring frequency	Method of intervention delivery	Health-related outcomes
	after the implementation of the campaign.		to prevent malaria during pregnancy, facility-based childbirth delivery, utilization of postnatal care services, and use of a modern form of contraceptive).			women's groups developed and facilitated the radio programs with the technical support of the project managers and the community-based radio station. The communities initiated radio listening clubs, where women listened to the program in groups and discussed the key messages afterward.	services was significantly higher among women who were exposed to the media campaign of the intervention when compared to those who were not exposed. No significant association was found between facility-based childbirth and exposure to the media campaign.

Note: ANC = Antenatal care; HEW = Health extension worker; HIV = Human immune-deficiency virus; MNCH = Maternal, newborn and child health; NR = Not reported; PNC = Postnatal care; RCT = Randomized controlled trial; SBA = Skilled birth attendants; SHG = Self-Help Groups; SMS = Short Messaging Service; TV = Television

Table 3: Behavioural insights used in the behavioural change interventions

References	Reminders	Framing	Social influences	Incentives	Labelling	Timing/salience of information	Identity priming	Simplification	Quality of included studies
Ardiyanti et al., 2020	✓					✓		✓	Moderate
Ayiasi et al., 2016			✓			✓	✓		High
Baba-Ari et al., 2017				✓					Low
Cohen et al., 2017				✓	✓				High
Dhital et al., 2019		✓				✓			Moderate
Hazra et al., 2020		✓	✓			✓	✓	✓	Moderate
Yitayal et al., 2014			✓			✓		✓	Moderate
Kaufman et al., 2017	✓	✓	✓	✓		✓		✓	Moderate
Khan et al., 2015				✓					High
Lau et al., 2014	✓								High
McConnell et al., 2018	✓			✓		✓			High
Omole et al., 2016	✓								High
Rasouli et al., 2016		✓				✓			High
Mozumdar et al., 2018			✓				✓		Moderate
Sharma et al., 2016			✓	✓		✓		✓	Moderate
Villadsen et al., 2016						✓		✓	Moderate
Zamawe et al., 2016			✓			✓		✓	Moderate

Social influence and social norms

Building supportive social networks (family and friends) was part of the behavioural change intervention used in seven studies[41,46,48-51]. Most of the studies either created or used the platforms of existing women's self-help groups to deliver behavioural change interventions. For example, Mozumdar *et al*. and Yitayal *et al*. channelled their interventions through self-help groups of women selected from 'model family' households[50, 51]. These were women who were held in high esteem in society. These women were trained as role models for other women and educated these women on the need to ensure safe pregnancies and childbirth practice. Pregnant women were also taught social skills through program modules[49, 50]. Similarly, Hazra *et al*. utilized self-help groups where healthcare professionals had trained women to encourage pregnant women to attend antenatal clinics. Women in the groups celebrated pregnancies, childbirth, and successful breast-feeding[46].

Incentives

Six reviewed studies used incentives (financial and economic) as behavioural change interventions[41,43,51,53-55]. Four of the studies used financial incentives in the form of conditional cash transfers as a behaviour change intervention, with one of the studies adding a label to the cash transfer[41,43,51,55]. Another study gave women vouchers to help pay for contraceptives to improve the uptake of family planning methods in the study population[43]. Three of the studies used other economic incentives, such as giving women baby blankets to encourage them to attend antenatal clinics and providing women with t-shirts, bags, and stickers on which health promotion materials had been printed[41,50,55].

Of the studies that used a form of financial incentive, three found no effects on maternal health-seeking behaviour, while one saw a partial effect. However, the studies that used economic incentives as a behaviour change intervention found significant effects on improving maternal healthcare-seeking behaviour.

Timing and salience of information

Eleven of the included studies examined the effect of timing and salience of information options to influence the utilization of maternal and child healthcare services[40,41,43,45-49,51,52,54]. These interventions were delivered to childbearing women in the various study areas through health education, educational materials and message dissemination, and health awareness campaigns[40,45,48]. Two studies focused on the effect of health promotion messages on antenatal care attendance and ensuring the importance of meeting the required number of attendances[45,46]. Another study reported findings on using organized educational messages and materials to educate women on using skilled birth care[47]. Other studies targeted all maternal and child healthcare outcome variables. They reported comprehensive dissemination of health information on the importance of attending antenatal care, utilizing skilled birth attendants' services, having regular postnatal checks, and ensuring adequate breastfeeding practices to promote the health of newborns[48-50].

Identity priming

Three of the reviewed studies reported using elements of identity priming as behaviour change interventions[46,48,50]. These involved organizing activities where participating women could be celebrated as mothers, thus priming their 'motherhood' identities. For example, Hazra *et al*. reported that women who participated in the behavioural change intervention were trained to be cause-oriented and promulgated values and ideologies that enhanced their sense of identity[46].

Simplification

Seven studies used simplification as a behavioural change intervention in the targeted population of interest[40,41,46,49,51,52,54]. The simplified interventions included role-playing, pictorial representations, billboards, and pamphlets depicting images of successful pregnancies and childbirth to encourage pregnant women to use skilled maternal and child healthcare services. For example, Zamawe *et al*. and Kaufman *et al*. reported a significant change in

maternal healthcare-seeking behaviour with the use of short films, billboards, and branded materials such as t-shirts, bags, and stickers depicting desirable maternal healthcare behaviour[52,41]. Similarly, Yitayal *et al*. and Villadsen *et al*. regularly distributed pamphlets, visual cards, and other pictorial representations addressing specific maternal and child healthcare needs to women attending antenatal care clinics in the targeted populations[50,55]. Sharma *et al*. reported a significant change in the healthcare-seeking behaviour of childbearing women in the targeted population when they were engaged in participatory activities, including role-playing[55].

Discussion

This review explored how behavioural insights have been applied as behavioural change interventions to achieve better maternal and child healthcare-seeking behaviours and positive health outcomes in low and lower-middle-income countries. The behavioural change interventions during maternity care varied widely. Some interventions were tailored to a single health issue, e.g., attaining the minimum required number of antenatal care attendance or ensuring institutional childbirths, while others were applied more broadly. The studies selected for this review focused on maternal and child health-related behaviours that could lead to maternal and neonatal morbidity and mortality.

We identified 17 studies, with intervention components divided into reminders, framing effect, social influences, use of incentives, timing and salience of information, identity priming, and simplification. Four (4) interventions were single components, and thirteen (13) were multicomponent. Most interventions in this review combined behavioural insights into initiatives that reduced institutional utilization barriers (e.g., financial incentives), mass media campaigns, health education, women's self-help groups, and community outreach. The behavioural change interventions showed varying levels of success, with all but three studies reporting significant improvements in maternal and child health outcomes. Due to the multi-component nature of most of the interventions, it took much work to say which elements were most effective or determine each intervention's effect size. However, it was noticed that interventions that used financial incentives either reported no or partial effects in improving maternal and child healthcare-seeking behaviour.

Findings from this review revealed that education had been the dominant approach to changing women's health behaviour during pregnancy. Many studies incorporated health education and health awareness as components of behavioural change intervention. These interventions were also delivered at the time most appropriate to the recipient. These findings showed that it is pivotal to support people in learning to protect and improve their health (i.e., acquiring high health literacy). An emphasis on staying healthy in health research and day-to-day practice in healthcare leads to beneficial health-related outcomes. In other words, health promotion through the empowerment of pregnant women could have long-lasting positive impacts on family health.

Social influences were another practical way through which behavioural change interventions were delivered. In this review, we found that social influences and norms on healthy childbearing and childcare, propagated by women's self-help groups, recorded significant improvements in maternal and child healthcare-seeking behaviour within the targeted population. The behaviour change community has long harnessed social norms interventions to improve decision-making. Social influence could also explain how an individual's behaviour compares to the behaviour of a peer. While behavioural economics does not offer a magic formula for improving decision-making by women, households, and health providers, it does offer insights into why and how social norms and pressure influence our choices. However, compared to other behaviourally informed interventions, those that leverage social norms should be designed more carefully, given that individuals might draw different inferences based on the information provided[15].

The role of nudges in the form of reminders, short message services, and phone calls as behaviour change interventions to improve maternal and child healthcare-seeking behaviour was emphasized in this review. Behavioural economists' defence of small interventions called nudges draws on the view that actual people are boundedly rational and often make decisions against a particular background or choice architecture that may prevent them from

choosing what is in their best interest. The role of nudging is to change the choice architecture to overcome people's cognitive errors and, therefore, change their judgment and decision-making. In this sense, nudging is a soft paternalistic intervention that preserves freedom of choice. From a behavioural perspective, nudges are seen as antecedents of target behaviours presented by the environment. They represent the setting conditions of a choice or decision and its consequent course of action.

These consequences may be reinforcing or punishing but may not necessarily be intended as superimposed or artificial. Therefore, policymakers need to be open to involving behavioural experts when interventions to improve maternal and child health outcomes are first designed and when experiments on existing programs are conducted. Embedding innovation into the intervention design process leads to designs that have a greater chance of success than if we proceeded to test the first feasible and reasonable set of ideas about solving a problem.

Another objective of this review was to suggest practical ways to encourage maternal and child healthcare-seeking behaviour in low and lower-middle-income countries. Although the most frequently used behavioural change intervention in low and lower-middle-income countries was health education, available facts should make it very clear that changing individual behaviour is not dependent on education and information alone, regardless of how persuasive the message is, how credible the individual or medium that delivers it is, or how appropriate its theoretical basis is. Interventions designed to change maternal and child healthcare-seeking behaviours in low-resource settings should use a multifaceted approach. They should focus both on individual-level and system-level factors. To enhance the effectiveness of health information, we recommend the removal or at least reduction of financial or health system barriers to the utilization of maternal and child healthcare services and the enforcement of reasonable legislation and regulation that require reproductive-age women to "do the right thing" with regards to the utilization of maternal and child healthcare services in low-resource settings.

A significant gap identified in the literature was the lack of studies reporting the impact of behavioural change interventions on women's non-cognitive and personality characteristics, as recent evidence suggests the importance of these factors in maternal and child healthcare-seeking behaviour in low-resource settings. While acknowledging research that has substantiated the stability of non-cognitive and personality characteristics in adulthood, a deeper understanding of the links between behaviour and personality is the first step toward achieving transformative self-care that reflects an individual's healthcare-seeking behaviour[56]. Psychology experts opine that a persistent positive change in small measures might lead to long-term transformations in an individual's non-cognitive and personality characteristics[57]. Drawing from this, healthcare policymakers in low-resource settings should consistently use behavioural change interventions that have shown high levels of effectiveness, such as social influence through norms and nudging through short text messages and reminders in the design of interventions aimed at improving maternal and child health outcomes in low- and lower-middle-income countries.

Strengths and Limitations

This literature review provides an overview of available evidence regarding the applications of behavioural insights as behavioural change interventions for influencing maternal and child healthcare-seeking behaviour in low—and lower-middle-income countries. A systematic approach was based on a predefined search protocol using broad search terms—this way, as much of the existing evidence in the scientific literature as possible could be identified.

One limitation of this review is restricting our search strategy to three electronic databases using selected keywords and phrases. Though every effort was taken to include all relevant articles, there remains the possibility that a potentially helpful title/abstract should have been included. However, since we used primary medicine and health-related databases and a wide range of keywords and phrases, our review is likely to have included the most relevant publications. This review included low- and lower-middle-income countries from various regions, which vary significantly in culture and healthcare infrastructure. These regions are not homogenous, so findings may only apply to some low- and lower-middle-income countries.

Conclusion

Addressing the healthcare needs of childbearing women in low-resource settings requires multiple intersecting approaches. It requires a commitment to ensuring effective and efficient healthcare systems that provide quality and responsive healthcare services adapted to meet women's and children's needs. To achieve this, we make recommendations to the governments and relevant healthcare stakeholders in low- and lower-middle-income countries to be actively engaged in developing policies and strategies to improve maternal health outcomes. Strengthening the human dimensions of the quality of healthcare services rendered to women utilizing skilled birth care will help to build trust and confidence in interactions between women and healthcare professionals, which might prompt more women to use available healthcare services. The growing field of behavioural economics has collected robust evidence that human agency might not be constrained only by laws, contracts, and institutions but by individuals' perception of decision tasks, default rules, self-control problems, power of inertia, and particular incentives. Behavioural change interventions are critical in improving health and healthcare by taking advantage of insights into how people behave and translating that into policy interventions. Combining practical behavioural insights, such as social influence, framing, and reminders, in behavioural change interventions might prompt successful policy approaches to improve maternal and child healthcare-seeking behaviours. By considering the use of practical and effective behavioural insights in the design of maternal and child health interventions, it is hoped that significant improvements might be made in ensuring adequate utilization of maternal and child healthcare services, particularly in low— and lower-middle-income countries.

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Authors' contributions

JA and ST conceptualized the study and developed the protocol. JA and FY conducted database searches and extracted and collated the data. JA and ST assessed the quality of the review findings, and JA wrote the first draft of the manuscript. ST provided technical and methodological feedback throughout the review process and assisted in writing the final manuscript. All authors read and approved the final manuscript.

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Competing interests

The authors declare that they have no competing interests.

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