Assessment of interventions in Primary Health Care for improved maternal, new-born and child health in sub-Saharan Africa: A systematic review

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Abstract

Primary health care (PHC) holds great potential to improve maternal, new-born and child health (MNCH) outcomes. Meanwhile, there has been limited documentation of its effect on increasing universal access to maternal, new-born and child health services in sub-Saharan Africa. Also, not adequately known are the most effective interventions to improve the delivery of PHC services in the region. We conducted a systematic review of empirical evidence and interventions at the primary health care level for effective delivery of MNCH care in sub-Saharan Africa. Using terms related to primary health care and MNCH, we searched African Journals Online (AJOL), PubMed/Medline, Popline, ScienceDirect, Google Scholar, WHO Repository (IRIS), Directory of Open Access Journals (DOAJ), Cochrane Library and reference lists for studies published in English between 2000 and 2017. Studies were included in the search if they reported interventions, and strategies implemented to improve quality and access to primary health care for maternal, new-born and child health in sub-Saharan Africa. A total of 25 studies were included in the review. Effective interventions included financial incentives, task-shifting, community-directed engagements, training of providers, mobile health, cost-sharing and supportive supervision among others. The results documented in these studies indicate that effective delivery of primary health care will significantly improve maternal, new-born and child health in sub-Saharan Africa. However, strategies to scale and sustain the successes need to be in place. The protocol was registered on Prospero (Registration number CRD42019126029).

Introduction

The high rate of maternal, neonatal and child mortality continues to be a major public health concern in many sub-Saharan African countries [1, 2]. For instance, the highest estimated maternal mortality ratio (MMR) worldwide is in Sierra Leone (1360/100000 live births), and 18 other countries in sub-Saharan Africa are estimated to have very high MMR ranging from 500 to 999 [3]. Weak health systems made worse by conflicts, disasters, and forced displacement among other factors in the region increases exposure to the risk of death for mothers and children. Many of these deaths occur in hard-to-reach and underserved rural communities in the region, especially in illiterate and poorly educated women [4, 5]. It is increasingly evident that poor access to quality health care by socially disadvantaged women is at the root of the high rate of maternal and child mortality in many parts of sub-Saharan Africa. Evidence from Demographic and Health Surveys in sub-Saharan African countries suggests that a high proportion of pregnant women who have no formal education and those with only primary-level education deliver with unskilled traditional birth attendants rather than with skilled attendants in the formal health system, exposing them to higher risks of maternal and neonatal morbidity and mortality [6].

To address this, the World Health Organization has recommended Primary Health Care (PHC) as capable of increasing women's access to the level of care needed to attend to the majority of the minor conditions that lead to avoidable maternal, new-born and child morbidity and mortality [7]. Primary health care is a form of accessible, affordable and effective health care that enables citizens to enter the formal health system to receive evidence-based promotive, preventive and curative care necessary to avert morbidity and mortality. It includes at least the education of women relating to prevailing health problems and the methods of preventing and controlling them; promotion of food supply and proper nutrition; an adequate supply of safe water and basic sanitation; maternal and child health care, including family planning; immunization against the major infectious diseases; prevention and control of locally endemic diseases; appropriate treatment of common diseases and injuries; and the provision of essential drugs. Consequently, most countries in sub-Saharan Africa have adopted PHC as the

foundation of their health care systems in efforts to reach the most vulnerable persons [8]. A country like Ethiopia has made impressive progress in providing primary health care across the country, particularly to rural communities through an elaborate health extension programme with notable impact on maternal and child health [9, 10]. In the Gambia, Hill *et. al* [11] documented evidence of significant decline in childhood mortality in communities with a primary health care facility compared to communities without a PHC in the 1980s. However, the gain in childhood mortality in the Gambia waned when PHC programme began to receive reduced governmental support after 1994. Nigeria recently revitalized its PHC approach by recommending the creation of Primary Health Care Development Agencies in its 36 States and identifying nine indicators to measure their successful performances [12, 13]. The policy referred to as “Primary Health Care Under One Roof (PHCUOR)“, if well implemented promises to strongly position PHC for effective delivery of maternal and child health care to under-served communities in Nigeria.

However, despite the promise of PHC, there has been limited documentation of its effectiveness in improving maternal, new-born and child health in sub-Saharan Africa, a region with the highest burden of maternal and child mortality and morbidity. Also, not adequately known are the best approaches for developing and implementing policies on PHC to enable them respond to the health needs of women and children. However, a few systematic reviews have been conducted on best practices in effective PHC delivery in sub-Saharan Africa but they are limited in focus. For instance, Christopher et al [14] reviewed studies on the effectiveness of Community Health Workers in sub-Saharan Africa. Their study was limited in its coverage, focusing only on child health and on three countries in the region (Gambia, Ghana and Benin).

Therefore, through a review of the existing literature, we specifically focused on how effective primary health care has been positioned using different interventions to improve maternal, new-born and child health care, including family planning and the prevention of related morbidity and mortality in sub-Saharan Africa. We solicited information on community, outreach and facility-based interventions, strategies and approaches that have been applied to improve access and quality of services for MNCH at the primary health care level. We believe this review of existing studies will be useful for developing policies and programmes for improving the quality of delivery of primary maternal and child health services in the region.

Methods

Search Strategy

The Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) statement was followed in conducting this review and the protocol was registered on Prospero (Registration number CRD42019126029). The search for literature targeted peer reviewed and published journal articles. We searched bibliographic databases including African Journals Online (AJOL), PubMed/Medline, Popline, ScienceDirect, Google Scholar, WHO Repository (IRIS), Directory of Open Access Journals (DOAJ), and Cochrane Library. Also, searched were reference lists of relevant systematic reviews and other articles. Keywords used in the systematic search of the literature included key words drawn from the WHO recommended interventions for pregnancy, childbirth, postpartum, new-born, infant and child care and family planning at the community and first-level facility [2]. Also included were synonyms and Medical subject Headings (MeSH) of each database (Medline/PubMed).

Inclusion Criteria

The evidence for this review was drawn from intervention studies that were PHC facility-based, community-based and related to the functions of a PHC, with outcomes designed to improve quality and access to PHC services for maternal, new-born and child health care. Quality of service was defined in terms of improvement in self-reported or otherwise tested competence of providers in providing PHC functions for MNCH. Access was defined as improvement in utilization of PHC facility, community and outreach services by women for MNCH. Studies were included if they used quantitative design, were written in English, conducted in sub-Saharan Africa between 2000 and 2018 and published in a peer-reviewed journal. The review was limited to 2000 and 2018 in order to assess the progress made in sub-Saharan Africa in achieving health for all through primary health care before the Alma Ata deadline in 2000 and efforts made toward the attainment of the Millennium Development Goals. The initial search using the various terms generated 2055 articles (Figure 1). After removing duplicates, 119 potentially relevant articles were retrieved for full-text review and 25 met our inclusion criteria. Articles were retrieved and screened by two authors (LFCN and SA).

Data extraction, synthesis and analysis

Using a data extraction form we extracted the following information from each study: authors, date of publication, setting, data source, research design, intervention/strategy implemented, follow-up period, desired outcome measured, and major findings. The information extracted from the studies were qualitatively analysed and organized into thematic areas on types of interventions or strategies for improved quality of care and utilization of primary health care services. Improvement in quality and access to PHC for MNCH care was our primary outcome of interest. Thus, interventions, strategies and approaches were assessed to be effective if the reported outcome was statistically significant, resulted in quantified or self-reported improvement in quality of care provided and in utilization of services for MNCH care.

An assessment of the quality of evidence was conducted using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach [15, 16]. Quality of evidence was classified into high, moderate, low. In the GRADE approach high quality means that further research is very unlikely to change the confidence in the estimate of effect; Moderate quality indicates further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate Low quality—Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate Studies were ranked on a scale of 3–1 (3 = high quality, 2 = moderate quality and 1 is low quality) on eight criteria: Study design, adequate description of the intervention, adequate description of the outcome measures before and after intervention, period between the intervention and outcome more than one year, analysis involved inferential statistics and control of potential confounders, results clearly reported, reported positive results, and limitations/biases reported. The highest obtainable score was 24. The cumulative quality score of each study was converted to percentage. Scores ≥ 70% was classified as high quality (3), medium quality score was from 50% to < 70% (2), and low-quality score if < 50% (1). With respect to study design, randomized control trials were rated as high quality except where there are inconsistencies in the results, and reporting bias, case-control studies, pre-post or before and after without control, were rated moderate, cross sectional and descriptive studies were rated low. Summary of the reviewed literature is presented in Table 1.

Fig 1: Flow diagram of study selection according to PRISMA Flow Chart

Results

The included studies differed in terms of study design, method of data collection, type of data collected and analytical strategies. Thus, the articles were grouped according to similar interventions for narrative synthesis.

Characteristics of the included studies

The included articles are relatively a good representation of studies across sub-Saharan Africa as the studies covered all the regions except Central Africa. Studies from Eastern Africa were the highest (n = 12): Tanzania [17–22], Rwanda [23, 24], Ethiopia [25, 26], Kenya [27] and Uganda [28]. There were five studies from Southern Africa: South Africa [29–31], Malawi [32], and Zimbabwe[33]. Studies conducted in Western Africa were 9: Nigeria [24, 34–38], Burkina Faso [39], Senegal [40], and Ghana [41]. The majority of the studies used quasi-experimental designs (n = 16); seven studies were cluster/community randomized trials, and three were prospective studies that engaged descriptive and mixed methods. The subject in three studies was financial incentives in the form of results-based payments, conditional and unconditional cash transfers. One study evaluated the effect of increasing the number of facility-based providers; another one study evaluated task-shifting. Community-directed interventions were the subject of 10 studies, and in some cases the community-based interventions were implemented with improvements in facility-based activities. In three studies, interventions were focused on upgrading the skills of facility-based providers but in one of the three studies, a community-based intervention was also implemented alongside providers' training. Other themes were mobile health (n = 3), cost-sharing (n = 1), introduction of a sub-specialty (n = 1) and supportive supervision (n = 3). Assessment of the quality of evidence showed that 15 studies were of high quality (≥70%), particularly the randomised control trials, 11 were assessed moderate in quality of evidence and none was of low quality.

Interventions and their effect on maternal, new-born and child health

Included in this review were studies that examined facility and community-based interventions and strategies implemented to improve the quality of care and utilization of primary health care services for maternal, new-born and child health in sub-Saharan Africa. The results are presented qualitatively using themes that describe the types of intervention. The interventions and strategies and their outcomes were described under each theme.

Financial Intervention

Financial incentives in forms of payment for performance and conditional and unconditional cash transfers to households and women increased the quality of care and access to primary health care facilities for MNCH preventive and curative services, albeit there were variations across the different outcome indicators. For instance, in a prospective study conducted by Basinga et al [22] the potential of a payment for performance scheme to increase the use and quality of MNCH services was assessed using antenatal care visits and institutional

deliveries, quality of antenatal care, and child preventive care visits and immunization as outcome measures. Facilities in the intervention group experienced a 23% increase in the number of institutional deliveries and 56% increase in the number of preventive care visits by children aged 23 months or younger and 132% rise in visits for children aged between 24 months and 59 months (132%) and a significant increase in antenatal care quality (0.157 standard deviations –95% CI 0·026–0·289). Although antenatal quality reportedly increased there was no improvement in the number of women who completed four or more antenatal visits and the number of children who received full immunization. In Zimbabwe [33], conditional cash transfer (CCT) and unconditional cash transfer (UCT) was associated with better outcome in the intervention sites than the control clusters where no cash transfer was implemented. Compared with the control group, the number of children aged 0–4 with birth certificates increased by 16.4% (95% CI 7.8–25.0) in the CCT group and 1.5% (95% CI –7.1–10.1) in the UCT group, but the difference was only significant in the CCT group. For complete vaccination of children aged 0–4, there was an increase by 3.1% in the UCT group and 1.8% in the CCT group but there was no difference with the control group. Similar to Zimbabwe, conditional cash transfer intervention in a pilot study conducted in 37 PHC facilities in 9 Nigerian States improved maternal health. Compared to the control sites, conditional cash transfer was associated with a statistically significant increase in the monthly average number of women who completed 4 or more antenatal care visits by 15.11 visits per 100,000 catchment population (95% CI: 7.38–22.85), and the number of women receiving two or more tetanus toxoid doses during pregnancy by 21.66 cases per 100,000 catchment population (95% CI:9.23–34.08) [34].

Cost-sharing in the form of Community Health Fund (CHF) was another form of financial intervention.Murshi [17] assessed the impact in Tanzania on quality of care, attendance and utilization of PHC services as the CHF improves The program presented two options of paying medical bills to households—over the counter cash payment on receipt of services or pre-payment through the CHF. Under the CHF, participating households pay a fixed amount per year to cover their medical expenses in public PHC facilities within the district. All the revenues are kept in a common district account that is managed by the District Medical Officer. The government increased regular inflow of medical supplies to PHC facilities. With increased regular supply, revenue from the CHF was used mainly for minor renovations, extensions of health facility premises, and occasional purchase of medical supplies when there is a shortage. The programme resulted in improvement in the quality of primary health care services, attendance by all categories of clients for MCH care almost doubled by year 2005, and under–5 mortality declined in one district.

Human Resource Intervention

One of the challenges of effective functioning of PHC in sub-Saharan Africa is the dearth of skilled health providers. Interventions addressing this barrier revolved around increasing the number of nurses/midwives, community health workers (CHWs), task shifting and recruitment of community health volunteers with or without the assistance and involvement of the target communities [18, 24, 25, 27, 34]. The volunteers are trained in diverse target components of MNCH for outreach to individuals, families, households, small groups, and communities. In a few settings they received stipend, and in many cases, they were not given any stipend. In Kenya the volunteers were trained to deliver reproductive health messages one-on-one and with small groups and they received no stipends. The effect of the human resource intervention in Kenya was a significant increase in knowledge of maternal and child health and facility delivery for women who were exposed to the health message [27]. In a Nigerian study [34], recruitment of more midwives between 2012 and 2014 reportedly resulted in a 42% increase in

new antenatal care visits, 56% in skilled birth attendance, 33% in postnatal visits and 66% in use of contraceptives. The recruitment of young local women as Health Extension workers and the “model family” strategy in Ethiopia [25] was associated with increased programme intensity which increased the odds of antenatal care (OR 1.13 CI: 1.03–1.23), receiving iron supplement (OR 1.14 CI:1.02–1.26), receiving at least 2 Tetanus Toxoid injections (OR 1.09 CI: 1.00–1.18), birth preparedness (OR 1.31 CI: 1.19–1.44), postnatal care (OR 1.60 CI 1.34–1.91) and initiation of breastfeeding immediately after birth (OR 1.10 CI: 1.02–1.20), knowledge of danger sign during childbirth (β = 0.06 CI:0.02–0.10), postnatal period (β = 0.04 CI: 0.00–0.07) and neonatal danger sign (β = 0.04 CI: 0.00–0.07). In Tanzania [18], the use of safe motherhood promoters (men and women) who were married, literate and accepted by the community resulted in a significant improvement in skilled deliveries (34% to 51.4% p<0.05), early booking for antenatal care (18%–56.9% p<0.01) and four or more antenatal care visits (42.2%–51.3%) for primigravid mothers. Increasing the number of professionally trained providers in a PHC facility as in the Nigerian study or trained volunteers as in Kenya, Ethiopia and Tanzania who provide community-based PHC services is germane for improved quality and access to PHC services for MNCH.

Another component of human resource intervention was capacity-building through training and retraining of providers. In a community-directed intervention in Nigeria ([24], PHC staff were trained on malaria and malaria in pregnancy and they reached out to community leaders and volunteers. The program significantly increased the coverage of intermittent prevention treatment (IPTp) and insecticide-treated nets and prenatal care attendance in the intervention communities compared to the control communities. The proportion of pregnant women taking at least two sulfadoxine-pyrimethamine doses during pregnancy was five times in the experiment communities compared with three times in the control group (P < 0.001). in another Nigerian study, a two-day training in ten PHCs on child feeding resulted in improved health providers’ knowledge, attitude and practices of one-on-one individualized infant and young child feeding counselling in line with global Infant and Young Child Feeding recommendations [36]. A capacity building intervention in KwaZulu-Natal, South Africa [30] with a focus on using routine data for problem identification, target setting and monitoring for HIV, PMTCT, maternal and child health (MCH) increased the coverage of CD4 testing from 40 to 97%; uptake of maternal nevirapine increased from 57 to 96%; uptake of infant nevirapine increased from 15 to 68%; while six weeks PCR testing increased from 24 to 68%.

Noteworthy is that although the human resource interventions were primarily aimed to improve maternal and new-born health, the capacity of the providers (professionals and volunteers) are also built as an intended or unintended consequence. For instance, In Ethiopia, a home-visit package reportedly improved the capacity and confidence of the home-visit team of Health Extension Workers, Community Health Development Agents, and Traditional Births Attendants to provide better maternal and new-born care [26]. In Tanzania, 94% of the SMPs reported that the training was useful to themselves and their work [18].

Home-visits Intervention

Some of the studies reported specialised packages of home-visits to increase utilization of PHCs services for maternal, new-born and child care [21, 26, 31]. The specialized home visits were particularly useful for recognition of danger signs by mothers, improvement in child health, male involvement, and adequate antenatal and postnatal care. In Kwazulu-Natal, South Africa, CHWs delivered a package of home visit, Good Start Saving New-born Lives, which involved provision of essential maternal and new-born care to pregnant and postnatal women and their new-born to prevent mother to child transmission of HIV. Mothers were counselled and referred to a PHC

where necessary. Referrals to PHC clinics increased and compliance to the referrals was reported to be 95% among mothers who completed the referral forms. Also, compared to none in mothers who did not complete the referral forms, 51% of mothers who completed the referral forms recognised danger signs and reported improved infant health [31]. Specialised visits by CHW who were trained in Home-Based Life-Saving Skills (HBLSS), to visit identified pregnant women and their husbands four times to provide education in two districts of Tanzania [21] was associated with a statistically significant improvement in male involvement in the intervention sites (39.2% – 80.9% CI: 28.5–53.8). In the intervention sites, there was a statistically significant net intervention effect (NIE) in women's knowledge of at least three danger signs during pregnancy (NIE 21.3%, 95% CI: 13.7–28.9), childbirth (NIE 13.9%, 95% CI: 10.5–17.4) and postpartum (NIE 15.1%, 95% CI: 9.2–21); proportion of men who accompanied their wives to antenatal care visits (NIE 16.4%, CI:5.6–27.2), childbirth (NIE 33.1%, 95% CI: 24.1–42.1), and joint decision between wife and husband about place of delivery (NIE 38.5%, 95% CI: 28.0–49.1). The proportion of men who mentioned at least three danger signs during pregnancy, childbirth and postpartum significantly improved in the intervention relative to the control sites (NIE 27%, 95% CI: 15.3–38.5), took at least three birth preparation and complications readiness actions (NIE 26.8%, 95% CI: 15.3–38.2). In Ethiopia, the home visit strategy was conducted by a team comprising a Health Extension Worker, Community Health Development Agent and Traditional Birth Attendant trained in HBLSS who taught skills to women and their care givers in their second and third trimester of pregnancy. Behaviour change communication tools such as films and drama among others were also used. This intervention significantly increased the number of women who received 4 or more antenatal care visits, use of skilled providers for childbirth, and postnatal care for mothers and new-borns.

Birth preparedness and complications readiness Intervention

Birth preparedness plan between a provider and a pregnant woman was reported in only one study conducted in Tanzania and was associated with increase in skilled delivery, uptake and early initiation of postnatal care. In Ngorongoro district, Arusha region, Tanzania, the intervention consisted of the introduction and promotion of birth plans during antenatal care visit to prepare women and their families for birth and complication readiness was implemented [22].. Health providers at the intervention sites were given a birth plan implementation guide and instructions on how to assist women develop a birth plan. They discussed with women on planned place of delivery, the importance of skilled delivery care, transport arrangement to the health facility during delivery or an emergency, funding arrangements for delivery or emergency, identification of possible blood donors, identification of a birth companion if desired and appropriate, and support in looking after the household while the woman is at the facility. Also discussed were strategies for accessing skilled care, recognition of danger signs during pregnancy, labour and postpartum. Women were asked about their choice of place of delivery (dispensary or hospital) and with her consent, their male partners or any other persons they identified as a carer were invited for subsequent discussion. The birth plans were written, one copy for the woman and a second copy retained at the dispensary. Relative to the control sites, skilled delivery care was 16.8%, higher in the intervention sites [95% CI 2.6–31.0; p = 0.02]postnatal care utilisation in the first month of delivery was higher (difference in proportions: 30.0% [95% CI 11.3–46.7; p < 0.01]) and was also initiated earlier (mean duration 6.6 ± 1.7 days vs. 20.9 ± 4.4 days at the control, P < 0.01).

Mobile Health (mHealth) Intervention

Mobile health was shown to facilitate emergency medical responses, point-of-care support, improvement in access and adoption of maternal, prenatal and neonatal service.. An assessment of the impact of using mHealth (Chipatala cha pa Foni) in Malawi [32] showed a large, positive effect of the project on the aggregate home-based care for child health ($p<0.01$), and a sharp, negative impact on facility-based care seeking for fever among children whose mothers/caretakers used the services offered by the intervention. A cluster randomized controlled trial conducted in primary health care facilities in Zanzibar, Tanzania demonstrated that an intervention using mobile phones with a voucher component for the wired women resulted in a 50% significant reduction in perinatal mortality (odds ratio 0.50, 95% CI 0.27–0.93) in the intervention clusters. The mobile phone intervention was associated with increase in uptake of four and more antenatal care visits. In the intervention group, 44% of the women received four or more antenatal care visits versus 31% in the control group (OR, 2.39; 95% CI, 1.03–5.55) [19, 20].

Introduction of a sub-specialty

The intervention reported in Cox et al [29] was the introduction of sub-specialty service (paediatric surgical clinic) at the primary health care level in Western Cape, South Africa. Over a 58-month period, 1, 171 children aged 0–19 were seen, the largest group being under one year. The correct diagnosis was established by the nurse practitioners in 255 children (71%). In total, 597 patients were referred directly to an appropriate care facility, while 574 patients could be managed entirely at the clinic level. The clinic allowed for timely surgical intervention in 65% of surgical cases, thereby decreasing inappropriate tertiary referrals. The introduction of a subspecialty in primary health care facilities in Western Cape, South Africa improved accuracy in diagnosis and appropriate diagnosis and highlights the preventative and cost-effective role of a surgical clinic at primary health care level.

Supportive supervision Intervention

Contrary to the top-down supervision approach which tends to concentrate more on administrative functions and emphasize fault-finding, supportive supervision emphasizes mentoring, joint problem-solving and two-way communication between the supervisor and supervisee. A significant improvement in the quality and access to sexual and reproductive health services was reported after implementing supportive supervision in different settings. In Senegal, Suh, Moreira & Ly [40] reported improvement in technical competence in infection prevention improved by 28% and 32% in Theies and Louga, respectively. Skills in family planning consultation improved by 16% in Louga region and 10% in Tivaoune. The management of staff and services, record-keeping, and community involvement also improved considerably.

Ia facility-based intervention to measure the effect of supportive supervision of PHC workers in malaria case management for under–5 children was implemented in Jos, Nigeria Bello et al [38]. Using the WHO guidelines, training in supportive supervision was conducted in the intervention sites (PHCs) while the traditional supervisory method continued in the control sites. The mean score on knowledge of malaria significantly increased from pre-intervention score of 10.3±1.4 to 113±1.5 post intervention, whereas it decreased in the control group from 10.6±1.7 to 10.5±2.3 ($t = 3.57$ $p<0.0015$). Malaria management practices mean score for the intervention group increased from 5.8±1.7 before intervention to 7.1±6.4 post-intervention. Scores for the control group decreased from 6.2±1.7 pre-intervention to 5.7±1.6 post-intervention; but the difference was not statistically significant. Statistically significant increase in the percentage of workers who would refer to a secondary facility following a

poor response to treatment increased from 47.3% to 84.3% post-intervention for the experiment group. In Uganda, after one year of the intervention significantly more functioning tippy taps ($p<0.002$) were present in the intervention villages (47 %) than in control villages (35 %). Visits to pregnant women by CHVs increased from 2% of pregnant women visited once before the study to 33% of pregnant women visits 2.3 times during the study for the control sites. At the intervention, the visits increased from 9% once pre-intervention to 46%. Visits to new-borns improved from 28% once visit to 44% 1.8 time visit at the control sites; at the intervention sites, it increased from 9% once visit to 67% an average of 2 visits [28].

Combined interventions

In some of the studies, more than one strategy was employed to achieve the expected outcomes [37, 39, 41]. For instance, to increase delivery in a primary health care facility, a community education programme for traditional rulers, women groups, religious organisations and traditional birth attendants was implemented in Port-Harcourt, Nigeria. In addition, the delivery fee was collected upfront with antenatal care fee at the time of registration for antenatal care. The amount was equivalent to the average charge by TBAs in the community, and less that the fee for normal delivery in a teaching hospital. The effect was assessed one year after. Antenatal registration increased by 15.04% after the programme. The ANC-Delivery ratio of the health centre increased by 3.09%, p-value > 0.05 [37]. In Burkina Faso, Brazier et al [39] reported a combination of facility and community-based interventions. The intervention package at the facilities (primarily focused on primary health centres) included activities to improve the quality, availability, and accessibility of routine and emergency obstetric care (EMOC): upgrading the skills of all maternity care providers through training in routine and emergency obstetric care; addressing gaps in essential obstetric equipment and supplies; strengthening the referral system; introducing a quality assurance methodology for maternal health services; and improving management systems. Community-level interventions focused on increasing women's information about services. There was a large increase in the per cent of births in health facilities in the intervention district from 29% at baseline to 57% at end line ($Chi2 = 185.3$, $p<0.001$); increase in delivery by skilled attendants from 24% to 56% ($Chi2 = 256.4$, $p<0.001$). In the comparison district, there was no significant increase in number of births at a health facility between the baseline and end line, but there was a slight increase in the proportion of births assisted by a skilled attendant from 32% to 36% ($Chi2 = 6.2$, $p<005$).

Discussion

The objective of this review was to document the interventions aimed at addressing the improvement of PHC service delivery for reducing maternal, new-born and child mortality in sub-Saharan Africa. Specific evidence was sought for interventions, strategies and approaches that have been implemented to improve quality and access to primary health care for maternal, new-born and child health in sub-Saharan Africa. Strategies that resulted in improvement in the outcome of interest included financial incentives, increasing the number of providers, home visits, birth plan during antenatal care, cost sharing, task shifting, capacity-building training of providers, mobile health, introduction of a sub-specialty, and supportive supervision. All the studies reported some improvement in quality of care and utilization of primary health care for maternal, new-born and child health. The outcome indicators observed included effective management of malaria in pregnant women and infants, accurate diagnosis of childhood morbidity, timely and appropriate referrals from PHC facilities, effective service delivery for PMTCT of HIV, increase in utilization of PHC facilities for pregnancy care, delivery and postnatal care, increased

male involvement in maternal health, improved capacity of PHC providers to provide better services, reduction in maternal and child mortality, and reduction in facility-based workload among others.

The successes recorded in the reviewed studies point to the essential role of primary health care in achieving better maternal, new-born and child health outcomes in the region [7–9]. Studies in other countries confirm the important role of primary health care and the place of appropriate interventions in scaling of access and quality of care at this level [42–47]. An appraisal of community health workers prograamme in Malawi, Uganda, and Ethiopia in 2009 showed that effective delivery of care at the primary health level is constrained by issues such as inadequate remuneration which leads to loss of workers from time to time, insufficient attention to quality supervision and continuous training [48]. The results presented in the current review suggest that these constraints among others can be overcome with appropriate design of interventions. Analysis of the effect of applying appropriate interventions in sub-Saharan Africa shows that over 4 million deaths of mothers, newborns, and children will be averted if known effective interventions reach 90% of targeted populations [49].

Although the reviewed articles reported improvements in primary health care for MNCH, some gaps were identified. For instance, most of the studies did not report on confounders that may have influenced the reported results such as alternative public and private health care outreaches, improvement in economic status, better transportation, and access to health care and environmental factors among others. None of the studies focused specifically on PHC policy. The involvement of government and non-governmental agencies in Ethiopia [9, 10], for instance, strengthened PHC in that country, suggesting the critical role of PHC policy. There is the need for more proactive involvement of governments in enhancing quality and access to PHC for MNCH care and in reforming PHC policies to suit prevailing demographic social and economic changes in the country. Results from an analysis of the 2014 PHC reform in Poland suggests the importance of regular revision and scale up of PHC operation and services to reflect changing health needs attuned to current and future demographic structure of a country [50]. Another major recommendation from the case of Poland is the need for the voice of the beneficiaries to be taken into account in policy making and decision-making processes.

None of the studies focussed on maternal mental health, perhaps indicating a paucity of research on mental health and a weak health system attention to mental health in sub-Saharan Africa [51]. Maternal mental health affects child care [52–54]. There is the need to scale up the scope of PHC services to include maternal mental health where it does not exist in sub-Saharan Africa. A study conducted in Australia showed the importance of scaling up the scope of PHC services for maternal health to include maternal mental health four years postpartum[55]. In this Australian study, almost one in three women reported depressive symptoms at least once in the first 4 years after birth. The prevalence of depressive symptoms at 4 years postpartum was 14.5% and was higher than at any time-point in the first 12 months postpartum. More studies on maternal mental health are needed in sub-Saharan Africa.

Of note in this review is the fact that in spite of the positive results reported in the 25 articles, MNCH indicators in many of the countries have not improved substantially. For instance, at the termination of the MDGs in 2015, no progress was made in reduction of MMR in Malawi, Kenya, Nigeria but Tanzania and Ethiopia were reported to have achieved a level of change that was viewed as progress [3]. This suggests the need to scale up the successful interventions to sustainable dimensions using various novel approaches including knowledge transfer and community ownership. Most interventions in the region are sponsored by development partners from outside Africa. When the sponsorship ends, the programmes inevitably suffer setbacks in many cases, especially when

there is insufficient governmental or community commitment to sustain the gains. Although there were reports of community involvement in the reviewed articles particularly in recruiting community health volunteers, there is need to strengthen sustained community ownership, including leverage private sector support. Primary health care facilities in many countries in sub-Saharan Africa are more likely to be used by the lower socioeconomic groups than the more privileged groups [10] and many communities in the region have high levels of poverty. Thus, communities alone cannot sustain the gains of successful interventions programmes in primary health facilities, and as such political commitments from the governmental sector would be required.

The mhealth strategy is imperative given the increasing use of mobile telecommunication in many countries in sub-Saharan Africa. The mhealth in Malawi reduced the burden of care-seeking in health facilities for childhood illnesses particularly fever [32]. This indicates that mhealth strategy would reduce facility-level workload of PHC workers. Previous studies point to the adverse effect of large workload on providers' efficiency in service delivery [56]. Evidence from the reviewed studies and findings from other regions [57, 58] show that mHealth adapted to suit local peculiarities of the served community would increase the quality of care given by primary health care providers, and promote access to facility-based maternity care.

In some countries such as Uganda, Ethiopia, Nigeria, the outcomes of interventions with regard to skilled attendance during delivery was not statistically significant. Yet, it is evident that skilled attendance at delivery is one of the most important components that can substantially improve maternal health and reduce maternal and perinatal mortality in many African countries. This is an indication that more needs to be done with respect to promoting the use of facility delivery. In addition to training more skilled MNCH providers and strengthening PHC facilities, there is the need for projects that will improve providers' attitude to clients and reduce long waiting times. Many studies across sub-Saharan Africa point to these as major deterrents to health facility utilization for delivery and maternal, new-born and child care [59–61]. In addition, evidence from studies indicates that there still exists a deep-seated confidence in traditional forms of maternal care in many countries in sub-Saharan Africa [62, 63]. This points to the need for strategies that will involve traditional birth attendants such as the "guide team" in Ethiopia [26] to encourage skilled delivery care.

A limitation of the review is the exclusion of studies published in other languages. In spite of this limitation, this review presents systematic evidence on the effectiveness of PHC in improving maternal, new-born and child health in sub-Saharan Africa.

Policy and programmatic implications

The results of this systematic review suggest the need for implementation research to determine how to scale up effective interventions for improving women's access to maternal, new-born and child health care at the primary health care level in sub-Saharan African countries. Universal access to maternal health care premised on primary health care to reach the most vulnerable and poor communities hold the key to reducing the current high burden of maternal and child mortality in the region. A knowledge transfer component should always be integrated into any intervention that is designed to improve the delivery of primary maternal health care in Africa so as to ensure that any knowledge gained are transferred into over-arching policies and programs. A strong political will backed by accountability mechanisms through political leadership and ownership would be critical to ensure the adoption and scaling of the best practices in primary maternal health care in the region any time soon.

Regions where there are few studies

Conclusions

In conclusion, the results of this review reveal a large number of existing information in sub-Saharan African countries on innovative practices that can be adopted to increase women's access to primary maternal health care for preventing maternal, new-born and child morbidity and mortality. However, the challenge remains on identifying ways to scale such interventions to reach the most vulnerable citizens for greater impact in all parts of the continent.

Conflict Of Interest

The authors declare no conflict of interest.

References

1. Kinney MV, Kerber KJ, Black RE, Cohen B, Nkrumah F, Coovadia H, et al. Sub-Saharan Africa's mothers, newborns, and children: where and why do they die? PLoS Med. 2010;7:e1000294.
2. World Health Organization. Packages of interventions for family planning, safe abortion care, maternal, newborn and child health. WHO; 2010.
3. World Health Organization. Trends in maternal mortality: 1990 to 2015. Estimates by WHO, UNICEF, UNFPA, The World Bank and the United Nations Population Division. Geneva, Switzerland: World Health Organization; 2015.
4. Black RE, Morris SS, Bryce J. Where and why are 10 million children dying every year? The Lancet. 2003;361:2226–34.
5. World Health Organization. World health statistics 2016: monitoring health for the SDGs, sustainable development goals. Geneva: World Health Organization; 2016.
6. ICF International. The DHS Program STATcompiler. 2015. http://www.statcompiler.com.
7. World Health Organization. Declaration of Alma-Ata: International Conference on Primary Health Care, Alma-Ata, USSR, 6–12 September 1978. Retrieved February. 1978;14:2006.
8. World Health Organization. Ouagadougou Declaration on primary health care and health systems in Africa: achieving better health for Africa in the new Millennium. Brazzaville: WHO Regional Office for Africa. 2008.
9. African Union. Draft Policy Brief for the International Conference on Maternal, Newborn and Child Health (MNCH) in Africa. Johannesburg, South Africa. Policy Brief. 2013.
10. Memirie ST, Verguet S, Norheim OF, Levin C, Johansson KA. Inequalities in utilization of maternal and child health services in Ethiopia: the role of primary health care. BMC health services research. 2016;16:1.
11. Hill AG, MacLeod W, Joof D, Gomez P, Walraven G. Decline of mortality in children in rural Gambia: the influence of village-level Primary Health Care. Tropical Medicine & International Health. 2000;5:107–18.
12. Federal Government of Nigeria. Integrating Primary Health Care Governance in Nigeria (PHC Under One Roof): Implementation manual. National Health Care Development Agency; 2013.
13. NPHCDA. National Primary Health Care Development Agency: Minimum Standards for Primary Health Care in Nigeria. Abuja, Nigeria: Department of Planning, Research and Statistics, National Primary Health Care

Development Agency; 2012. www.nphcda.gov.ng.

14. Christopher JB, Le May A, Lewin S, Ross DA. Thirty years after Alma-Ata: a systematic review of the impact of community health workers delivering curative interventions against malaria, pneumonia and diarrhoea on child mortality and morbidity in sub-Saharan Africa. Human resources for health. 2011;9:27.
15. Guyatt GH, Oxman AD, Vist GE, Kunz R, Falck-Ytter Y, Alonso-Coello P, et al. GRADE: an emerging consensus on rating quality of evidence and strength of recommendations. BMJ: British Medical Journal. 2008;336:924.
16. Oxman AD, GRADE Working Group. Grading quality of evidence and strength of recommendations. Bmj. 2004;328:1490–4.
17. Mushi D. Impact of cost sharing on utilization of primary health care Services: providers versus household perspectives. Malawi Medical Journal. 2014;26:83–9.
18. Mushi D, Mpembeni R, Jahn A. Effectiveness of community based safe motherhood promoters in improving the utilization of obstetric care. The case of Mtwara Rural District in Tanzania. BMC pregnancy and childbirth. 2010;10:14.
19. Lund S, Rasch V, Hemed M, Boas IM, Said A, Said K, et al. Mobile phone intervention reduces perinatal mortality in Zanzibar: secondary outcomes of a cluster randomized controlled trial. JMIR mHealth and uHealth. 2014;2:e15.
20. Lund S, Nielsen BB, Hemed M, Boas IM, Said A, Said K, et al. Mobile phones improve antenatal care attendance in Zanzibar: a cluster randomized controlled trial. BMC pregnancy and childbirth. 2014;14:29.
21. August F, Pembe AB, Mpembeni R, Axemo P, Darj E. Community health workers can improve male involvement in maternal health: evidence from rural Tanzania. Global health action. 2016;9.
22. Magoma M, Requejo J, Campbell O, Cousens S, Merialdi M, Filippi V. The effectiveness of birth plans in increasing use of skilled care at delivery and postnatal care in rural Tanzania: a cluster randomised trial. Tropical Medicine & International Health. 2013;18:435–43.
23. Basinga P, Gertler PJ, Binagwaho A, Soucat AL, Sturdy J, Vermeersch CM. Effect on maternal and child health services in Rwanda of payment to primary health-care providers for performance: an impact evaluation. The Lancet. 2011;377:1421–8.
24. Haver J, Brieger W, Zoungrana J, Ansari N, Kagoma J. Experiences engaging community health workers to provide maternal and newborn health services: implementation of four programs. Int J Gynaecol Obstet. 2015;Suppl 2. doi:10.1016/j.ijgo.2015.03.006.
25. Karim AM, Admassu K, Schellenberg J, Alemu H, Getachew N, Ameha A, et al. Effect of Ethiopia's health extension program on maternal and newborn health care practices in 101 rural districts: a dose-response study. PLoS One. 2013;8:e65160.
26. Sibley LM, Tesfaye S, Fekadu Desta B, Hailemichael Frew A, Kebede A, Mohammed H, et al. Improving maternal and newborn health care delivery in rural Amhara and Oromiya regions of Ethiopia through the Maternal and Newborn Health in Ethiopia Partnership. Journal of Midwifery & Women's Health. 2014;59:S6–20.
27. Adam MB, Dillmann M, Chen M, Mbugua S, Ndung'u J, Mumbi P, et al. Improving maternal and newborn health: effectiveness of a community health worker program in rural Kenya. PloS one. 2014;9:e104027.
28. Singh D, Negin J, Orach CG, Cumming R. Supportive supervision for volunteers to deliver reproductive health education: a cluster randomized trial. Reproductive Health. 2016;13:126.

29. Cox S, Mpofu F, Berg A, Rode H. The impact of subspecialty services on health care delivery-a community health centre based study. South African Medical Journal. 2006;96:945–9.
30. Doherty T, Chopra M, Nsibande D, Mngoma D. Improving the coverage of the PMTCT programme through a participatory quality improvement intervention in South Africa. BMC public health. 2009;9:406.
31. Nsibande D, Doherty T, Ijumba P, Tomlinson M, Jackson D, Sanders D, et al. Assessment of the uptake of neonatal and young infant referrals by community health workers to public health facilities in an urban informal settlement, KwaZulu-Natal, South Africa. BMC health services research. 2013;13:47–47.
32. Fotso JC, Bellhouse L, Vesel L, Jezman Z. Strengthening the home-to-facility continuum of newborn and child health care through mHealth: Evidence from an intervention in rural Malawi. Etude de la Population Africaine. 2015;29:1663.
33. Robertson L, Mushati P, Eaton JW, Dumba L, Mavise G, Makoni J, et al. Effects of unconditional and conditional cash transfers on child health and development in Zimbabwe: a cluster-randomised trial. The Lancet. 2013;381:1283–92.
34. Okoli U. Strengthening Primary Health Care Services in Rural Nigeria: The Potential of Using Midwives as Skilled Birth Attendants. Health Systems and Policy Research. 2016.
35. Okoli U, Morris L, Oshin A, Pate MA, Aigbe C, Muhammad A. Conditional cash transfer schemes in Nigeria: potential gains for maternal and child health service uptake in a national pilot programme. BMC pregnancy and childbirth. 2014;14:408.
36. Samuel FO, Olaolorun FM, Adeniyi JD. A training intervention on child feeding among primary healthcare workers in Ibadan Municipality. African journal of primary health care & family medicine. 2016;8:1–6.
37. Ordinioha B, Seiyefa B. Improving skilled attendants at birth: Experience in a primary health care facility in Rivers State, South-South Nigeria. Journal of Community Medicine and Primary Health Care. 2013;25:59–66.
38. Bello DA, Hassan ZI, Afolaranmi TO, Tagurum YO, Chirdan OO, Zoakah AI. Supportive supervision: an effective intervention in achieving high quality malaria case management at primary health care level in Jos, Nigeria. Annals of African Medicine. 2013;12:243–51.
39. Brazier E, Andrzejewski C, Perkins ME, Themmen EM, Knight RJ, Bassane B. Improving poor women's access to maternity care: Findings from a primary care intervention in Burkina Faso. Social science & medicine. 2009;69:682–90.
40. Suh S, Moreira P, Ly M. Improving quality of reproductive health care in Senegal through formative supervision: results from four districts. Human Resources for Health. 2007;5:26.
41. Pence BW, Nyarko P, Phillips JF, Debpuur C. The Effect of Community Nurses and Health Volunteers on Child Mortality: The Navrongo Community Health and Family Planning Project. Working paper. New York, USA: Population Council; 2005.
42. Fischer EA, Jayana K, Cunningham T, Washington M, Mony P, Bradley J, et al. Nurse mentors to advance quality improvement in primary health centers: lessons from a pilot program in Northern Karnataka, India. Global Health: Science and Practice. 2015;3:660–75.
43. Ghimire M, Pradhan YV, Maskey MK. Community-based interventions for diarrhoeal diseases and acute respiratory infections in Nepal. Bulletin of the World Health Organization. 2010;88:216–21.
44. Macinko J, Guanais FC, De Souza MDFM. Evaluation of the impact of the Family Health Program on infant mortality in Brazil, 1990–2002. Journal of epidemiology and community health. 2006;60:13–9.

45. Setiawan A, Dignam D, Waters C, Dawson A. Improving access to child health care in Indonesia through community case management. Maternal and child health journal. 2016;20:2254–60.
46. Shei A, Costa F, Reis MG, Ko AI. The impact of Brazil's Bolsa Família conditional cash transfer program on children's health care utilization and health outcomes. BMC international health and human rights. 2014;14:10.
47. Soofi S, Ahmed S, Fox MP, MacLeod WB, Thea DM, Qazi SA, et al. Effectiveness of community case management of severe pneumonia with oral amoxicillin in children aged 2–59 months in Matiari district, rural Pakistan: a cluster-randomised controlled trial. The Lancet. 2012;379:729–37.
48. Hermann K, Van Damme W, Pariyo GW, Schouten E, Assefa Y, Cirera A, et al. Community health workers for ART in sub-Saharan Africa: learning from experience–capitalizing on new opportunities. Human resources for health. 2009;7:31.
49. Friberg IK, Kinney MV, Lawn JE, Kerber KJ, Odubanjo MO, Bergh A-M, et al. Sub-Saharan Africa's mothers, newborns, and children: how many lives could be saved with targeted health interventions? PLoS Med. 2010;7:e1000295.
50. Mokrzycka A, Kowalska-Bobko I, Sagan A, Włodarczyk WC. The 2014 primary health care reform in Poland: Short-term fixes instead of a long-term strategy. Health Policy. 2016;120:1226–32.
51. Jenkins R, Othieno C, Okeyo S, Aruwa J, Kingora J, Jenkins B. Health system challenges to integration of mental health delivery in primary care in Kenya - perspectives of primary care health workers. BMC Health Services Research. 13.
52. Harpham T, Huttly S, De Silva MJ, Abramsky T. Maternal mental health and child nutritional status in four developing countries. Journal of epidemiology and community health. 2005;59:1060–4.
53. Koutra K, Chatzi L, Bagkeris M, Vassilaki M, Bitsios P, Kogevinas M. Antenatal and postnatal maternal mental health as determinants of infant neurodevelopment at 18 months of age in a mother–child cohort (Rhea Study) in Crete, Greece. Social psychiatry and psychiatric epidemiology. 2013;48:1335–45.
54. Patel V, Rahman A, Jacob K, Hughes M. Effect of maternal mental health on infant growth in low income countries: new evidence from South Asia. BMJ: British Medical Journal. 2004;328:820.
55. Woolhouse H, Gartland D, Mensah F, Brown S. Maternal depression from early pregnancy to 4 years postpartum in a prospective pregnancy cohort study: implications for primary health care. BJOG: An International Journal of Obstetrics & Gynaecology. 2015;122:312–21.
56. Ogu RN, Ntoimo LFC, Okonofua FE. Perceptions of women on workloads in health facilities and its effect on maternal health care: A multi-site qualitative study in Nigeria. Midwifery. 2017;55:1–6.
57. Tamrat T, Kachnowski S. Special delivery: an analysis of mHealth in maternal and newborn health programs and their outcomes around the world. Maternal and child health journal. 2012;16:1092–101.
58. Watterson JL, Walsh J, Madeka I. Using mHealth to improve usage of antenatal care, postnatal care, and immunization: A systematic review of the literature. BioMed research international. 2015;2015.
59. Balde MD, Bangoura A, Sall O, Soumah AM, Vogel JP, Bohren MA. Perceptions and experiences of the mistreatment of women during childbirth in health facilities in Guinea: a qualitative study with women and service providers. Reproductive Health. 2017;14:3.
60. Bamidele AR, Hoque ME, Van der Heever H. Patient satisfaction with the quality of care in a primary health care setting in Botswana. South African Family Practice. 2011;53:170–5.

61. Bohren MA, Vogel JP, Tunçalp Ö, Fawole B, Titiloye MA, Olutayo AO, et al. Mistreatment of women during childbirth in Abuja, Nigeria: a qualitative study on perceptions and experiences of women and healthcare providers. Reproductive Health. 2017;14:9.
62. Sialubanje C, Massar K, Hamer DH, Ruiter RA. Reasons for home delivery and use of traditional birth attendants in rural Zambia: a qualitative study. BMC pregnancy and childbirth. 2015;15:216.
63. Doctor HV, Dahiru T. Utilization of non-skilled birth attendants in Northern Nigeria: a rough terrain to the health-related MDGs. African Journal of Reproductive Health. 2010;14:37–45.

Tables

Table 1: Summary of the reviewed studies

Authors/Year/Setting	Study Design/Objective	Exposure/Follow-up	Intervention	Key findings	Quality assessment
(1) Basinga et. al. (2011) Rwanda	Design: Prospective study/Experimental design Objective: To access the effect of an incentive-based bonus	Baseline: June-October, 2006 End-line survey: 25 months after	Financial incentive: Payment for performance (P4P)	Increase in antenatal care quality, the number of institutional deliveries and. preventive care visits by children, . No improvements in the number of women completing four antenatal care visits and children receiving full immunisation.	High
(2) Okoli, U. (2016) Nigeria	Design: Evaluation Research/baseline and end line survey Objective: To assess the potential of using midwives as skilled birth attendants in providing access to maternal health services in rural Nigeria	Baseline November 2012.Follow-up in August 2014	Increase in number of facility-based providers	Increase in new ANC visits, focused antenatal care attendance,births by skilled birth attendants , postnatal visits and the number of women using contraceptive methods.	High
(3) Haver et al. (2015) Rwanda/Nigeria	Design: Case/control studies Objective: To review implementation of jhpiego's programs on engaging community health workers to provide maternal and new-born health services.	Rwanda: 2010-2011 Nigeria: 2007-2011	Rwanda: Task-shifting Nigeria – implementation of community-directed intervention (CDI) to address malaria in pregnancy in Akwa Ibom state, Nigeria.	Rwanda: Increase in the number of pregnant women accompanied to the health centre for care and delivery. Nigeria: Significant increase in the coverage of IPTp and insecticide-treated nets and prenatal care attendanceIncrease in the proportion of pregnant women taking at least two sulfadoxine-pyrimethamine doses during pregnancy.	Medium
(4) Adam, M.B. et al. (2014) Kenya	Design: Quasi-experimental non-equivalent comparison group design Objective: To describe the effectiveness of a volunteer community health worker project.	2009-2011	Recruitment of community health volunteers Intervention was exposure to the CHW delivered health messages	Increase in MNCH knowledge and the number of women delivering under skilled attendance..	Medium
(5) Okoli et al., (2014) Nigeria	Evaluation Research/Prospective study	2012-2014	Financial incentive:	Increase in the monthly average	High

	Objective: To examine use of a Conditional Cash Transfer (CCT) programme to encourage use of critical MNCH services among rural women in Nigeria.		Conditional cash transfer	number of women attending focused 4 or more ANC visits, number of women receiving two or more Tetanus toxoid doses during pregnancy.	
(6) Samuel, F.O. et al (2016) Nigeria	Design: A before and after clinic-based intervention study. Objective: To evaluate the effect of training on the knowledge, attitudes and provision of infant and young child feeding (IYCF) information.	Data collected at Baseline-after intervention same day & 4 weeks after	A 2-day training intervention implemented in PHC facilities using lectures, interactive sessions, group work, quizzes, songs and role play to provide information and training on current global Infant and Young Child Feeding (IYCF).	Improvement in health workers' knowledge of IYCFattitudes and practices of one-on-one individualized infant and young child feeding counseling on	Medium
(7) Fotso et al., (2015) Malawi	A two-arm quasi-experimental, pre-post design. Objective: To assesses the impact of a mobile health (mHealth) intervention on uptake of home-based care for new-born and child health, and investigates the extent to which uptake of home-based care resulted in lessened pressure on health facilities for conditions that can be handled at the household level.	July 2011 and June 2013	Mhealth: Chipatala cha pa Foni (CCPF) – or Health Centre by Phone.	Adjusted effects of the intervention shows a large, positive effect on the aggregate home-based care for child health.	High
(8) Robertson et al., (2013) Zimbabwe	Design: A matched cluster-randomised controlled trial Objective: To investigate the effects of unconditional cash transfers (UCTs) and	2009-2011	Financial incentive: Unconditional and conditional cash transfers	Increase in the proportion of children aged 0–4 years with birth certificates, and complete vaccination records	High

	conditional cash transfers (CCTs) on birth registration, vaccination uptake, and school attendance in children in Zimbabwe.				
(9) Ordinioha & Seiyefa (2013) Nigeria	Design: Before-and-after design Objective: To highlight the experience of a PHC facility in south-south Nigeria, in encouraging the utilization of its maternity service	2007-2008	A community education for traditional rulers, women groups, religious organisations and traditional birth attendants.. Implementation of upfront collection of a delivery fee equivalent to the average charges by TBAs and less than the fee for normal delivery in a teaching hospital.	Antenatal registration and ANC-Delivery ratio increased.	Medium
(10) Mushi (2014) Tanzania	Design: Evaluation study (survey) Objective: To assess the impact of a community health fund (CHF), a cost-sharing programme on quality of care, attendance and utilization of PHC services as the CHF improves.	2000-2003	Cost-Sharing	The quality of primary health care improved. Attendance by all categories of clients for MCH care almost doubled andunder-5 mortality declined in one district.	Medium
(11) Cox, Mpofu, Berg & Rode (2006) South Africa	Design: Descriptive and prospective study – case extraction from patients files Objective: To evaluate the role of a paediatric surgical consultant at a CHC	2001-2005	Introduction of sub-specialty service (paediatric surgical clinic) at the primary health care level.	Increase in the number of children treated, correct diagnosis, appropriate referrals, and cases managed appropriately at the PHC clinics.	Medium
(12) Karim et al., (2013) Ethiopia	Design: Prospective study using before-and-after surveys Objective: To report an analysis of the effectiveness of the Health Extension Program to improve maternal and new-born health care knowledge and practices at scale..	2008-2010	Recruitment and training of young local women with high school education, as Health Extension workers (HEWs) to train volunteer community health promoters (CHPs)	Between 2008 and 2010, median program intensity score increased 2.4-fold. Odds of receiving antenatal care, birth preparedness, postnatal care and initiation of breastfeeding immediately after birth increased.	High
(13) Lund et al.	Design: Cluster	2009-2010	mHealth: An	Lower perinatal	Medium

(2014) Zanzibar,Tanzania	randomized, controlled trial Objective: To evaluate the association between a mobile phone intervention and perinatal mortality in a resource-limited setting.		automated short message service (SMS) system	mortality in the intervention sites, reduction in in stillbirth and death within the first 42 days of life.	
(14) Lund et al (2014) Zanzibar,Tanzania	Design: cluster-randomized controlled trial Objective: To evaluate the association between a mobile phone intervention “wired mothers” and antenatal care in Zanzibar.	2009-2010	mHealth: Same as above	Increase in antenatal care attendance and improved timing and quality of antenatal care services.	High
(15) Mushi et al. (2010) Tanzania	Design: Pre-post comparison of the same group Objective: To describe and analyse the process and the effectiveness of a community-based intervention package for Safe Motherhood	2004-2006	Training of safe motherhood promoters (SMP), home visits, to educate pregnant women and their husbands and key community members, follow-up of pregnant mothers.	Deliveries with skilled attendant, and early ANC booking increased significantly.	High
(16) August et al (2016) Tanzania	Design: A quasi-experimental study (non-equivalent group) Objective: To evaluate the effect of HBLSS training in the community on male involvement in maternal health in a rural area	2012-2014	Health workers trained to use Home Based Life-Saving Skills by community health workers. (HBLSS). The health workers then trained community health workers (CHWs)	The proportion of men accompanying their wives to antenatal and delivery improved. Shared decision-making for place of delivery improved markedly.	High
(17) Sibley et al., (2014) Ethiopia	Design: Uncontrolled before/after study design (surveys) Objective: To describe the extent to which the Maternal Health in Ethiopia Partnership (MaNHEP) project’s objectives were met	Baseline survey June-Sept 2010 End line May-August 2012	1) A Community Maternal and New-born Health (CMNH) training program 2) Continuous quality improvement through Quality improvement teams 3) Behaviour change communication	Improved capacity and confidence of health workers. Significant increases in the proportion of women who received antenatal care, andwomen and new-borns who received postnatal care. The use of family and other unskilled providers decreased.	High

				Improved perinatal survival.	
(18) Doherty et al (2009) South Africa	Design: Descriptive Objective: To present results of a participatory intervention to improve an integrated PMTCT programme in a rural district in South Africa	2007-2008	Use of routine data for problem identification, target setting and monitoring for HIV, PMTCT, maternal and child health (MCH).	Coverage of CD4 testing increased from 40 to 97%, uptake of maternal nevirapine from 57 to 96%, uptake of infant nevirapine from 15 to 68% and six week PCR testing from 24 to 68%.	Medium
(19) Brazier et al. (2009) Burkina Faso	Design: Baseline and endline population-based surveys Objective: To present results of a three-year maternal health intervention aimed at influencing access to skilled maternity care during childbirth	2003-2006	. Facility intervention included improving the quality, availability, and accessibility of routine and emergency obstetric care (EMOC). Community-level interventions focused on increasing women's information about services.	A large increase in the per cent of births in health facilities in the intervention district; increase in delivery by skilled attendant compared to the comparison district.	High
(20) Bello et al (2016) Nigeria	Design: quasi-experimental Case-control study Objective: To measure the effect of supportive supervision of PHC workers in malaria case management for under-5 children.	12 weeks	Local Government supervisors were trained on supportive supervision. They carried out supportive supervision in the intervention sites while the traditional supervisory method continued in the control sites.	Significant increase in knowledge of malaria, referral to a secondary facility, correct adherence to guidelines, eliciting of symptoms of malaria from a sick child, and treatment and dosing of patients.	Medium
(21) Suh, Moreira & Ly (2007) Senegal	Design: Evaluation study Objective: To assess how formative supervision affected service quality and community involvement in improving quality of service	2003-2005	A program of formative supervision which uses observation emphasizing problem-solving approach	Improvement in technical competence in infection prevention, skills in family planning consultation, management of staff and services, record-keeping, and community involvement.	Medium
(22) Singh et al (2016) Uganda	Design: Pair-matched cluster randomized trial	2014-2015	Community Health workers were recruited and trained to supervise the	More functioning tippy taps. in the intervention villages than in control villages..	High

	Objective: To determine if supportive supervision would improve retention rates, numbers of home visits related to pregnant women and new-born babies, and improve specific outcomes related to hygiene.		Community Health Volunteers	Visits to pregnant women by CHVs increased. Visits to new-borns improved.	
(23) Pence et al., 2005 Ghana	Design: Community-randomized controlled experiment Objective: To examine the impact of Community Health and Family Planning Project (CHFP) on under-five mortality.	Baseline was 1994 and end line 2000	Training, establishment of a village health committee to appoint and oversee male health volunteers, re-assignment of nurses from sub-district clinics to serve in the community.	Decrease in under-5mortality	High
(24) Nsibande et al 2013 South Africa	Design: Cluster-randomised controlled trial Objective: To develop, evaluate and cost an integrated and scalable home visit package delivered by CHWs.	2008-2011	CHWs visited mothers and new-borns during the last trimester of pregnancy and during the early postnatal period to deliver a package relating to maternal and child health.	Increase in referrals and high compliance with CHW	High
(25) Magoma et al 2013 Tanzania	Design: A cluster-randomized trial Objective: To determine the effectiveness of birth plan in increasing use of skilled care at delivery and for postnatal care	Dec 2008- August 2009	Introduction and promotion of birth plans during ANC to prepare women and their families for birth and complication readiness.	Skilled delivery and postnatal care in the first month of delivery was higher in the intervention units than in the control .	High

Figures

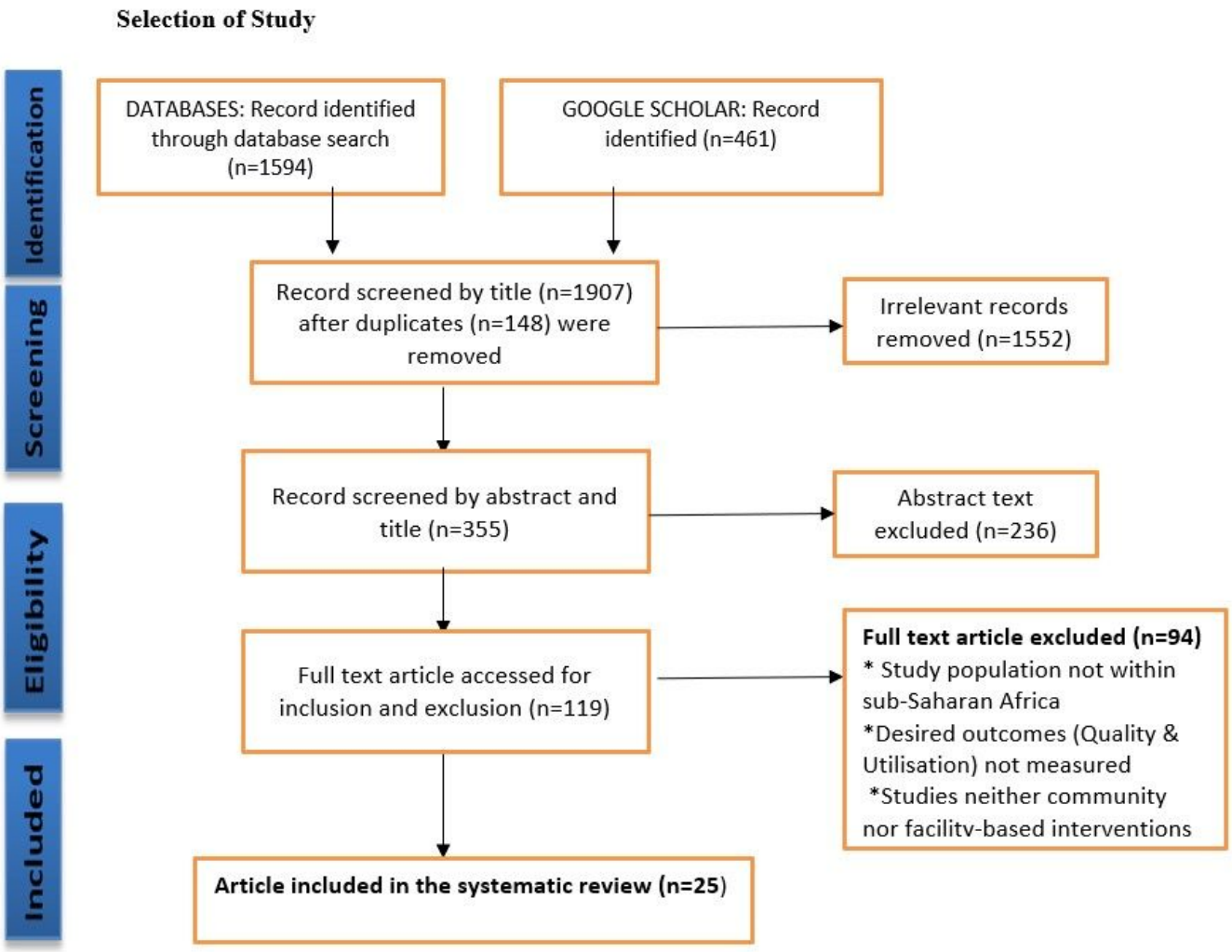

Fig 1: Flow diagram of study selection according to PRISMA Flow Chart

Figure 1

Flow diagram of study selection according to PRISMA Flow Chart