

Sustainable high impact community health worker programs for low-income urban settings: Designing of ANCHUL (AnteNatal and Child Health Care in Urban sLums) intervention for Accredited Social Health Activist (ASHAs) in Delhi, India

Suparna Ghosh-Jerath (✉ suparna.ghoshj@iiphd.org)

Public Health Foundation of India <https://orcid.org/0000-0002-2229-4455>

Niveditha Devasenapathy

Public Health Foundation of India

Monika Rana

Delhi State Health Mission

Sanjay Zodpey

Public Health Foundation of India

Anuraj Shankar

University of Oxford

Research

Keywords: community health workers, urban health, implementation research, intervention at scale, urban poor

Posted Date: January 28th, 2020

DOI: <https://doi.org/10.21203/rs.2.22100/v1>

License: © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License. [Read Full License](#)

Abstract

Background: Urbanization in India has led to increasing economic disparities and health inequalities with worse maternal and child health indicators among the urban poor. Community health workers (CHW) within the urban community health systems (UCHS) can play important role in addressing the health needs of urban poor. We present here a 3-stage process of development of a remodelled program for the existing CHWs called Accredited Social Health Activists (ASHAs) working in urban poor settlements of Delhi, India, in collaboration with Delhi State Health Mission (DSHM); the implementers of the program. The intervention was called ANCHUL (Antenatal and Child Health in Urban sLums) intervention and was designed in three phases; formative phase, design phase and evaluation phase. In this paper we discuss the formative and design phase.

Methods: We used a mixed methods approach including surveys, qualitative enquires, desk reviews and consultations with key stakeholders (program implementers, decision makers in the health system, ASHAs, clients and healthcare providers) during the formative and design phase. The goal was to create a dynamic adaptive model for the urban ASHA program based on current evidence yet bound within the decision space and options of program implementers. Principles of implementation research was applied to design the ANCHUL intervention. A pragmatic quasi experimental design was used to evaluate this complex intervention.

Results: The formative phase identified the current maternal and child health needs of the urban poor, the programmatic challenges of the ASHA program and helped in creating a conceptual framework for the intervention. The design phase formalised the key components of the ANCHUL intervention namely selection, training, monitoring and supervision, and execution of ASHAs' day to day activities; identify the standardized components and flexible functions, and list the process indicators for evaluating this intervention.

Conclusion: Principles of implementation research was used for designing a context specific intervention directed towards ASHAs while engaging with a wide range of stakeholders. Such an approach may prove to be time consuming yet is feasible to address implementation challenges of an ongoing program and remodel it with evidence based components planned within the decision space of implementers.

Background

The world's population is urbanizing at an unprecedented pace, with the highest rates in low and middle income countries (LMICs) [1]. Unplanned and unregulated urbanization brings in its wake several socio-demographical problems and impose a heavy burden of disease and inequity on the urban poor [2]. This urbanization is changing the face of poverty and marginalization, and so the nature of preventable maternal and newborn morbidity and mortality in the 21st century. Unfortunately, many LMICs have weak, or absent, urban community health systems (UCHS) and are unable to deliver quality reproductive, maternal, neonatal and child health (RMNCH) services. This gap is exacerbated by the unique challenges of the urban setting including migration within the population of slums and informal settlements. Processes are needed whereby high impact community health workers (CHW) for UCHS can be developed. This requires development of human resource management practices that are evidence-based, practical, and sustainable within the decision space of the program implementers to improve service quality and outcomes [3]. We report here a 3-stage process in development of a complex intervention for CHWs that was implemented by UCHS. The intervention was

developed in collaboration with the Delhi State Health Mission (DSHM) to address the need for Accredited Social Health Activists (ASHA) as CHWs in urban slum settlements in Delhi, India.

In India, urbanization has led to increasing economic disparities and health inequalities [4], with the worse RMNCH indicators among the urban poor [5, 6]. In Delhi, the national capital, disparities have been attributed to limited access and provision of services [7-9]. This is due, in part, to the multiplicity of controlling agencies with ambiguities in accountability, coupled with inefficient institutional frameworks and poor programme implementation. The problems are exacerbated by highly variable population density and mobility of migrant populations, poorly defined catchment areas [10] and lack of community utilization of services. A well implemented system of CHWs could play an important role in such settings.

The impact of CHWs on health needs of underserved populations has been extensively studied, and have shown that they can enhance health status in some communities [11, 12]. Studies have documented impact of CHW through women's groups, provision of door-to-door RMNCH services, and timely referrals to local health centers. However, most studies have been conducted in rural areas with few examining the specific needs of urban CHWs. [13,14,15]

A report from India's National Rural Health Mission (NRHM) examined the role of CHWs called [Accredited Social Health Activist (ASHAs)] deployed in rural villages since 2005. This report though highlighted reductions in infant mortality rates (IMR) and maternal mortality ratios (MMR), and total fertility rate (TFR) [16-19], but also raised concerns about quality of services delivered and supervision of ASHAs. Following the NRHM guidelines, in 2008, the Delhi State Health Mission (DSHM) pioneered ASHA deployment in urban areas of Delhi after modifications to the rural model to accommodate for differences in access, availability and delivery of RMNCH care. Activities performed by the ASHAs in urban slums of Delhi include community based MCH promotion for early referral to health care services and increase awareness for utilization of institutional care during pregnancy, childbirth, the immediate post-partum period, childhood illnesses, family planning measures and other general health issues of the community. The program aims to utilize ASHAs in mobilizing the community towards awareness of their health issues and orienting them towards government entitlement programs thereby improving healthcare utilization [20].

An evaluation of the program in two districts of Delhi showed high attrition of ASHAs due to withdrawal from this voluntary post, or dismissal due to non-performance. The associated factors to this sub-optimal output included lack of a structured training, delays in incentive payments, lack of supervision and support staff, and ineffective use of a performance monitoring system for programme planning and monitoring [10]. Hence there was a felt need for a newer approach that would adapt the ASHA program to the dynamic urban setting and strengthen monitoring of performance in a timely manner. Further, the approach should allow frequent modifications in the components program to suit the needs of the urban poor communities that are continuously in flux.

The goal of ANCHUL (**A**ntenatal and **C**hild **H**ealth in **U**rban **s**Lums) intervention was to create a dynamic adaptive process for the urban ASHA program for low income urban settlements that was supposed to be based on current evidence yet bound within the decision space and options of program implementers. We applied principles of Implementation Research (IR) [21] to understand the operational challenges of the ASHA program. The ANCHUL intervention was created as an iterative cycle with active and continuous consultation with key

stake holders (program implementers, decision makers in the health system, ASHAs, clients and health care providers) that permitted monitoring of processes related to the program implementation, regular feedback for necessary changes and amendments in its design. The ultimate purpose of this real world approach was to present a model with its findings in a format and context that would enable rapid uptake and use by planners and decision-makers within the health system. The entire process of identifying the implementation gaps in a program while embracing the ecosystem of frontline care quality contextualized to the needs, barriers and aspirations of urban set up was the core principle adapted to design the intervention.

This manuscript is a part of ANCHUL project, which aimed to develop, implement and evaluate the impact of an intervention directed towards ASHAs working in urban slums of Delhi, the national capital of India, using a quasi-experimental design (CTRI/2011/091/000095). The overall objective of this intervention was to improve the work performance of ASHAs in the urban poor settlements of Delhi which would lead to increase in institutional deliveries and improvement in maternal, neonatal and child healthcare (MNCH) practices.

In this paper, we have described the formative and the design phase of the ANCHUL project. The intervention we propose is focused specifically on selection, training, monitoring and supervision, and execution of ASHAs' day to day activities with mechanisms to address operational challenges. Though ASHAs are considered the first "port of call" for any health issues in the community, our intervention focused primarily on enhancing the MNCH care component of their work.

Methods

Study setting: The urban poor settlements of Delhi.

Study period: September 2011 to December 2013

Study context: In order to make the intervention fit within the context of the implementing organization, which in the present case was the urban community health system catered by primary urban health systems (PUHCs) under the DSHM, its culture and networks were also assessed.

The ANCHUL intervention was envisaged to be an add on to the existing ASHA program. At the time of planning of the ANCHUL intervention, the ongoing model of ASHA program was implemented in various districts of Delhi where new seed PUHCs were being operationalized in addition to the existing ones. One ASHA was supposed to cater to a population of 2000. The vision was to have 1 PUHC catering to a population of 50,000. Hence one PUHC would have 25 ASHAs under it and 2 centres would usually cater to a population of 100,000 with 50 ASHAs. This 100,000 population would comprise of 1 administrative unit. The selection strategy for ASHA for Delhi urban areas entailed a committee comprising of an ANM, Medical officer, area Pradhan, anganwadi supervisor who would collect the nominations for ASHA, and the selection was done at the Unit level. The nominations were then sent to the district for endorsement. The training was conducted at the PUHC and after the first module training, a kit was provided to the ASHAs. At the time of planning of ANCHUL intervention, the ASHAs were providing preventive care. There were various mentor groups at the unit, district and state level. There was however a lack of clarity on the role of these mentor groups. Delhi State had also developed Public Health Standards and Quality Assurance Manuals for the PUHCs, an essential input towards health system strengthening. The incentivisation strategy for ASHAs was also revised in December 2010. We

attempted to follow this structural framework of the ASHA program while incorporating specific components in the program to address implementation challenges.

Study population: This included the key stakeholders of the program including the ASHA program implementers, decision makers, program planners, policy makers, academicians, health care providers of public health system and the community living in urban poor settlements.

Study design: The ANCHUL intervention design was informed from data collected by mixed methods i.e. by data from quantitative surveys, qualitative enquiries like in-depth interview, focus group discussions and key informant interviews and desk review.

The intervention was developed in three phases:

Formative phase (Phase 1): This was a combination of community based survey, consultations with the program implementers and decision makers, and a desk review with the goal to identify key gaps in the program and a rapid assessment of the existing MCH needs in urban poor settlements of Delhi. This led to the development of the conceptual framework for our intervention.

Design phase (Phase 2): Based on the conceptual framework, this phase aimed at developing the key components of the ANCHUL intervention that needed to be contextualized within the care provision set up, external environment and the end users of the intervention as identified in Phase 1. The processes of implementing each component of ANCHUL intervention were finalized. This phase also identified key process indicators linked to each component of intervention for the purpose of evaluation.

Evaluation phase (Phase 3): The intervention was rolled out with the goal to test its feasibility, but allowing flexibility of modifying the processes through an iterative rapid feedback mechanism. In this phase we also evaluated the intervention using a pragmatic quasi experimental design.

A schematic presentation of phases is provided in figure 1. In this paper we have focussed on the formative and design phase of the intervention.

In the following section, methodology for each phase along with the results are discussed.

Methods

Formative Phase: (Phase 1)

Desk review: A desk review of the existing ASHA models in various states of India and their evaluations was conducted. Informal meetings with key stakeholders of the ASHA program were also conducted to facilitate understanding their perception regarding factors associated with the success and weaknesses of the program in urban areas.

Community survey: The formative phase included a cross sectional household (HH) survey in three slum clusters namely CPJ, Buland Masjid and Chanderpuri of Seelampur, Gandhinagar and Kailash Nagar Assembly respectively of the north east district of Delhi. Apart from collecting information on cluster level characteristics including vulnerability in terms of infrastructure and access to MCH services, we collected information about

family details, socio demographic status, place of childbirth (for women who had given birth in the past 1 year), and maternal and child deaths within households in the past 1 year. All households with pregnant women, recently delivered mothers and randomly selected households with under-5 children, were revisited and detailed information was collected about antenatal care (ANC), child birth, immediate postnatal period, new born care practices, morbidity in children, nutritional status of mothers and children and presence of any community based maternal, neonatal and child health (MNCH) services. Qualitative data were also collected from the community and the service providers in order to assess the MNCH care practices and availability, access and utilization of both community and facility based MNCH services in the study areas.

Development of a conceptual framework: This included listing the key issues/gaps and identifying the key interventions which had the potential to address issues were identified.

A round table consultation: A round table consultation was organized to present the findings of community survey and to take into account the perspectives of the policy makers, MCH experts and researchers, nutritionist, health specialist, representative from Delhi Urban Shelter Improvement Board (DUSIB) and ANCHUL team members. The main objective of the RTC was to obtain inputs of the RTC members on the feasibility, sustainability of the intervention framework, and scalability of the proposed model.

Presentation of ANCHUL intervention to DSHM and permission to conduct the trial: The proposed intervention was presented to DSHM. This exercise was crucial in understanding what was feasible within the decision space of the program implementers and getting their feedback on practical feasibility of proposed processes to address the gaps identified. Following this, formal permissions were obtained to roll out and evaluate the modified components of ASHA program in the intervention area in consultation with DSHM officials and program implementers.

Results

Formative phase (Phase 1)

Desk Review: The desk review revealed various models of the ASHA program that are operational in different states of India. Review of the training modules of ASHAs, highlighted the need for restructuring and to remove some repetitive sections. The document on evaluation of the Delhi ASHA model as part of the 6th Common Review Mission 2013 [10] provided some crucial inputs regarding the need for restructuring with specific focus on the training, supervision and monitoring of ASHAs. Further, recommendations existed on strengthening the ASHA selection process in order to optimize their productivity and consistency of performance [22, 23].

Literature also suggested a consensus that continuous training or refresher training of community health workers is as important as the initial training [24]. Also, there was evidence on the importance of context specific supervision with supportive approaches as crucial factor for worker performance [25].

Informal meetings: Eleven informal discussions were conducted with key policy makers and stakeholders in the health department of both the National and the State Government, Planning Commission of India (currently renamed as Niti Ayog), at a tertiary level medical institute, and in an NGO doing extensive work in MCH. The meetings provided insight into the following:

(1) The felt need for an urban community health worker.

(2) The relevance of ANCHUL project as a very timely initiative as the National Urban Health Mission was a priority in the then proposed 12th five year plan.

(3) A need for a realistic appraisal of the feasibility and likelihood of success of ANCHUL model in urban slums in the context of:

- a. Optimal utilization of existing infrastructure, exploring a public private partnership in the proposed model
- b. An ideal worker to population ratio in the urban context
- c. Clarity about the role definition of the worker with clear-cut strategies on curative and preventive roles of the ASHAs and their supervisors i.e. Auxillary Nurse Midwives (ANMs),
- d. Life cycle approach to address intergenerational influence on health of mother and child
- e. Convergence of various sectors related to health
- f. Optimal utilization of an existing ASHA kit and its synergy with the promising AYUSH department (Ayurveda, Yoga, Unani, Sidhha and Homeopathy);

(4) A need for robust referral component at various levels of the health system with better linkage between the levels of continuum of care

Community survey: A survey that was conducted in 6092 HHs with a median family size of five showed that among the women (n=852) who gave birth in the previous year, 53% (95% CI 49.7 to 56.6) had delivered at home. The predictors of these home births included multiparity, low literacy and migrant status are reported in details elsewhere [26]. In the qualitative enquiries with the community, fear of hospitals, comfort of home and lack of social support for child care emerged as the primary reasons for home births. Almost 80% of the pregnant and recently delivered women who participated in the detailed survey reported receiving some form of ANC but the package was inadequate in terms of the components covered and the quality. The various determinants for non-utilization of ANC included poverty, literacy, migration, duration of stay in the locality and high parity [27].

Just above half (57.3%) of these women availed ANC from a public health facility but only 44% of them made their first ANC visit within the 1st trimester. Prevalence of anaemia in pregnant women across all gestational ages was 85%, and 97.1 % in women who had recently delivered. Among the under five children, 17% did not receive any immunization and amongst those who received immunization, only 58.8% were completely immunized for age. A high prevalence of undernutrition (Z score <-2SD) in terms of underweight (34.9 %), stunting (61.3%) and wasting (10.2%) was observed among under-5 years children. The qualitative enquiries with recently delivered women and mothers of children under 5 years of age showed a clear preference towards the private health care providers in case of illnesses in neonates and children. With respect to CHW (i.e. anganwadi Worker, ASHAs and other voluntary health workers associated with NGO), there was a very nominal presence of any CHW in the slums studied with only 29% of the households being aware about the presence of any CHW in their area. There was however, a felt need by the community for a CHW to serve in their area.

Development of conceptual framework: Based on findings of the formative phase and the existing literature on the evaluation of the ASHA program in different set ups in India, a conceptual framework was developed that informed the ANCHUL intervention (Figure 2).

Improvement in MCH care practices and better healthcare utilization were the core outcomes of the intervention. In order to achieve those, various factors that led to this outcome were identified. The factors identified were categorized into three core areas:

- Quality of community based care provided by ASHAs
- Motivation level of ASHAs
- Knowledge, awareness and practices regarding MNCH care among the community

This was followed by identification of factors that may influence these outcomes. These factors were especially those that could be tackled by addressing the implementation challenges of ASHA program. Better selection of motivated ASHAs, their enhanced work performance which would lead to better awareness in the community, better trust on ASHA workers, and improved referral for MNCH care needs were identified as the key factors. Hence, 4 crucial interventions that could address most of these factors included:

- Selection of ASHAs
- Modified training
- Supportive supervision and monitoring
- Improved job-aids, structured work schedule and data for review

Round table consultation: The community survey findings were presented in a round table meeting along with a proposed ANCHUL intervention model. The RTC ended with a positive note on the proposed model and the experts emphasized the need for trying out the intervention in a real world set up and within the current framework of the program.

Presentation of ANCHUL intervention to DSHM and permission to conduct the trial: The same findings along with the proposed model were also presented to the key officials of DSHM. DSHM was keen on interventions that would motivate the workers to perform their day to day job responsibilities, made them accountable for their work and improve their skills in executing quality work. It was also desirable that none of the process would ideally need additional resources in terms of manpower or financial inputs. The DSHM identified two matched slum settlements under the PUHC of Sangam Vihar (B block) and Lalkuan in the South east district of Delhi and provided formal permission to ANCHUL team to roll out the intervention in one of the settlement while the other was supposed to serve as the control where the standard Government ASHA program was planned to be rolled out.

Methods

Design phase (Phase 2)

Based on a conceptual framework developed and the feedback from the program implementers, the key components of the intervention were developed and the processes to implement the intervention were finalised. The process indicators to monitor the implementation of the ANCHUL intervention and its evaluation were also finalized.

Study team: The intervention development team consisted of the researchers from Indian Institute of Public Health - Delhi, Public Health Foundation of India, All India Institute of Medical Sciences, New Delhi, Harvard T.H. Chan School of Public Health, Boston, Massachusetts, USA, CARENIDHI, a grass root NGO and the implementers, policy makers and decision makers at the DSHM. At every stage of the development of this intervention, the DSHM provided specific feedback on various concerns in the existing ASHA model and possibility of adaptation of the proposed modifications into the existing framework.

Results

Design Phase (Phase 2)

Components of the ANCHUL intervention

The ANCHUL framework was consistent with the ongoing ASHA program but had added components to address implementation challenges. Figure 3 provides an overview of the salient differences between the ANCHUL intervention and the existing ASHA program. The four components of the intervention included

1. A competitive selection process (multi stage selection process)
2. Enhanced training (modified training modalities)
3. Active monitoring and surveillance (supportive supervision and data driven decision making)
4. Effective implementation of the program (use of job aids and active use of data)

Though all these components existed in the Government run program, we incorporated some simple processes that had the potential to address implementation gaps identified during formative phase of the study.

Table 1 details out each component of intervention while comparing it with the standard government protocol. We also assessed the readiness of the program implementers (DSHM) for the proposed changes in the program and maintained a continuous dialogue with them. While working on each component of the ANCHUL intervention, we assessed the acceptance of the modifications suggested thus assuring the “the feasibility of modifications suggested”.

ANCHUL intervention was a complex intervention and each of the component was fixed by form but flexible by function. (Table 2) [28]. In other words, the intervention had provision of options for flexible modalities for better adaptation in varied contexts in which it was implemented. This was a crucial component of this entire evolution as it led to identification of processes that were feasible within the limits of the health system.

Processes of implementation of the proposed component: Standard government norms were followed for the coverage area for ASHAs, their activities, reporting mechanism and supervisory structure. The ANCHUL intervention introduced two additional components namely, a real time data entry of the information gathered by the ASHAs. This aided in better supervision and incentive calculation. We also introduced a supervisory cadre similar to the cadre of ASHA facilitator in other states. The cadre provided supportive supervision and assessed the work performance of ASHAs using simple scores like head (knowledge), heart (attitude) and hand (practice) (HHH score) (table 1) and supported them in enhancing the same.

Process indicators for monitoring implementation of the intervention and its evaluation:

Process indicators were identified for each component of the intervention and data was required to be collected from the records of ASHAs and supervisors and target population like pregnant and recently delivered women and mothers of under 5 children . Table 3 shows the list of process indicators identified.

Methods

Evaluation phase (Phase 3)

A quasi experimental design was used to study the feasibility of this complex intervention. During the roll out of the intervention, its various components and their implementation modalities were tested for feasibility and modified through an iterative process in consultation with implementers of the program. The project was evaluated in catchment areas of two seed PUHCs of south-east district of Delhi namely Sangam Vihar “B Block” (intervention area) and Lalkuan (control areas) that were purposively selected in consultation with DSHM. Both the PUHC did not initially have any ongoing ASHA program. In the control area the Government ASHA program was rolled out as per the established procedures.

Study team consisted of an intervention team and an independent surveillance team. The intervention team consisting of an intervention officers and researchers worked closely with the DSHM and its field functionaries and tested the feasibility of each of the components of intervention while the surveillance team collected data on process indicators from both the intervention and control areas.

Results: The ANCHUL intervention was successfully rolled out in the intervention area while the routine Government ASHA program was rolled out in the control area.

Discussion

In this narrative we present the process of designing a complex intervention aimed at the community health workers of the health system in the context of urban poor setting of developing nations using principles of implementation research. The present study was an effort to develop an intervention that was potentially feasible, scalable, acceptable, and sustainable to the implementers of the program. To facilitate such an endeavour, the first step was to generate evidence on the needs of the stakeholders, identify gaps, identify existing interventions in literature and modify an existing program to the current context and needs. Below we discuss the importance of use of implementation research along with the challenges and lessons we learnt from this exercise.

Adopting principles of implementation research in designing interventions: The potential role of community based MNCH care with CHWs as the key players in improving health outcomes has been well documented [11]. However, factors like weak management and supervision among others have been identified as barriers to the scale-up and sustainability of such programs [12]. Though there was a felt need for community health workers in the urban settlements of Delhi and presence of an ongoing ASHA program since 2008, there was only a nominal presence of these workers in the community studied. This could be attributed to various barriers and challenges within the ASHA program model. In order to identify these challenges, we utilized implementation research. Similar studies adapting this approach have shown that dearth of competent and motivated health

workers can act as major impediment to improving health and saving lives [21]. The strategies adopted in such scenario focus on the building of local capacity; instil ownership for processes supporting human resource management and related health systems activities for improving work force performance and wider health system. Further, Action Research (plan, act, observe and reflect) is often used to develop and then evaluate strategies feasible within the existing context for strengthening processes [29]. One such research group called PERFORM supports the district health management teams (DHMT) in Ghana, Uganda and the United Republic of Tanzania in Africa to plan their own 'bundles' of human resource and health systems strategies, act to implement these strategies and observe the impact of the strategies they have developed on health workforce performance. They then reflected on how well their plans have been achieved and if necessary, revise the plan or address new challenges thus beginning to embed the process within their districts [30]. The ANCHUL intervention was planned on similar lines and it identified critical points in processes for ASHA workforce strengthening like selection, training, supervision and day to day implementation of job responsibilities.

Working with implementers: One key aspect of implementation research is in bringing the researchers and policy makers to the same platform in order to make the research and its findings readily adaptable and sustainable. It is crucial that researchers and policy-makers need to come together very early on to agree on their shared objectives and how to attain them [31]. It is also important to assess the policy-makers' appetite to engage in new research and their intentions in utilising the findings from the research. In the present study, implementers were presented with evidence regarding the MCH needs of the community. Following this, by utilizing the conceptual framework, solutions were suggested within the ambit of the existing ASHA program. Once a dialogue was initiated, key process were identified while understanding the decision space of the implementers and backed by the evidence generated during the formative phase. Further advocating the principle of complex intervention enabled us to have flexible functions to suit a wide range of scenario. This approach has the potential for immediate buy-in from the implementers and successful translation of the research plan into action. However, the approach proved to be a time consuming process as systems work under a set of rules and bringing changes needed multiple levels of clearances and acceptance within the system. A continuous engagement with the program implementers and decision makers, and following an iterative process may lead to pushing back some planned deadlines but have the potential to evolve processes that are potentially adaptable within the existing health frameworks. Thus the processes developed might not have painted a larger than life and ambitious picture with huge cost implications but were surely implementable without huge investments on additional resources.

Feasible innovation in proposed ANCHUL intervention: Based on the findings of the formative phase, we explored components of the ASHA program that could be strengthened to improve its overall impact. Various reports of the countrywide ASHA program have documented a variety of ASHA selection process and that the prescribed selection practices are often not followed. A recent study has recommended the need for a decentralised, community driven and participatory selection process for ASHAs in order to maximize their productivity and consistency [22, 23]. In the present intervention, for better accountability, the committee for ASHA nomination was given an orientation regarding criteria for the nomination of candidates. Another simple process of a screening test for the potential ASHAs, was also introduced for ASHA selection (table 1) with the intention of screening only the motivated ASHA who were willing to learn.

Further, factors like lack of a structured training component has also been associated with sub optimal performance of the ASHA program in Delhi [10]. The importance of continuing or refresher training of community health workers have been reiterated in the literature. A number of studies have found that if regular refresher training is not available, acquired skills and knowledge are quickly lost [24] and that, on the other hand, good continuing training may be more important than who is selected [32]. The ANCHUL intervention streamlined the various components of ASHA training program and had periodic need based refresher programs (table 1) to facilitate on-the-job capacity building of ASHAs. In the present study, we trained more workers and selected the best performing ones as ASHAs and the rest added to the pool of back up ASHAs (table 1). This strategy is feasible provided transparency is maintained about the selection process among the potential candidates. Expertise in core areas of training is also crucial. Providing skill based training and adopting innovations in training is also important.

Though a diverse variety of supervisory approaches are available, the choice of approach should be context specific. Literature supports the fact that high-quality supervision that focuses on supportive approaches, community monitoring, quality assurance and problem solving may prove to be most effective [25]. Poor clarity in the ASHA support structure including roles of the support staff has been reported as a weakness of the ASHA program in Delhi [10]. A supervisory cadre in ANCHUL intervention similar to the cadre of ASHA facilitator in other states provided the necessary supportive supervision and assessed the work performance of ASHAs and supported them in enhancing the same.

It is known that the performance of community health workers can be limited by weak delivery of appropriate training and re-training, unsupportive supervision and ineffective job aids. Apart from developing simple process of structured training, supervision, a series of appropriate and simple job aids in the form of pictorial message card, flip books, stickers, microplan sheets and SMS reminders (table 1) were developed as part the ANCHUL intervention which might have facilitated effective job performance of ASHAs.

Conclusion

The ANCHUL intervention was designed while engaging with a wide range of stakeholders and developing a context specific intervention keeping the key aspects like existing care provision set up, external environment, people involved who are the end users and taking actual process of implementation into consideration to address complex implementation challenges of an ongoing program delivered by community health workers. The outcomes of this research is expected to contribute to the body of knowledge on ways for improving ongoing programs while working within the existing health system and in consultation with the existing implementers.

Limitations: We have not reported the study findings on the process indicators that were collected during the evaluation phase of the study as they are beyond the scope of this manuscript. The data on the qualitative enquiries that were made during the situational analysis are not documented in detail in this paper. The current design developed has limited generalisability for urban areas in other states of India and other countries. The model needs to be further tested for effectiveness.

Abbreviations

LMICs: Low and Middle Income Countries; ASHA: Accredited Social Health Activist; ANCHUL: AnteNatal and Child Health care in Urban sLums, CHW: Community Health Worker, UCHS: Urban community Health System, DSHM: Delhi State Health Mission, PUHC: Primary Urban Health Centre; ANC Antenatal Care, HBNC: Home Based Newborn Care.

Declarations

Ethics approval and consent to participate: The study protocol of the entire project was approved by Health Ministry Screening Committee of Government of India, Institutional Ethics Committees of the Public Health Foundation of India, All India Institute of Medical Sciences, New Delhi, WHO Geneva and Harvard T.H. Chan School of Public Health, Boston. Informed consents were taken from the participants of community survey and qualitative interviews.

Consent for publication: Not applicable

Availability of data and materials: The datasets used during the current study are available from the corresponding author on reasonable request.

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

Funding: This work is funded by WHO, Geneva (Alliance for Health Policy and Systems Research (HSS/AHPSR), The Special Programme for Research and Training in Tropical Diseases (IER/TDR), The Special Programme of Research, Development and Research Training in Human Reproduction (HRP), Child and Adolescent Health and Development (FCH/CAH)) (Grant 2011/139172-0).

Author's contributions: SGJ and ND conceived and designed the study with additional inputs from AHS and SZ. SGJ and ND supervised the data collection. ND analysed the data. SGJ and ND jointly prepared the first draft of the manuscript. MR, AS and SZ commented on drafts. All authors contributed to critique and modification of the manuscript, read and approved the final version. SGJ had full access to all the data in the study and had final responsibility for the decision to submit for publication.

Acknowledgements: We would like to acknowledge all the families, policy makers, program implementers who volunteered to provide data for the surveys and qualitative enquiries. We thank the efforts of field staff, data manager and data entry operators.

References

1. Urbanization | UNFPA - United Nations Population Fund. <https://www.unfpa.org/urbanization>. Accessed 01 May 2018
2. World Health Organization. Regional Consultation on Health of the Urban Poor. Mumbai, India; 2011. http://apps.searo.who.int/PDS_DOCS/B4682.pdf. Accessed 01 May 2018
3. Coast E, McDaid D, Leone T, Pitchforth E, Matthews Z. What are the effects of different models of delivery for improving maternal and infant health outcomes for poor people in urban areas in low income and lower middle income countries? Department of International development, London. 2012.

4. Brockhoff M, Brennan E. The poverty of cities in developing regions. *Popul Dev Rev.* 1998;24(4):75–114. <http://www.jstor.org/stable/2808123>. Accessed 01 May 2018
5. Population Sciences (IIPS) and Macro International. National Family Health Survey (NFHS-3), 2005-06, India. Mumbai; 2007. http://rchiips.org/nfhs/NFHS-3%20Data/VOL-1/India_volume_I_corrected_17oct08.pdf. Accessed 01 May 2018
6. Prakash R, Kumar A. Urban poverty and utilization of maternal and child health care services in India. *Journal of Biosocial Science.* 2013;45(4):433–49.
7. Dua A, Sachdev T, Rasania S. A study on community awareness on child immunisation. *Indian Journal of Public Health.* 2000;44(4):134–6.
8. Kar M, Reddaiah VP, Kant S. Primary Immunization Status of Children in Slum Areas of South Delhi-The Challenge of Reaching the Urban Poor. *Indian J Community Med.* 2001;26(3):151–4.
9. Banerjee B. A Qualitative analysis of maternal and child health services of an urban health centre, by assessing client perception in terms of awareness, satisfaction and service utilization. *Indian J Community Med.* 2003;28(4):153.
10. MoHFW. 6th Common Review Mission 2012, Delhi. Ministry of Health and Family Welfare, Government of India. 2013. <http://nhm.gov.in/monitoring/common-review-mission/6th-common-review-mission-crm.html>. Accessed 01 May 2018
11. Gilmore B, McAuliffe E. Effectiveness of community health workers delivering preventive interventions for maternal and child health in low- and middle-income countries: a systematic review. *BMC Public Health.* 2013;13(1):847.
12. Pallas SW, Minhas D, Pérez-Escamilla R, Taylor L, Curry L, Bradley EH. Community Health Workers in Low- and Middle-Income Countries: What Do We Know About Scaling Up and Sustainability? *Am J Public Health.* 2013;103(7):e74-82.
13. Namazzi G, Okuga M, Tetui M, Muhumuza Kananura R, Kakaire A, Namutamba S, et al. Working with community health workers to improve maternal and newborn health outcomes: implementation and scale-up lessons from eastern Uganda. *Global Health Action.* 2017;10(sup 4):1345495.
14. Choudhury N, Moran AC, Alam MA, Ahsan KZ, Rashid SF, Streatfield PK. Beliefs and practices during pregnancy and childbirth in urban slums of Dhaka, Bangladesh. *BMC Public Health.* 2012. doi:10.1186/1471-2458-12-791.
15. More NS, Bapat U, Das S, Patil S, Porel M, Vaidya L, et al. Cluster-randomised controlled trial of community mobilisation in Mumbai slums to improve care during pregnancy, delivery, postpartum and for the newborn. *Trials.* 2008;9(1):7.
16. MoHFW. Achievements under the National Rural Health Mission (NRHM). Ministry of Health and Family Welfare, Government of India, Press Information Bureau. 2015. <http://pib.nic.in/newsite/PrintRelease.aspx?relid=123670>. Accessed 01 May 2018
17. MoHFW. Evaluation of Accredited Social Health Activists (ASHA). Ministry of Health and Family Welfare, Government of India, Press Information Bureau. 2015. <http://pib.nic.in/newsite/PrintRelease.aspx?relid=116029>. Accessed 01 May 2018
18. Census of India. Sample Registration System: Statistical Report, India: Registrar General, Ministry of Home Affairs, Government of India. 2012. http://censusindia.gov.in/vital_statistics/SRS_Bulletins/SRS_Bulletin-

October_2012.pdf

19. Census of India. Sample Registration System: Vital Statistics, India: Registrar General, Ministry of Home Affairs, Government of India. 2005.
20. MoHFW. Guidelines for ASHA and Mahila Arogya Samiti in the Urban Context, National Urban Health Mission.2014.

https://www.wbhealth.gov.in/NUHM/CommunityProcess/Guidelines_for_Asha_and_MAS_in_Urban_Context.pdf. Accessed 7 May 2018.

21. Peters DH, Tran NT, Adam T. Implementation Research in Health: A Practical Guide. 2013. Geneva: World Health Organization. www.who.int/about/licensing/copyright_form/en/index.html. Accessed 7 May 2018.
22. Bajpai N, Dholakia R. Improving the performance of accredited social health activists in India, Working Paper-1. Mumbai: Columbia Global Centres South Asia.2011.
23. (NHSRC) National Health Systems Resource Centre. ASHA: Which way forward? Executive summary- Evaluation of ASHA Programme. 2011. http://www.nipccd-earchive.wcd.nic.in/sites/default/files/PDF/Evaluation_of_ASHA_Program_2010-11_Executive_Summary.pdf. Accessed 01 May 2018
24. Ashwell HE, Freeman P. The clinical competency of community health workers in the eastern highlands province of Papua New Guinea. *P N G Med J.* 1995;38(3):198–207.
25. Hill Z, Dumbaugh M, Benton L, Kä Llander K, Strachan D, Ten Asbroek A, et al. Supervising community health workers in low-income countries -a review of impact and implementation issues. *Glob Health Action.* 2014;7(1):24085.
26. Devasenapathy N, George MS, Jerath SG, Singh A, Negandhi H, Alagh G, et al. Why women choose to give birth at home: a situational analysis from urban slums of Delhi. *BMJ Open.* 2014;doi:10.1136/bmjopen-2013-004401.
27. Ghosh-Jerath S, Devasenapathy N, Singh A, Shankar A, Zodpey S. Ante natal care (ANC) utilization, dietary practices and nutritional outcomes in pregnant and recently delivered women in urban slums of Delhi, India: an exploratory cross-sectional study. *Reproductive Health.* 2015;12(1):20.
28. Hawe P, Shiell A, Riley T. Complex interventions: how“out of control”can a randomised controlled trial be? *BMJ.* 2004;328(7455):1561–3.
29. The Perform approach. Strengthening health management and workforce performance: How action research can help. <http://performconsortium.com/media/1030/perform-methodology-brief.pdf>. Accessed 7 May 2018.
30. Home - PERFORM Consortium. <http://performconsortium.com/>. Accessed 7 May 2018.
31. Tran NT, Hyder AA, Kulanthayan S, Singh S, Umar RSR. Engaging policy makers in road safety research in Malaysia: a theoretical and contextual analysis. *Health policy.* 2009(1);90:58–65.
32. Ande O, Oladepo O, Brieger WR. Comparison of knowledge on diarrheal disease management between two types of community-based distributors in Oyo State, Nigeria. *Health Education Research.* 2004. doi:10.1093/her/cyg004

Tables

Table 1: Components and comparison of ANCHUL ASHA intervention to existing ASHA program

Components		ANCHUL ASHA	GOVT ASHA
I Selection	Nomination committee	Sensitization of the nominators, nominator's guide and then nomination Strategy: Better accountability and transparency	Nomination by nomination committee
	Selection for training	A Screening test: Written test followed by interview of selected nominees who pass the written test using interview criteria. More candidates are selected from training than the total number of posts. Strategy: Selection of motivated candidates	No screening test Interviewing all nominees
	Final selection	Based on the performance during training, the best performing candidates are selected as ASHAs. The candidates with better leadership and managerial skill along with better overall performance are selected as supervisors. Rest act as back up ASHAs	Based on performance during interview
II Training	Modules	Training modules : 7 + 1 Supervisory module Module 1: Roles and responsibilities of ASHA Module 2: Skill development Module 3: Adolescent health and family planning Module 4a:Antenatal Care Module 4b: Intranatal care and post natal care Module 5: Child care Module 6:Communicable and Non communicable diseases and health programs Module 7:Supervisory protocol Strategy: Rearranging the chapters, changing sequences for streamlined training	Training modules: 7 Module 1 Module 2 Module 3 Module 4 Module 5 Module 6 Module 7
		Trainer's manual for each manual Strategy: Standardization of training modality	
	Duration	Initial 11 days followed by 2-5 days divided in 5-6 refresher trainings Strategy: Better capacity of the ASHAs to work in the community from initial days	Initial training for 4 days and then 7 days training in phased manner
		Need based refresher training using standard manuals or protocols Strategy: Need based and flexible	
	Modality	Classroom based: Didactic, power point presentations, role play, group discussion, short video films Strategy: Innovative Behaviour Change Communication	Classroom based: didactic teaching and hand-outs
		Field based training: For lane mapping, household listing and visit to referral health facility Strategy: Orientation to the field area, health system and hands-on experience	No field training
III Induction		Introducing the field area and handholding (6 weeks) Strategy: Confidence building	Introducing the field area (ANM)
IV Job responsibilities	Household (HH) survey	Survey of HH and risk profiling (6 monthly HH updating) using population workbook and update forms Strategy: Systematic approach and better coverage	Household survey and recently introduced (from May 2015) regular updation Survey diary
		Identification and scheduling periodic visits of target HHs Strategy: Systematic approach and better coverage	Identification and HH visits
		Providing services (mobilization, counselling, sensitization and referral)	Providing services (mobilization, counselling, referral)
		Maintaining target group task sheets (pregnant women, recently delivered women and	Maintaining ASHA diary

	under 5 children) Strategy: Systematic approach and better coverage	
	Convergence with other MNCH care providers	Convergence with other MNCH care providers in the community
Group meetings	Group meetings in the community primarily with adolescent girls and eligible couples Strategy: Group approach for increasing demand for services	None
Use of IECs, job aids for day to day work	A set of IECs and job aids like message card, flip books, stickers, posters, leaflets Strategy: Effective use of IEC for BCC in the community	A set of flash cards and ASHA diary
	Micro plan sheet: Maintaining monthly micro plan sheet for scheduling visits based on master calendar (a document explained in the next section) for better coverage	None
V Data management	Data entry in Database for report generation, performance appraisal, calculation of incentives and Data Driven Decision Making using a software (D3M) A monthly master calendar of scheduled visits generated from the data entered and SMS alerts sent to ASHA reminding them about their home visits Strategy: Effective use of data for decision making	Database for HH survey available
		No timelines for data entry and report generation
VI Supervision	Using supervisory protocol: By an appointed supervisor. One supervisor over 10 ASHAs. Periodic performance appraisal of ASHA by Head (knowledge), Heart (Attitude) and Hand (Practice) score. Supportive supervision and monthly meeting Strategy: Better monitoring and support	Supervision by ANM
VII Mentoring group	At community level (Field NGO, slum representative, community leader, ANM, MO-IC)	
VIII Incentives and Salary	Incentive based and encouragement allowance	Incentive based and encouragement allowance
	Incentives linked and calculated from the ASHA activities entered in the D3M Strategy: Time Management	Incentives calculated on the activities verified by ANM and entered in a software

Table 2: ANCHUL intervention components standardized by form and flexible in function

Component	Standardized by form	Flexible in function
Screening and selection of ASHA	<p>(1) Sensitizing nominees before nominating</p> <p>(2) Nomination process</p> <p>(3) Information given to ASHAs prior to a screening test</p> <p>(4) Screening test for short listing</p> <p>(5) Interview of short listed candidates using a standard checklist</p>	<ul style="list-style-type: none"> • Mode of sensitization, using leaflets or one to one meeting • Who sensitizes (ANM/MO-IC) • Where the sensitization occurs (community meeting/any meeting at PUHC) • Individual nomination by committee members or unanimous nomination • Reading material or • A film on MCH • Test can be given in paper form or a timed computer assisted test • Composition of the selection committee
Training of ASHAs	<p>(1) Topics to be covered using a set of 8 training modules along with trainers modules</p> <p>(2) Number of days to be assigned/modules</p> <p>(3) Field visits to the health centres and catchment area</p> <p>(4) Assessment of participants during and after the training</p> <p>(1) Total number of days of refresher trainings in one year</p> <p>(2) Using standard modules on topics to be covered</p>	<ul style="list-style-type: none"> • Training modalities like power point presentation, flip charts, group activities etc • Sequence of modules • Method of assessment may vary according to the module and the dynamics of work e.g group work , written test etc • Timing, frequency and topics of refresher training e.g training on topics based on felt needs of the community/ ASHA
Refresher training		
Supervision of ASHA	<p>(1) Protocols to be followed under supervisory module for supportive supervision</p> <p>(2) Assessment of performance using Head, Heart and Hand (HHH) score</p> <p>(3) Feedback to ASHAs on performance</p> <p>(4) Ratio of supervisor to ASHA</p>	<ul style="list-style-type: none"> • Total number of days of handholding • Initiation of assessment of ASHA using performance scoring • Modality of feedback
Execution of community work	<p>(1) Knowing the community</p> <p>-Mapping of catchment area using right hand rule and rapport formation with community members</p>	<ul style="list-style-type: none"> • Using the communication and negotiation skills taught during training

(2) Initial HH survey	
(3) Home visitation using standard formats for target population	
(4) Referrals following strict protocol	<ul style="list-style-type: none"> • Using paper form • Using mobile app
(5) Actual visitation of target population following monthly master calendar	<ul style="list-style-type: none"> • Counselling on need basis using appropriate IEC material suitable to the target population
(6) HH update following protocols	
(7) Deliverable based incentivization	<ul style="list-style-type: none"> • Micro-planning based on the practicality of home visitation within a window period of one week

Table 3 :Process indicators identified for monitoring and evaluation of ANCHUL intervention

Content of Indicator	Process indicator	Data source
Selection and	<ul style="list-style-type: none"> • Number of applicants • Applicants who cleared screening test • Applicants finally selected for training • Selected applicants trained • ASHAs selected • ASHAs inducted 	Applicants and selected ASHAs
Implementation	<p>Coverage of target population by ASHA:</p> <ul style="list-style-type: none"> • Pregnant women • Recently delivered women • Under 5 children <p>Specific activities performed by ASHAs on each target group And health care utilization by the target population</p> <p>Pregnant women</p> <ul style="list-style-type: none"> • Identification of pregnant women by ASHAs • Registration • ANC visits • Immunization • Nutrition Supplementation • Referral to Integrate counselling and treatment centre (ICTC) • Identification of high risk pregnancy • Emergency referral <p>Recently delivered women</p> <ul style="list-style-type: none"> • Institutional delivery • Home based newborn care and PNC <p>Under 5 children</p> <ul style="list-style-type: none"> • Immunization • Facilitating visit to anganwadi centre (AWC) • Promoting growth monitoring • Identifying Morbidity 	<p>ASHAs' records</p> <p>ASHAs' records</p> <p>And community survey (pregnant women, recently delivered women and mothers of under 5 children)</p> <p>Community survey (pregnant women, recently delivered women and mothers of under 5 children)</p>

	<p>Knowledge transfer of ASHAs to the community on</p> <ul style="list-style-type: none"> • ANC and PNC • Child birth • New born care • Immunization in children • Illness in children <p>Compassion of ASHAs Felt need for ASHAs</p> <p>Knowledge, attitude and practices on MNCH care</p>	
<p>ing and ion</p>	<p>Performance of ASHAs</p> <p>Head</p> <p>Heart</p> <p>Hand score</p>	<p>Supervisors's records</p>

Figures

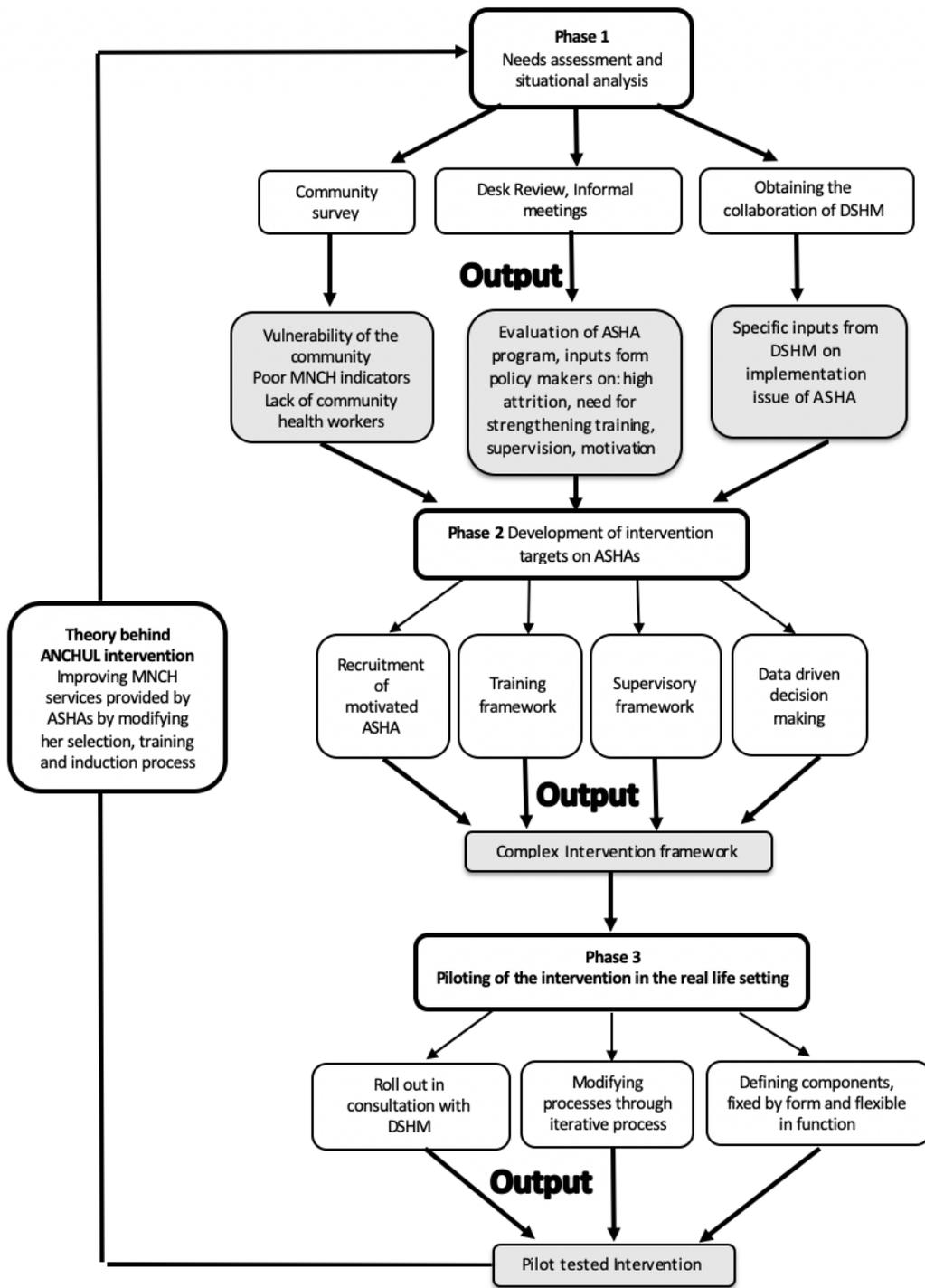
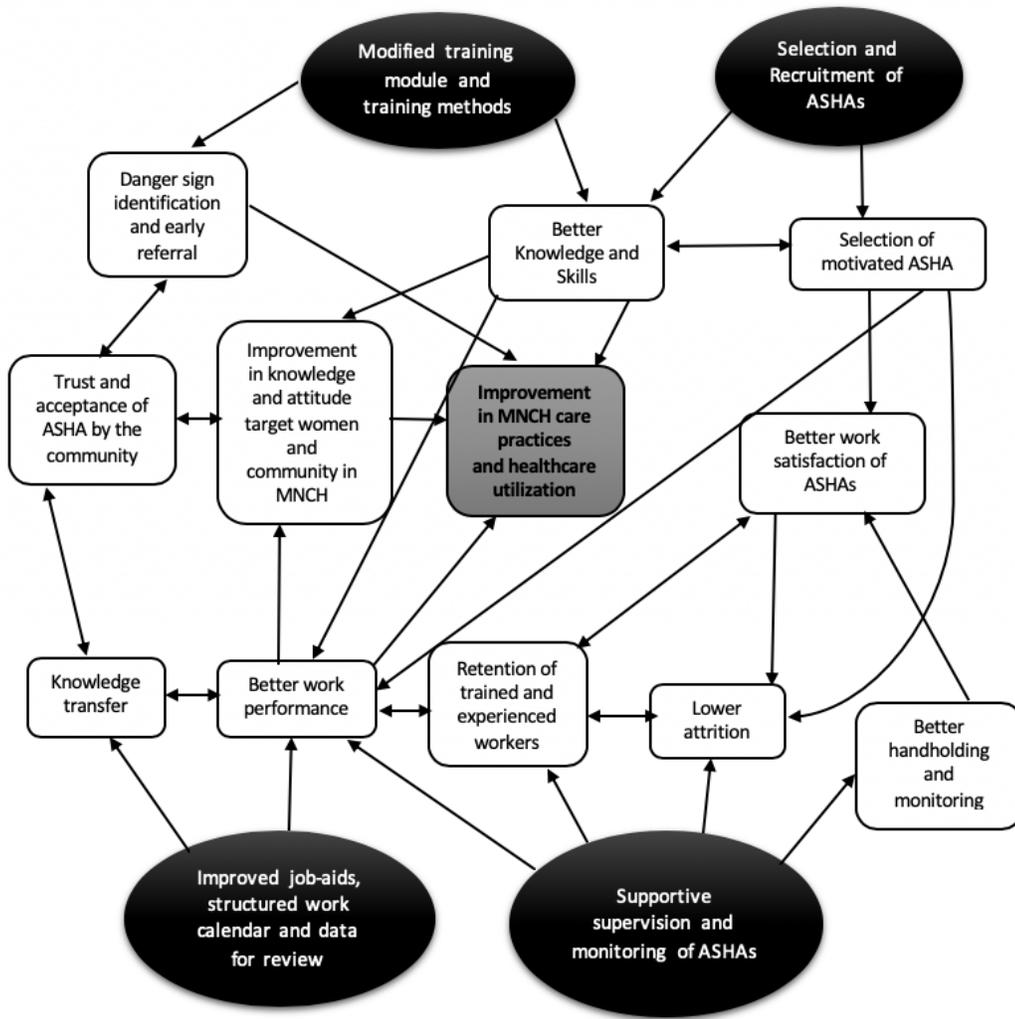


Figure 1

Phases of designing ANCHUL intervention



Intervention components		Addressed by intervention	
Primary outcome		Outcome directly related to intervention	
Process indicators influenced by intervention		Hypothesized relation between outcomes	

Figure 2

Conceptual framework

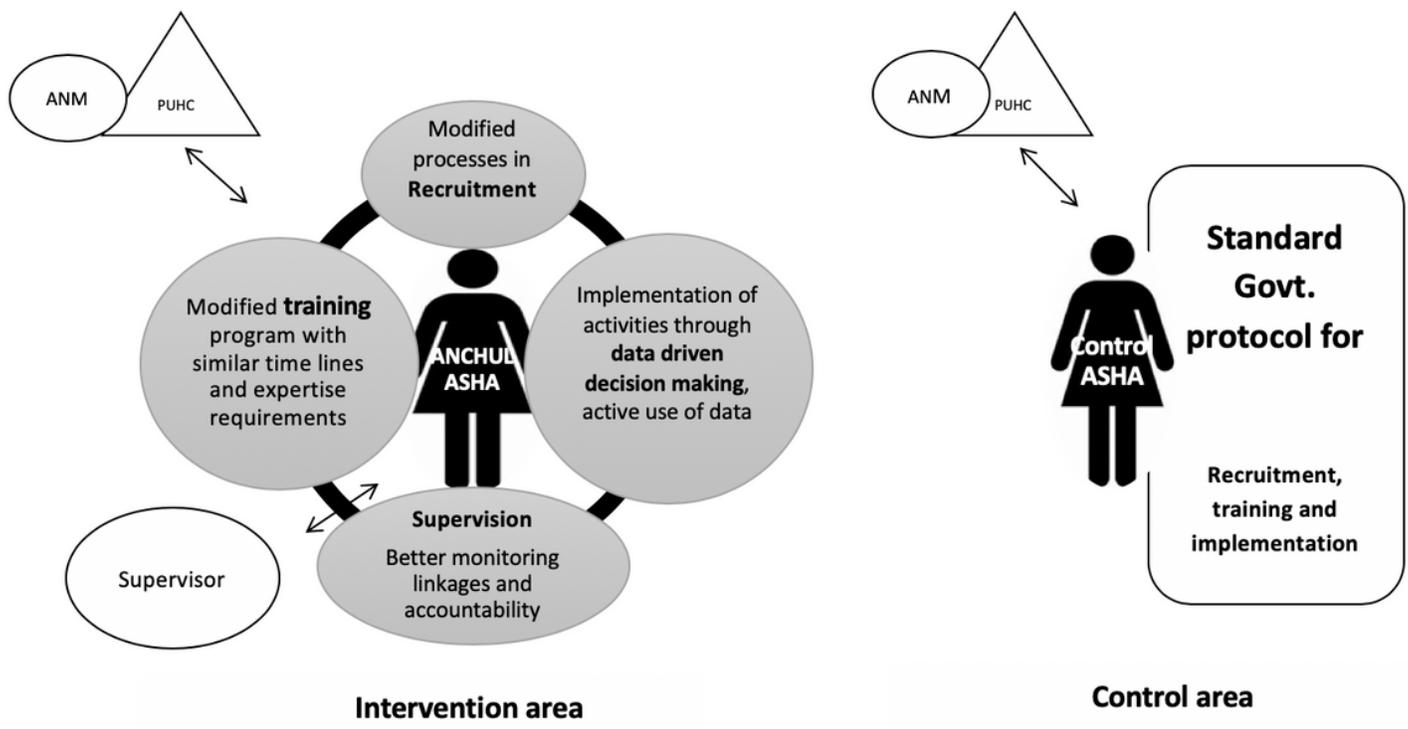


Figure 3

Salient differences between the ANCHUL intervention and the existing ASHA program (control)