



# Maternal and Newborn Health Service Delivery Redesign

Planning Package

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## Introduction

This document provides guidance on instituting maternal and newborn health service delivery redesign (redesign). It has been developed using the learnings from the implementation of the concept in Kakamega County, Kenya, complemented by global best practices. While we have tried to propose guidelines that would fit many low- and middle-income settings embarking on redesign, we recognize that each system is unique. As such, the content of the document should not be considered prescriptive, but rather seen as a framework to help plan and implement redesign.

The target audience for this document includes health ministries, departments or agencies (local and national) that would lead the implementation of a redesign program, as well as any academic institutions and implementing partners who would support or collaborate with the health administration during the redesign process. This document would help the partners familiarize themselves with the components of this complex health system intervention and help make planning and implementation more efficient.

The document was developed with the district (or other sub-national level) in mind as the implementing context, and therefore its application at the national level should be adapted, as necessary. Where relevant, we indicate some of the key adaptations that would be necessary if redesign were to be executed at the national level.

This document is divided into three main sections and an appendix. The first section is a brief concept note that provides the rationale for and components of maternal and newborn health service delivery redesign. The second section describes the elements necessary for planning redesign, including potential key actors and their roles, and an illustrative budget. The third section provides guidance on how the various stages of redesign could be carried out. For the first stage of the process, the feasibility assessment, this document links to a detailed toolkit that provides operational guidance on performing the feasibility assessment (Please find the feasibility assessment toolkit in the attachments section of this PDF document).

At the time of developing this first edition of this planning document, the feasibility assessment phase had been concluded in Kakamega County, and planning was underway for the other phases. The report of the feasibility assessment in Kakamega County is available upon request from the QuEST Secretariat at the Harvard T.H. Chan School of Public Health.

This guidance document is considered a “living document”; updates will be issued based on new lessons from implementation sites.

## 1. Concept note

*Rationale:* Despite increased utilization of facilities for childbirth, decline in maternal and neonatal mortality and morbidity has stagnated in many low- and middle-income countries.<sup>1-3</sup> A growing body of evidence suggests that this may be because facilities are unable to effectively manage delivery complications and sick newborns, which present without warning and require rapid, highly expert care.<sup>4,5</sup> Yet in many countries, 30-45% of facility deliveries occur below the level of a hospital; these clinics cannot realistically handle complications and cannot count on emergency referral, which is often slow or non-functioning. Because of the unpredictable nature of birth complications, hospitals or birthing centers with access to surgical and sick newborn care within 30 minutes are the best option for all deliveries.<sup>6-8</sup>

*Concept:* Service delivery redesign (redesign), as proposed by the Lancet Global Health Commission on High-Quality Health Systems in the SDG Era, is a systemic reform that rationalizes the health system such that high quality services are provided at the right level, by the right provider and at the right time to optimize outcomes.<sup>9</sup> For maternal and newborn health (MNH), service delivery redesign means restructuring health systems so that all women deliver in hospitals (delivery hubs) providing the full scope of obstetric and neonatal care for complications—e.g., Caesarean section, blood transfusion and care for sick mothers and newborns—or in nearby affiliated birthing facilities, while lower level facilities provide quality antenatal, postnatal, and newborn care. For MNH redesign to save lives, investments are needed to ensure quality of care, access, equity, and financial protection. There are five programmatic considerations for MNH service delivery redesign. The exact content of each programmatic area will depend on the context, but some general elements are shown in figure 1.

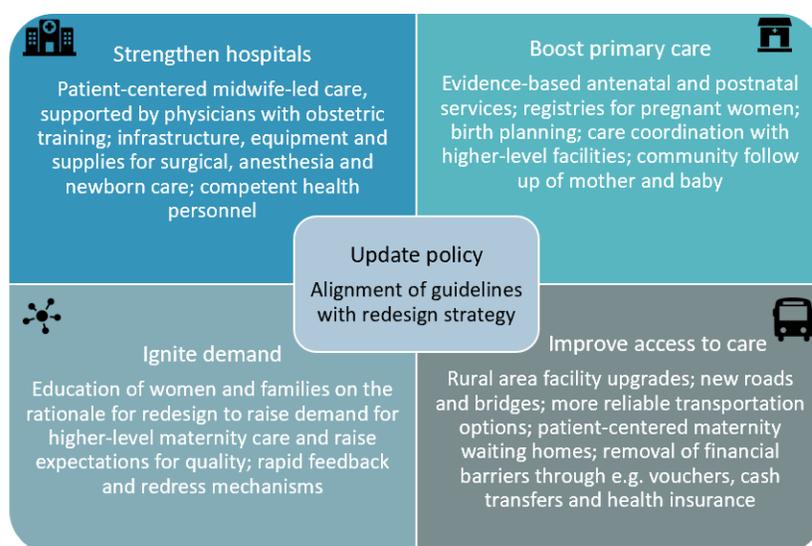


Figure 1: The five programmatic considerations for redesign

The main goal of MNH redesign is to improve survival of mothers and newborns. Other potential benefits include increased efficiency in the use of health system resources such as health providers and infrastructure, as these would be concentrated in fewer facilities. Redesign would also create room at the primary care level to shift management of non-communicable diseases, e.g. stable hypertension and diabetes, from hospitals. This, together with shifting routine antenatal and postnatal care away from the hospital, would help to decongest hospitals allowing them to focus on the management of complex conditions, which is at the core of their

competency. Potential risks of redesign include an increase in iatrogenic complications if existing advanced facilities are of poor quality; increased medicalization of births; and reduced physical and financial access for rural and poor women.

*Political economy of redesign:* Health system redesign is fundamentally a political choice and must be led by political leaders who believe that a double standard of low quality care for women and newborns in LMICs, while high-quality hospital care is the norm in wealthy countries, is no longer acceptable. The final decision on whether or not the new policy would be instituted will not only depend on the strength of the evidence in favor of it, but also on its political acceptability to policy makers and the public. Political commitment is central to determining whether redesign is realistic and how quickly it can be implemented.

*Applicability of concept:* The idea of service delivery redesign is applicable to any condition, and has four main components: 1) **Revise and strengthen platforms for care:** This requires the segmentation of the patient population for conditions such that care is provided and received at the right level. The infrastructure, equipment and personnel needed to meet the various categories of patient needs must be identified and provided. 2) **Improve access to care:** This is to ensure that all healthcare consumers can reach the high-quality care that redesign seeks to provide. It may involve improving road networks, transportation and communication services in some places and for some conditions. Beyond physical access, financial access and the social and cultural acceptability of services should be ensured. 3) **Ignite demand:** This aims to increase public understanding of the need for quality care, and to increase their demand for quality services. Health care users and communities should be involved in the redesign process, and a human-centered design approach should guide any institutional changes to service provision. 4) **Update policy:** Policy review and the introduction of new practice guidelines would be necessary to reflect the aims and structures of the redesigned service provision model. As with every new policy, extensive education of health providers and healthcare users should precede policy rollout. It is also advised that policy change about the recommended location of delivery be the last step, occurring only after all the necessary infrastructure and human resource improvements have been instituted and access barriers for healthcare users have been addressed.

*Further reading:* A comprehensive discussion of maternal and newborn health service delivery redesign has been published by Roder-DeWan and colleagues.<sup>10</sup> A brief summarizing this paper, along with other relevant publications related to the subject, is included in the appendix.

## 2. Planning for redesign

### Summary of stages of service delivery redesign

Service delivery redesign is a stepwise process involving four phases (Figure 2). It starts with a *feasibility assessment* that maps out health system capacity and identifies the major gaps that would need to be filled for redesign to be implemented. The findings of the feasibility assessment also help gauge whether redesign is necessary and feasible. Proceeding with the subsequent phases should only occur when redesign is found to be necessary and feasible. The second phase is the *design phase*, which identifies the most appropriate rollout strategy that best leverages existing initiatives. This design phase would also entail developing strategies to close the identified gaps from the feasibility assessment and developing a fully costed plan and financing strategy for redesign. To ensure redesign is people-centered, the perceptions of healthcare users and other community members should be sought and incorporated in the design. The design phase would be followed by an *improvement phase* where the plans developed and preparatory activities (e.g. needed infrastructure and equipment upgrades and health provider trainings) are carried out in preparation for policy implementation. It is only after all the facility and non-facility improvements are made that redesign can be rolled out, i.e. the *implementation phase*. To ensure that the process and outcomes of redesign are carefully assessed, a rigorous evaluation plan should be built into the entire redesign process.

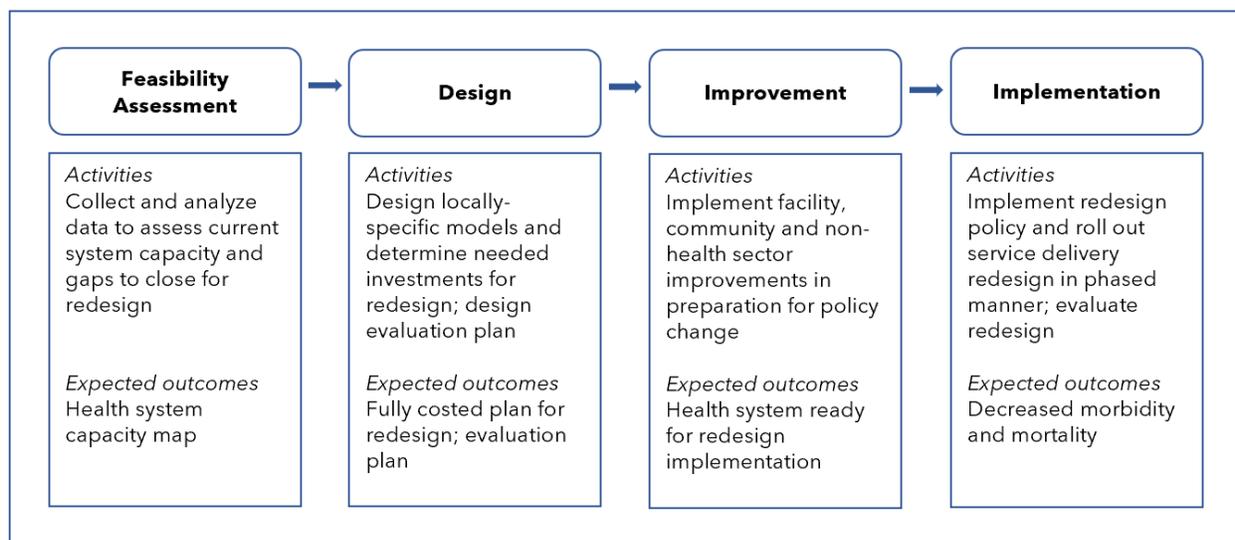


Figure 2: Phases of the Service Delivery Redesign process

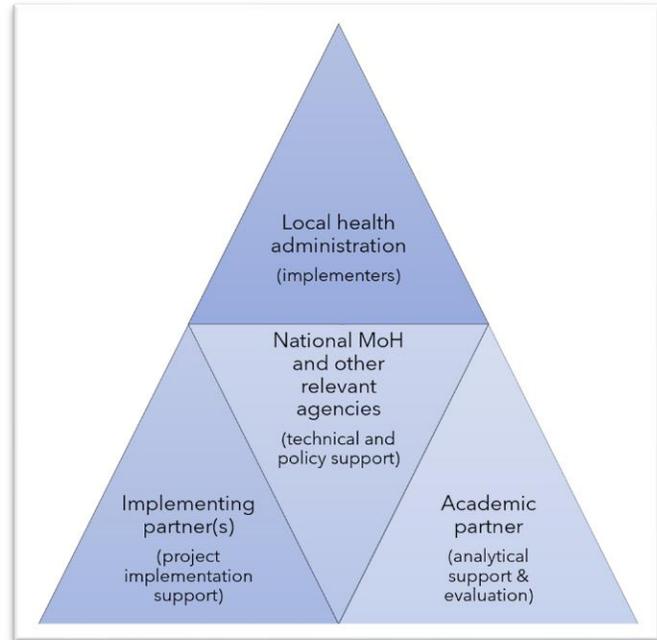
### Actors and roles

Service delivery redesign is a collaborative effort that requires local leadership, political support, technical expertise and analytical rigor. The likely key actors for this process are depicted in Figure 3, and their roles are described below:

1. Local health administration (e.g. provincial/district): they are the conveners of the partnership and the lead implementers. They are the drivers and political champions of

the redesign process within the province or district and have final authority on the strategy for implementing redesign. They are also responsible for coordinating with relevant non-health institutions to facilitate this multisectoral process. They are the main funders of redesign in decentralized settings. Depending on the context, the entire local government, rather than just the local health ministry, may be the lead implementer.

2. National Ministry of Health (MoH): they are the in-country technical experts and would provide policy development support and strategy assistance to the local health administration. In countries where redesign is planned for the entire country from the start, or where health administration is centralized, the roles of the “Local health administration” would be subsumed by the National MoH. It should also be noted that in some countries there may be other national bodies



apart from the National Ministry of Health, who have significant influence on health sector reform, and would thus need to be involved in the redesign process, e.g., in Kenya, the Council of Governors, in Ghana, the Ghana Health Service, and in Rwanda, the Rwanda Biomedical Center, would be key national partners. In such a case, the roles outlined for the National Ministry of Health would be shared with these institutions.

*Figure 3: Actor roles and relationships for redesign*

3. Implementing partner(s): these are organizations which could provide assistance to the local health administration to implement the redesign program. Their support may be in the form of project management assistance, technical assistance and/or funding support. The implementing partners could include development partners, non-governmental organizations and for-profit project delivery organizations. Different implementing partners or groups of them may be partnered at different phases of the redesign process.
4. Academic partner: their role is to provide analytical support for the redesign process and also to evaluate the program. The academic partner would also assist the partners to maintain fidelity to the basic concept and components of redesign. Having one academic partner may allow for consistency and continuity in partner deliberations, but different academic partners may be involved in the different phases of the process as the partners see fit, e.g., there may be one academic partner for the feasibility assessment and another for the program evaluation.

The envisaged roles of the partners for the various stages of redesign are defined below.

Table 1: Potential actor roles in the various phases of redesign

	<b>Feasibility Assessment</b>	<b>Design</b>	<b>Improvement</b>	<b>Implementation</b>
Local health administration	<ul style="list-style-type: none"> <li>• Co-identify redesign candidate region(s)</li> <li>• Provide information on the health system to assist in feasibility assessment</li> <li>• Review results of the feasibility assessment and make determination about proceeding</li> </ul>	<ul style="list-style-type: none"> <li>• Co-develop policies for redesign with National Ministry of Health</li> <li>• Lead development of locally relevant strategies for implementing redesign</li> <li>• Develop financing structure for redesign</li> </ul>	<ul style="list-style-type: none"> <li>• Lead capital projects to improve infrastructure and equipment for redesign</li> <li>• Strengthen data systems to support monitoring and evaluation of redesign</li> </ul>	<ul style="list-style-type: none"> <li>• Spearhead the rollout of the new maternal and newborn health service delivery policies</li> </ul>
National Ministry of Health (and other relevant agencies)	As above	<ul style="list-style-type: none"> <li>• Co-develop policies for redesign with local health administration</li> </ul>	<ul style="list-style-type: none"> <li>• Provide technical assistance to the local health administration to support the improvement projects</li> </ul>	<ul style="list-style-type: none"> <li>• Provide technical support for iterations of the implementation process</li> </ul>
Implementing partner(s)	<ul style="list-style-type: none"> <li>• Contract for collection of data for feasibility assessment</li> <li>• Perform preliminary costing of redesign process</li> </ul>	<ul style="list-style-type: none"> <li>• Conduct stakeholder engagement to develop local models to implement redesign</li> <li>• Develop fully costed plan for redesign implementation</li> <li>• Support local health administration to develop financing structure for redesign</li> </ul>	<ul style="list-style-type: none"> <li>• Act as project management partner to oversee the improvement projects for redesign</li> <li>• Engage communities to ignite demand for quality and prepare for redesign</li> </ul>	<ul style="list-style-type: none"> <li>• Monitor implementation process to assure fidelity to the principles of redesign</li> </ul>
Academic partner	<ul style="list-style-type: none"> <li>• Develop research plan for feasibility assessment</li> <li>• Oversee data collection and perform analyses for feasibility assessment</li> </ul>	<ul style="list-style-type: none"> <li>• Curate global evidence on approaches to improve quality, access, and demand</li> <li>• Perform supplementary analyses and surveys to assist in determining appropriate strategies and models for implementing redesign</li> <li>• Develop prospective evaluation plan</li> </ul>	<ul style="list-style-type: none"> <li>• Collect baseline data for the evaluation of redesign</li> </ul>	<ul style="list-style-type: none"> <li>• Collect follow-up data for the evaluation of redesign</li> <li>• Disseminate evaluation findings in collaboration with other partners</li> </ul>

## Budget

The cost of the various phases of redesign could vary widely from one setting to the other depending on the scope of the program (e.g. in one district versus ten), the prevailing cost of goods and services in the country/district, and the extent of health system improvements required before redesign is implemented. Nonetheless, redesign has been understood as a country-led effort and therefore capital investments, and other direct implementation costs would largely be borne by the lead implementers, i.e., the local health administration or national MoH. The health administration may, however, develop financing arrangements with implementing partners (e.g., with development partners) to complement their efforts.

We present below some key areas for estimating the cost of service delivery redesign. There are likely to be economies of scale, and therefore relatively lower cost per district/province, if redesign is planned for or implemented in more than one province/district. For example, the same implementing partner could provide project management support in three districts that are implementing redesign, and therefore the cost of identifying and contracting the partner, and the cost of performing the project management activities may be significantly reduced for each of the three districts.

An illustrative budget based on emerging lessons from the Kakamega County Service Delivery Redesign efforts is presented in the appendix.

*Table 2: Budget considerations for service delivery redesign*

<b>Phase (Suggested duration)</b>	<b>Key budget areas</b>	<b>Specific budget items to consider</b>	<b>Notes</b>
Feasibility assessment (4-7 months)	Conducting the feasibility assessment	Personnel Training costs Field work logistics Stakeholder engagements Software for analyses Travel costs Dissemination activities	Costs may be lower if a recent facility assessment is available. Nonetheless, extensive stakeholder engagements should be done.
Design phase (6-12 months)	Identification and contracting of project management support partner	Advertisements Interviews	Depending on the partnership arrangement, this activity may be conducted by the academic partner, the local (or national) health administration or another implementing partner
	Supplementary surveys and analyses to support design phase decision-making	Personnel Training costs Field work logistics Stakeholder engagements Software for analyses	This would be carried out on an as-needed basis. The cost may thus vary widely from one context to the other.
	Project management support activities for development of redesign implementation strategies	Personnel Local travel Stakeholder engagements Office support Partner meetings Consultant (expert) costs Community participation activities	The local or national health administration leading the implementation may have existing capacity to manage the redesign program and thus this additional cost may be significantly curtailed
Improvement phase (12-18 months)	Direct improvement activities	Capital projects (e.g., ward construction, amenities improvements, equipment purchases) Recurrent expenditure items (e.g., hiring of new health providers) Training programs (e.g., trainings for health providers and health care managers on redesign or on respectful maternity care) Community engagement activities	This would likely be the largest budget item for the redesign process in most settings. Adopting a phased approach to improvement/implementation (see next section) may help pace out the fiscal burden on the implementers.

		Policy development activities	
	Project management support for oversight of improvement activities	Personnel Monitoring activities Ongoing stakeholder engagements	The local or national health administration leading the implementation may have existing capacity to manage the redesign program and thus this additional cost may be significantly curtailed
	Baseline evaluation activities (component of full evaluation)	Personnel Training costs Field work logistics Software for analyses Travel costs	A process and impact evaluation is currently recommended to help develop knowledge on effective implementation strategies and impact of redesign; as more knowledge is generated, implementing districts or countries may decide to perform one or the other evaluation, or both, as they deem expedient.  The evaluation results would be a beneficial global public good; global research funding facilities could thus be leveraged to assist with the evaluation activities
Implementation (Up to 24 months)	Follow-up evaluation activities (component of full evaluation)	As above	As above
	Project management support for monitoring of program and adaptation of implementation as necessary	Personnel Monitoring activities Stakeholder engagements for implementation adaptation	

### 3. Conducting redesign

#### Feasibility assessment

A step-by-step guide to conducting a feasibility assessment for maternal and newborn health service delivery redesign is provided in a toolkit that is available as an attachment to this document (**Please find the feasibility assessment toolkit in the attachments section of this PDF document**).

#### Design phase

This phase entails defining the policies, care models, and investments needed to address the identified gaps, and developing a fully costed plan and financing structure for implementing redesign. This stage also entails developing a robust evaluation plan for redesign implementation (details on the evaluation design is covered under the section on evaluation).

The expectation is that by the end of this stage, the local health administration would have decided on key operational modalities for implementing redesign, taking the local context into consideration. E.g., they would have to decide whether to have only hospital-based, single unit, delivery hubs or to have an on-site midwife led option in addition, or to also establish off-site delivery units led by midwives that are operationally linked to the main delivery hubs, or to upgrade some primary care centers to provide surgical care for some under-served areas.<sup>10,11</sup> Similarly, a decision would have to be established on the strategies to deal with access and other gaps (such as transportation or cost barriers) identified during the feasibility assessment. Some options for improving access to care are provided in the appendix.

#### *Timelines*

This phase may take about 6-12 months to complete. Where a project management partner is needed, but has not been identified already, a lead time of 2-4 months should be anticipated to find an appropriate partner to assist the local health administration manage the design phase.

#### *Workstreams for design phase*

Planning for necessary improvements will need to happen across the relevant areas identified to have gaps during the feasibility assessment. Using the components of redesign as a framing, the potential areas to be planned may include:

1. High-quality, people-centered hospitals
2. Competent primary care
3. Effective networks of care
4. Transportation and communication
5. Community engagement
6. Policy, management, and financing

Each area would involve several workstreams to ensure that all the necessary inputs are fully considered and planned for. Following is a description of the objectives/outputs and potential methodologies to utilize for each of the key workstreams under each focus area. Each workstream could develop a budget that could be collated to form the overall budget for the implementation of redesign. The activities in the workstreams would be led by the local health administration or partly contracted out to a project management partner who would work in close partnership with and under the supervision of the local health administration. The academic partner may provide support for any needed analytic components. It should be noted that not all the workstreams described below would be relevant for each context; also, this list may not be exhaustive. The design phase workstreams activated in each setting would depend significantly on the findings from the feasibility assessment.

1. High-quality, people-centered hospitals

The goal is to ensure that delivery care is provided in well-equipped facilities, with competent providers, who provide patient-centered, high quality and respectful care. It also seeks to ensure that there is sufficient space in hospitals to prevent overcrowding and that the design of facilities is welcoming to mothers, birth companions and families.

<b>Workstream</b>	<b>Objective/output</b>	<b>Potential methodology</b>
Care models	Develop a delivery care model best suited to redesign implementation region, with most effective staffing ratios	Planning workshops; community co-design dialogue sessions
Workforce	Determine additional clinical health workers needed in facilities	Utilize results of feasibility assessment
	Determine additional ancillary staff required	Use staffing standards for ancillary workers
Infrastructure and equipment	Determine complete list of additional infrastructure and equipment needed for: <ul style="list-style-type: none"> <li>• Maternity ward improvements/ward redesign</li> <li>• Newborn unit improvement</li> <li>• Blood transfusion unit upgrade</li> <li>• Amenities for patients (bathrooms, etc.)</li> </ul>	Use results of feasibility assessment, supplemented by rapid assessment using in-country quality tools and infrastructure norms and standards
	Consider facility design to: <ul style="list-style-type: none"> <li>• Improve space to promote triage, patient flow and privacy</li> <li>• Make facilities welcoming and people-friendly (including focus on birth companions)</li> </ul>	Assessment by human-centered design experts
Blood supply	Develop strategies for improved availability and supply of blood	Consultative meetings

Continuing education and mentorship	Develop quality improvement initiatives to improve facility and provider quality: <ul style="list-style-type: none"> <li>• Produce resources for in-service trainings</li> <li>• Develop training programs for health providers</li> <li>• Develop mentoring strategies</li> <li>• Develop strategies for hiring expert clinicians</li> <li>• Develop other innovations for quality improvement</li> </ul>	Planning workshops
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2. Competent primary care

The goal is to ensure that there is adequate infrastructure and equipment and competent providers who provide evidence-based antenatal and post-natal services to all mothers and newborns.

Workstream	Objective/output	Potential methodology
Infrastructure and equipment	Determine additional infrastructure and equipment needed for ANC/PNC in facilities: <ul style="list-style-type: none"> <li>• Waiting room and consulting room improvements</li> <li>• Equipment improvements</li> </ul>	Use in-country quality model/tool and infrastructure norms and standards for rapid assessment
Workforce	Determine additional health workers needed in facilities	Gap analysis using redesign implementation region facility-level human resource data
	Develop training programs for health providers	Planning workshops
Care models	Develop models for providing quality ANC and PNC (e.g., individual vs group ANC)	Planning workshops; community co-design dialogue sessions
Continuing education and mentorship	-as above for hospitals	-as above for hospitals
Community Health Workers (CHWs)	Develop plan to integrate CHWs in redesign process	Consultative meetings with CHWs
Patient communication	Develop strategies for communicating with mothers during pregnancy and in the postpartum period (for feedback, reminders, etc.)	Planning workshops

3. Effective networks of care

This is to ensure that there is effective coordination of care between primary care facilities and hospitals and ensure there are linkages across care levels and across the system as a whole. It would involve the development of clinical protocols and procedures, learning, collaboration and health system approaches, health provider communication, data and electronic medical record systems (software). It also includes development of plans for communication infrastructure, medical transportation, and general IT needs (hardware).

<b>Workstream</b>	<b>Objective/output</b>	<b>Potential methodology</b>
Data and communication systems	Develop plan for setting up and/or strengthening data systems: <ul style="list-style-type: none"> <li>• Internet connection to facilities</li> <li>• Computers</li> <li>• Telephones</li> <li>• Electronic medical record (EMR) systems (integrated with Health Management Information Systems and pregnancy registry)</li> </ul>	Planning workshops; assessment by EMR experts
Linkages between facilities	Develop plan to link primary care facilities and delivery hubs, and develop standard operating procedures for interfacility transfers and clinical consultations	Planning workshops
Learning systems	Develop structures for inter-facility learning networks/collaboratives	Planning workshops
Ambulances	Develop strategies for seamless transfers between delivery hubs and more advanced centers	Planning workshops

#### 4. Transportation and communication

The goal is to identify the hardware needed for transportation and communication, including vehicle options, road upgrades, access to cellular phones and cellular network coverage. It would also determine the need for public assistance to reach care.

<b>Workstream</b>	<b>Objective/output</b>	<b>Potential methodology</b>
Needs assessment	Determine actual need for transportation in the implementation areas	Exit survey of ANC attendants in primary care facilities
	Determine mothers' access to cell phones and other means for communication	
Vehicle inventory	Develop inventory of type and number of vehicles available for routine maternal transport	Market survey/ transportation database assessment
Transportation options	Develop transportation options for mothers (e.g., voucher programs, rideshare applications, mother-vehicle linkage programs)	Consultant-led discussions
	Develop criteria for government-assisted transportation	Consultative meetings
Road improvement	Map out roads that need urgent improvement	Request data from road authorities
Communication	Map out available options for effective communication between mothers and the health system (e.g., cellular network coverage)	Request data from relevant local authority (e.g., communications authority)

## 5. Community engagement

This aims to ensure that the community and other stakeholders are included in the development of the redesign strategy. It would also develop effective strategies for information dissemination, activation of community champions and for feedback or redress on the policy and its implementation.

<b>Workstream</b>	<b>Objective/output</b>	<b>Potential methodology</b>
Stakeholder engagement	Develop strategies to engage stakeholders (political actors, healthcare users and healthcare providers) on redesign and increase demand for quality care	Assessment of prevailing strategies in redesign implementation areas; literature review for additional strategies; community dialogue sessions; redesign implementation area health management team discussions
Communication strategies	Develop effective communication strategies for information dissemination for redesign (e.g., radio and television adverts and plays)	
Redesign champions	Develop strategies to activate community champions and leaders	
Feedback	Identify community feedback options available and develop additional feedback mechanisms (e.g., hotlines, redesign report card)	

## 6. Policy, management, and financing

The goal is to define the quality standards required in hospitals and primary care and to develop new guidelines for maternal and newborn care that align with the new policy of service delivery redesign. It also aims to determine the governance/oversight structures for the implementation of redesign and identify the financing mechanisms to support implementation.

<b>Workstream</b>	<b>Objective/output</b>	<b>Potential methodology</b>
Quality guarantee	Develop scope of quality practice (minimum quality guarantee) for primary care and hospitals	Planning workshops/consultations
Guidelines	Update guidelines for ANC, delivery care and PNC	Consultative meetings
Supervision	Define supervision and accountability structures to oversee implementation	Consultative meetings
Dissemination	Develop plan for dissemination of findings and for cross-district learning	Consultative meetings
Partners	Identify development and other implementing partners to support (financial or technical) implementation of redesign	Consultative meetings
Financing maternal and newborn care	Assess financing structures available for maternal and newborn care	Consultative meetings
Budget	Develop total costed plan for redesign	Collate cost projections from the individual work streams

### Improvement phase

This is the phase where the operational strategies and the investment options developed during the design phase to fill health system gaps are carried out, in preparation for the policy change whereby deliveries are shifted away from primary level. It requires that the partners coordinate with health facility managers, health providers, healthcare users and relevant non-health actors to ensure that the improvement initiatives instituted remain contextually relevant and maintain fidelity to the principles of service delivery redesign.

### *Timelines*

The timeline for the improvement phase would depend on the geographic rollout strategy adopted by the local health administration (*phased* or *simultaneous*—see below, under implementation phase), the extent of system deficits, the administrative processes of local government (i.e. budget and procurement cycles), and the fiscal space available for improvement initiatives. However, to maintain momentum for the redesign process, implementers should aim to complete all improvement activities within 12-18 months. Where a phased rollout approach is adopted, the improvement and implementation phases could overlap, with implementation going on in areas which have completed improvement and improvement going on in other areas simultaneously. Some “no-regret” investments, like procuring surgical care equipment where there is a recognized need and increasing bed capacity in overcrowded facilities, may be commenced even during the *design phase*; this overlap could further reduce the time spent exclusively on the improvement phase and contract the total program time.

### *Benchmarks for redesign implementation*

To maintain fidelity to the principles of service delivery redesign, it is necessary to define basic minimums that should be present before the redesign policy is rolled out in the province/district. These basic minimums would capture the core elements of redesign and would be the foundation on which additional investments are made.

These benchmarks would be expected to be achieved only in the areas that are about to come online for the redesign policy change (i.e., places where mothers are about to be asked to deliver in delivery hubs). Thus, if a phased rollout approach is adopted, only the first batch of sub-provinces/sub-districts must achieve these benchmarks at the start of policy rollout, while the others only need to reach the benchmarks when they are about to come online for redesign.

These benchmarks would help judge the readiness of specific areas within the province/district for the rollout of redesign. Examples of minimum and desirable benchmarks, depending on the district’s design plan, are described below in Table 3.

*Table 3: Examples of minimum and desirable benchmarks to achieve before the rollout of redesign*

Area	Key activities	Benchmarks to achieve before rollout of redesign	
		Minimum	Desirable
High-quality, people-centered hospitals	Upgrade delivery hubs to provide Cesarean section and blood transfusion services	All delivery hubs in intervention areas providing Cesarean section and blood transfusion	As for minimum
	Upgrade delivery hubs to provide care for sick newborns	All delivery hubs have functioning newborn units (staffed and stocked)	As for minimum
	Upgrade infrastructure and equipment in delivery hubs to support provision of dignified, patient-centered obstetric care	70% of planned infrastructural and equipment improvements completed in each delivery hub, with all critical inputs provided (i.e. additional beds, labor and delivery rooms, and obstetric equipment and supplies)	All planned infrastructural and equipment improvements completed in all delivery hubs
	Increase provider numbers to accommodate expected increase in utilization	40% of needed additional staff recruited in each delivery hub, with the possibility for a rapid increase	>80% of needed additional staff recruited in each delivery hub
	Update knowledge and clinical skills of providers	70% of health providers in each delivery hub have appropriate knowledge and skills to provide quality obstetric care	>90% of health providers in each delivery hub have appropriate knowledge and skills to provide quality obstetric care
	Train all providers on redesign policy	All providers in delivery hubs trained on redesign policy	As for minimum
Competent primary care	Update knowledge and clinical skills of providers	50% of health providers in each ANC/PNC facility have appropriate knowledge and skills to provide quality antenatal and postnatal care	>90% of health providers in each ANC/PNC facility have appropriate knowledge and skills to provide quality antenatal and postnatal care
	Train all providers on redesign policy	All ANC/PNC unit heads of participating primary care facilities trained on redesign policy	All providers in participating primary care facilities trained on redesign policy
Effective networks of care	Establish linkage between primary care facilities and delivery hubs	Each participating primary care facility operationally linked with one delivery hub for routine delivery care	Each participating primary care facility operationally linked with one delivery hub for routine delivery care and infrastructure provided in all delivery hubs and participating primary care facilities (telephones, electronic medical records, etc.) to facilitate communication

	Develop standard operating procedure (SOP) for interfacility transfers (ANC→Delivery→PNC, and emergency referral)	Interfacility transfer SOP developed, available in all delivery hubs and participating primary care facilities, and understood by providers	As for minimum
Transportation and communication	Provide transportation options for mothers around the time of delivery	Transportation options identified and to be made available to all women in very remote areas during rollout of redesign	Transportation options identified and to be made available to all women in very remote areas during rollout of redesign, and all other women provided with suggestions on means of transportation around the time of labor
Community engagement	Engage community in design and implementation of redesign program	At least one communication/engagement event on the redesign implementation process organized in each geographic subdivision within the participating area	Community advisory board set up and several communication/engagement events on the redesign implementation process organized in each geographic subdivision within the participating area
	Raise awareness of redesign program among healthcare users	All participating primary care facilities and delivery hubs have established an ongoing awareness program for their ANC attendants	All participating primary care facilities and delivery hubs have established an ongoing awareness program for their ANC attendants and there are regular announcements on the redesign program on commonly used media at least one month before the roll out of redesign
Policy, management, and financing	Update guidelines for ANC, delivery care and PNC	New guideline documents received by all delivery hubs and all participating primary care facilities	As for minimum
	Develop financing structure for remaining improvements for redesign	Written plan for financing remaining improvements for the redesign process developed	Written plan for financing the remaining improvements for the redesign process developed, and funds earmarked by province/district/national government for the process

All these improvement benchmarks should be discussed during the design phase of the redesign process and the decided targets should serve as a guide for the activities in the improvement phase.

## Implementation phase

This is the stage when the redesign policy is rolled out. i.e. mothers are asked to deliver in designated delivery hubs. Redesign should only be implemented after facility and non-facility improvements discussed earlier have occurred and the minimum benchmarks for implementing redesign haven been achieved.

### *Options for rollout*

Two key decisions would have to be made on how redesign would be rolled out. The first concerns the geographic strategy to be used, and the second involves the switching strategy.

**Geographic strategy:** The local health administration would have to decide whether redesign would be implemented in all areas at same time (*simultaneous rollout*) or the rollout would be done in phases (*phased rollout*). As redesign is a complex system-level policy, a *phased rollout*, where batches of sub-units of the implementation area come online at a time, may be preferable. This would allow for learning and adaptation from one phase to the next. It would also help pace out improvement initiatives necessary for implementing redesign, since only the areas that are about to come “online” for SDR would need to meet the minimum benchmarks outlined in the improvement phase. Such a phased approach is planned in Kakamega County, Kenya, where the rollout of the redesign policy would begin in three sub-counties with significant health system assets, followed by four sub-counties with varying demographic and resource characteristics, followed by the remaining five sub-counties.

**Switching strategy:** The local health administration would also need to determine the desired rapidity of the policy change to delivery in high-quality delivery hubs. The policy change could be a *rapid (overnight) switch*, a *gradual shift*, or it could entail only *encouragement* to deliver in delivery hubs. Each of these options may have relative (context-specific) advantages and disadvantages and these should be taken into consideration before making a decision. For e.g., a gradual shift may be preferred to allow for additional improvements to be made to bring delivery hubs to full capacity and to continue sensitizing the public about the upcoming change, while a rapid switch may be opted for in settings where all facilities are ready and pregnant women have been well-engaged on the redesign process. It would be best for the local health administration to explore these options carefully during the *design phase* and revisit their decision towards the end of the improvement phase.

### *Timelines*

The timelines for the rollout of redesign would be dictated by the desired geographic and operational rollout strategy. It may take up to 24 months for all areas to come online if a phased approach is adopted. It must be noted that redesign is not a short-term experiment, and as such a plan for ongoing review and adaptation (after the initial rollout is complete) should be included in the implementation process.

### *Monitoring and evaluation*

To allow for learning from and adaptation of the redesign implementation process, rigorous monitoring should be embedded into the implementation phase. Potential data sources and key

implementation processes and outcome indicators that need to be tracked regularly are discussed in the evaluation section.

Also, an outcome evaluation to assess the impact of service delivery redesign on maternal and newborn morbidity and mortality, and a process evaluation to assess implementation successes and failures, are necessary to document learnings from the process. This is described in detail in the evaluation section below.

#### *Adaptations to redesign implementation*

Adaptations of redesign implementation may be necessary to enhance its successful implementation over time. Reasons, types and outcomes of adaptations should be documented appropriately to allow learning to inform redesign implementation in subsequent waves on implementation or to inform scale-up to other regions/settings.

### Evaluation

Service delivery redesign is a new and complex system-level reform comprising many different components. It is therefore necessary to rigorously evaluate the reform to not only document the impact of the reform in the area of implementation, but also to learn how the implementation of the reform has contributed to its success or failure, and to understand how service delivery redesign may work in other contexts. We recommend that implementers work with an evaluation partner (academic partner) to conduct a hybrid or combined implementation and impact evaluation; the impact evaluation would quantify the impact of the reform on key outcomes of interest, and the implementation evaluation would help stakeholders understand the coverage, fidelity, and factors that are critical to the reform's effective implementation. The exact outcomes of interest, indicators, and evaluation design will depend on the implementation package, how rollout is conducted and the broader political, geographic, health system, and data context of the implementation.

The evaluation should address three questions:

1. What is the impact of service delivery redesign on health outcomes such as maternal, fetal, and newborn survival and maternal morbidity?
2. What is the impact of service delivery redesign on secondary outcomes such as facility delivery rates, labor and delivery quality, women's satisfaction with delivery, equity in utilization patterns, and out-of-pocket spending associated with delivery?
3. What elements of the service delivery redesign implementation, health system context, and institutional and political environments are critical to the reform's effectiveness?

As with all components of service delivery redesign, the evaluation should be co-designed with implementers and policymakers. Where the capacity exists, the evaluation should be conducted by local researchers.

#### *Impact evaluation*

A rigorous impact evaluation should be used to assess the impact of service delivery redesign on key outcomes of interest, including health outcomes, facility delivery, quality of care, satisfaction and out of pocket spending.

**Study design:** Because service delivery redesign is a system-level reform, a randomized control trial may be challenging to estimate the impact of the reform on these outcomes. However, in some settings, especially in large jurisdictions where simultaneous rollout is challenging for logistical reasons, policymakers may be willing to randomize the order in which subunits implement the policy (a stepped-wedge design with randomized order of implementation). Where this is not possible, a number of other quasi-experimental study designs could be considered depending on the implementation rollout, data infrastructure and availability of suitable comparison areas. A difference-in-differences design could be used if: there are areas outside of the implementation area that have similar trends in the outcomes prior to implementation, are not involved in other efforts to improve maternal and newborn health at the same time as service delivery redesign, and have the ability to collect data on the same outcomes. If possible, multiple study designs could be used to triangulate estimates or serve as backup in the case that implementation does not happen as planned. Depending on the study design chosen, substantial baseline data prior to implementation of redesign may be required, which may delay the timeframe for implementation.

**Primary outcomes:** As the primary goal of service delivery redesign is to improve maternal and newborn health, a composite outcome of maternal and newborn health outcomes is recommended as the primary study outcome. A composite was selected because service delivery redesign is intended to impact both maternal and neonatal outcomes and the individual components of this measure would not occur frequently enough to allow us to detect changes in these outcomes. The composite measure will reflect severe maternal, fetal, and neonatal adverse events that occur within 28 days after delivery relative to the total number of birth events. Similar composite outcomes have been used in previous large-scale maternal/newborn health improvement initiatives, like the Better Births Trial in India.<sup>12</sup>

**Data collection:** The primary health outcome will need to be collected for women delivering in delivery hubs, primary care facilities and at home. Given the relative rarity of this outcome, the sample size required to detect a change will likely be higher than the sample size required for other secondary outcomes. Several data sources could be considered to measure this primary outcome. First, if the HMIS system is robust and captures health outcomes for mothers and newborns delivered outside of the health system, it would be an ideal existing data source. However, many HMIS systems may not capture all components of the composite, capture births occurring outside of the health system, nor track mortality for the recommended length of time (28 days). Therefore, primary data may need to be collected on these outcomes. Data will likely need to be collected from women during at least two points, at birth and 28 days later; consequently, follow up contact information will need to be gathered. Women could be enrolled into the study during antenatal care if coverage is high, through community health workers during pregnancy or just after delivery, or in health facilities at delivery with other data collectors enumerating home births.

**Secondary outcomes:** Secondary outcomes of interest may include facility delivery rates, labor and delivery quality, antenatal and postnatal care quality, women's satisfaction with delivery, or out of pocket spending associated with maternal care including direct and indirect costs. Some of these outcomes may also be found in the implementation evaluation, though can be estimated

using the same study design methods as were used for the primary outcome. Potential data sources for these secondary outcomes include the HMIS, facility assessments including observations of care or provider vignettes and exit interviews with women.

Beyond the quantitative data, qualitative methods like focus group discussions and in-depth interviews could be employed to provide a deeper understanding of the impact of the intervention on people and to complement the quantitative results.

*Implementation evaluation*

The purpose of the implementation evaluation is both to document implementation coverage and fidelity, as well as to understand the factors that are critical to the reform’s effective implementation. These factors include aspects of the reform design, characteristics of implementing organizations, and the implementation process as well as aspects of the health system context and the institutional and political environments. The implementation evaluation may have quantitative components, which focus on measuring implementation of the intervention and collecting data on program activities and outputs. In addition, there may be a qualitative component focused on the barriers and facilitators to implementation, including community and provider perspectives as well as qualitative data collection and analysis of the broader political and institutional context.

There are many implementation science frameworks that evaluators may use to structure the implementation evaluation. The Kakamega County service delivery redesign evaluation uses the EPIS framework.<sup>13</sup> The EPIS framework has two key conceptual elements. The first element is the identification of four distinct temporal stages of a policy or program (Exploration, Preparation, Implementation, Sustainment). The second component of the EPIS framework is that for each of these four phases, it distinguishes between the “inner context” factors (internal to an organization) and the “outer context” (broader institutional environment) as distinct elements to be studied. Examples of indicators which may be tracked, organized by EPIS, are shown in Table 4.

*Table 4: Examples of indicators tracked under the EPIS framework for implementation*

<b>Element</b>	<b>Description</b>	<b>Potential indicators</b>
Exploration	This phase describes the policy and research design process. It takes place prior to implementation.	See feasibility assessment indicators
Preparation	Stakeholder analysis: In the preparation phase, qualitative interviews are conducted to understand the likelihood that the policy can be adopted and implemented, by gauging the position, degree of mobilization, and influence of relevant stakeholders.	Favorability/ unfavorability of selected stakeholders vis-à-vis SDR  Degree of mobilization and influence of selected stakeholders vis-à-vis SDR
Implementation	Surveys and administrative data will be used to measure program implementation, i.e.:	

	Dose	<p>Delivery hub capacity- e.g. number of beds, providers, operating theaters, essential medicines, etc.</p> <p>Delivery hub occupancy rate; Percent of women with counseling on delivery location during ANC</p> <p>Elements determined by design, e.g number of vouchers distributed</p>
	Reach	<p>Women’s and providers’ awareness of the SDR reform</p> <p>Delivery hub utilization</p> <p>Elements determined by design, e.g; percent of women using transportation vouchers</p>
	Fidelity	<p>Proportion of counselled pregnant women who delivered in a delivery hub vs primary care facility</p> <p>Percent of primary care facilities that stopped providing routine delivery care</p> <p>Percentage of women reporting receipt of respectful care during delivery</p>
	Dynamic effects	<p>Percent of births delivered by c-section</p> <p>Percent of total deliveries occurring at home</p> <p>Economic effects on women</p>
	Political economy analysis	<p>Stakeholder influence:</p> <p>Political commitment</p> <p>Government oversight</p> <p>Donor influence</p> <p>Local leadership influence</p>
Sustainment	This section could consist of most variables from implementation section, measured again in long run, in addition to other measures suggesting future sustainability	<p>User and provider satisfaction</p> <p>Local leadership ownership</p> <p>SDR take-up in other areas</p>

*Additional evaluation considerations*

The evaluation will need to be approved by a local institutional review board, the local government administration, as well as any national research review bodies. These approvals can take substantial time to acquire, so the academic partners should seek them as early as possible.

In addition, the evaluation design should include a plan for sharing the findings with relevant stakeholders including policymakers at the local and national levels, facility managers and health workers, and women and their families.

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## Appendixes

### 1. Key readings

This reading guide compiles key references relating to Service Delivery Redesign published as of October 2020. Short descriptions of the readings are below. They are thematically grouped into the following topic areas:

1. Principles of service delivery redesign
2. Rationale for redesign
3. Models of care
4. Improving quality of care in hospitals
5. Distance to care and transportation
6. Igniting demand for quality and accountability

#### **Principles of service delivery redesign**

Roder-DeWan S, Nimako K, Twum-Danso NAY, Amaty A, Langer A, Kruk M. [Health system redesign for maternal and newborn survival: rethinking care models to close the global equity gap](#). *BMJ Global Health* 2020; 5(10): e002539

This foundation article lays out the rationale for why the dominant model of childbirth in primary care facilities in low-income countries is inadequate to improve maternal and newborn health outcomes. It describes models for care that have been used effectively in a range of settings to provide care near hospitals with definitive care for complications and outlines five core principles for undertaking service delivery redesign.

#### **Rationale for redesign**

Gabrysch, S., Nesbitt, R. C., Schoeps, A., Hurt, L., Soremekun, S., Edmond, K., ... & Kirkwood, B. (2019). [Does facility birth reduce maternal and perinatal mortality in Brong Ahafo, Ghana? A secondary analysis using data on 119 244 pregnancies from two cluster-randomised controlled trials](#). *The Lancet Global health*, 7(8), e1074-e1087.

Higher proportions of facility births in a cluster in this study in Ghana were not linked to reductions in any of the mortality outcomes. Women living closer to any health facility did not have better health outcomes, but women living near facilities with comprehensive emergency obstetric care or high quality care had better outcomes.

Kruk, M. E., Leslie, H. H., Verguet, S., Mbaruku, G. M., Adanu, R. M., & Langer, A. (2016). [Quality of basic maternal care functions in health facilities of five African countries: an analysis of national health system surveys](#). *The lancet global health*, 4(11), e845-e855.

Quality of basic maternal care functions was substantially lower in primary care facilities (score of 0.38) than secondary care facilities (score of 0.77). Low delivery volume was consistently associated with poor quality.

Semrau, K. E., Hirschhorn, L. R., Marx Delaney, M., Singh, V. P., Saurastri, R., Sharma, N., ... & Kodkany, B. S. (2017). [Outcomes of a coaching-based WHO safe childbirth checklist program in India](#). *New England Journal of Medicine*, 377(24), 2313-2324.

Implementation of the WHO Safe Childbirth Checklist in Uttar Pradesh was associated with better adherence to essential birth practices, but did not improve maternal or perinatal health outcomes.

*Elmusharaf, K., Byrne, E., AbuAgha, A., AbdelRahim, A., Manandhar, M., Sondorp, E., & O'Donovan, D. (2017). [Patterns and determinants of pathways to reach comprehensive emergency obstetric and neonatal care \(CEmONC\) in South Sudan: qualitative diagrammatic pathway analysis](#). *BMC pregnancy and childbirth*, 17(1), 1-15.*

Once the decision is made to refer a woman to a higher level of care, she may face a series of complex steps before reaching an appropriate health facility in South Sudan. The authors conclude that outcomes are better where there is no facility available than when women access a non-functioning facility due to lack of safe and timely referral.

*Salazar, M., Vora, K., & De Costa, A. (2016). [Bypassing health facilities for childbirth: a multilevel study in three districts of Gujarat, India](#). *Global health action*, 9(1), 32178.*

Over one in three women in Gujarat delivering in a health facility bypassed their nearest facility for childbirth. Women were more likely to bypass their nearest health facility when the nearest is not adequately functional.

*Aoyama, K., D'Souza, R., Pinto, R., Ray, J. G., Hill, A., Scales, D. C., ... & Fowler, R. A. (2018). [Risk prediction models for maternal mortality: A systematic review and meta-analysis](#). *PLoS One*, 13(12), e0208563.*

A systematic review of risk prediction models for maternal mortality in high income countries finds that no models have sufficient discrimination to be applicable for clinical decision making at the individual patient level. Risk stratification is challenging even in data rich contexts.

### **Models of care**

*Miller, S., Abalos, E., Chamillard, M., Ciapponi, A., Colaci, D., Comandé, D., ... & Manuelli, V. (2016). [Beyond too little, too late and too much, too soon: a pathway towards evidence-based, respectful maternity care worldwide](#). *The Lancet*, 388(10056), 2176-2192.*

This systematic review presents evidence-based clinical practice guidelines for routine antenatal, intrapartum, and postnatal care and develops a framework for thinking about how to avoid both the “Too little, too late” and “Too much, too soon” approaches to maternal care.

*Long, Q., Allanson, E. R., Pontre, J., Tunçalp, Ö., Hofmeyr, G. J., & Gülmezoglu, A. M. (2016). [Onsite midwife-led birth units \(OMBUs\) for care around the time of childbirth: a systematic review](#). *BMJ global health*, 1(2).*

This systematic review finds no difference in maternal and perinatal deaths between onsite midwife-led birth units and standard obstetric units, but often had fewer intensive

interventions. OMBUs also had greater satisfaction among women and lower costs of birth than standard obstetric units.

Hofmeyr, G. J., Mancotywa, T., Silwana-Kwadjo, N., Mgudlwa, B., Lawrie, T. A., & Gülmezoglu, A. M. (2014). [\*Audit of a new model of birth care for women with low risk pregnancies in South Africa: the primary care onsite midwife-led birth unit \(OMBU\)\*](#). *BMC pregnancy and childbirth*, 14(1), 417.

The advantages of a OMBU that opened in East London, South Africa include: decongestion and increased attention for high-risk women in the regular obstetric unit; greater capacity for more low-birth women to give birth on premises with immediate access to emergency care if needed; timely management of complications; highly motivated staff in the OMBU and improved birth experience for women.

Cheung, N. F., Mander, R., Wang, X., Fu, W., Zhou, H., & Zhang, L. (2011). [\*Clinical outcomes of the first midwife-led normal birth unit in China: a retrospective cohort study\*](#). *Midwifery*, 27(5), 582-587.

Women in the first midwife-led normal birth unit in China had higher rates of vaginal births than those in the standard care unit and higher satisfaction with their care than women in the standard obstetric unit.

### **Improving quality of care in hospitals**

Burgoine, K., Ikiror, J., Akol, S., Kakai, M., Talyewoya, S., Sande, A., ... & Olupot-Olupot, P. (2018). [\*Staged implementation of a two-tiered hospital-based neonatal care package in a resource-limited setting in Eastern Uganda\*](#). *BMJ global health*, 3(1), e000586.

Implementation of a low-cost hospital-based neonatal care package of simple changes in practice, provision of basic equipment and protocols and training resulted in decreasing neonatal mortality even in the absence of specialist equipment.

Agarwal, R., Chawla, D., Sharma, M., Nagaranjan, S., Dalpath, S. K., Gupta, R., ... & Agarwal, K. (2018). [\*Improving quality of care during childbirth in primary health centres: a stepped-wedge cluster-randomised trial in India\*](#). *BMJ global health*, 3(5).

Provider-led multipronged quality management program with external facilitation in Haryana, India was successful in improving key care practices during childbirth and immediate postnatal period, though structural problems hampered their progress.

Magge, H., Nahimana, E., Mugunga, J. C., Nkikabahizi, F., Tadiri, E., Sayinzoga, F., ... & Hedt-Gauthier, B. (2020). [\*The All Babies Count Initiative: Impact of a Health System Improvement Approach on Neonatal Care and Outcomes in Rwanda\*](#). *Global Health: Science and Practice*, 8(3), 505-517.

A district-wide health system improvement program combining facility readiness support, clinical training/mentoring, and district-wide improvement collaboratives in Rwanda

increased quality improvement capacity, improved maternal and newborn quality of care, and reduced neonatal mortality.

Zaka, N., Alexander, E. C., Manikam, L., Norman, I. C., Akhbari, M., Moxon, S., ... & Pearson, L. (2018). [Quality improvement initiatives for hospitalised small and sick newborns in low-and middle-income countries: a systematic review](#). *Implementation Science*, 13(1), 20.

Meso level, single center, and educational interventions were the most common interventions found in this review of quality improvement initiatives for small and sick newborns. Key barriers to implementing QI included overburdened staff and lack of sufficient equipment.

Rowe, A. K., Rowe, S. Y., Peters, D. H., Holloway, K. A., Chalker, J., & Ross-Degnan, D. (2018). [Effectiveness of strategies to improve health-care provider practices in low-income and middle-income countries: a systematic review](#). *The Lancet Global Health*, 6(11), e1163-e1175.

This review of strategies to improve health worker performance is not specific to maternal and newborn care, nevertheless it compares a wide variety of potential strategies.

### **Distance to care and transportation**

Gage, A. D., Carnes, F., Blossom, J., Aluvaala, J., Amatya, A., Mahat, K., ... & Kruk, M. E. (2019). [In Low-And Middle-Income Countries, Is Delivery In High-Quality Obstetric Facilities Geographically Feasible?](#) *Health Affairs*, 38(9), 1576-1584.

A policy of service delivery redesign would reduce two-hour access for women by 10 percentage points in Tanzania but only 0.6 percentage points in Malawi. Relocating delivery services to hospitals would not unduly impeded geographic access to care in the six countries examined.

Fogliati, P., Straneo, M., Brogi, C., Fantozzi, P. L., Salim, R. M., Msengi, H. M., ... & Putoto, G. (2015). [How can childbirth care for the rural poor be improved? A contribution from spatial modelling in rural Tanzania](#). *PLoS One*, 10(9), e0139460.

In Southern Tanzania, reducing delivery sites by 40% would decrease population access within 2 hours by 7%. About half of the facilities examined had insufficient staff to offer full-time obstetric services and had very low annual caseload. Focused efforts on fewer delivery sites might assist strengthening delivery services in resource-limited settings.

Onono, M. A., Wahome, S., Wekesa, P., Adhu, C. K., Waguma, L. W., Serem, T., ... & Ong'wen, P. (2019). [Effects of an expanded Uber-like transport system on access to and use of maternal and newborn health services: findings of a prospective cohort study in Homa Bay, Kenya](#). *BMJ global health*, 4(3), e001254.

An integrated community-based Uber-like transport system in Homa Bay, Kenya reduced delays in reaching an appropriate facility for delivery. Timely reminders and information regarding health and transport services available via interactive text messages help women to

remember, plan and stay motivated to seek appropriate maternal healthcare services in a timely manner.

Patel, S., Awoonor-Williams, J. K., Asuru, R., Boyer, C. B., Tiah, J. A. Y., Sheff, M. C., ... & Phillips, J. F. (2016). [Benefits and limitations of a community-engaged emergency referral system in a remote, impoverished setting of northern Ghana](#). *Global Health: Science and Practice*, 4(4), 552-567.

A low-cost emergency and communication transportation system in Northern Ghana used 3-wheeled motorcycles driven by trained community volunteers. Delivery referrals were redirected from health centers to hospitals capable of advanced services including cesarean deliveries, which was associated with reduced facility-based maternal mortality.

Chibuye, P. S., Bazant, E. S., Wallon, M., Rao, N., & Fruhauf, T. (2018). [Experiences with and expectations of maternity waiting homes in Luapula Province, Zambia: a mixed-methods, cross-sectional study with women, community groups and stakeholders](#). *BMC pregnancy and childbirth*, 18(1), 42.

Women and communities in Luapula Province, Zambia accept and value maternity homes. However, interventions are needed to address women's needs for better infrastructure, services, food, security, privacy and transportation.

Massavon, W., Wilunda, C., Nannini, M., Majwala, R. K., Agaro, C., De Vivo, E., ... & Criel, B. (2017). [Effects of demand-side incentives in improving the utilisation of delivery services in Oyam District in northern Uganda: a quasi-experimental study](#). *BMC pregnancy and childbirth*, 17(1), 431.

Transportation vouchers in Northern Uganda were effective in increasing institutional deliveries and increased the proportion of women who bypassed their local health center to deliver at a further health facility.

### **Igniting demand for quality and accountability**

Prost, A., Colbourn, T., Seward, N., Azad, K., Coomarasamy, A., Copas, A., ... & MacArthur, C. (2013). [Women's groups practising participatory learning and action to improve maternal and newborn health in low-resource settings: a systematic review and meta-analysis](#). *The Lancet*, 381(9879), 1736-1746.

With the participation of at least a third of pregnant women and adequate population coverage, women's groups practicing participatory learning and action are a cost-effective strategy to improve maternal and neonatal survival in low-resource settings.

Björkman, M., & Svensson, J. (2009). [Power to the people: evidence from a randomized field experiment on community-based monitoring in Uganda](#). *The Quarterly Journal of Economics*, 124(2), 735-769.

Through two rounds of village meetings in Uganda, localized nongovernmental organizations encouraged communities to be more involved with the state of health service provision and strengthened their capacity to hold their local health providers to account for performance. A year after the intervention, treatment communities were more involved in monitoring providers, and the health workers appeared to exert higher effort to serve the community

*Bohren, M. A., Hunter, E. C., Munthe-Kaas, H. M., Souza, J. P., Vogel, J. P., & Gülmezoglu, A. M. (2014). [Facilitators and barriers to facility-based delivery in low-and middle-income countries: a qualitative evidence synthesis](#). *Reproductive health*, 11(1), 71.*

Perceptions of low quality care in health facilities was one of the major barriers to institutional delivery identified in this systematic review. Ensuring women know where high quality respectful care is provided could help increase facility deliveries.

## 2. Sample budget

We provide below an illustrative budget using lessons from the work done in Kakamega County, Kenya. The county has a population of approximately 2 million people, about 300 health facilities, including about 20 hospitals, and approximately 70,000 deliveries in a year.

As the pioneering context for maternal and newborn service delivery redesign, the work in Kakamega County involves many activities that are necessary to further develop the concept. Hence, some of the estimated costs provided below may be higher than expected.

Phase	Key budget areas	Estimated cost
Feasibility assessment	Conducting the feasibility assessment (personnel cost, training costs, field work logistics, stakeholder engagements, software for analyses)	\$ 35,000-45,000
Design phase	Identification and contracting of project management support partner	2 FTEs of academic partner's effort for 2-3 months
	Supplementary survey on barriers to care	\$ 15,000-25,000
	Project management support activities (redesign implementation model development, stakeholder engagements and technical assistance from experts)	\$ 350,000-400,000 (over 1 year)
Improvement phase	Baseline evaluation activities (component of full evaluation)	\$1- 1.3 million
	Project management support for oversight of improvement projects and ongoing stakeholder engagements	\$ 250,000-350,000 (over 1.5 years)
	Direct improvement activities (capital projects, training programs, community engagement activities)	TBD (expected to be the largest budget item)
Implementation	Follow-up evaluation activities (component of full evaluation)	\$1.2- 1.5 million

	Project management support for monitoring of program implementation	\$ 250,000-350,000 (over 2 years)
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FTE: Full-time equivalent

### 3. Strategies to improve access to maternal and newborn care

Below are examples of strategies that can be employed to bridge the equity gap in access<sup>10</sup>

Category	Option	Details/examples
Infrastructure	Develop additional advanced neonatal and obstetric capacity	In areas with no access to hospitals or other facilities providing advanced care (surgery, newborn intensive care) within 2 hours, such facilities could be established, or existing facilities could be upgraded. This must be done equitably, preferably using geographic mapping and population density analyses. In Tanzania, health centers are being upgraded for surgical capacity to increase access to surgical care across the country. <sup>14,15</sup>
	Construct roads, bridges and other physical connections	Extending road networks to rural communities, constructing bridges and providing ferries and other physical infrastructure to connect communities are means to reduce the time and distance to reach care. Bangladesh added over 50,000 Km of roads and 300 Km of bridges to the transportation network between 2001 and 2010, decreasing travel time and increasing access to facilities, which likely contributed to the reductions in maternal mortality observed in that period. <sup>16</sup> A similar attribution is made for Cambodia. <sup>17</sup>
Transportation and referral	Expand use of public transportation and private vehicles	In many communities, public transportation options are available and predictable. Once women plan to reach delivery care early, these public buses, trains and share taxis can offer an affordable and reliable means of transportation. On-demand private taxis or community-owned vehicles are also a viable means of transportation for both rural and urban populations.
	Utilize ride-share technologies	As mobile penetration increases in low-income settings, ride-share is becoming increasingly popular, and this technology can be utilized in facilitating maternal transportation. An Uber-like application piloted in Homa Bay County in Kenya was found to provide 1-hour access to skilled birth care to nearly 90% of users. <sup>18</sup>
	Mobilize community transportation funds	Community funds to cover emergency transportation have been used in a variety of locations. For example, Health and Insurance Management Services Organization (HIMSO) trains communities to manage their own low-cost emergency transportation fund in rural Tanzania.
	Provide dedicated medical transportation	When primary care centers have dedicated vehicles for medical transportation, reaching advanced care is easier and/or safer for patients. In rural Ghana, the provision of modified three-wheeled motorcycles to health centers was found to have resulted in a shifting of deliveries from primary care to advanced facilities. <sup>19</sup>

	Improved communication	New digital technologies and expanded mobile telephone and internet coverage mean that communication between facilities can improve. For example, WhatsApp is being used in rural Tanzania to “give report” between referring and receiving facilities.
Waiting options	Establish dignified maternity waiting homes	Maternity waiting homes enable women who are very remotely located to stay in or close to a health facility when they are near term in order to be close to care when they go into labor. A recent study in Ethiopia found that hospitals with maternity waiting homes had 40-50% lower rates of maternal and perinatal complications compared to hospitals without waiting options. <sup>20</sup>
	Encourage staying with relatives in towns with advanced obstetric and neonatal care during last few weeks of pregnancy	With increasing urbanization throughout the world, including in low- and lower middle-income countries, an increasing proportion of rural residents will have relatives living in urban and peri-urban areas where health facilities with advanced obstetric and neonatal care are likely to be found. Thus, encouraging pregnant women living in rural areas to temporarily stay with relatives in towns may be preferable than maternity waiting homes for some.
	Explore Airbnb-like options	Where there are no maternity waiting homes, lodging with a host can bring women closer to advanced care when they are near term. An Airbnb-like online platform would allow clients to select options that meet their specific needs (e.g. hosting siblings or birth companions) and rate their lodging experience. This platform can be used to plan the stay during antenatal care and the rating function provides an important accountability mechanism. This initiative could be combined with a voucher scheme that defrays the cost of stay for the woman.
Financing mechanisms	Institute conditional cash transfer schemes for delivery in advanced facilities.	Making monetary payments to women who deliver in advanced facilities can provide an incentive for women to continue to do so. Evidence from India’s Janani Suraksha Yojana program and from studies in Sub-Saharan Africa suggests that conditional cash transfers are a viable demand-side strategy to increase access to services and bridge equity gaps, but only if facilities are of adequate quality. <sup>21,22</sup>
	Provide vouchers for facility deliveries and/or transport	Voucher programs can reduce or remove the cost of reaching and obtaining quality delivery care. Voucher programs have enabled women in rural Uganda to access private transportation options during labor without any upfront costs and helped subsidize maternal care services for poor women in Kenya <sup>23,24</sup> These schemes can be further targeted for delivery in advanced facilities.