



Save the Children

SOCIAL BEHAVIOUR CHANGE AND COMMUNICATION (SBC/C) STRATEGY TO IMPROVE FEEDING PRACTICES AND VACCINATION UPTAKE FOR ALL CHILDREN UNDER TWO YEARS OF AGE IN SOMALIA

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Acronyms

APEASE	Affordability, Practicability, Effectiveness and cost-effectiveness, Acceptability, Side-effects/Safety and Equity
BCTs	Behaviour Change Techniques
BCW	Behaviour Change Wheel
CHASP	Community Health & Social Accountability Program
CO	Country Office
COM-B	Capability, Opportunity and Motivation – Behaviour
EPHS	Essential Package of Health Services
e4c	Evidence for Change
EPI	Expanded Programme on Immunization
FAO	UN Food and Agriculture Organization
FEWS -NET	Famine Early Warning Systems Network
GAM	Global Acute Malnutrition
HE	Humanitarian Emergency
HCW(s)	Health Care Workers
INGO	International Non-Governmental; Organization(s)
IYCF	Infant and Young Child Feeding
KAP	Knowledge, Attitude and Practices
LMIC	Low and Middle-income Countries
MCHN	Maternal and Child Health and Nutrition
M&E	Monitoring and Evaluation
MoH	Ministry of Health
NGO	Non-Governmental Organization
NGT	Nominal Group Technique
OCHA	UN Office for the Coordination of Humanitarian Affairs
PLA	Participatory Learning and Action
SAM	Severe Acute Malnutrition
SBCC	Social and Behaviour Change Communication
SCI	Save the Children International
ToC	Theory of Change
ToR	Terms of Reference
UoM	University of Manchester
UNICEF	United Nations Children’s Fund
USAID	U.S. Agency for International Development
WASH	Water, Sanitation and Hygiene
WFP	World Food Programme
WHO	World Health Organization

Executive Summary

Somalia has been affected by decades of conflict, drought, and famine, which have led to numerous humanitarian crises and significant challenges for the country. As a result, chronic food insecurity, poor-access to sanitation, disease outbreaks and sub optimal-feeding practices have contributed to high levels of malnutrition in the country, particularly among children under 5 years of age. Given the high burden of malnutrition and low vaccination coverage rates in Somalia, there is an urgent need to develop and implement a Social and Behaviour Change Communication (SBCC) strategy to improve feeding practices and vaccination uptake for children younger than 2 years.

This SBCC strategy is part of the **Community Health & Social Accountability Program (CHASP)**. The overall objective of the program is to ensure the 'Increased utilization of quality, gender-sensitive reproductive, maternal, newborn and child health services which are accessible, acceptable, affordable, and equitable through EPHS'. For this work we conducted a comprehensive situational and barrier analysis, and developed an effective, contextualized, and gender transformative, inclusive, and evidence-based SBCC strategy for positive behaviour change. We targeted different behaviours that could improve **feeding practices of the first 1000 days and increase the completion of scheduled vaccines for all children under 2 years.**

The methodology used was the **Behaviour Change Wheel** (BCW, [1]) framework for **designing behaviour change interventions**. It consists of 8 different steps that help you understand the behaviour, identify intervention, content and implementation options while guiding the process of evidence-synthesis and systematic decision-making. Moreover, we used **participatory approaches** for selecting target behaviours and designed the intervention for it to target barriers at the different levels of the **socio-ecological model**. The specific steps of our methodology were as follows:

Step 1: define the problem in behavioural terms - we performed a literature review and developed a behavioural map including all the different behaviours contributing to the main outcomes and indicated in each case which actor was intended to perform that behaviour. In total, 49 behaviours were identified, 30 of which contribute to the feeding practices and 19 to the uptake of children vaccination.

Step 2: selecting the target behaviour - we analysed each of the behaviours according to their probable positive impact, likelihood of change, spillover effects and measurability. This led to a list of 27 candidate behaviours which were presented in three different workshops to different actors of the community for them to prioritise which of them they wanted to target. We carried out one participatory workshop in each of these three regions: Puntland, Jubaland and Galmudug. Each workshop had at least 15 attendees that included mothers, fathers and HCWs. Through an adapted version of the Nominal Group Technique (NGT) we gathered the opinions and priorities of participants, while allowing them to suggest new behaviours. The results of the prioritisation exercise were analysed in conjunction with the evidence available to select a total number of 11 target behaviours. For families' behaviours regarding feeding practices, we selected (1) breastfeed the child within the first one hour of birth while allowing them to be in skin-to-skin contact with the mother, (2) give colostrum, (3) breastfeed exclusively on demand (0-6 months), (4) increase maternal food intake of balanced food and add one snack during pregnancy and breastfeeding. The target behaviours for families concerning vaccination included (1) mothers taking children to health centres for vaccination, (2) fathers telling mothers to take the child to vaccination, (3) family members/friends sharing positive experiences with vaccination and (4) storing health records. HCW's behaviour for feeding practices was (1) providing help with breastfeeding problems. (1) Reminding parents of the next dose and (2) increasing sensitization at community level by CHWs were selected as the target behaviours for HCWs/CHWs concerning vaccination.

Step 3: specify the target behaviour and audience - we detailed exactly what each behaviour consists of and selected primary, secondary and tertiary audiences.

Step 4: identify what needs to change - we analysed the different barriers reported in the available evidence and grouped them following the COM-B model [1] which organises barriers and enablers according to psychological capability, physical capability, social opportunity, physical opportunity, automatic motivation and reflective motivation.

Step 5: identify intervention functions - we selected the intervention functions based on the barriers identified and the evidence from previous interventions performed in Somalia and similar contexts. We also reflected on their affordability, practicability, effectiveness and cost-effectiveness, acceptability, side-effects/safety and equity (**APEASE criteria**, [1]). The intervention functions selected were education, persuasion, incentivisation, training, environmental restructuring, modelling, and enablement.

Step 6: identify policy categories - we suggest that the policy options regulation, communication/marketing, guidelines, and service provision could be effective.

Step 7: identify behaviour change techniques (BCTs, defined as active components of an intervention) - we used the list of most/less frequently used BCTs for every intervention function and designed the intervention accordingly.

Step 8: Identify mode of delivery - we evaluated the evidence and decided to include two modes of delivery for our SBCC strategy: one face-to-face, mainly at group level, and the other by distance over the phone.

The **SBCC intervention designed consists of different activities** that target barriers from the different levels of the socio-ecological model [2]. At the **community level** the suggested intervention consists of support groups (through Abaay-Abaay groups, and SCI mother-to-mother/father-to-father support groups), which include redesigning health record cards. At the **health facility level**, we suggest providing mHealth reminders of vaccination, organise outreaches, provide training to healthcare workers to improve their knowledge of the current EPI policy, and provide training in communication skills. Finally, at the **policy level**, our intervention suggests expanding the eligibility age for routine vaccinations and advocating to adopt user-friendly immunization cards. We provided details of which barriers will be targeted by each activity and which BCTs will be implemented. Moreover, we suggest details of the timing, location and who will be the deliverers of each activity.

For the **evaluation** of the intervention, we will compare two main approaches for delivering the intervention: (1) Participatory, Learning and Action (PLA) and (2) mHealth. Messages will be delivered in the PLA groups through face-to-face meetings (Abaay-Abaay, mother-to-mother and father-to-father support groups) whereas in the mHealth arm they will be shared as a drama-series and re-enforcement messages. All activities conducted at health facilities and the policy level will focus on addressing barriers in both study arms equally. We suggest a three-phased process in which we develop and test the manuals or messages on the first phase. In the second phase, we propose to conduct formative research to pilot two scaling up approaches for the PLA approach and delivering the mHealth audio messages focused to test and refine them. In the last phase, a cluster randomised trial will be conducted to test the pilot study effectiveness and potentially cost-effectiveness of the interventions. In a 3-arm pilot study, we will test the impact of the PLA and mHealth interventions compared to the control. The main outcomes for evaluation include caregivers' knowledge and social norms, early initiation of breastfeeding, exclusive breastfeeding prevalence, child diet diversity and women dietary diversity and children vaccination coverage. Finally, the Theory of Change for the intervention can be found at the end of the report.

In conclusion, we have designed an evidence-based intervention that will help overcome most of the barriers preventing key behaviours of feeding practices and vaccination uptake for children up to the age of 2 years in Somalia.

CHAPTER 01

INTRODUCTION AND SITUATIONAL ANALYSIS

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Context in Somalia

Somalia has been affected by decades of conflict, drought, and famine, which have led to numerous humanitarian crises and significant challenges for the country. As a result, chronic food insecurity, poor-access to sanitation, disease outbreaks and sub optimal-feeding practices have contributed to high levels of malnutrition in the country, particularly among children under 5 years of age. According to Donkor et al. [3], Somalia has high prevalence of child malnutrition, with 17.2% of children under five years of age being stunted and 19.6% being wasted.

Malnutrition weakens the immune system, making children more vulnerable to infectious diseases, and increases the risk of death from common childhood illnesses such as diarrhoea, pneumonia, and measles. Poor feeding practices, such as delayed initiation of breastfeeding, inadequate complementary feeding, and feeding of unsafe or unhygienic foods, contribute to malnutrition and increase the risk of infectious diseases.

Given the high burden of malnutrition and low vaccination coverage rates in Somalia, there is an urgent need to develop and implement an SBCC strategy to improve feeding practices and vaccination uptake for children younger than 2 years. The proposed project aims to address this need by using the Behaviour Change Wheel (BCW) approach to situational and behavioural analysis and intervention development, while also using participatory approaches to research and behaviour change.

Overview of vaccination rates among children

Somalia also has low vaccination coverage rates, with only 30% of children under one year of age receiving all recommended vaccines, this is relatively low when compared to the global coverage of almost 80% [4]. Vaccine-preventable diseases such as measles, are still common in the country and outbreaks occur regularly, due to low immunization coverage.

Overview of Infant and Young Child Feeding Practices (IYCF)

The primary causes of malnutrition during a child's first two years are sub optimal infant feeding practices and infectious diseases. According to a knowledge, attitude, and practices study [5], Somalia has very poor IYCF practices due to strong beliefs and cultural practices. According to the study, the initiation of breastfeeding takes place 2-3 days after birth, and people generally consider exclusive breastfeeding to be providing a child breast milk and water without food. Additionally, colostrum is thought to have no health benefits and cause diarrhoea. Some mothers have no knowledge of when to introduce complementary foods, while others introduce soft and semi-solid foods as early as the third month.

Overview of maternal nutrition

The nutrition of a pregnant and lactating woman directly impacts the growth and development of her child during pregnancy and early infancy. According to the Somalia Nutrition analysis report, the country has critical levels of maternal malnutrition [6]. Additionally, micronutrient deficiencies are rampant among women of reproductive age and pregnant women, as deficiencies of iron, zinc, vitamin A, among others, have been reported [7]. This suggests the country's intergenerational cycle of poverty and growth failure will continue unless maternal nutrition is addressed.

CHASP Project

Save the Children has been running the Community Health & Social Accountability Program (CHASP) in Somalia since 2017. The overall objective of the program is to ensure the 'Increased utilization of quality, gender-sensitive reproductive, maternal, newborn and child health services which are accessible, acceptable, affordable, and equitable through EPHS'.

This project is currently in its second phase and plans to deliver interventions that promote access to health services, while also strengthening regional and district health structures. It is essential that the interventions delivered address the social and gender norms and gender inequalities that limit women's access to basic services such as health and nutrition.

Within the CHASP project, we conducted this thorough situational and barrier analysis that led to an evidence-based Social and Behaviour Change and Communication (SBCC) Strategy that is also effective, contextualized, inclusive, and gender transformative. The SBCC strategy intends to improve feeding practices of the first 1000 days and increase the completion of scheduled vaccines for all children under 2 years.

Social Behaviour Change and Communication Strategies

There is a substantial body of evidence that suggest altering people's health-related behaviours can significantly reduce the risk of some of the leading causes of mortality and morbidity [8]. Understanding why these behaviours occur and how the interventions manage to generate their effects is crucial for developing more effective solutions to solve society's modern challenges [9].

Social and behaviour change refers to a collection of strategies and tools that aim to improve a specific behavioural outcome. In order to achieve change, specialists need to comprehend which cognitive, social, and structural variables are acting as barriers or enablers for change and collaborate with communities, partners, and authorities to co-design development solutions.

In this report, we aim to describe the different steps that were carried out to develop this evidence based SBCC strategy specifically designed for the Somalia context alongside community members.

CHAPTER

02

METHODOLOGY AND THEORETICAL MODELS

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Several guidelines for intervention implementation and evaluation have highlighted the importance of using theories to develop more effective interventions and to optimise our understanding of their effects [10], [11].

This report sought to develop an integrated feeding practices and vaccination intervention to be implemented in Somalia. To design the intervention we applied two relevant frameworks: (a) the Behaviour Change Wheel (BCW; [12]) and (b) participatory approaches to research and behaviour change.

Behaviour Change Wheel

The Behaviour Change Wheel has been developed by integrating 19 frameworks of behaviour change found in literature [12] and aims to improve the translation of evidence into behaviour change interventions and policies. The BCW provides a systematic way of analysing the drivers of behaviour, which will inform the selection of intervention functions and policy options that are intended to change those barriers or increase those enablers.

The Behaviour Change Wheel provides us with a step-by-step method for designing behaviour change interventions. The 8 steps are shown in Figure 1 but will be described in detail in each section of the report.

COM-B framework

At its core, the BCW contains the COM-B framework which details different components of the interacting system that composes behaviour [1]. We will use the COM-B framework to identify the different barriers and enablers for changing our target behaviours, corresponding to “Capability”, “Opportunity” and “Motivation”. Capability is defined as “the individual’s psychological and physical capacity to engage in the activity concerned” [12, p. 4] and includes mainly the knowledge and skills necessary to perform a behaviour. Motivation is defined as “all those brain processes that energize and direct behaviour” [12, p. 4]. It includes not only automatic motivation processes such as habit and emotion, but also reflective motivation processes like goals and conscious decision-making. Opportunity is defined as “all the factors that lie outside the individual that make the behaviour possible or prompt it” [12, p. 4] and refers to physical and social influences of context to the behaviour that we want to perform.

Socio-ecological model

The socio-ecological model explores the multifaceted and interactive impact of personal and environmental factors that influence behaviour change [13] and highlights the importance of using multi-dimensional approaches that consider social and physical environments to gain a more complete picture [14]. Therefore, the rationale for the application of this model was to provide us with further exploration of factors that influence vaccination uptake among children under 2 years, proper IYCF and maternal nutrition practices, while simultaneously helping put in place interventions on an individual, community, and policy level.

Participatory learning approaches

To empower the community to strengthen capabilities and assets, we decided to include participatory approaches. In the scientific literature, there are a plethora of studies detailing the benefits of these approaches to improve health outcomes of communities. For example, a meta-analysis has identified that participatory action learning interventions led to reductions in maternal mortality in low and middle-income countries [15], and another study carried out by Seal et al. [16] showed that participatory interventions have a positive impact on uptake of child vaccination specifically in Somalia. For this reason, we decided to engage different target groups to provide their valuable insights into prioritizing which behaviours to target with the intervention. Three workshops were carried out with the community using the **Nominal Group Technique** to reach consensus on the selection of priority behaviours. More methodological details of this workshops will be provided in *Step 2: Selecting the target behaviour*.

The subsequent report will follow the structure by which the intervention was developed, detailing each of the different steps of the BCW. For more details on the different methodological steps carried out, please refer to the corresponding section of the report.

Figure 1. Steps of the Behaviour Change Wheel framework [1].



CHAPTER

03

UNDERSTAND THE BEHAVIOUR

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Literature review

We performed a comprehensive literature review to understand in detail the Somali context and to identify barriers and enablers related to the core thematic areas of this SBCC strategy. The objective was to collect evidence on barriers/enablers and different behaviours around feeding practices and vaccination. For this, we selected articles or reports from the previous 15 years, with a preference towards those from the previous ten. The reports included were performed mainly in Somalia. Nonetheless, some reviews that corresponded to other low-income countries or other sub-Saharan countries were included if they provided any new information that could be relevant to build the behavioural map.

Regarding vaccination behaviour, we reviewed different peer-reviewed articles on barriers to vaccination of children living in Somalia, either with a quantitative survey approach [4], [17] or a qualitative one [18], [19]. The study performed by Jelle et al. [19] not only included observation data and interviews from different stakeholders, but it also analysed policy documents and health facilities to provide a thorough barrier analysis for vaccination uptake. Moreover, we reviewed research performed in other countries where the access to vaccines is provided, but Somali families are still hesitant on vaccinating their children [20]–[25]. These research papers were used as secondary evidence to understand some beliefs present in Somali culture. A systematic literature review on barriers to childhood vaccination in low and middle-income countries was included as well to have a broader scope of the different variables that could affect immunization uptake [26]. Finally, we included insights from other SBCC reports performed for the Somalia context [27], [28] and an intervention performed for vaccination uptake among internally displaced persons using a participatory learning and action cycle [16].

Regarding feeding practices on the first 1000 days, we analysed different sources of information as well. We included quantitative studies evaluating the risk factors for malnutrition [3], [29] and also qualitative studies evaluating barriers to exclusive breastfeeding [30], [31]. We reviewed as well a qualitative research paper on the roles and responsibilities of men, mothers, and grandmothers on child feeding practices that are extremely important for understanding cultural aspects in Somalia [32]. Finally, we included insights from previous SBCC interventions developed for improving feeding practices in Somalia [27] and Ethiopia [33], and a qualitative study analysing the effect of an intervention based on cash transfers [34].

Developing a behavioural map

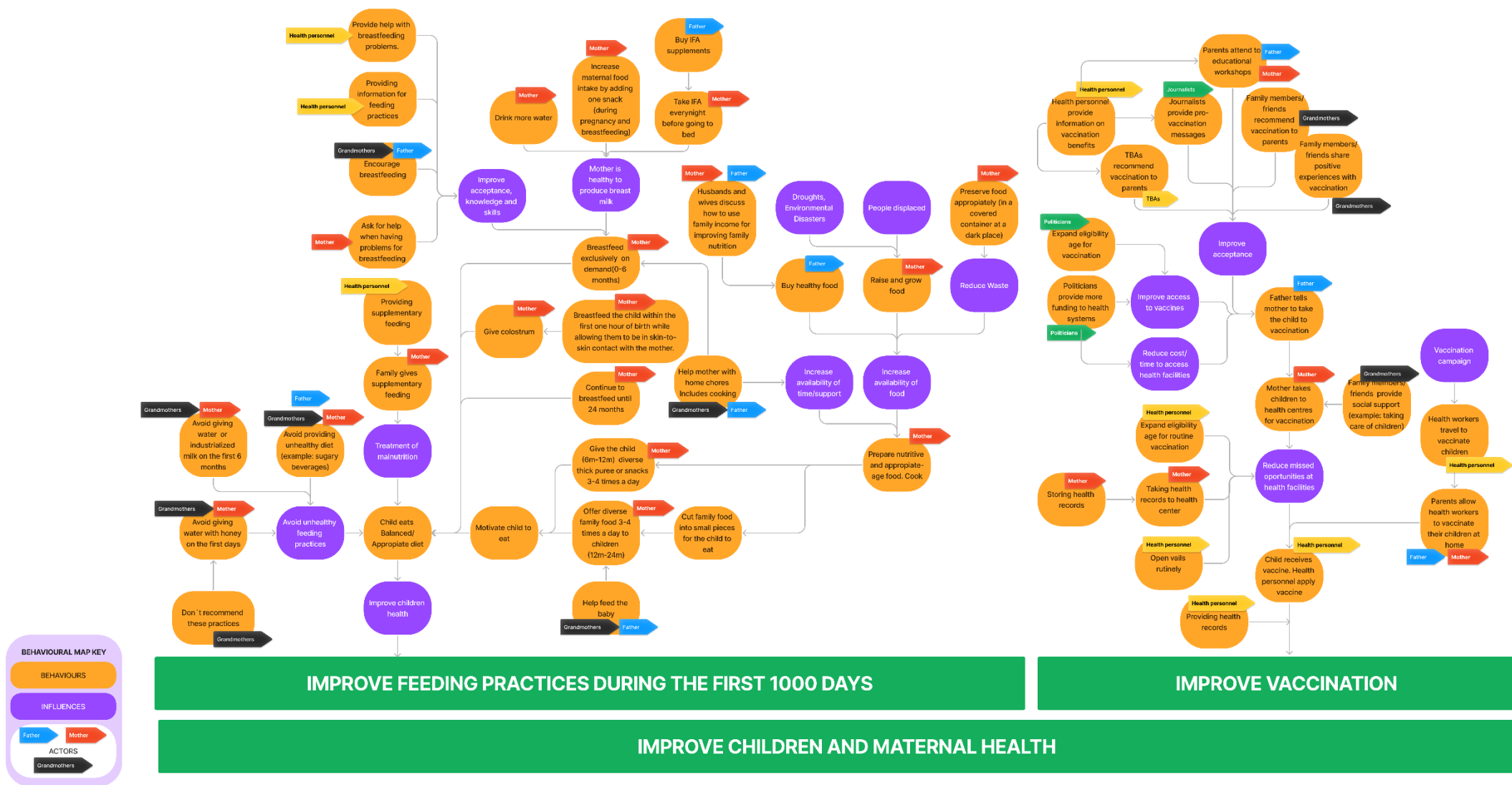
Through the assessment of the literature, we identified different behaviours that contributed to the improvement of feeding practices during the first 1000 days and increased the completion of scheduled vaccines for all children under 2 years.

We developed a behavioural map in which we specified all the different behaviours contributing to these outcomes and indicated in each case which actor was intended to

perform that behaviour. Behavioural systems mapping is a novel and developing methodology that aims to represent the different behaviours, influences and actors while establishing their relationships [35]. For example, it allows us to understand that some behaviours influence others and some need to be performed previously for another behaviour to happen. This methodology allows us to understand the complexity of public health issues and identify which behaviours need to change to achieve the expected outcomes. When we consider every behaviour in relation to one another in a behavioural map, then we increase the likelihood of selecting a behaviour that will have a clear impact on our main objectives.

In total, 49 behaviours were identified, 30 of which contribute to the feeding practices and 19 to the uptake of children vaccination. The behavioural map can be found in Figure 2.

Figure 2. Behavioural map.



STEP 02

SELECT THE TARGET BEHAVIOURS

At this step, we analysed each of the 49 behaviours according to four variables detailed in the BCW. Firstly, we analysed the possible *positive impact* the behaviour could have if it changes. Secondly, the *likelihood of change* was evaluated according to the different influences that the specific behaviour had. For example, providing food 3 to 4 times a day is a behaviour that might be difficult to change if there is no food available. Thirdly, we took into consideration the *spillover effects*, and how changing one behaviour could impact other behaviour or other outcomes. For example, if mothers breastfeed exclusively up to 6 months this could help them save money. And finally, we analysed the *measurability* of the different behaviours. Since our aim was to develop an intervention that could be evaluated to establish its effectiveness, it was necessary to evaluate how easy it is to measure the different behaviours.

In order to assign a numerical value to each variable, we incorporated evidence from different research studies and reports performed in Somalia. Under the likelihood of change column, we included lists of different barriers identified in the literature for each behaviour and some variables that we hypothesized that could have an impact on the likelihood of change but were not studied yet in the literature. The table can be found in the *Supplementary Material 1* and the corresponding citations are present in the table.

Once all the behaviours were analysed, we pre-selected those with the higher values to continue analysing them further. The short list of behaviours can be found in Table 1. Behaviours were grouped in 4 categories (feeding practices families, feeding practices HCWs, vaccination families and vaccination HCWs).

Table 1. Candidate behaviours selected for workshops.

Feeding practices	
Feeding practices - Families	Feeding practices - HCWs
Breastfeed the child within the first one hour of birth while allowing them to be in skin-to-skin contact with the mother.	Providing information for feeding practices
Give colostrum	Providing supplementary feeding
Avoid giving water or industrialized milk in the first 6 months/Avoid giving water with honey on the first days	Provide help with breastfeeding problems
Breastfeed exclusively on demand (0-6 months)	
Give the child (6m-12m) a diverse thick puree or snack 3-4 times a day	
Feed the child with diverse family food 3-4 times a day to children (12m-24m). Diverse food includes for example eggs, vegetables, fruits, meat, etc.	
Continue to breastfeed until 24 months	
Avoid providing unhealthy diet (example: sugary beverages)	
Family gives supplementary feeding	

Increase maternal food intake of balanced food and add one snack during pregnancy and breastfeeding.	
Help feed the baby (father, grandmother, siblings)	
Husbands and wives discuss how to use family income for improving family nutrition	
Buy healthy food	
Vaccination	
Vaccination - Families	Vaccination - HCWs
Mother takes children to health centres for vaccination	Health workers travel to vaccinate children
Parents allow health workers to vaccinate their children at home	Open vials routinely
Storing health records	Providing health records
Taking health records to health centre	Expand eligibility age for routine vaccination
Family members/friends provide social support (example: taking care of children)	
Family members/friends recommend vaccination to parents/Family members/friends share positive experiences regarding vaccination	
Father tells mother to take the child to vaccination	

At this stage we included the community for them to provide their insights into the final selection of target behaviours. We developed three workshops with different actors of the community for them to prioritise which behaviours they wanted the intervention to target. For these workshops, we adapted the Nominal Group Technique (NGT) which has already been used for health issues [36] and with different communities [37], [38]. Images were included in the form used to aid with the comprehension of the different behaviours by people with low literacy. This was extremely relevant for this population because it has been reported that only 32% of women are literate in Somalia [39]. NGT is particularly good for groups where there is a social hierarchy, as there are open discussions, but the final voting is done individually and privately. Therefore, everyone has an opportunity to contribute their ideas and opinions.

The NGT is a focus group research approach used to gather the opinions and priorities of participants. The four main steps of the NGT process are idea generation, idea recording, idea clarification, and ranking [37], [38]. Participants are first given a description of the study issue during stage one, then they are given some time to come up with possible answers on their own. Participants give their thoughts at stage two, and the researchers record and show these ideas. In the third stage, researchers group the concepts into broad themes, and participants can combine, delete, or add things as needed. The fourth stage concludes with participants ranking the ideas individually in order of importance.

For this piece of work, we decided to adapt the NGT. Firstly, the people delivering the workshops were instructed to make the introduction, provide the form to each person attending and to explain the different behaviours selected. Secondly, people were invited to discuss in small groups and suggest different behaviours which were afterwards discussed with the wider group and added to the list if appropriate. Thirdly, everyone ranked the different behaviours individually, providing 3 points to behaviours they believed were more

important and 1 point to the ones they considered had less relevance. Finally, the group was provided with the results of which behaviours got top ranked. The same procedure was followed for feeding practices and vaccination behaviours. The form used for the workshops can be found on *Supplementary Material 2*.

The people delivering the workshops were trained in a two-hour session carried out by two of the authors (MS and MJ). All the assistants were health care workers. Twelve assistants sent their ranking of the behaviours, and their answers were incorporated to the analysis. Seven extra behaviours suggested by them were incorporated:

1. Parents wash their hands before feeding children and washing children's hands.
2. Spacing of children.
3. Allowing children to eat at their own pace. Responsive feeding.
4. Mother properly attaching and placing the baby while breastfeeding.
5. Health worker friendly gesture and welcoming the mother and child to the health facility.
6. Give information before vaccination (which vaccine they are providing, how many doses it has, side effects). Give information on managing side effects.
7. Tell parents it's time to vaccinate their children. Reminding the parents of the next dose.

Workshop 1 was carried out in person with families and HCWs of Bari (Puntland) region. Of the total 15 attendees, 5 were fathers, 5 mothers and 5 HCWs. They ranked all the behaviours, including those proposed by HCWs on the training session. Seven extra behaviours/influences were included, discussed, and ranked at this workshop:

1. Advise mothers expressing their breast milk if she is going away. E.g., travelling, working or education.
2. Provide counselling at a private place.
3. Don't force a child to eat meals.
4. Build trust with mothers so they can communicate openly with you
5. Some mothers believe there is not enough breastmilk for the first 5 days after delivery.
6. Educate mothers about proper feeding practices.
7. If the mother becomes pregnant it is not recommended to stop breastfeeding if the pregnancy is uncomplicated

Workshop 2 was carried out in person in Dhobley (Jubaland). Fifteen participants attended. From this group 5 were HCWs, 5 were mothers and 5 were fathers. Some extra behaviours were proposed in this workshop:

1. Increase awareness raising at community level on vaccination by community healthcare workers.
2. Healthcare workers should not vaccinate children whose parents are not around.
3. Health workers should increase sensitization on hygiene and handwashing during outreaches.

Workshop 3 took place in the Galmudug state with 16 participants. Six of the attendees were mothers, 5 were fathers and 5 HCWs. At this workshop, six extra behaviours were discussed and ranked.

1. Mothers to prepare expressed breastmilk and store it to feed the baby while she is away from home.
2. Personal hygiene should be carried out for both mother and child before feeding.

3. Husbands and wives should discuss child spacing method to continue breastfeeding until 24 months.
4. Let infant finish one breast and come off by before switching to the other breast.
5. Health workers to provide health education to communities about importance of immunization to child.
6. Health workers should engage fathers to allow and support mothers to take the child to vaccination centre.

All the workshops were carried out in April-May 2023. Pictures from the workshops can be found on [Supplementary Material 3](#).

Analysis of ranking

For analysing the results, we calculated the mean value for each behaviour. We divided the total number of points given to each behaviour by the number of people that ranked that specific one. We decided to analyse means because some behaviours were not ranked in every region. This was due to some of them being proposed in one region but not in another, and to reduce the impact of missing data. A few behaviours proposed in different communities were similar, so they were calculated as being the same one. The results can be found on Table 2.

Table 2. Mean values of behaviours analysed in workshops.

Behaviour	Sum of ranking points	n of people assigning value to that behaviour	Mean value
Feeding practices - families			
Build trust with mothers so they can communicate openly with you	42	15	2.80
Breastfeed the child within the first one hour of birth while allowing them to be in skin-to-skin contact with the mother.	161	58	2.78
Give colostrum	158	58	2.72
Breastfeed exclusively on demand (0-6 months)	158	58	2.72
Parents wash their hands before feeding children and washing children's hands // Personal hygiene should be carried out for both mother and child before feeding	153	57	2.68
Let infant finish one breast and come off by before switching to the other breast	42	16	2.63
Mother properly attaching and placing the baby while breastfeeding	106	41	2.59
Increase maternal food intake of balanced food and add one snack during pregnancy and breastfeeding.	147	58	2.53

Continue to breastfeed until 24 months	140	58	2.41
Buy healthy food	139	58	2.40
Give the child (6m-12m) a diverse thick puree or snack 3-4 times a day	135	57	2.37
Feed the child with diverse family food 3-4 times a day to children (12m-24m). Diverse food includes for example eggs, vegetables, fruits, meat, etc.	136	58	2.34
Allowing children to eat at their own pace. Responsive feeding	96	41	2.34
Help feed the baby (father, grandmother, siblings)	133	58	2.29
Husbands and wives should discuss child spacing method to continue breastfeeding until 24 months	36	16	2.25
Husbands and wives discuss how to use family income for improving family nutrition	128	58	2.21
Family gives supplementary feeding	126	58	2.17
Advise mothers expressing their breast milk if she is going away. Eg travelling, working or education // Mothers to prepare expressed breastmilk and store it to feed the baby while she is away from home	67	31	2.16
Avoid giving water or industrialized milk in the first 6 months/Avoid giving water with honey on the first days	125	58	2.16
Avoid providing unhealthy diet (example: sugary beverages)	124	58	2.14
Don't force child to eat meals	27	13	2.08
Spacing of children	77	41	1.88
Some mothers believe there is not enough breastmilk for the first 5 days after delivery	28	15	1.87
If the mother conceives new pregnancy is not recommended to stop breastfeeding if the pregnancy is uncomplicated	21	15	1.40
Feeding practices - HCW			
Provide help with breastfeeding problems	153	56	2.73
Providing information for feeding practices	152	57	2.67
Health worker friendly gesture and welcoming the mother and child to the health facility.	105	40	2.63
Provide counselling for private place	39	15	2.60
Providing supplementary feeding	130	56	2.32
Educate mothers proper feeding practices	34	15	2.27

Vaccination - Families			
Mother takes children to health centres for vaccination	152	56	2.71
Family members/friends recommend vaccination to parents/Family members/friends share positive experiences regarding vaccination	145	56	2.59
Storing health records	140	56	2.50
Parents allow health workers to vaccinate their children at home	139	56	2.48
Taking health records to health centre	137	56	2.45
Family members/friends provide social support (example: taking care of children)	137	56	2.45
Father tells mother to take the child to vaccination	136	56	2.43
Vaccination - HCWs			
Health workers should increase sensitization on hygiene and handwashing during outreaches	42	14	3.00
Increased awareness raising at community level on vaccination by CHWs	38	14	2.71
Tell parents it's time to vaccinate their children. Reminding the parents of the next dose.	89	33	2.70
Health workers to provide health education to communities about importance of immunization to child	43	16	2.69
Healthcare workers should not vaccinate children whose parents are not around	37	14	2.64
Health workers travel to vaccinate children	145	55	2.64
Give information before vaccination (which vaccine they are providing, how many doses it has, side effects). Give information on managing side effects	92	35	2.63
Providing health records	137	55	2.49
Expand eligibility age for routine vaccination	122	55	2.22
Health workers should engage fathers to allow and support mothers to take the child to vaccination centre	35	16	2.19
Open vials routinely	105	55	1.91

Selection of target behaviours

A list of the selected target behaviours and their corresponding audiences is found on Table 3.

Feeding practices

For families' behaviours regarding feeding practices, we selected a total number of 4

behaviours. The behaviours chosen were: breastfeed the child within the first one hour of birth while allowing them to be in skin-to-skin contact with the mother, give colostrum, breastfeed exclusively on demand (0-6 months) and increase maternal food intake of balanced food and add one snack during pregnancy and breastfeeding. The three breastfeeding behaviours were chosen firstly because they were the highest ranked. Secondly, it has been suggested in the literature that encouraging mothers during pregnancy to give a first breast feed increased their motivation to breastfeed [40]. Sustaining peer support groups can increase women's self-efficacy (the belief about one's ability to perform a behaviour) to continue breastfeeding [40]. Therefore, we believe that providing an intervention during pregnancy and in the first months after birth could have an impact on sustained breastfeeding.

The behaviour on maternal food intake was selected because it was the highest ranked behaviour among those that did not refer to breastfeeding. We believe that improving maternal diet could have a positive impact on children feeding practices. A policy brief has suggested that if maternal nutrition is not improved, it is unlikely that any of the global targets for maternal and child nutrition would be met [41]. Lack of maternal information and poor feeding practices are important causes of malnutrition in young children [5]. Therefore, we suggest that working with maternal feeding practices could improve children feeding practices in the long run.

For HCWs behaviours regarding feeding practices, we decided to target the highly ranked behaviour of "Provide help with breastfeeding problems". Not only this behaviour is seen as extremely important by the community, but we also consider it corresponds perfectly with the behaviours targeted for families. It is essential that HCWs provide help with breastfeeding problems to increase the rates of early initiation of breastfeeding and exclusive breastfeeding.

The highest ranked behaviour for families feeding practices ("Build trust with mothers so they can communicate openly with you") was excluded because it emphasizes the communication style in which a behaviour is performed rather than a behaviour per se. WASH behaviours for both vaccination and feeding practices were excluded because we considered that they fell outside the scope of our research.

Vaccination

Regarding vaccination behaviours for families, we decided to select the following behaviours: "Mother takes children to health centres for vaccination", "Father tells mother to take the child to vaccination", "Family members/friends recommend vaccination to parents & Family members/friends share positive experiences regarding vaccination" and "Storing health records". The last two behaviours were selected because they were the second and third highly ranked behaviours.

The higher ranked behaviour was "Mother takes children to health centres for vaccination", nonetheless we decided to target the behaviour of "Father tells mother to take the child to vaccination" as well even though it was the lowest ranked. We have found in the literature that for mothers to take the child to vaccination, they need the authorization of fathers first [18]. We believe that by targeting fathers' behaviour as well, we will have an impact on mothers' behaviour of taking the child to vaccination and increase the overall vaccination uptake of children.

Regarding HCWs behaviour for vaccination, we decided to include the behaviours "Increase awareness raising at community level on vaccination by CHWs" and "Reminding

the parents of the next dose” because they included two important aspects regarding children vaccination. In one behaviour, they will be providing information on the topic, but the second behaviour is key to achieving timely vaccination. It is crucial to work on timely vaccination since delayed immunization may result in an increase of mortality [42].

STEP 03

SPECIFY THE TARGET BEHAVIOUR AND AUDIENCE

Once we selected the target behaviours with the community, we focused on specifying them even more. For each of the behaviours, we described *who* needs to perform the behaviour, *what* needs to be done differently, *when* will they do it, *where* will they do it, *how often* and *with whom*, in line with the Action, Actor, Context, Target, Time (AACTT) Framework for specifying behaviour [43].

The specifications of the target behaviours can be found in Table 3.

Specifying audience

This section provides information regarding the target audiences of the SBCC strategy. After thoroughly analysing the behavioural map we believe that numerous actors are involved in improving vaccination uptake and positive feeding practices among children. The different actors identified will be organised in three categories (primary, secondary and tertiary).

Primary audience: these are actors that are involved in or have a direct impact on vaccination uptake and feeding practices of children. Additionally, they can carry out the intended actions required to attain our objectives [44]. According to our behavioural map, we have identified that the actors that have a direct impact include mothers, fathers and caregivers. We understand that not all mothers and fathers will have the same characteristics across the whole country and that mothers/fathers do not perform the same behaviours because of gender norms. These actors will have different barriers to perform the behaviours depending on their ages, their literacy level or area in which they live in, just to name a few. Nonetheless, we have identified them as the primary audience and will design the intervention taking into consideration different barriers for each behaviour.

Secondary audience: these actors directly influence the primary audience in performing the desired behaviours. Firstly, we include grandmothers, family members, and friends as they provide advice and support to parents. Another category of secondary audiences includes those actors who are involved in educating, counselling, and supporting the primary audience to increase and improve efforts of child vaccination and feeding practices. These include HCWs which according to the Somali health system range from nurses, doctors, midwives, auxiliaries, technicians, pharmacists, among others and community health workers (CHWs)/female health workers (FHWs) which are actors that promote health in the community through the primary health units (according to the Somali Essential Package of Health Services) [45]. Thirdly, traditional birth attendants (TBAs) have a significant influence on parents' behaviour in Somalia. Even though they do not work formally in the health system they are very active in the communities [45] and 57.5% of births are assisted by them [39]. Fourthly, we included other community actors as part of the

secondary audience such as religious leaders, leaders from Abaay-Abaay and trained facilitators of support groups. Finally, at the community level, actors that are part of NGOs and professional groups also contribute to community health [45].

Tertiary audience: are actors that have a higher indirect influence on primary and secondary audiences. They impact the environment through policies, increasing awareness or mobilising resources [28]. Policy makers were identified in our behavioural map as one of the actors that could influence our desired outcomes. This includes those working in the Ministry of Health and other Ministries, international NGOs, donors or any other actor that indirectly influence the community and the parents of children.

Table 3. Behaviours selected, specification of behaviours and priority groups.

Topic	Behaviour	Priority groups	Specification
Feeding practices	Breastfeed the child within the first one hour of birth while allowing them to be in skin-to-skin contact with the mother.	<i>Families</i> - Pregnant mothers (young and “older”) - Traditional birth attendants - Grandmothers - Caregivers	WHO: Mother WHAT: Place baby on breast and breastfeed WHEN: In the first hour after birth WHERE: At health facility or at home HOW OFTEN: Once, when the child is born WITH WHOM: Alone or helped by HCW, family or traditional birth attendants
Feeding practices	Give colostrum	<i>Families</i> - Mothers that have given birth to a child recently - Pregnant mothers - Traditional birth attendants - Grandmothers	WHO: Mother WHAT: Breastfeed WHEN: During the first 3 days after birth. WHERE: At her house (during Umul) or at hospital if she has given birth at a hospital HOW OFTEN: On baby’s demand WITH WHOM: Alone or helped by HCW, family
Feeding practices	Breastfeed exclusively on demand (0-6 months)	<i>Families</i> - Mothers that have given birth to a child recently - Pregnant mothers - Traditional birth attendants - Grandmothers	WHO: Mother WHAT: Breastfeed WHEN: During the first 6 months WHERE: At her house or where she travels with the baby HOW OFTEN: On baby’s demand WITH WHOM: Alone or with family.
Feeding practices	Increase maternal food intake of balanced food and add one snack during pregnancy and breastfeeding.	<i>Families</i> - Pregnant and lactating mothers - Traditional birth attendants - Grandmothers	WHO: Mother WHAT: Eat an extra healthy food serving WHEN: Each day, during pregnancy and BF WHERE: At her house, or at work HOW OFTEN: Every day, at least once (in addition to the 3 usual food servings) WITH WHOM: Alone or with family
Feeding practices	Provide help with breastfeeding problems	<i>HCWs</i> - HCWs (nurses and midwives) - CHWs/FHWs	WHO: Health care workers WHAT: Evaluate breastfeeding of mothers and help to problem solve WHEN: When the child is born or when the mother asks for help

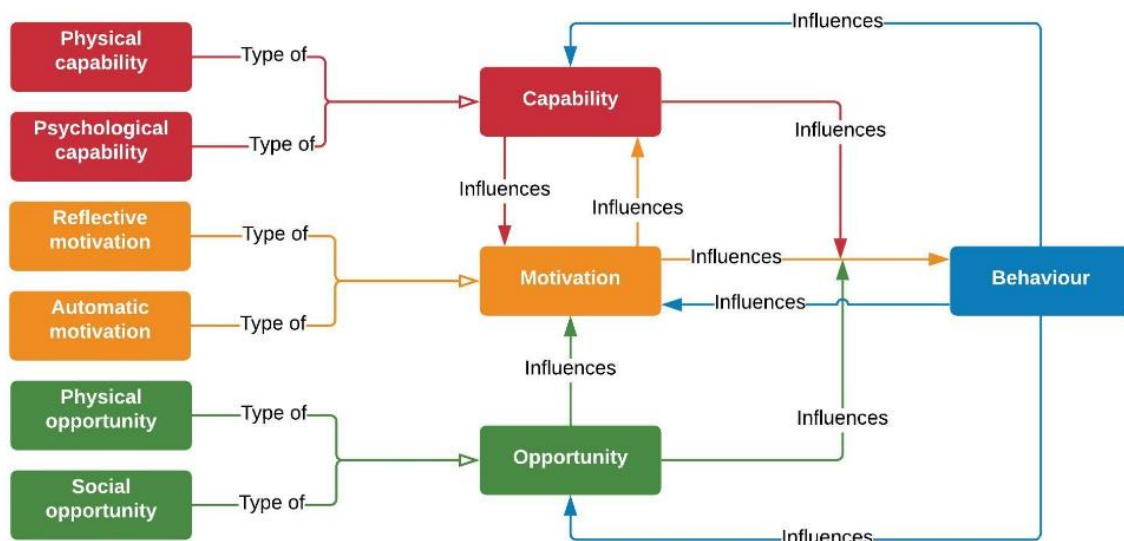
		- Traditional birth attendants	WHERE: At health care centres, at mother's home or at women's meetings. HOW OFTEN: Every time a child is born or when the mother asks for help WITH WHOM: HCWs/CHWs/FHWs
Vaccination	Mother takes children to health centres for vaccination	<i>Families</i> - Mothers of children up to 2 years - Pregnant mothers - Grandmothers, fathers of children up to 2 years	WHO: Mothers/Caregivers WHAT: Take the child to the health care centre WHEN: When the child is due for the first vaccination or when it is the due date for the next vaccine WHERE: At health care centres HOW OFTEN: Whenever a child is due for vaccination. WITH WHOM: With the child.
Vaccination	Father tells mother to take the child to vaccination	<i>Families</i> - Fathers of new-borns and children up to 2 years - Men who are expecting children soon	WHO: Father WHAT: Tells mother to take the child to vaccination centre WHEN: When the child is born or whenever they are due for the next one WHERE: At their home HOW OFTEN: At least once or every time a child is due for their vaccine WITH WHOM: Alone
Vaccination	Family members/friends recommend vaccination to parents. Family members/friends share positive experiences regarding vaccination	<i>Families</i> - Grandmothers - Women of the community - Fathers	WHO: Grandmothers and other mothers WHAT: Recommend vaccination to mothers of new-borns. WHEN: When the baby is born WHERE: At family home HOW OFTEN: At least once WITH WHOM: Alone
Vaccination	Store health records	<i>Families</i> - Pregnant and lactating mothers - Mothers of children up to 2 years	WHO: Mother/Caregiver WHAT: Stores health records safely at home WHEN: When she comes back from the vaccination centre WHERE: At her house HOW OFTEN: Every time her child is vaccinated. WITH WHOM: Alone
Vaccination	Tell parents it's time to vaccinate their children. Reminding the parents of the next dose.	<i>HCWs</i> - HCWs (nurses) - CHWs	WHO: HCWs/CHWs WHAT: Remind families that it is time to vaccinate their children WHEN: One week before the due date of the vaccine and on the previous day. WHERE: (To be defined) HOW OFTEN: Until mother receives the reminder WITH WHOM: Alone
Vaccination	Increase awareness raising at community	<i>HCWs</i> - CHWs	WHO: CHWs WHAT: Provide information on vaccines, diseases they prevent and how to deal

	level on vaccination by CHWs	<p>with side effects such as fever.</p> <p>WHEN: When the child is born or when they have a visit to the community</p> <p>WHERE: At the health care centre or at a community location</p> <p>HOW OFTEN: Every time a child is born or every time they travel to a community.</p> <p>WITH WHOM: With other HCWs</p>
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STEP 04 IDENTIFY WHAT NEEDS TO CHANGE

After specifying the target behaviours, we conducted an analysis of the different barriers and enablers of these behaviours. The barriers and enablers were categorized according to components of the COM-B framework [12] described in the methodology section. Barriers identified were assigned to one of their corresponding six sub-components of the COM-B framework: *social opportunity*, *physical opportunity*, *reflective motivation*, *automatic motivation*, *psychological capability*, and *physical capability*. A figure of the COM-B framework, including its sub-components and relationships can be found in Figure 3.

Figure 3. COM-B framework [46]



It is crucial to thoroughly analyse what influences need to change for the behaviour to occur, so our intervention can directly target those influences. In order for the behaviour to occur, we need to change one or more of its components: capability, opportunity and motivation.

Data has been collected from different sources including peer-reviewed articles and international organization reports. The information was collected from different sources to provide triangulation of information.

COM-B Analysis of “Breastfeed the child within the first one hour of birth while allowing them to be in skin-to-skin contact with the mother” & “Give colostrum”

Physical capability	Psychological capability
<ul style="list-style-type: none"> Feeling sick or having discomfort after birth (barrier) [27], [31], [47] Giving birth through caesarean delivery or having complications during birth (barrier) [48]. Previous experience with breastfeeding (enabler) [30]. 	<ul style="list-style-type: none"> Lack of knowledge (barrier) [5], [47]. Rely on the information received from relatives, grandmothers, religious leaders, traditional birth attendants or other elderly women (barrier) [5]. Some mothers have knowledge that breastfeeding decreases the risk of illnesses, and therefore needs to be initiated early [5] (enabler). Mothers with previous experience have more knowledge on how to breastfeed (enabler) [30].
Physical opportunity	Social opportunity
<ul style="list-style-type: none"> Having a home-delivery [47], [49] or a lack of access to skilled support during birth (barrier) [30]. Poor attendance to maternal and child health services (barrier) [48]. Receiving antenatal care (enabler) [50]. Nonetheless, in Somalia only 30% of deliveries are attended by skilled health personnel and only 24% have attended antenatal care visits [51]. Access to media (enabler) [47]. But in Somalia, 93% of women did not access any of the three forms of media (radio, newspaper and television) at least once a week [39]. 	<ul style="list-style-type: none"> Grandmothers are key decision makers regarding breastfeeding (barrier) [32]. Mothers tend to be guided by social norms. Giving sugar and water to the baby is inherently linked to the culture (barrier). Behaviours of birth attendants after birth have an impact on breastfeeding behaviours (barrier) [52].
Reflective motivation	Automatic motivation
<ul style="list-style-type: none"> Belief that there is no milk on the breasts on the first 3 days (barrier) [5]. Belief that they don't have enough breastmilk (barrier) [30], [47]. Belief that the child should receive water with sugar or that the baby cannot survive without having water (barrier) [5]. Belief water is a way of removing air and mucus swallowed in the womb and during birth (barrier) [5]. Belief colostrum is heavy and thick; hence babies are unable to swallow 	<ul style="list-style-type: none"> Feeling pain in breasts and uterus (barrier) [5]. Feel afraid of losing their husband's interest if their breasts sag (barrier) [5].

<p>and it can cause them illnesses like diarrhoea (barrier) [5].</p> <ul style="list-style-type: none"> • Belief that if they do not give breastmilk during the first days, their breasts will not sag or change size (barrier) [5]. • Belief that the pain they experience would lead to maternal death (barrier) [5]. 	
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Conclusion

In conclusion, we suggest that one of the main barriers is physical capability (feeling discomfort after delivery), but it should be targeted through increasing the **physical opportunity** (increase access to skilled support). Moreover, mothers have barriers regarding psychological capability (they lack knowledge on its benefits), but it could be targeted through increasing their **reflective motivation** to increase breastfeeding, through challenging misbeliefs that impact on their motivation to do the behaviour. Finally, we suggest that norms and **social opportunity** are key to changing this behaviour.

COM-B Analysis of “Breastfeed exclusively on demand (0-6 months)”

Physical capability	Psychological capability
<ul style="list-style-type: none"> • Women report that being pregnant is a barrier to exclusive breastfeeding (barrier) [30], [31]. • Mothers with previous experience find breastfeeding easier because they know how to perform the behaviour (enabler) [30]. 	<ul style="list-style-type: none"> • Lack knowledge (barrier). Rely on the information received from relatives, grandmothers, religious leaders, traditional birth attendants or other elderly women [5]. • When they have knowledge, they tend to breastfeed more (enabler) [30]. • Do not remember to exclusively breastfeed (barrier) [30].
Physical opportunity	Social opportunity
<ul style="list-style-type: none"> • Maternal workload and being away from home (barrier) [5], [30], [34]. When grandmother participates in domestic tasks, mothers have more time to care for the new-born (enabler) [32]. • Mothers have reported that not having enough food or not being well nourished (barrier) [30], [31]. • Lack of access to skilled support (barrier) [30]. • Limited availability of health services (barrier) [51] • Advertisements of industrialized milk impact on the rate of mothers breastfeeding (barrier) [27]. 	<ul style="list-style-type: none"> • Depend on grandmothers’ approval (barrier) [30] • Mixed findings regarding father’s support in different reports. Some state that fathers do not interfere with breastfeeding [32] but others state that they discourage it (barrier) [5]. • Social norms (mothers that breastfeed are 7.5 times more likely to say that most people approve exclusive breastfeeding [30]) (enabler) • Exclusive breastfeeding rates up to six months are low being 33% nationwide [30] (barrier) • Some fathers assert pressure on mothers to continue breastfeeding [5] (enabler).
Reflective motivation	Automatic motivation

<ul style="list-style-type: none"> • Belief the child is thirsty only with breastmilk [30] (barrier) • Belief that if the mother is not eating enough nutritious food, then the child might not get enough milk [32] (barrier). • Belief that exclusive breastfeeding limits freedom (barrier) [30]. • Belief it will make the child become deaf [5], will change the size of breasts [32] or will make the mother grow older [27] (barrier) • When pregnant, they stop breastfeeding because they tend to believe that pregnant woman's milk is red, poisonous and strong, and that breastfeeding will be harmful for their child and the baby in the womb [5] (barrier). • Belief they do not have enough breastmilk (barrier). • Belief child would get sick if they are breastfed while the mother isn't feeling well (barrier). • Reinforcement from the Quran regarding the duration of breastfeeding for at least 2 years [5] (enabler). 	<ul style="list-style-type: none"> • Women feel afraid that their husbands will leave them if they do not get pregnant quickly, so they decide to stop breastfeeding soon [32] (barrier). • Postnatal depression (barrier) [32].
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Conclusion

For this behaviour it is key to target **psychological capability**, to increase mothers' knowledge on breastfeeding. For first-time mothers it is important to help them develop physical capability and provide them the skills on how to breastfeed. Moreover, we should try to increase their **reflective motivation** to exclusively breastfeed, through challenging misbeliefs that impact on their motivation to do the behaviour. Finally, **physical and social opportunity** barriers need to be addressed.

COM-B Analysis of "Increase maternal food intake of balanced food and add one snack during pregnancy and breastfeeding"

<p style="text-align: center;">Physical capability</p> <ul style="list-style-type: none"> • No physical capability barriers were described in the reports analysed. 	<p style="text-align: center;">Psychological capability</p> <ul style="list-style-type: none"> • Most Somali mothers have knowledge on the importance of increasing consumption of nutritious food during the breastfeeding period (enabler) [5].
<p style="text-align: center;">Physical opportunity</p> <ul style="list-style-type: none"> • Lack of access to food (barrier) [5]. • Poor economic conditions and inflation influence their opportunity to buy nutritious food such as dairy products, chicken, fish, red meat or eggs [5], [41] (barrier). 	<p style="text-align: center;">Social opportunity</p> <ul style="list-style-type: none"> • Mothers, grandmothers and traditional birth assistants have the biggest influence on pregnant women behaviour [5] (barrier). • In some areas women are encouraged to eat meat, vegetables and eggs to

<ul style="list-style-type: none"> • Droughts have made Somalia one of the countries with the lowest food security (barrier) [29]. Many Somalis require humanitarian aid [51]. • Low attendance to antenatal visits [51] limiting their access to quality nutrition information [5] (barrier). 	<ul style="list-style-type: none"> • reduce anaemia during pregnancy (enabler) [5]. • Intra-household food distribution norms (give food firstly to the husband, then to the children and lastly to women [5]) (barrier). • Women have limited financial decision-making [32] (barrier).
Reflective motivation	Automatic motivation
<ul style="list-style-type: none"> • Mothers are motivated to restrict their diets during pregnancy since they believe that if they eat certain foods then the baby will grow too big, and that would lead to difficulties during labour [5] (barrier). • Belief that certain foods cause abortion, bleeding or could stop the child's heart beat [5] (barrier). • Belief that some food increase breastmilk production [5] (enabler). 	<ul style="list-style-type: none"> • Personal preferences and cravings have been identified to impact on maternal food intake [53] (barrier or enabler depending on what she craves).

Conclusion

The main barriers that should be addressed are those corresponding to **reflective motivation, physical opportunity** and **social opportunity**. The main barrier is physical opportunity since they generally do not have access to food, due to droughts, economic and political situations. Moreover, mothers are extremely influenced by the recommendations of their social network and are not motivated to eat healthily because of misbeliefs regarding the risks of eating certain food.

COM-B Analysis of “Provide help with breastfeeding problems”

Physical capability	Psychological capability
<ul style="list-style-type: none"> • No physical capability barriers were described in the reports analysed. 	<ul style="list-style-type: none"> • Generally HCWs lack communication skills and cannot simplify information for illiterate communities [28] (barrier).
Physical opportunity	Social opportunity
<ul style="list-style-type: none"> • HCWs need to perform their work without adequate health system facilities and funding [18] (barrier). • There are staff shortages [18], [19] and a big amount of people to serve, since camps are usually overcrowded [16] (barrier). • Language barriers since they do not speak some of the uncommon dialects [19] (barrier). 	<ul style="list-style-type: none"> • Mothers who had negative experiences with HCWs tend to delay health seeking behaviours [22] (barrier). We believe that some patients or residents of the communities might reject the help of HCWs sometimes.
Reflective motivation	Automatic motivation
<ul style="list-style-type: none"> • Motivation to improve breastfeeding uptake and health outcomes in the communities they work (enabler). 	<ul style="list-style-type: none"> • Since TBAs are part of the community, share the same cultural values and are trusted [54], they feel appreciated

when they provide support to breastfeeding mothers (**enabler**).

Conclusion

Even though there is not enough evidence regarding influences on HCWs behaviour, we suggest that the barriers that have a greater impact on this behaviour are three. HCWs lack **physical opportunity** to do the behaviour because they do not have enough time or resources. In other instances, they also lack the **psychological capability** to do it because they might lack the skills regarding how to deliver workshops or how to communicate with illiterate mothers, for example. Finally, we think that increasing the **automatic motivation** of HCWs if they feel frustrated and feel that their work is not valued, could have a positive impact in providing more help with breastfeeding problems.

COM-B Analysis of “Mother takes children to health centres for vaccination”

Physical capability	Psychological capability
<ul style="list-style-type: none"> No physical capability barriers were described in the reports analysed. 	<ul style="list-style-type: none"> Lack of knowledge (barrier) [18], [19]. Somali mothers with high level of education tend to vaccinate their children [55] (enabler). Many cannot read health record cards (barrier). Only identify the vaccines given to their children depending on which body part they were given [19]. Forget appointments (barrier) [56].
Physical opportunity	Social opportunity
<ul style="list-style-type: none"> Lack of resources to pay for transport costs [17], [28] (barrier). If fathers do not provide financial aid, mothers do not go (barrier) [28]. High costs of transportation (barrier) [16]. Missed opportunities because there is irregular opening of vaccine vials [16] and HCWs are sometimes hesitant to open multi-dose ones [19] (barrier). Stock-outs of vaccines and long waiting lists at facilities [16] (barrier). Being nomadic: makes it harder to continue with different doses at health facilities (barrier) [18]. 	<ul style="list-style-type: none"> Influenced by negative past experiences with HCWs [22] (barrier). Rely on the information or rumours they receive from their social network [19] (barrier). Need mothers-in-law [19] support or the father’s authorization [18] (barrier). Mothers need father’s authorization before taking children to vaccination (patriarchal system) [18].

Reflective motivation	Automatic motivation
<ul style="list-style-type: none"> • Misbeliefs: cannot vaccinate a child if he or she is ill [27], has a boil or it is a hot day [19] (barrier). • Lack of confidence in vaccines: believe vaccines are not safe [18], [25] (barrier). • Low perceived severity of the diseases: belief that the diseases they protect are not that serious [57] (barrier). • Lack of trust in HCWs and thinking that vaccines are used after expiry date (barrier) [18]. • Misinterpretation of religious beliefs (some believe it is sinful to vaccinate children against diseases that only Allah is aware of, thus they put their reliance in Allah rather than vaccines) (barrier) [17]. 	<ul style="list-style-type: none"> • Feel worried about vaccination and might fear living with the permanent guilt of hurting their children (barrier) [22]. • Fear about vaccines side effects (barrier) [19]. • Might feel frustrated with some missed opportunities for vaccination in which they invested time and money but the child did not get vaccinated (barrier). • Feeling judged by HCWs and that decreased their motivation to vaccinate their children (barrier) [22].

Conclusion

The main barriers for a mother to take the child to vaccination are three. Firstly, they lack the **reflective motivation** to do the behaviour because they have doubts regarding the safety of vaccines. Secondly, they do not have the knowledge regarding which vaccines should be given or their schedules. This reduces their **psychological capability** to perform the behaviour. Finally, mothers have barriers regarding the **physical opportunity** of the behaviour because they might lack the economic resources or have low accessibility to health care centres and **social opportunity** since they rely on grandmothers and father’s approval.

COM-B Analysis of “Father tells mother to take the child to vaccination”

Physical capability	Psychological capability
<ul style="list-style-type: none"> • No physical capability barriers were described in the reports analysed. 	<ul style="list-style-type: none"> • Lack of knowledge (barrier) [18], [19]. If fathers are educated, they positively influence child immunization routine [55] (enabler). • Might not remember which vaccines were given to the children (barrier).
Physical opportunity	Social opportunity
<ul style="list-style-type: none"> • Lack of economic resources to pay for transport costs (barrier) [17], [28]. • Missed opportunities because there is irregular opening of vaccine vials [16] and HCWs are sometimes hesitant to open multi-dose ones [19] (barrier). 	<ul style="list-style-type: none"> • Social norm for Somali fathers is to be a good Muslim man and take care of their children [28] (enabler). • Beliefs of religious leaders are extremely important [57] (enabler/barrier). • Might as well be influenced by negative past experiences with HCWs [22] (barrier).

<ul style="list-style-type: none"> • Stock-outs of vaccines and long waiting lists at facilities [16] (barrier). 	<ul style="list-style-type: none"> • Rely on the information or rumours they receive from their social network [19] (barrier). • Mobilization campaigns rarely target fathers thus depriving them of rights to be fully informed regarding their children's welfare [18] (barrier).
Reflective motivation	Automatic motivation
<ul style="list-style-type: none"> • Want to be considered as a good Muslim father (enabler) [28]. • Misbeliefs: cannot vaccinate a child if he or she is ill [27], has a boil or it is a hot day [19] (barrier). • Lack of confidence in vaccines: believe vaccines are not safe [18], [25] (barrier). • Low perceived severity of the diseases: belief that the diseases they protect are not that serious [57] (barrier). • Lack of trust in HCWs and thinking that vaccines are used after expiry date (barrier) [18]. • Misinterpretation of religious beliefs (some believe it is sinful to vaccinate children against diseases that only Allah is aware of, thus they put their reliance in Allah rather than vaccines) (barrier) [18]. 	<ul style="list-style-type: none"> • Feel worried about vaccination and might fear living with the permanent guilt of hurting their children (barrier) [22]. • Fear about vaccines side effects (barrier) [19]. • Might feel frustrated with some missed opportunities for vaccination in which they invested time and money but the child did not get vaccinated (barrier).

Conclusion

The main barriers for a father to tell the mother to take their children to vaccination are three. Firstly, they lack the **reflective motivation** to do the behaviour because they have doubts regarding the safety of vaccines. Secondly, they do not have the knowledge regarding which vaccines should be given or their schedules. This reduces their **psychological capability** to perform the behaviour. Finally, fathers have barriers regarding the **physical opportunity** of the behaviour because they might lack the economic resources to provide the mother with money to travel to the health care centre.

COM-B Analysis of “Family members/friends recommend vaccination to parents” & “Family members/friends share positive experiences regarding vaccination”

Physical capability	Psychological capability
<ul style="list-style-type: none"> • No physical capability barriers were described in the reports analysed. 	<ul style="list-style-type: none"> • Having the knowledge is key to sharing experiences or recommending vaccinating children, but generally there is a lack of knowledge in the community [17] (barrier).

Physical opportunity	Social opportunity
<ul style="list-style-type: none"> Long waiting lists at facilities and irregular opening of vaccine vials [16] (barrier). 	<ul style="list-style-type: none"> Being aware of rumours and cultural beliefs that discourage vaccination [19] [57]. (barrier). Beliefs of other women that constitute Abaay-Abaay groups influence intention to vaccinate children (women groups that meet every week and part of the same cultural clan) (barrier/enabler) [16].
Reflective motivation	Automatic motivation
<ul style="list-style-type: none"> Belief that vaccines cause autism [25], AIDS or infertility [18] (barrier). Lack of trust in services and technical competence of vaccinators [18] (barrier). Low perceived severity of the diseases: belief that the diseases they protect are not that serious [57] (barrier). Misinterpretation of religious beliefs (some believe it is sinful to vaccinate children against diseases that only Allah is aware of, thus they put their reliance in Allah rather than vaccines) (barrier) [17]. 	<ul style="list-style-type: none"> Feel worried about side effects of immunization [19] and do not feel concerned of diseases [57] (barrier).

Conclusion

For the behaviour of recommending vaccination, the main barriers are related to **reflective motivation** and **social opportunity**. Firstly, people tend to believe some rumours or false information that prevent them from recommending vaccination to their networks. Secondly, their social norms do not favour vaccination and there are several rumours and culture beliefs.

COM-B Analysis of “Storing healthcare records”

Physical capability	Psychological capability
<ul style="list-style-type: none"> No physical capability barriers were described in the reports analysed. 	<ul style="list-style-type: none"> Cannot read health record cards [19] (barrier). Lack knowledge on vaccines and tend to remember which vaccines were given to children according to the body parts through which they were administered (barrier) [19].
Physical opportunity	Social opportunity
<ul style="list-style-type: none"> Structure of health record cards makes them hard to read and understand (barrier) [58]. Do not have a safe place to store those records (barrier). 	<ul style="list-style-type: none"> Social norm is that they do not store health records (only 4% of mothers can present the health records of their children [39]) (barrier).

Reflective motivation	Automatic motivation
<ul style="list-style-type: none"> Do not consider the health records an important document [4] (barrier). 	<ul style="list-style-type: none"> No automatic motivation barriers were described in the reports analysed.

Conclusion

Regarding the behaviour of storing health record, we suggest that mothers do not do it mainly because of the barriers regarding **psychological capability** and **physical opportunity**. Generally, mothers lack the motivation to store them, but this is probably caused by the fact that they do not understand their content or their importance. The way in which this health record cards are designed does not aid understanding by communities.

COM-B Analysis of “Reminding the parents of the next dose”

Physical capability	Psychological capability
<ul style="list-style-type: none"> HCWs would need to have the skills necessary for using a phone (enabler). 	<ul style="list-style-type: none"> HCWs have the necessary skills to know how to perform a telephone call or how to organise, plan and learn how to monitor reminding procedures (enabler). Remembering to perform a call (barrier). Lack communication skills and find it hard to simplify information for illiterate communities [28] (barrier).
Physical opportunity	Social opportunity
<ul style="list-style-type: none"> HCWs need to perform their work without adequate health system facilities and funding [18] (barrier). There are staff shortages [18], [19] and a big amount of people to serve, since camps are usually overcrowded [16] (barrier). Language barriers since they do not speak some of the uncommon dialects [19] (barrier). 	<ul style="list-style-type: none"> Communities may not be receptive to the assistance provided to them (barrier). Mothers who had negative experiences with HCWs tend to delay health seeking behaviours [22].
Reflective motivation	Automatic motivation
<ul style="list-style-type: none"> Believe in the value of timely vaccination (enabler). Motivated to generate a positive impact on their communities (enabler). 	<ul style="list-style-type: none"> Feel frustrated because they do not achieve the targets and they tend to feel unappreciated [28] (barrier). Might feel frustrated if they spend time reminding but then parents do not come (barrier).

Conclusion

We suggest that the barriers that have a greater impact on this behaviour are three. HCWs lack **physical opportunity** to do the behaviour because they do not have enough time or resources. Additionally, they sometimes lack the **psychological capability** to do it because they might lack the skills regarding how to deliver workshops or how to communicate with illiterate mothers, for example. Finally, we think that one of the main barriers is that they lack

the **automatic motivation** to remind parents of the next dose because they feel frustrated and that their work is not valued.

COM-B Analysis of “Increased awareness raising at community level on vaccination by CHWs”

Physical capability	Psychological capability
<ul style="list-style-type: none"> No physical capability barriers were described in the reports analysed. 	<ul style="list-style-type: none"> Lack communication skills and find it hard to simplify information for illiterate communities [28] (barrier).
Physical opportunity	Social opportunity
<ul style="list-style-type: none"> HCWs need to perform their work without adequate health system facilities and funding [18] (barrier). There are staff shortages [18], [19] and a big amount of people to serve, since camps are usually overcrowded [16] (barrier). Language barriers since they do not speak some of the uncommon dialects [19] (barrier). For HCWs it might be hard and costly to travel to communities (barrier). 	<ul style="list-style-type: none"> Some patients or residents of the communities might reject the help of HCWs sometimes. Some mothers who had negative experiences with HCWs tend to delay health seeking behaviours [22] (barrier).
Reflective motivation	Automatic motivation
<ul style="list-style-type: none"> Might be motivated to generate a positive impact on their communities and might have the belief that providing information to their communities is empowering (enabler). 	<ul style="list-style-type: none"> Feel frustrated because they do not achieve the targets and they tend to feel unappreciated [28] (barrier). Might feel happy when they see that someone has learned of vaccination, or they might feel joy because they are helping their community (enabler).

Conclusion

We suggest that the barriers that have a greater impact on this behaviour are three. HCWs lack **physical opportunity** to do the behaviour because they do not have enough time or resources. Additionally, sometimes they lack the **psychological capability** to do it because they might lack the skills regarding how to deliver workshops or how to communicate with illiterate mothers, for example. Finally, we think that one of the main barriers is that they lack the **automatic motivation** to sensitise the community regarding the importance of vaccination because they feel frustrated and that their work is not valued.

General conclusion

After thoroughly analysing the different barriers and enablers to vaccination uptake and feeding practices, we suggest that the main barriers for family’s behaviours are psychological capability, reflective motivation, physical and social opportunity. Regarding HCWs behaviour, the main barriers identified are those related to physical opportunity,

automatic motivation and psychological capability. Table 4 shows which are the main barriers for each of the behaviours analysed.

Table 4. Summary of the main barriers of each of the behaviours.

Behaviour	COM-B Components					
	Physical Opportunity	Social Opportunity	Automatic Motivation	Reflective Motivation	Psychological Capability	Physical Capability
"Breastfeed the child within the first one hour of birth while allowing them to be in skin-to-skin contact with the mother" & "Give colostrum"	Green	Green	White	Yellow	White	White
"Breastfeed exclusively on demand (0-6 months)"	Green	Green	White	Yellow	Red	White
"Increase maternal food intake of balanced food and add one snack during pregnancy and breastfeeding"	Green	Green	White	Yellow	White	White
"Provide help with breastfeeding problems"	Green	White	Yellow	White	Red	White
"Mother takes children to health centres for vaccination"	Green	Green	White	Yellow	Red	White
"Father tells mother to take the child to vaccination"	Green	White	White	Yellow	Red	White
"Family members/friends recommend vaccination to parents" & "Family members/friends share positive experiences regarding vaccination"	White	Green	White	Yellow	White	White
"Storing health records"	Green	White	White	White	Red	White
"Reminding the parents of the next dose"	White	White	Yellow	White	Red	White
"Increased awareness raising at community level on vaccination by CHWs"	Green	White	Yellow	White	Red	White

CHAPTER

04

IDENTIFY INTERVENTION OPTIONS

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STEP 05

IDENTIFY INTERVENTION FUNCTIONS

This is the first step towards intervention design. After performing the behavioural diagnosis of what needs to change for our target behaviours to be carried out, we selected the corresponding intervention functions.

Intervention functions are defined as “the broad categories of means by which an intervention can change behaviour” [1]. The BCW identifies nine intervention functions including: education, persuasion, incentivisation, coercion, training, restriction, environmental restructuring, modelling, and enablement. Definitions of each of them can be found in Table 5.

Table 5. Definitions of the intervention functions [1].

Intervention function	Definition
Education	Increasing knowledge or understanding.
Persuasion	Using communication to induce positive or negative feelings or stimulate action.
Incentivisation	Creating an expectation of reward.
Coercion	Creating an expectation of punishment or cost.
Training	Imparting skills.
Restriction	Using rules to reduce the opportunity to engage in the target behaviour (or to increase the target behaviour by reducing the opportunity to engage in competing behaviours).
Environmental Restructuring	Changing the physical or social context.
Modelling	Providing an example for people to aspire to or imitate.
Enablement	Increasing means/reducing barriers to increase capability (beyond education and training) or opportunity (beyond environmental restructuring).

For selecting intervention types, we used the matrix provided by Michie et. al. [1]. This matrix links which intervention function should be used when addressing each of the COM-B components. For example, in order to address the barriers of “Physical Capability” we should apply the intervention function “Training”. We applied the matrix for family’s behaviour and HCWs behaviour separately. The matrix for family behaviours is provided in table 6, and the one for HCWs in table 8.

Each intervention function was analysed according to APEASE criteria to decide whether it should be included or not. The **APEASE criteria** is a set of factors that should be considered when designing and evaluating interventions and refers to: **Affordability, Practicability, Effectiveness and cost-effectiveness, Acceptability, Side-effects/Safety**

and **Equity** [1]. *Affordability* refers to whether the intervention is within the explicit or implicit budget. *Practicability* is whether the intervention can be delivered as it is designed (for example, if we need highly trained providers but we do not have access to them, then the intervention is not practicable). *Effectiveness* refers to the effect size of the intervention performed in a real context, while cost-effectiveness takes into consideration its costs as well. *Acceptability* is whether the different stakeholders categorise the intervention as appropriate. Unwanted *side-effects* of the intervention should be considered as well when we are designing an intervention. Finally, *equity* is pointed out as an important criterion to analyse; we should consider whether the intervention increases or reduces disparities in standards of living, wellbeing or health.

The APEASE criteria was used to determine which intervention functions we included in our intervention. The use of APEASE criteria for family behaviours is provided in table 7, and the one for HCWs in table 9.

Selecting intervention functions for families:

Table 6. Applying the matrix for families behaviours

COM-B Components	Intervention functions								
	Education	Persuasion	Incentivisation	Coercion	Training	Restriction	Environmental Restructuring	Modelling	Enablement
Physical capability									
Psychological capability									
Physical opportunity									
Social opportunity									
Automatic motivation									
Reflective motivation									

Table 7. APEASE criteria applied for families behaviours

Candidate intervention functions	Previously selected COM-B components	Comments on: Affordability, Practicability, Effectiveness and cost-effectiveness, Acceptability, Side-effects/Safety and Equity	Selected?
Education	Psychological capability Reflective motivation	<p>An analysis of health behaviour change initiatives in Africa (which included several health behaviours and targeted people from any gender) showed that they majority are education and training-based interventions, leaving behind contextual and social barriers [59]. In addition, another review has found that complementary feeding interventions in LMIC depend predominantly on education and enablement [60].</p> <p>The review on maternal and child nutrition interventions in Sub-Saharan Africa concluded that education appeared to have a smaller impact on infant diet and infant body composition outcomes, but it tended to improve psychological outcomes such as knowledge and confidence [61]. This review included interventions done with fathers and caregivers, and not only mothers.</p> <p>A mixed-methods systematic review on behavioural interventions to improve maternal, child and infant feeding practices in low and middle-income countries found that minimal educational interventions with fathers and grandmothers impacted on exclusive breastfeeding rates [62].</p> <p>A previous intervention performed in Somalia found that nutritional counselling, alone or in combination with unconditional cash transfers, did not impact household food security or children’s growth [63].</p> <p>Providing education could be affordable and acceptable by the community. No side-effects have been described in education interventions. Since there are knowledge barriers to performing the different behaviours, we can address them through education. Nonetheless, it is important to keep in mind that education might be necessary but not sufficient. That is why we decided to include other intervention functions as well.</p>	YES
Persuasion	Reflective motivation	<p>The review on maternal and child nutrition interventions in sub-Saharan Africa concluded that the best interventions for behaviour change in these contexts should include persuasion [61]. This review included interventions done with fathers and caregivers, and not only mothers. Many interventions in the review</p>	YES

		<p>included singing groups, storytelling and women's groups, engaging both automatic and reflective motivation [61]. A recent mHealth intervention designed in Somalia including a fictional story to provide health promoting messages found that it improved food diversity, even if it did not improve knowledge, vaccination outcomes or breastfeeding [42]. In Somalia, access to media is limited since 93% of women did not access to any of the three forms of media (radio, newspaper and television) at least once a week [39]. Persuasion is probably an effective intervention function to generate behaviour change. It is necessary to think about the mode of delivery for persuasion, since more affordable ways such as media are restricted. For it to be equitable we need to make sure to use a strategy that could be accessed by these communities. mHealth provides a suitable alternative.</p>	
Incentivisation	Reflective motivation	<p>Regarding effectiveness, results are mixed. The review on maternal and child nutrition interventions in Sub-Saharan Africa concluded that the best interventions for behaviour change in these contexts should include incentivisation [61]. Providing incentives such as vouchers or cash transfers improved health outcomes, including psychological ones such as knowledge or confidence [61]. This review analysed interventions done with fathers and caregivers, and not only mothers. Regarding vaccination, one intervention providing bracelets, as a form of social signalling, showed that there was a significant increase in vaccination uptake [64]. A study using conditional cash-transfers in Somalia showed that it helped to increase vaccination uptake of some vaccines (but the intervention also included a redesigned health record card), but did not have an effect on malnutrition [42]. Nonetheless, a recent review has found that conditional cash transfers in sub-Saharan Africa do not impact on immunisation coverage [65]. In addition, a previous intervention performed in Somalia found that nutritional counselling, alone or in combination with unconditional cash transfers, did not impact household food security or children's growth [63]. One study reported that the use of incentives has been associated with higher cost-effectiveness [66]. Nonetheless, another study</p>	<p>NO (For cash-based interventions)</p>

		<p>raised that cash-based transfers are cost-effective interventions [42].</p> <p>One possible side-effect might be that in contexts where there is high mistrust on vaccines, incentives can be seen as coercive strategies [67].</p> <p>Cash-based interventions in humanitarian aid have gained more acceptance, including beneficiary satisfaction [42].</p>	
Coercion	Reflective motivation	<p>None of health behaviour change initiatives in Africa has used coercion as its intervention function [59]. Therefore, we do not have evidence on its effectiveness. Using coercive strategies has not been accepted by the communities. For example, Somali mothers in Stockholm reported that they delayed vaccination of their children because of their negative experiences at health care centres [22]. Moreover, even though some health workers believed that confiscating health cards to vaccinate children was acceptable, communities in Somalia say this is one of the reasons why they do not go to health centres [19].</p>	NO
Training	Psychological capability Physical opportunity	<p>An analysis of health behaviour change initiatives in Africa (which included several health behaviours and targeted people from any gender) showed that the majority are education and training-based interventions, leaving behind contextual and social barriers [59]. The review on maternal and child nutrition interventions in Sub-Saharan Africa concluded that training appeared to have a smaller impact on infant diet and infant body composition outcomes, but it tended to improve psychological outcomes such as knowledge and confidence [61]. This review included interventions done with fathers and caregivers, and not only mothers.</p> <p>A quasi-experimental study carried out in Somalia, including support groups, trained mothers and fathers on facilitating IYCF sessions. It improved dietary diversity and increased the likelihood of continue breastfeeding up to 2 years [68].</p> <p>Moreover, it has been pointed out that although many interventions in complementary feeding have focused in demonstrations of the behaviour, it is likely that they have not involved training because they have not allowed people to practice the skills [60].</p> <p>Regarding interventions with TBAs, in older</p>	YES

		<p>reports, researchers raised that in Somalia many skilled ones return to working alone in hostile environments without access to referral networks and therefore training is not enough [69]. But more recently, during a program done in Somaliland, TBAs were trained as “health promoters” & “birth companions”, and were linked to staff working in health facilities for referral [54]. It was found that TBAs adopted this role easily and accompanied or referred mothers to a nearby facility for delivery, prenatal care, or postnatal care. Nonetheless, it is important to consider that they also received a monetary compensation.</p> <p>From the evidence gathered, it seems that training could be effective for increasing knowledge and confidence regarding feeding practices, but it is necessary to include the opportunity for participants to practice the behaviour.</p> <p>We assume that training could be acceptable, but more costly. Also, we would like to raise the problem that maybe not everyone will be able to access training due to time and resource limitations, reducing its equity. Maybe training is a good way of providing information without using a classical education-based intervention.</p>	
Restriction	Physical opportunity Social opportunity	<p>None of health behaviour change initiatives in Africa has used restriction as its intervention function [59]. Therefore, we do not have evidence on its effectiveness. Moreover, a lack of clarity and a restriction on eligible age for routine vaccinations in Somalia has been found to be a barrier for vaccination uptake [19], therefore we do not think restriction would be a suitable strategy. It has been suggested that HCWs should not restrict the provision of vaccines to children if the mother does not take the vaccination record [58]. It is preferred that a child receives the vaccine twice, rather than not receiving it at all. Therefore, restriction can have serious side-effects for health and children mortality</p>	NO
Environmental Restructuring	Physical opportunity Social opportunity	<p>Different studies have addressed behaviour change through environmental restructuring. For example, an intervention in Somalia that included conditional cash transfers and a redesigned health card showed to be effective to increase vaccination [42].</p> <p>An intervention done in Pakistan found that providing redesigned card alone was more</p>	YES

		<p>effective than education alone in increasing Diphtheria tetanus toxoid and pertussis immunisation completion [70].</p> <p>The review on maternal and child nutrition interventions in sub-Saharan Africa concluded that the best interventions for behaviour change in these contexts should include environmental restructuring [61]. In that review, provision of land, livestock, seedlings, and equipment were referred. This review included interventions done with fathers and caregivers, and not only mothers.</p> <p>On the other hand, environmental restructuring can involve social norm change. Interventions to modify social norms may be centred on values at the community level, appeal to emotions, address power disparities, promote critical reflection, and foster circumstances that are conducive to changing social norms through advocacy, diffusion, social support, and involvement of the community [71]. For example, in an intervention to modify social norms regarding complementary feeding in Ethiopia they used sermons from priests/leaders, community conversations and radio/TV spots providing jingles, testimonials and stories [72]. Although they dramatically rose in the intensive group, minimum dietary diversity and minimum acceptable diet remained low at endline. They reported significant decline in child stunting.</p> <p>In Somalia, social norms interventions have been carried out to reduce gender-based violence [73]. In the Communities Care program, influential and diverse community members were engaged in facilitated dialogues with the goal of inspiring reflection on shared values and objectives and examining social norms that support and sustain gender-based violence. Moreover, they were invited to share publicly their new ideas and carry out actions that support the new norms. The program was effective on changing harmful social norms.</p> <p>This study suggests that social norms interventions in Somalia can be effective to changing behaviour. Nonetheless, it is notable that reports rarely measure outcomes related to social norms [71], therefore it is crucial to analyse it in our intervention.</p> <p>A review on the cost-effectiveness of intervention functions in different health behaviours concluded that environmental restructuring had a higher cost-effectiveness to behaviour change [66].</p>	
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Modelling	Social opportunity	A review on maternal and child nutrition practices found that modelling helped to improve psychological outcomes such as knowledge, intention or confidence [61]. This review included interventions done with fathers and caregivers, and not only mothers. A review on the cost-effectiveness of intervention functions in different health behaviours concluded that modelling had a higher cost-effectiveness to behaviour change [66].	YES
Enablement	Psychological capability Physical opportunity Social opportunity	A review that analysed which were the mostly used BCTs in complementary feeding, found that interventions in LMIC depend predominantly on education and enablement [60]. The review on maternal and child nutrition interventions in Sub-Saharan Africa, which analysed interventions done with fathers and caregivers as well, concluded that enablement appeared to have a smaller impact on infant diet and infant body composition outcomes compared to other intervention functions [61]. Nonetheless, peer support was effective for reducing the likelihood of mothers to discontinue exclusive breastfeeding in LMIC [74]. In Somalia, a study using women's group Participatory Learning and Action approach increased maternal/caregiver knowledge, possession of a child health record card and coverage of both measles vaccination and completion of the pentavalent vaccination series [16]. Therefore, we could assume that enablement could be an effective and acceptable strategy to work on the topics proposed in this intervention.	YES

Selecting intervention functions for HCWs:

Table 8. Applying the matrix for HCWs behaviours

	Intervention functions								
COM-B Components	Education	Persuasion	Incentivisation	Coercion	Training	Restriction	Environmental Restructuring	Modelling	Enablement
Physical capability									

Psychological capability									
Physical opportunity									
Social opportunity									
Automatic motivation									
Reflective motivation									

Table 9. APEASE criteria applied for HCWs behaviours.

Candidate intervention functions	Previously selected COM-B components	Comments on: Affordability, Practicability, Effectiveness and cost-effectiveness, Acceptability, Side-effects/Safety and Equity	Selected?
Education	Psychological capability	Providing education to HCWs is crucial but is not enough to improve behaviour change in communities. A study carried out in Ethiopia suggested that the health extension workers provide information but they do not help in changing other barriers [75]. Therefore, interventions should include more than providing information. Education alone (without training) i.e., the development of knowledge alone, does not address barriers of acquiring skills, e.g., developing communication skills. Therefore, education alone is not selected but together with training is important.	YES
Persuasion	Automatic motivation	Out of the reports and articles reviewed, none of them used persuasive techniques to change HCWs behaviour.	NO
Incentivisation	Automatic motivation	HCWs need incentives to increase their behaviour of helping with breastfeeding problems and practices, sensitising communities on vaccination and reminding parents of vaccination. The final evaluation report of the Social Mobilization Network for polio vaccination in Somalia highlighted that mobilizers thought that the incentives given to them were too small [76]. Another study on strengthening systems to improve mothers and children's feeding practices suggested that incentives play an important part in motivating HCWs to perform the behaviours and to retain them [77]. A review on different interventions to modify CHWs behaviour in LMICs has pointed	YES

		<p>out that financial incentives tend to increase motivation, but also trust and respect from the community (as non-monetary incentives) [78]. They highlighted that different interventions have used greetings, honour, recognition at ceremonies and more participation in decision making as possible social rewards. Moreover, no career advancement was reported as a disincentive.</p> <p>Providing incentives, whether they are material or social, could be an effective intervention function to use. It will probably be well-accepted. Providing material or cash incentives might be costly.</p>	
Coercion	Automatic motivation	To the best of our knowledge, no interventions have been done that use coercive intervention functions.	NO
Training	Psychological capability Physical opportunity Automatic motivation	<p>Training has been described as a useful way to increase knowledge and skills in three programs for strengthening systems to support mothers in infant and young child feeding at different countries [77]. In addition, another study has pointed out how useful it can be to strengthen health workers' interpersonal communication and counselling capabilities [67]. Training that included practical exercises was more useful than only providing information [79].</p> <p>A previous intervention done in Somaliland provided education and training on emergency obstetric care to nurses, midwives, midwifery tutors, obstetricians, medical officers, medical interns, and final-year medical and midwifery students. In the description of the intervention they explain that they provided a manual, a CD-ROM (containing videos, reviews, guidelines and manuals), posters in Somali and bags/masks for each health facility [80]. There was an increase in their knowledge, skills and confidence to perform the different activities.</p> <p>A clinical training for newborn practices performed in Bossaso for midwives and registered nurses, has shown that by providing training (in conjunction with other interventions) they increased providers knowledge and the proportion of newborns who received two or more essential newborn care practices [81]. The training included not only didactic lectures, but also videos, small group discussions and skills practices with simulators. It has been reported that even though there wasn't enough funding for training all HCWs, generally they</p>	YES

		<p>tend to teach the skills to their colleagues. This shows that providing training can bring positive spillover effects.</p> <p>A study carried out in Ethiopia found that training health extension workers to perform behaviour change strategies with communities was acceptable and enjoyable for them [75]. They used role-play exercises to practice skills. Training can have a high cost, if the trained workers are not retained in their positions [77]. If a big number of health workers are trained, we might be able to reach more communities with effective strategies, improving equity.</p>	
Restriction	Physical opportunity	To the best of our knowledge, no interventions have been done that use restrictive intervention functions.	NO
Environmental Restructuring	Physical opportunity Automatic motivation	<p>Some interventions that employed environmental cueing to change HCWs hand hygiene behaviour have been effective [82]. It has been pointed out that to strengthen systems to support mothers in infant and young child feeding it is necessary to consider physical conditions of the counselling room, and allocate work according to the amount of staff available [77].</p> <p>Environmental restructuring can be effective and accepted. Its affordability will depend on which environmental change is planned and whether it is possible to apply it in every clinic will determine if it is equitable.</p>	YES
Modelling	Automatic motivation	<p>It has been pointed out in the literature that sometimes a role-model can demonstrate their skills [77] and that social norms strategies are effective in changing health care workers behaviour [83]. Specifically, providing information from a credible source, social comparison and social rewards were effective [83].</p> <p>Modelling could be a cost-effective and acceptable intervention function. It can be affordable, but we would need to spend some time researching who is a role model in each case.</p>	NO
Enablement	Psychological capability Physical opportunity	Other strategies have been proposed for improving systems for supporting mothers on feeding practices. These include having supportive supervision and clear expectations from the start [77]. A review on interventions provided to CHWs in LMICs has shown that supervision increases motivation and that being	NO YES

	<p>Automatic motivation</p>	<p>provided with continuous training increases not only job satisfaction but also performance [78]. Moreover, a study to improve hand hygiene of HCWs found that social cohesion (reminding each other between colleagues) was effective. In Somalia, community workers performing tasks for the Social Mobilization Network for increasing Polio vaccination reported that a way to overcome security threats was working in pairs and reporting to their supervisors [76]. Therefore, we believe that in this context it would be extremely helpful to provide social support among HCWs.</p> <p>Providing text-message reminders about paediatric malaria case-management to health workers improved the quality of treatment provided to children in Kenya [84]. The intervention showed also a long-term improvement 6 months afterwards and was carried out at a low cost, which could mean that widespread implementation can be done quickly and successfully.</p> <p>A review of mHealth interventions for frontline health workers (including CHWs, midwives, pharmacists, nurses and doctors) in LMICs suggested that sending reminders to health workers can reduce in average number of days clients were overdue for a visit [85]. The available research demonstrates that such interventions are practical and generally well appreciated by healthcare workers, patients, and other healthcare system participants [85]. The intervention provided in Bossaso that included training, also gave providers a supplemental newborn register. This register changed the way they record data, which HCWs reported that facilitated easier review of information to them [81]. Therefore, we believe that having an enabling environment in which they can perform tasks more easily will be extremely useful for HCWs.</p> <p>Enablement strategies could be cost-effective, and acceptable by HCWs.</p>	
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Conclusion

In conclusion, after thoroughly analysing the different intervention functions that could be used to change families and HCWs behaviours, we decided to use multiple functions in each case. It has been reported that behaviour change interventions that include more functions tended to increase maternal and child nutrition outcomes [61].

The intervention functions selected for families' behaviours are: Education, Persuasion, Training, Modelling, Environmental Restructuring and Enablement. A recent review of behaviour change interventions for improving maternal and infant feeding practices

has reported that the interventions that included incentivisation, persuasion and environmental restructuring tended to be the most effective ones [61].

The intervention functions selected for HCWs' behaviours were: Education, Incentivisation, Training, Environmental restructuring and Enablement.

STEP 06 IDENTIFY POLICY CATEGORIES

After identifying which intervention functions we suggested for our intervention, we selected the relevant policy categories. The BCW recognizes seven policy categories that could be applied by authorities to support interventions. The seven categories are: communication/marketing, guidelines, fiscal measures, regulation, legislation, environmental/social planning, and service provision. Definitions of each of them can be found in Table 10.

Table 10. Definitions of the different policy options [1].

Policy category	Definition
Communication/ Marketing	Using print, electronic, telephonic, or broadcast media.
Guidelines	Creating documents that recommend or mandate practice. This includes all changes to service provision.
Fiscal measures	Using the tax system to reduce or increase the financial cost.
Regulation	Establishing rules or principles of behaviour or practice.
Legislation	Making or changing laws.
Environmental/ Social planning	Designing and/or controlling the physical or social environment.
Service provision	Delivering a service

After thoroughly analysing the literature reviewed, we considered that several policy options are essential for improving feeding practices and vaccination uptake.

Regarding vaccination uptake, there are several policy barriers to be addressed. Jelle et al [19] have reported that there were discrepancies between WHO guidelines and Somali policies regarding catch-up and age limits for vaccination. Firstly, it is important that Somali government reviews their regulations and to expand the eligibility age for routine and catch-up vaccination. This will guarantee that more children get all their vaccines and will reduce missed opportunities in health care centres in which children do not get vaccinated because of their age. Secondly, after updating their regulation they need to provide clear guidelines of care for HCWs to apply the new regulations appropriately. Internationally, evidence-informed guidelines are recognised as essential to improving quality of care [86]. They are designed to standardize care, increase its quality and safety, lower costs, and

enhance patient outcomes, among other things [86]. It has been reported that there are some confusions and health workers are not sure which vaccines are recommended by EPI policies for children older than 12 months [19]. However, if guidelines are not used by HCWs, then they do not impact on quality of care. Therefore, we suggest that communication/marketing strategies should be used to improve HCWs knowledge on guidelines. For examples, posters can be placed in health facilities to remind them of the updates of eligibility ages for vaccination.

Another recommendation to reduce the barriers to vaccination uptake would be that governments and humanitarian organisations should buy smaller vials for vaccines. Jelle et al [19] pointed out that HCWs tend to avoid vaccinating children because they do not want to open a vial with many doses just to use it for one child, wasting all the other doses. This recommendation could be applied as a regulation for government, and it would help to improve the vaccination uptake.

In addition, high immunization coverage in migratory communities has been attained using mobile clinics [87]. In a previous study using the participatory learning and action cycle approach in Somalia, multiple stakeholders agreed that providing vaccination services through mobile health clinics was a solution to increasing immunization uptake and was acceptable for them [16]. Therefore, we suggest that mobile clinics or outreaches should continue to be implemented in the area. They can be categorised as a service provision policy option according to the BCW categories.

A recent intervention implemented in Somalia found that a conditional cash transfer intervention with a redesigned health record card improved the uptake of vaccination [42]. It might be necessary to review the regulations regarding health record cards.

Finally, if an automated system could be used to send reminders to patients it would help to reduce the burden of work to health professionals and make sure that every patient receives their reminder on time. The policy option used in this case would be service provision.

Pregnant mothers will need to receive a service provision in which they will receive help with breastfeeding problems such as latching. This will be a key part of the intervention to increase the number of mothers breastfeeding.

CHAPTER 05

IDENTIFY CONTENT AND IMPLEMENTATION OPTIONS

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56	Step 8: Identify mode of delivery

STEP 07

IDENTIFY BEHAVIOUR CHANGE TECHNIQUES (BCTs)

In this step we specified the content of our intervention and which behaviour change techniques will be used.

Behaviour change techniques (BCT) are defined as “an active component of an intervention designed to change behaviour” [1] and are intended to deliver the intervention functions. Originally, the BCW includes the BCT Taxonomy version 1 (BCTTv1; [88]) to classify all the BCTs available. It consists of 93 BCTs organised into 16 groups.

In step 7, we decided to use the list of most/less frequently used BCTs for every intervention function provided by Michie et al. [1]. This list provides information on BCTs that could be used for every intervention function. Taking into consideration our barrier analysis and the intervention functions chosen, we selected the BCTs that were more likely to be effective.

The final BCTs selected are described in Table 11.

STEP 08

IDENTIFY MODE OF DELIVERY

One important part of designing the intervention is defining how it will be delivered. For this, we analysed the different modes of delivery described in the BCW and chose the one most aligned to the context.

Modes of delivery are grouped into face-to-face or distance. For face-to-face modes we specify whether the intervention is delivered individually or to a whole group. For distance modes we specify whether it is population level (through broadcast, digital, outdoor or print media) or individual level (by phone or computer).

For this intervention, we decided to include two modes of delivery: one face-to-face, mainly at group level, and the other by distance over the phone.

Reviews have highlighted several benefits of providing mHealth interventions in LMICs. Reminders and one-way messaging to support behaviour change are representative of a time-saving, direct-to-consumer way of thinking in which we can intervene at the moment people should perform the behaviour [89]. Moreover, it has been raised that they are ideal for population health approaches, since they have the potential to reach a big number of people at a relatively low cost [89]. Not only they can provide the possibility of tailoring, but also offer the possibility of scaling-up projects. The acceptance of these kind of interventions is well-established in LMICs [89], but there is still the need to develop more evidence of their effectiveness and equity. We propose to use this mode of delivery as well to help build evidence on its effectiveness.

CHAPTER

06

DESCRIPTION OF THE SBCC STRATEGY

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Description of the intervention

The intervention is described in detail in the *Table 11*. This table includes details of the different activities that will be carried out, which barriers will be targeted and through which BCTs. Moreover, the table includes details of the timing, location and who will be the deliverers of each activity.

The proposed intervention will have ten activities corresponding to different levels of the Social-Ecological Model [2], [90]. We propose interventions in the community, institutional (health facility) and policy level.

All the community level interventions will follow the Participatory Learning and Action approach (PLA approach), which provides communities, who are concerned about maternal and child health, with a framework to organize and take collective action on the demand and supply-side barriers facing them. It actively engages individuals and communities in identifying and addressing local problems, fostering a sense of ownership, accountability, and sustainability by actively including participants [73]. Trained facilitators use structured meetings in a four-phase action cycle where they: a) identify the health challenges affecting women and children; b) explore the root causes and design local solutions; c) lead their communities to implement these locally feasible solutions; and d) evaluate the results [73], [74]. In Somalia, the intervention has been reported to improve maternal knowledge and improving child vaccination coverage within a 3-month period (IVACS trial) [8]. A description of the group cycle used for the IVACS trial can be found on Figure 4.

Figure 4. The Abaay-Abaay Group cycle designed during the IVACS trial [16].

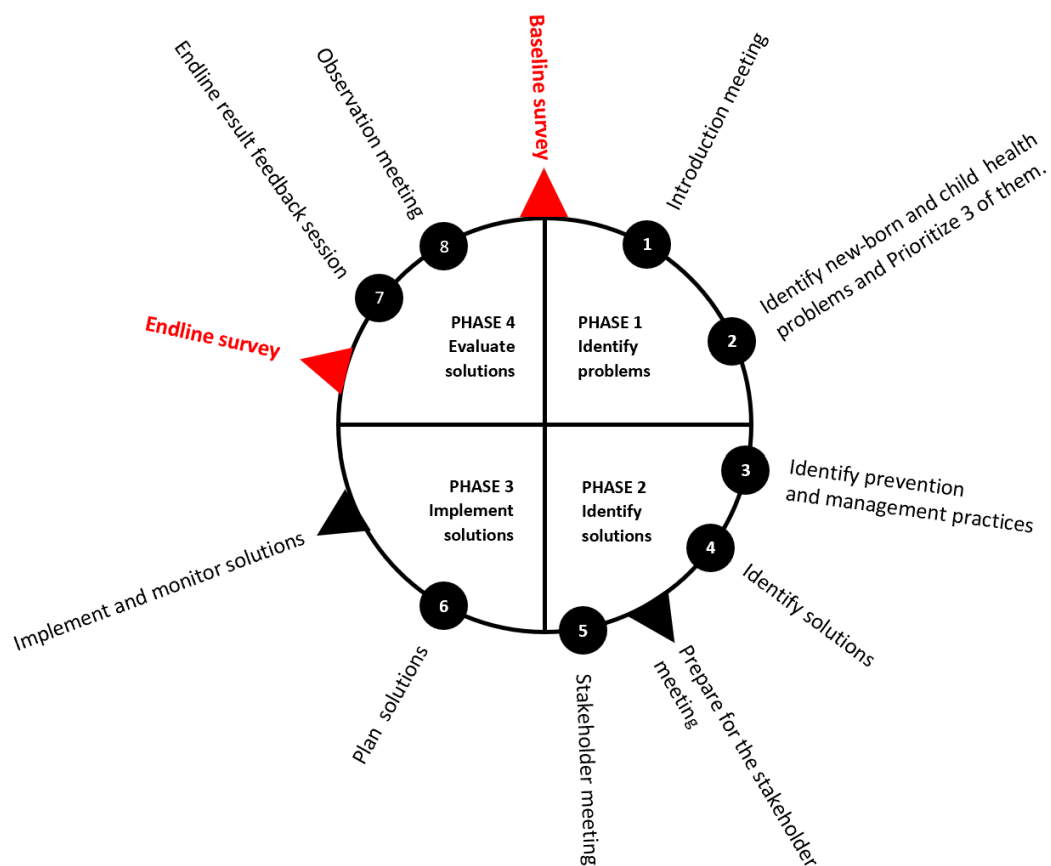


Table 11. Description of the intervention at different levels.

Behaviours:						
"Increase maternal food intake of balanced food", "Mother takes children to health centres for vaccination", "Store health records", "Family members/friends recommend vaccination/share positive experiences regarding vaccination", "Breastfeed the child within the first one hour of birth while allowing them to be in skin-to-skin contact with the mother", "Give colostrum", "Breastfeed exclusively on demand", "Reminding parents of the next dose", "Increased awareness raising at community level on vaccination by CHWs", "Provide help with breastfeeding problems" "Father tells mother to take the child to vaccination".						
Activity	Barrier/Enabler	BCTs (Behaviour Change Techniques)	Detailed description (How)	Timing (When)	Location (Where)	Deliverer (Who will perform)
COMMUNITY LEVEL						
Abaay Abaay groups (AAG)	Barriers: - Lack of knowledge of the benefits of breastfeeding and vaccination. Lack of knowledge regarding the recommended diet for pregnant and lactating women - Maternal workload - Beliefs that they do not have enough milk, colostrum is not good for the baby, the child could get sick, breasts will become bigger, the baby needs water, colostrum can cause diarrhoea. -Belief about consequences of breastfeeding (for example, breasts becoming bigger, not enough breastmilk, child would get sick if they are breastfeeding while the mother isn't feeling well etc.). Strong cultural beliefs and practices regarding IYCF practices and vaccination.	- Information about social and environmental consequences (BCT 5.3) - Information about health consequences (BCT 5.1) - Information about emotional consequences (BCT 5.6) - Instruction on how to perform the behaviour (BCT 4.1) - Credible source (BCT 9.1) - Anticipated regret (BCT 5.5, change regret for relief) - Information about others approval (BCT 6.3) - Comparative imagining of future outcomes (BCT 9.3) - Restructuring social environment (BCT 12.2) - Demonstration of the behaviour (BCT 6.1) - Social support (practical) (BCT 3.2)	Young mothers, pregnant and lactating mothers, mothers/caregivers of children up to 2 years, TBAs and grandmothers will be invited to join the locally available Abaay-Abaay groups. Trained facilitators (Abaay-Abaay leaders and CHWs) will deliver information regarding the importance of proper IYCF practices, maternal nutrition and vaccination. It is important that facilitators deliver the messages in a way that is understandable to women of the community. The information will cover the following topics of vaccination: available vaccines, diseases they protect (including their symptoms and signs), importance of timely vaccination, when to give vaccines to child. Trained facilitators will deliver information regarding the social, health and emotional benefits of providing colostrum to children and to breastfeed exclusively until 6 months.). Moreover, facilitators will explain how the behaviour should be performed, providing information on correct positioning and attachment.	Weekly	At Abaay-Abaay group venues.	Trained facilitators

<ul style="list-style-type: none"> -Belief breastfeeding limits freedom - Rely on grandmothers and fathers' approval - Most women do not breastfeed - Lack of access to skilled support and high rate of home deliveries - Belief that the child will get sick or die with vaccination (should not vaccinate child in a hot day, child with a boil, vaccines are not safe). Mistrust in vaccines - People in the community do not understand the content of the health record card. - Do not remember which vaccines were given and when is the next appointment - Low access to food (droughts, poverty, displaced) - Social network recommends restrictive diets during pregnancy - Mothers need father's authorization before taking children to vaccination (patriarchal system) - Misinterpretation of religious beliefs regarding vaccination <p>Enablers:</p> <ul style="list-style-type: none"> - Somali mothers with high level of education tend to vaccinate their children. - Reinforcement from the Quran regarding the duration of breastfeeding for at least 2 years. - Some mothers have knowledge that 	<ul style="list-style-type: none"> - Problem solving (BCT 1.2) - Valued self-identity (BCT 13.4) - Prompts/cues (BCT 7.1) - Action planning (BCT 1.4) 	<p>The facilitators will also challenge misbeliefs regarding vaccination and feeding practices. Abaay- Abaay leaders/IYCF officers will use the technique of debunking to challenge misbeliefs (this technique includes providing a fact, warning about the myth, explaining the fallacy and repeating the fact).</p> <p>Women will be invited to share positive experiences and to discuss their decisions with their mothers-in-law. For example, they could be invited to discuss how can they divide house chores or how can grandmothers support them. In addition, discussions on their values will be raised. By reflecting in their roles, women will be invited to make decisions and think about how they will act in line with those values.</p> <p>BREASTFEEDING:</p> <p>Women will be allowed to breastfeed during the meeting if they want to and feel comfortable with it. This might have a positive impact on changing social norms.</p> <p>Moreover, trained IYCF counselors will offer one-to-one counselling for breastfeeding problems after Abaay-Abaay group meetings to increase the accessibility of this service.</p> <p>TBAs that support early initiation of breastfeeding are invited to share their knowledge and experiences. Sharing for example, how they help mothers breastfeed and what are the procedures that they follow to encourage breastfeeding when assisting births.</p> <p>MATERNAL NUTRITION:</p> <p>Regarding maternal nutrition, women will receive a healthy meal during the meetings. Women will be taught about different budget friendly, locally available and healthy meals to prepare.</p> <p>VACCINATION:</p>		
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	<p>breastfeeding decreases the risk of illnesses.</p> <p>- Some fathers assert pressure on mothers to continue breastfeeding.</p>		<p>Regarding vaccination, mothers will not only receive information of vaccines and diseases, but they will also be taught on how to understand the health record card. Moreover, they will be invited to design a reminder for themselves and make a plan of where they will place it at their house for it to be visible. The reminders should list the different vaccines, the diseases they protect against and when they need to take their children to the health centre for vaccination. Drawings and stickers will be provided to help illiterate mothers to design their reminders.</p>			
<p>Peer counselling.</p> <p>Mother-to-mother support group (M2MSG)</p>	<p>The barriers and enablers that would be addressed in these groups will be the same ones addressed in the Abaay-Abaay groups.</p>		<p>We propose to build on the existing SCI IYCF mother-to-mother support groups. Some specific interventions could be added to target the barriers detailed before. The strategies and activities detailed for the Abaay-Abaay groups could be used for the mother-to-mother support groups as well.</p>		<p>IYCF groups</p>	<p>Trained facilitators</p>

<p>Peer counselling. Father-to-father support group (F2FSG)</p>	<ul style="list-style-type: none"> - Belief that the child will get sick or die with vaccination (should not vaccinate child in a hot day, child with a boil, vaccines are not safe). Mistrust in vaccines. Strong cultural beliefs and practices - Lack of knowledge on vaccination - Might lack the economic resources to provide the mother with money to travel to the health care centre. - Misinterpretation of religious beliefs (some think that it is sinful to vaccinate children and that they depend on Allah’s will). - Generally, mobilization campaigns not targeting fathers. <p>Enablers:</p> <ul style="list-style-type: none"> - Psychological value of being a good Muslim father as an enabler - If fathers are educated, they positively influence child immunization routine. - Fathers assert pressure on mothers regarding breastfeeding behaviour. 	<ul style="list-style-type: none"> - Credible source (BCT 9.1) - Identity associated with changed behaviour (BCT 13.5) - Information about social and environmental consequences (BCT 5.3) - Information about health consequences (BCT 5.1) - Anticipated regret (BCT 5.5, change regret for relief) - Information about others approval (BCT 6.3) - Comparative imagining of future outcomes (BCT 9.3) - Monitoring of behaviour by others without feedback (BCT 2.1) - Social reward (BCT 10.4) 	<p>We propose to build on the existing SCI IYCF father-to-father support groups. Some specific interventions could be added to target the barriers detailed before.</p> <p>Group facilitators should provide knowledge and explain the importance of IYCF practices and vaccination. Moreover, they should emphasize on the importance of fathers' roles in communicating and encouraging mothers to promote their children's health and nutrition.</p> <p>We suggest including religious leaders in the meetings, who will reinforce the role of fathers in taking care of their families health. In addition, religious leaders will provide information on the importance of timely vaccination.</p>	<p>Religious leaders will attend the father-to-father support group weekly</p>	<p>IYCF groups</p>	<p>Trained facilitators (including religious leaders)</p>
<p>Redesigned health record cards</p>	<ul style="list-style-type: none"> - People in the community do not understand the content of the health record card. 	<ul style="list-style-type: none"> - Adding objects to the environment (BCT 12.5) 	<p>We will co-design a user-friendly card with illiterate caregivers. This card will probably use more images than texts. It will be passport-sized, able to fit in a pocket and contain a water-resistant cover. This intervention will only be used for the trial.</p>	<p>When the child gets vaccinated. The redesigned card will be provided</p>	<p>At health facilities or during mobile-clinic campaigns.</p>	<p>HCWs</p>

HEALTH FACILITY LEVEL

<p>Provider engagement (mHealth)</p>	<ul style="list-style-type: none"> - Overcrowded camps (too many people to remind) - Staff shortages (lack of time, too much work) - Language barriers related to the different dialects such as Jiido, Gare, Mushunguli etc. - Nomadic population - Difficult to deliver written messages because the majority of the population is illiterate. - Lack of a system or procedure to remind people 	<p>- Prompts/cues (BCT 7.1)</p>	<p>An automated system will be established to send voice messages with reminders. HCWs will ask parents/caregivers to provide a telephone number, the name of the baby and local language for the voice message. Voice messages will be sent one week and one day before due date. The reminder one week before will give them time to organise who they should leave their children with, where will they get the money from or how will they travel to the health facility.</p>	<p>Messages will be sent one week and one day before due date.</p>	<p>Parents will be asked to provide details on the place where their children are getting the vaccine.</p>	<p>HCWs will record the information on the automated system</p>
<p>Provider engagement (outreaches)</p>	<ul style="list-style-type: none"> - Difficult access to health facilities (high transport cost and low income) 	<p>- Restructuring the physical environment (BCT12.1)</p>	<p>In the pilot area, increased outreaches will be organised by SCI to reach communities that live far away from health facilities and mothers that might have delivered at their homes. Outreaches will be purposively targeted for the missed/under immunized children/communities. HCWs will go to the community to vaccinate children.</p>	<p>Monthly (could change depending on resources)</p>	<p>At the community</p>	<p>HCWs</p>
<p>Provide training on the current EPI policy</p>	<ul style="list-style-type: none"> - Misunderstanding of the current EPI policy and giving routine vaccination to only children below the age of one year instead of two years 	<p>- Instruction on how to perform the behaviour (BCT 4.1)</p>	<p>SCI to train HCW in the study area on the current EPI so that they can vaccinate all children below the age of 2 years.</p>	<p>Before the study starts with regular supportive supervision during the study to check compliance.</p>	<p>Study area.</p>	<p>Health and nutrition teams of SCI.</p>
<p>Provide training to HCWs/ CHWs and FHWs regarding communication skills.</p>	<ul style="list-style-type: none"> - Under-trained - Lack of communication skills - Frustration (HCWs do not feel recognized, and they cannot reach the targets) 	<p>- Demonstration of the behaviour (BCT 6.1)</p> <p>- Instruction on how to perform the behaviour (BCT 4.1)</p> <p>- Behavioural practice/ rehearsal (BCT 8.1)</p>	<p>In order to increase HCWs/CHWs and FHWs motivation and capabilities to perform the behaviours, we suggest that they should assist trainings on communication skills. The training on communication and counselling skills will be based</p>	<p>Once for each person. It could be delivered multiple times to make sure</p>	<p>To be defined.</p>	

		<ul style="list-style-type: none"> - Feedback on behaviour (BCT 2.2) - Feedback on outcome (BCT 2.7) - Social reward (BCT 10.4) - Material Incentive (BCT 10.1) 	<p>on the trainer’s guides provided by the World Health Organisation that include <i>listening and learning</i> skills, in addition to <i>building confidence and giving support</i> skills. For example: https://www.who.int/publications/i/item/9241546522.</p> <p>To increase their automatic motivation and reduce their feelings of frustration we propose to provide rewards (for example: diplomas and positive comments provided by the community). New rewards could be proposed by HCWs and discussed with the team (to be defined). Moreover, we will provide feedback on the outcomes of their behaviour (for example: “<i>thanks to the children you included in the automated system a total amount of 100 reminders were sent this year</i>”)</p>	everyone attends. Timing to be arranged with each community.		
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POLICY LEVEL

Expand eligibility age for routine vaccination	- Missed opportunities in health centres which increase cost.	-	This will reduce missed opportunities. Health actors & government should review the current policy and try to expand the age of catch-up vaccinations to up to 5 years. Members of NGOs, professional groups, international or humanitarian organisations will advocate for more flexibility on the eligibility ages for vaccination.	During the piloting study where the effectiveness of the SBCC strategy will be tested.	In the study area.	Health and nutrition teams of SCI
Change regulations to adopt user-friendly immunization cards	- Caregivers do not remember which vaccines were given and when is the next appointment.	-	SCI will advocate the government and other health actors such as UN agencies, international and local NGOs, professional groups, to endorse the adoption of user-friendly immunization cards that can be easily understood by caregivers with varying levels of knowledge. We propose that these cards should be used for the trial. A significant number of mothers/caregivers cannot read or write, making it difficult to use cards written in English. To overcome this challenge, it is proposed to find a way to accommodate the different backgrounds of caregivers in	During the piloting study where the effectiveness of the SBCC strategy will be tested.	In the study area.	Health and nutrition teams of SCI

			the design of the immunization cards.			
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Inclusivity of the strategy

In Somalia, almost half of the girls and women have never been to school, and only a 32% of them are literate [39]. In contrast, almost a 50% of men are literate [39]. Our intervention takes into consideration the low literacy level among Somali population by delivering interventions face-to-face or verbally. None of the interventions contain written materials. This will facilitate the reach of our intervention.

Moreover, we are aware that 28% of households have a foster or orphan child [39]. To include all those children, our target audiences are mothers/fathers or caregivers, among others. Therefore, the training interventions will refer to parents/caregivers and not only parents.

Regarding disabilities, the last demographic survey pointed out that 4.6% of men have any type of disability and a 4.9% of women do [39]. Sight disabilities are the most prevalent among Somalia [39]. Since most of the intervention will be verbal, people with sight disabilities will be able to participate in all activities. In order to include people with other disabilities we suggest contacting health actors and organisations to make sure we develop culturally appropriate interventions for these communities.

CHAPTER

07

IMPLEMENTATION AND EVALUATION OF THE SBCC STRATEGY

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69	Data management
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There will be two main approaches for the intervention: (1) Participatory, Learning and Action (PLA) and (2) mHealth. All the different messages that will be produced to improve the barriers we identified will be covered in both interventions i.e. messages will be delivered in the PLA groups through face-to-face meetings (Abaay-Abaay, M2M and F2F) whereas in the mHealth they will be shared as a drama-series and re-enforcement messages.

All activities conducted at health facilities and the policy level will equally focus on addressing barriers in both study arms. This ensures that any differences observed between the study arms are solely due to the mode of message delivery (face-to-face vs. mHealth).

PLA approach

To implement and evaluate the PLA intervention, we will perform tasks in three different phases. In Phase 1, the manual and materials required for implementation of the community group meetings will be developed and tested. In Phase 2, approaches for scaling up the intervention will be tested for their feasibility and acceptability. And in Phase 3 the intervention will be evaluated in a cluster randomized controlled trial.

Phase 1 – Manual development and testing

The group facilitators manual used for the IVACS trial will be adapted and expanded during Phase 1 to include high priority health topics such as feeding practices during the first 1000 days and vaccination for children below the age of 2 years.

Pictures, diagrams and photographs will be selected and included within the manual or separately to help engage illiterate community members. The manual will be iteratively developed and tested. The updated materials will be tested with staff volunteers, and in group meetings. Questionnaires will be used to assess the practicality, accessibility and appropriateness of the content and format.

Phase 2 – Formative research

Piloting and comparison of two different scaling up approaches will be performed. This will compare face-to-face group facilitation performed by: (a) NGO Community Health Workers (CHW) supervised by a group facilitation coordinator; (b) directly by Group Facilitators specifically recruited and trained for the role. The comparison will be performed by qualitative assessment of the facilitation process by direct observation, completion of observation checklists, and interviewing participants about the facilitation experience. The results from these pilot studies will be used to inform the design of the scaling up approach that will be tested in the third part of the study. While the use of trained facilitators proved to be effective during the IVACS trial, the cost of the intervention could be significantly reduced and sustainability increased, if it proves possible for CHW to take the role of the Group Facilitator.

mHealth approach

Phase 1 – Message development

We will design culturally appropriate audio message based on information that will be gathered during formative research with mothers, fathers and community leaders from the pilot study area. The design process will also be informed by the theoretical behaviour change approach used in the SBCC strategy development stage.

Messaging will be developed in collaboration with local Somali companies such as Shaqodoon and Media Inc., which are specialists in interactive voice response (IVR) technology and creative message development, respectively. Actors will record the messages related to the drama-series and the re-enforcement messages will be recorded by respected people of the community (for example: a doctor). Vaccination messages will cover common vaccine preventable childhood diseases, their prevention and control, vaccination schedule, types of routines vaccines, benefits of vaccination and debunking common myths about vaccinations. Messages on feeding practices will involve breastfeeding stories, benefits of breastfeeding, how breastfeeding works, breastfeeding recommendations, a kangaroo mother care story, common challenges of breastfeeding, early initiation of breastfeeding, exclusive breastfeeding, complimentary feeding etc.

Phase – 2: mHealth message testing

During testing we will deliver audio messages focused on each of the 2 priority topics to test them and refine them. Message content will be tested to ensure it is compelling and effective. Different formats for message delivery will be tested, such as drama or standalone short/succinct messages. The messages produced will be tested with small groups of people living in the same area as the study population and revised during several iterative rounds of development prior to general use. Full consideration will be given to ensuring the messaging will be culturally acceptable. This will ensure that listening to the message does not put any beneficiaries at risk. Messages will be recorded in Mahrati and Maay, the 2 Somali dialects widely spoken in Somalia, and recipients received broadcasts in their preferred language.

Evaluation phase

A cluster randomised trial will be performed to test the pilot study hypothesis. In a 3-arm pilot study, we will test the impact of the PLA and mHealth interventions compared to the control. The PLA and mHealth interventions will contain similar messages but the delivery model will be different. Whereas the PLA will use a face to face to approach, the mHealth intervention will use online approach. Both will be compared with a control arm that will not receive the intervention messages.

Cluster identification and randomisation

Clusters (IDP camps or villages) will be mapped and enumerated, and the location of the groups determined. Previous experience in IDP context has shown that a single group is usually to be found within a group of camps, known as a 'centre' or 'umbrella'. Each centre may typically consist of 2 to 6 camps with a single women group. Within each centre we will select the single camp where the group leader lives. We will identify a minimum of 45

clusters and then randomly allocate them to receive the PLA intervention, mHealth or control (1:1:1). The interventions will last for 12 months, during which all the priority health topics will be covered.

Data collection

Household surveys will be conducted at baseline and endline to assess: women's health knowledge (assessed using a custom designed questionnaire); child vaccination status as recorded on health record cards or reported by caregiver recall, feeding practices using standard IYCF questionnaire, and child nutrition status which will be assessed using MUAC and WHZ.

Health facilities will be mapped at baseline, and facility functioning and utilization will be assessed using adapted questionnaires and site visit checklists that were developed during the IVACS trial. Data will be collected from health facilities on an ongoing periodic basis to measure service utilization and facility related barrier over the course of the intervention.

Outcome measures

- Parental/caretakers' knowledge and social norms of vaccination and nutrition topics
- Vaccination coverage of children 0-<59 months of age who received all vaccines required by the national vaccination protocols.
- Early initiation of breastfeeding
- Exclusive breastfeeding of infants 0-5 months
- Child diet diversity score
- Women dietary diversity (WDD)

The secondary outcomes of interest are:

- Bottle-feeding;
- Early introduction of complementary foods at 1 and 5 months
- Incidence of acute malnutrition among children 6-59 months
- Incidence of child morbidity
- Incidence of mortality among children 6-59 months

Data management

Digital data capture will be done using mobile phones running the Android operating system and Open Data Kit (ODK) software. Data entered in the field will be uploaded to the project servers when they have access to a Wi-Fi network. Data will be subsequently downloaded from the server in .csv format and compiled using Excel Power Query.

Data analysis

Data will be analysed using Stata v17. Results from the cRCT will be analysed using an intention to treat analysis. The relative impact of the intervention will be assessed using mixed effects, multilevel regression models: linear, or logistic, depending on whether the outcome variables are continuous or categorical. Models will include cluster as a random-effect and dummy variables to denote the time-points (baseline or endline) and intervention as fixed-effects in the model. All models will include baseline data to account for any observed differences at baseline and will be adjusted for age, sex, and other covariates as necessary. We will use robust variance for calculation of standard errors. The absolute difference in risk or means, adjusted for the model covariates, will be obtained using the margins and contrasts post-estimation commands. Service utilization data from health facilities will be graphed and any changes in utilisation within each facility will be tested for using t-tests or chi-squared tests.

Process evaluation

The fidelity of the group meetings will be assessed using an observation check-list and the adoption will be measured by numbers attending each meeting recorded. Semi-structured key informant interviews will be held with the group Khalifada (Abaay-Abaay leader) and other selected members to solicit their opinion on the facilitated group meetings in order to evaluate the acceptability of the intervention. For the process evaluation of the mHealth intervention we suggest evaluating *engagement* by recording how many people listened to the audio recordings.

Cost effectiveness analysis

We will assess the cost-effectiveness of the interventions. Data will be collected regarding intervention costs, healthcare expenses, participant and staff costs, and other related factors.

We will collect data on costs from a provider perspective using the financial accounts from SCI and process evaluation documentation to estimate the time spent by community health workers or facilitators to provide PLA group supervision and costs linked to this as well as the mHealth development and testing. We will also identify joint project costs that cannot be directly allocated to either intervention or other trial activities (e.g. stakeholder engagement, monitoring and evaluation, and research). Capital costs will be annualized over the expected lifespan assuming constant linear depreciation.

CHAPTER

08

THEORY OF CHANGE

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72 Theory of change

Theory of Change

A theory of change works by elaborating on certain key points regarding why our intervention is necessary and its objectives. Our theory of change includes information regarding how our intervention will be delivered or what are the activities that will be carried out and what will the intervention achieve including short-term, medium-term, and long-term outcomes.

The theory of change can be found on Figure 5.

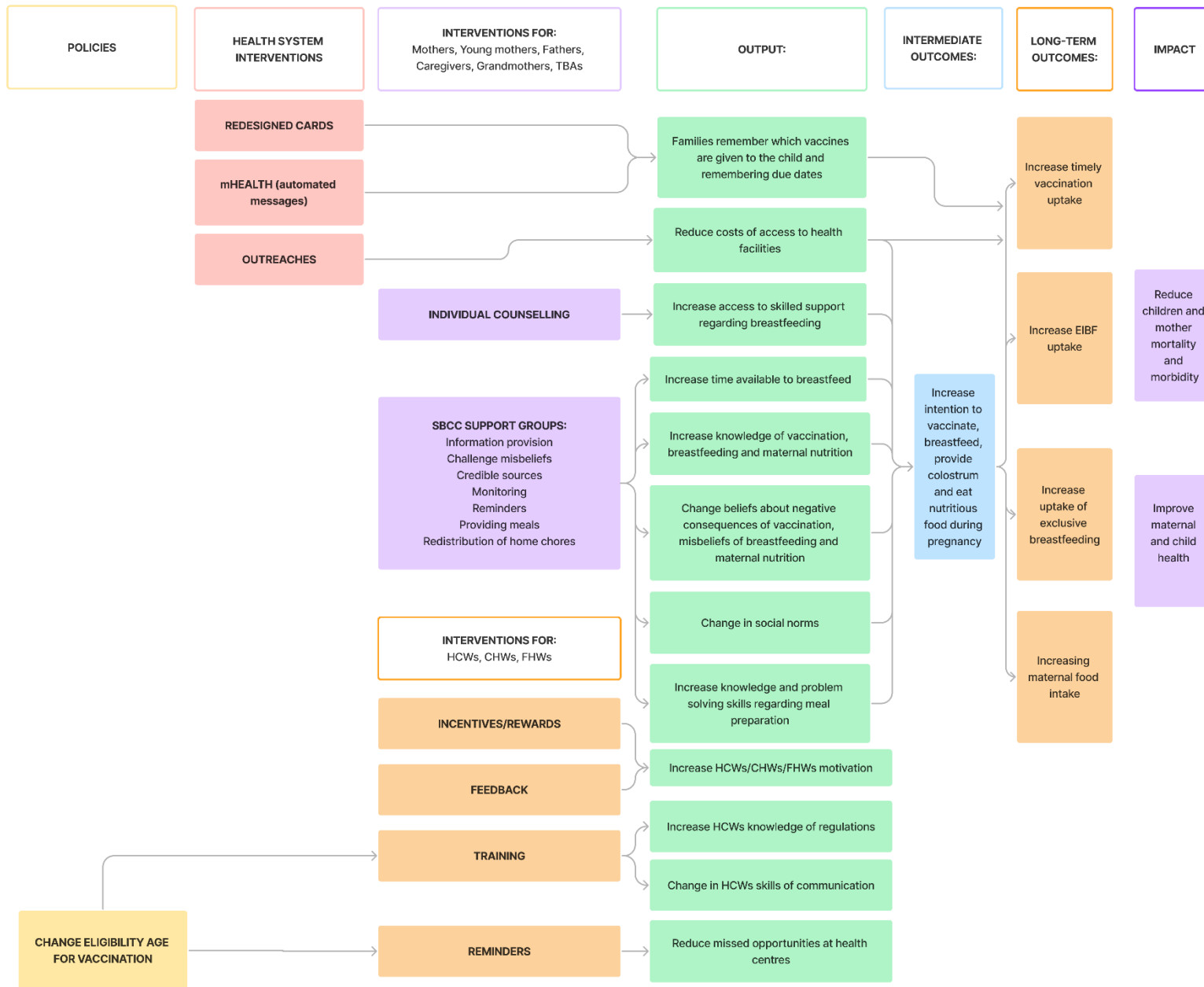


Figure 5. Theory of change for the SBCC strategy.


CHAPTER

09

CONCLUSION

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Conclusion

In conclusion, our intervention is a crucial step to tackle Somalia's challenges caused by prolonged conflict and frequent natural disasters which have led to problems including high levels malnutrition and poor health outcomes, particularly for children. We have designed an evidence-based intervention that will help overcome most of the barriers preventing key behaviours of feeding practices and vaccination uptake for children up to the age of 2 years in Somalia.

By applying the BCW, we have analysed different candidate behaviour and selected those that were ranked higher by the researchers and by the community. The COM-B analysis allowed us to thoroughly explore the different barriers to performing those behaviours. Afterwards, we applied the APEASE criteria and the intervention function matrix to select which types of interventions would be more effective. We described which policy options of the BCW could have an impact on the outcomes we were looking for. The intervention was designed to target the different levels of barriers using the socio-ecological model. We specified which behaviour change techniques could be used in each activity. Finally, we proposed a robust and rigorous method to evaluate the effectiveness and the cost-effectiveness of the interventions, including a process evaluation. We'll aim to assess not only behaviour changes but also how health and nutritional outcomes improve.

This multi-pronged approach is entrenched in the essence of practical, community-driven solutions, as we collectively strive for a healthier and brighter future for Somalia's children.

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Supplementary Materials

Supplementary materials can be found [here](#).