Evaluation of Mobile Decision Support Applications in Tanzania Final Report July 2013

Pilot Projects Implemented by D-tree International to Support the Provision of Screening, Examination and Treatment of Severe Acute Malnutrition (SAM) in Zanzibar and Maternal and Child Health services in Bagamoyo

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ABBREVIATIONS

AIDS	Acquired Immune Deficiency Syndrome
ANC	Antenatal Care
CCA	Community Change Agent
CCHP	Children's Community Health Plan
CDC	Centre for Disease Control
CHMT	Council Health Management Team
CHW	Community Health Worker
CoP	Community of Practice
CSO	Civil Society Organization
CORPS	Community Owned Resource Persons
DAC	Development Assistance Committee
D&D	Decentralization by Devolution
DHIS	District Health Information System
DHMT	District Health Management Team
DMO	District Medical Officer
DHS	Domestic Health Survey
eMNH	Electronic Maternal and Neonatal Health
EmOC	Emergency Obstetric Care
F-ANC	Focused Antenatal Care
FLWs	Frontline Workers
HIV	Human immunodeficiency virus
HMIS	Health Management Information System
ICT	Information and Communication Technology
IHI	Ifakara Health Institute
IMCI	Integrated Management of Childhood Illness
IPT	Intermittent Preventive Therapy
ITC	Inpatient Therapeutic Care
ITN	Insecticide Treated Bed-Net
ITU	International Telecommunications Union
LGA	Local Government Authority
MDG	Millennium Development Goals
MKUKUTA	Mpango wa Kukuza Uchumi na Kupunguza Umasikini Tanzania
MKUZA	Mpango wa Kupunguza Umasikini Zanzjbar
MNCH	Maternal, Newborn and Child Health
MoH	Ministry of Health (Zanzibar)
MoHSW	Ministry of Health and Social Welfare (Mainland)
MTUHA	Mfumo wa Taarifa za Uendeshaji wa Huduma za Afya
NGO	Non-Governmental Organization
NSGRP II	National Strategy for Growth and Reduction of Poverty II
OECD	Organisation of Economic Co-operation and Development
OTC	Outpatient Therapeutic Care
PPD/P	Public Private Dialogue/Partnership
PCA	Programme Cooperation Agreement
PHSDP	Primary Health Services Development Programme
PMTCT	Prevention of Mother To Child HIV Transmission
RCH	Reproductive and Child Health

RUTF	Ready to Use Therapeutic Food
SAM	Severe Acute Malnutrition
SMS	Short Message Service
SPSS	Statistical Package for the Social Sciences
STI	Sexually Transmitted Infections
TDHS	Tanzania Demographic and Health Survey
TDV	Tanzania's Development Vision
TOR	Terms of Reference
UKUN	Uhakika Kituo cha Ushauri Nasaha
UNDAP	United Nations Development Assistance Plan
UNEG	United Nations Evaluation Group
UNICEF	United Nations Children's Fund
WHO	World Health Organization
ZFSN	Zanzibar Food Security and Nutrition

Executive Summary

UNICEF has contributed toward the United Nations Development Assistance Framework (2007-2011) and the United Nations Development Assistance Plan (2011-2015) priorities for Health & Nutrition within which it works to support the Mainland Ministry of Health and Social Welfare (MoHSW) and the Zanzibar Ministry of Health (MoH) to strengthen health and nutrition monitoring and evaluation systems on the Mainland and in Zanzibar. The programmes are aligned with the Tanzania Development Vision 2025 and MKUKUTA for Mainland Tanzania, and Vision 2020 and MKUZA in Zanzibar. As part of this effort, UNICEF has been seeking innovative ways to improve the capacities of frontline health workers in the use of clinical guidelines and protocols to contribute toward improved quality of care. To achieve this UNICEF has been working with D-tree International (hereafter, D-tree), a non-profit organization specializing in the development of electronic decision trees to assist front-line healthcare workers working at facility and community levels. Over a two year period, UNICEF disbursed a total of TSH 728,025,794 (approx. equivalent $448,016) to D-tree to develop two mobile phone applications – eMNH and eNutrition – using electronic decision trees to assist frontline health workers perform their duties in the areas of maternal health and management of children with severe acute malnutrition. A further TSH 83,841,335 (approx. equivalent $51,595) was contributed by D-tree over two annual Programme Cooperation Agreements (PCAs). eNutrition is targeted toward facility-based health workers and eMNH is targeted toward both facility-based and community health workers.

In 2013, UNICEF commissioned an external evaluation of the two projects implemented by D-tree through a competitive bidding process in which Bluwat (Tanzania) Limited were selected to undertake the assignment. The external evaluation will contribute to accountability and learning for key stakeholders including the Tanzania Ministry of Health & Social Welfare and the Zanzibar Ministry of Health, D-tree, UNICEF, sub-national health teams and civil society; provide recommendations on future scale up; and inform UNICEF Tanzania Country Office programming strategies linked with the use of mobile technology for different areas of programme implementation and information systems strengthening.

The purpose of the evaluation is to assess the relevance, efficiency, effectiveness, and the sustainability of the use of mobile technologies for the screening and treatment purpose in the areas of nutrition and maternal health. Given the pilot nature of the project and duration of implementation over a two year period each, the criteria of impact is given lesser weight. Greater weight is given the criteria of relevance, efficiency, effectiveness and sustainability to strengthen the scope of examination on the pilot nature of the projects and their capacity to go to scale within the development context of Tanzania.

Methodology and Scope

The evaluation uses a cross-sectional plausibility evaluation design using an external control group to rule out other confounding factors which may have resulted in observed effects on the treatment group. Comparator facilities were selected based on similarity to the treatment sites in terms of socioeconomic and livelihood systems but where they were not exposed to the benefits of the project. For the maternal health project, two sites Chalinze and Kwaruhondo were selected for comparison with Chalinze and Miono in Bagamoyo district, whilst for the nutrition project, Sebuleni was selected as a match to Chumbun in Unguja Urban and Chaani Msingini, Kidoti and Gamba were selected from Unguja North A. All control areas were in proximity but an adequate distance from the treatment sites to prevent any spillover effects from the intervention.

The evaluation covers all the eight facilities that benefited from the intervention including the two eMNH project sites in Miono and Lugoba, Bagamoyo district and the six eNutrition projects in Zanzibar urban (Chumbuni) and those in Unguja A District (Chaani Kubwa, Kivunge, Tazari, Nungwi and Gomani).

Summary of Key findings

Relevancy – Overall the project objectives were found to be relevant and in accordance with the priorities and policies of the MoHSW on the Mainland and the MoH in Zanzibar. Implementation in Bagamoyo supported UNICEF existing commitments to the 7 Learning Districts to promote programme convergence in geographic areas of need. Maternal health and Nutrition continue to feature within the programmatic priorities of UNICEF's support to the United Nations Development Assistance Plan (UNDAP) being implemented over a four year period from 2011 to 2015. Investment in a decision support system works to address capacity challenges in adherence to standard protocols and guidelines and strengthen information management at the facility level.

Effectiveness – Overall the project sites where eMNh and eNutrition had been introduced had improved the accuracy and comprehensiveness of treatment. With built in error checks and skip logic designed as part of the application, the user is only required to input the necessary information to make a complete registration and screening to then be instructed of the necessary course of action. In these same facilities however, the accuracy and comprehensiveness of completion of the existing paper based systems for data gathering declined even below the levels of the comparators due to the additional burden of work in completing the task twice on the device and on paper.

Efficiency – Cost analysis of the eMNH project finds fixed costs to a total of TSH 399,669,649 and variable costs as TSH 29,039,992 ; for eNutrition project finds total fixed costs at TSH 350,292,034 and variable costs as TSH 35,400,000 over 2010 to 2012. On the basis of the review of variable costs, TSH 28,249 was expended per case (approximately $17/case) for the eMNH project as a result of the higher caseload for ANC over TSH 177,889 was expended per case (approximately $109/case) for eNutrition due to the smaller number of client interactions over the project period. In the absence of a comparative assessment of similar projects the information is presented for the consideration of key stakeholders as to the relative merits and valuation of such a structure on an ongoing basis. The cost categories indicated under the variable category are simplified to provide the MoHSW with an appreciation of the kinds of basic costs that would be required for continuation and expansion of the project to other areas using the existing government staff structure for implementation.

Impact – Clients of both project noted positive interactions with health workers using the eMNH and eNutrition tools compared with the experience of clients in comparator sites. Compared to the Sphere standards for nutrition however, the projects sites underperformed in terms of recovery and default rate. The death rate is low but it is difficult to measure as most of the complicated cases are referred to ITC and we were unable to track at what seriousness the patients at the time of referral. Other complementary factors are contingent upon the impact of the project including the availability of a consistent supply pipeline.

Sustainability – The huge investment for the extremely limited scale of coverage in just six facilities in Zanzibar and two facilities in Bagamoyo limits the ability to advocate for investment on the basis of value for money. Implementation of a product such as eMNH and eNutrition requires a substantial resource investment both in terms of human resources for technical support and in terms of financial resources making it difficult to conceive of a model where the applications could go to any significant scale or foresee for future cost-sharing scenario with Government. In addition, building and sustaining government commitment and prioritization on these issues is extremely important in determining future resource allocations from public funds and motivation for building technical capacity at the Ministry level to address other aspects such as data storage.

Summary of key recommendations

The following recommendations have been developed on the basis of the findings of the evaluation and consultation with partners to ascertain feasibility, practicality and accordance with evolving priorities and strategic direction.

1. Strengthen process and evidence to inform problem identification and programme design

Baseline survey and feasibility assessments are recommended prior to commencement of a pilot mHealth project to facilitate a more rigorous basis on which to evaluate a proof of concept. Analysis of needs as the basis for guiding the type of mHealth solution should be logical in the context of existing programme priorities and the work of other partners. Consideration should be given on the extent to which projects have sustained buy-in and ownership from national stakeholders and ensure a more structured process is initiated as the basis for feasibility assessment and building the evidence base for demonstrating the value of pilot projects on a broader scale.

2. Improve linkages between the use of mHealth initiatives such as eNutrition and eMNH with other health systems strengthening initiatives

mHealth projects have tremendous potential to contribute towards sector wide strengthening initiatives to the extent that these projects are aligned with broader programmes of support. UNICEF, in its capacity as a key development partner of the Governments of Tanzania and Zanzibar, plays an important role in feeding back the evidence from pilot projects such as eNutrition and eMNH to strategic policy discussions in the health sector; in ensuring the functionality and continuity of other complementary components which have the potential to impact upon implementation, such as the supply pipeline of essential commodities and equipment; as well as in ensuring a sound programme logic where projects are being implemented by different partners. UNICEF should continue to strengthen its convening and facilitating role to bring these different elements together in support of the MoHSW and MoH.

3. Ensure a consistent and active presence in maintained in the mHealth CoP

The mainland CoP shows great momentum amongst a crowded playing field. These structured partnerships have the potential for in generating political will through coalition building. UNICEF's positioning within this group needs to be clarified to ensure a more active and consistent presence, also harnessing the potential for advocacy from other investments in the use of mobile technology s in education and birth registration.

4. Ensure plans for scale up factor in the requirements of other complementary interventions and resourcing requirements

Use of CommCare requires substantial investment in both financial and technical resources to support implementation at facility and community level. Ensuring different models for scale up and factored into project design provides development partners with greater foresight on the capacity and investment required for a particular project to be expanded and/or scaled up to other areas.

5. Strengthen programme design and evidence base to improve project evaluability

As with the recommendation to UNICEF, a comprehensive baseline survey and feasibility assessment is recommended prior to commencement of a pilot mHealth project to facilitate a more rigorous basis on which to evaluate a proof of concept. Analysis of needs as the basis for guiding the type of mHealth solution

should be logical in the context of existing programme priorities and the work of other partners. Consideration should be given on the extent to which projects have sustained buy-in and ownership from national stakeholders and ensure a more structured process is initiated as the basis for feasibility assessment and building the evidence base for demonstrating the value of pilot projects on a broader scale.

6. Strengthen mHealth Community of Practice in Zanzibar

The communities of Practices in Tanzania and Mainland are at different stages of development. While the Tanzania Community of Practice is vibrant their counterparts in Zanzibar have met once during the project period. Strengthening the coordination of mHealth initiatives has the potential to reduce duplication and better promote synergies between projects and partners as well as in contributing toward fostering new partnership opportunities through such networking structures.

7. Strengthen regulatory environment for mHealth in Zanzibar to promote integration with national health information systems

Enhancing government ownership and stewardship of mHealth initiatives should be a long-term goal of the Ministry. mHealth initiatives continue to be largely donor-driven exercises and often maintaining parallel databases from the national health information systems. Greater capacity is required at the Ministry level to improve its ability to lead and coordinate the work of development partners in accordance with clear standards to ensure interoperability, privacy of patient records and ownership of project data.

8. Strengthen community management of acute malnutrition

Emphasis on regulating for an official cadre of CORPs to extend the capacity of the health system into the community has the potential for more systemic, long-term benefits for the sector. Furthermore, linkage of the project with a broader health systems strengthening initiative also addressing other aspects of capacity development, surveillance, community management of acute malnutrition, improvements in supply pipeline for RUTF and routine medicines, would have provided a more robust basis for linkage with broader health outcomes.

1. Introduction

UNICEF is working to support the Tanzania Ministry of Health & Social Welfare and the Zanzibar Ministry of Health to strengthen the quality of service delivery for children affected by Severe Acute Malnutrition (SAM) in Zanzibar through an eNutrition project in Zanzibar and Maternal Health through an eMNH project in Bagamoyo. This support was implemented as part of the United Nations Development Assistance Framework (2007-2011) and the United Nations Development Assistance Plan (2011-2015) priorities for Health & Nutrition within which UNICEF has committed to supporting the MoHSW and the MoH to strengthen health and nutrition monitoring and evaluation systems.

The programmes are aligned with the Tanzania Development Vision 2025 and MKUKUTA for Mainland Tanzania, and Vision 2020 and MKUZA in Zanzibar to ensure quality healthcare for all and reduce infant and maternal mortality rate by three quarters of current levels and to reduce mortality rates from 101 to 20 per thousand respectively.

As part of this effort, UNICEF has been seeking innovative ways to improve the capacities of frontline health workers in the use of clinical guidelines and protocols to contribute toward improved quality of care. To achieve this UNICEF has been working with D-tree International, a non-profit organization specializing in the development of electronic decision trees to assist front-line, in-community healthcare workers. Based on the requirements, D-tree and UNICEF piloted two modules in eNutrition in Unguja and eMNH in Bagamoyo with the following features:

- eNutrition modeled the Zanzibar MoH Guidelines for Outpatient Therapeutic Care (OTC) into a decision support application to enable health workers to correctly identify, register, examine and treat malnourished children. Through the use of the mobile phones, health workers are able to track the progress of children affected by severe acute malnutrition who are treated through the Outpatient Therapeutic Care (OTC) programme and those who need to be referred for more specialized treatment. The eNutrition project was implemented as a pilot in two sites during 2010-2011 and an additional four sites in 2011-2012, to cover a total of six facilities in the North A and Unguja Urban districts of Zanzibar.
- eMNH used the MoHSW guidelines for antenatal care as the basis for developing a decision support application to increase adherence to Tanzanian standards of care for antenatal care. The phone-based tool registers pregnant women either when they are first identified by health workers in the community or during their first antenatal visit at a health facility, and then supports health workers to provide appropriate antenatal care services; monitor the pregnancy; encourage pregnant women to complete all four antenatal clinic visits and to deliver in a health facility. The eMNH project was implemented in two health facilities (Miono and Lugoba Health Centers) in Bagamoyo district, Tanzania mainland.

Over a two year period, UNICEF and D-tree disbursed a total of TSH 814,401,975 (approx. equivalent $501,170) for the two projects over two years according to the breakdown in Table 1 to implement the agreed commitments in the Programme Cooperating Agreement (PCA). The timeframes indicated are aligned with the two annual PCAs signed between UNICEF and D-tree. The funding information reflects an amount of TSH 15,504,300 that was returned by D-tree in 2012 against the eNutrition project to conduct the evaluation externally and additional expenditure to the amount of TSH 3,169,362 which was covered directly by D-tree, against the eMNH project in 2012.

Table 1: eMNH/eNutrition Funding Breakdown (UNICEF & D-tree)

	2010-2011	2011-2012	TOTAL
eNutrition	TSH 207,110,724	TSH 178,581,310	**TSH 385,692,034 ($ 237,349)**
eMNH	TSH 305,701,500	TSH 123,008,441	**TSH 428,709,941 ($ 263,822)**
TOTAL	**TSH 512,812,224 ($ 315,577)**	**TSH 301,589,751 ($185,594)**	**TSH 814,401,975 ($ 501,170)**

In 2013, UNICEF commissioned an external evaluation of the two projects implemented by D-tree International through a competitive bidding process in which Bluwat (Tanzania) Limited were selected to undertake the assignment. The purpose of the external evaluation is to contribute to accountability and learning, provide recommendations for future scale up and inform future UNICEF Tanzania Country Office programming strategies linked with the use of mobile technology for different areas of programme implementation and information systems strengthening.

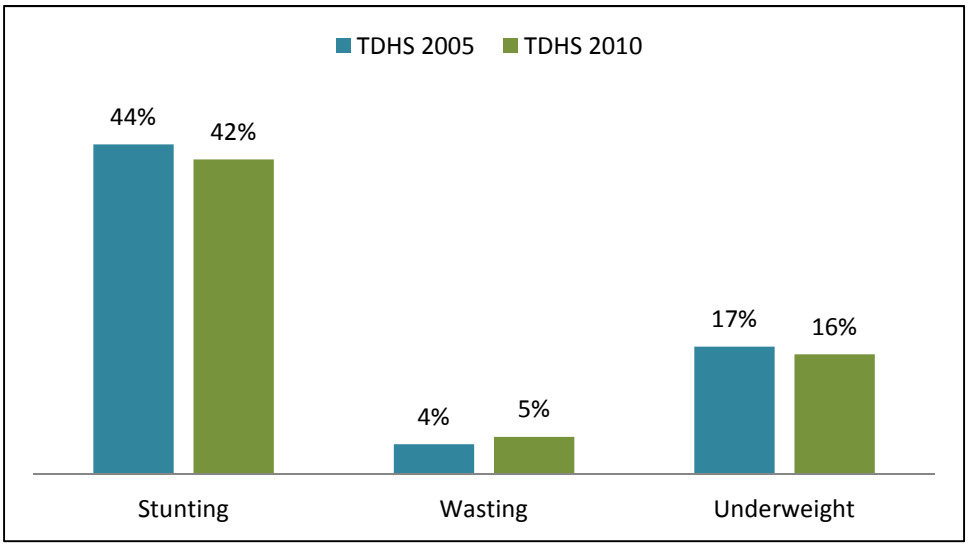
The overall objective of evaluating the eNutrition and eMNH projects implemented by D-tree was to assess the relevance, efficiency, effectiveness and sustainability of the use of mobile technology for the screening and treatment purposes in the areas of nutrition and maternal health. The specific objectives are:

- To assess the use, applicability and preference of mobile phone based tools compared to paper based methods to inform decision support systems in maternal health and nutrition progrmmes.
- To assess how information generated by the project is used by beneficiaries, health workers, district health officials, the Ministry of Health, UNICEF and other partners where relevant in maternal and nutrition programmes.
- To assess the extent of care to which mobile phone based tools improve the quality of care provided at the health facilities compared to traditional methods in maternal care and nutrition programmes
- To assess the potential for scale up and integration with the national health information systems and health (including m health) architectures in Tanzania.
- To systematically document weaknesses. Strength, constraints, opportunities and lessons learnt in the project implementation

1.1. Nutrition Situation in Tanzania/Zanzibar

Tanzania, encompassing both the Mainland and Zanzibar, has made considerable progress across a number of health indicators over the past decade, but not with regards to nutritional status. At national level, 42 percent of children under five are stunted, decreasing from 44 percent in 2005. Children who are underweight also remain consistently high at 16 percent in 2010. In addition, approximately one third of children aged 6-59 months suffer from iron and vitamin A deficiency and 69 percent are anaemic. Acute malnutrition is an issue in some areas more than others, most notably in Zanzibar where 12 percent of children are affected (12.7 percent in Unguja and 10.9 percent in Pemba).

Figure 1: Trends in nutritional status of children under-5



Source: TDHS 2005, TDHS 2010

Vulnerability to malnutrition is influenced by livelihood conditions with factors such as food and income poverty as well as the potential for agricultural productivity noted. In Zanzibar, the most vulnerable populations are found in Micheweni, Wete and Chake Chake district of Pemba and West, Town and North A districts of Unguja. Rural areas, particularly the coastal plain and coral rag areas are described as highly disadvantaged areas.

The World Health Organization (WHO) makes reference to prevalence ranges to classify levels of stunting, underweight, and wasting (Table 3). These categories and their corresponding "trigger levels" are used as the basis for targeting priority interventions. Using such designations as a starting point, the issue of stunting constitutes a more significant public health problem, regarded as "very high" on the Mainland and "high" in Zanzibar. Wasting, a manifestation of acute malnutrition is found to "high" in Zanzibar and "medium" on the Mainland. Far more alarming has been the poor trend of nutrition for both Mainland and Zanzibar, with only the status of underweight children under five decreasing between 2005 and 2010. All other indicators were found to have increased over the five year period, with both stunting and wasting reaching "high" levels in Zanzibar and stunting reaching a level of "very high" on the Mainland.

Table 2: Status of malnutrition on Mainland and Zanzibar using WHO prevalence ranges among children under 5 years of age

Indicator	Mainland		Zanzibar		Severity of malnutrition by prevalence ranges (%)			
	2005	2010	2005	2010	Low	Med	High	Very High
Stunting	38.0	42.3 ↑	23.1	30.2 ↑	<20	20 – 29	30 – 39	≥40
Underweight	21.9	15.7 ↓	19.0	19.9 ↑	<10	10 – 19	20 – 29	≥30
Wasting	2.9	4.6 ↑	6.1	12.0 ↑	<5	5 – 9	10 – 14	≥15

Source: TDHS 2005, TDHS 2010

On the Mainland, eight out of 21 regions (38 percent) were grouped within the "very high" category and a further 10 out of 21 regions in the "high" (48 percent) range for stunting in 2005, rising to 14 out of 21 regions (67 percent) in the "very high" category and five out of 21 regions (24 percent) in the "high" range in 2010. Further, at 2-3 months, only 51 per cent of infants are exclusively breastfed, and this falls to 23 per cent by the age of 4-5 months. The duration of exclusive breastfeeding is on average only 2.5 months in mainland Tanzania and a shocking two weeks in Zanzibar which most likely contributes to the high incidence of acute malnutrition on the island. Complementary foods given to children are often carbohydrate-based and lack sufficient protein, minerals and vitamins. Many mothers lack the knowledge and support from other family members to exclusively breastfeed and to feed their young children appropriately.

Malnutrition is often a result of disease and inadequate dietary intake which are caused by multiple underlying factors including inadequate physical or economic access to food, poor health services, an unhealthy environment and inadequate caring practices for children and women. Basic underlying causes include poverty, illiteracy, low status of women, social norms and behaviours. On the basis of available trend data, it can be surmised that the combinations of factors contributing toward child malnutrition have not been effectively addressed over the last five years.

The impact of poor child nutrition has devastating consequences beyond health including the potential for reduced economic output. For that reason, improving nutrition is a precondition to achieving most of the Millennium Development Goals (MDGs), including eradicating poverty and hunger, reducing child mortality, improving maternal health, combating disease, empowering women and achieving universal primary education. Malnourished infants and young children who survive to adulthood have an increased risk of developing obesity and other chronic conditions due to their already fragile health systems.

1.2. Policy and Programmes to Address Nutrition in Zanzibar

The Revolutionary Government of Zanzibar, through the MoH has committed itself to ensure access to equitable health services for its citizens. The mission of the MoH is *to ensure that all Zanzibari secure their right to quality health services, rendered in a cost effective and affordable manner*. To achieve the above, the government has worked toward the development of key policies, programmes and an enabling legal and political environment through the following instruments:

- Zanzibar Food Security and Nutrition Policy 2008
- Zanzibar Food Security and Nutrition ACT 2011
- Zanzibar Health Sector Reform Strategic Plan II 2006/07 – 2010/11

Zanzibar Food Security and Nutrition Policy (2008)[1]

Zanzibar Food Security and Nutrition Policy is aligned with the Zanzibar Strategy for Growth and Reduction of Poverty (ZSGRP II) 2010-2015 (or MKUZA, the Swahili acronym) outlining the key development priorities of the Revolutionary Government of Zanzibar. The Policy mission seeks to promote sustainable and permanent availability, equitable accessibility and utilization of safe and nutritious food for all through integrated and well-coordinated multi-sector measures/initiatives at all levels of Government directly involving civil society and the private commercial sector. The Policy follows the principles of the Universal Declaration of Human Rights, the International Covenant on Economic, Social and Cultural Rights that every

[1] Revolution Government of Zanzibar (2008); Zanzibar Food Security and Nutrition Policy accessed on 5/23/ 2013 at http://www.kilimoznz.or.tz/images/policies/zfsnpolicy.pdf

person has the right to adequate food and nutrition and to a standard of living conducive to an active and healthy life. Emphasis on the prioritization of food and nutrition security in development planning processes provides the basis for outlining an integrated approach to food and nutrition security with key actions in the agricultural, health and other sectors.

The Policy recognizes the challenges faced by Zanzibar including a low base for domestic food production and the consequent heavy reliance upon food imports from the Mainland, erratic household production, the high incidence of protein energy malnutrition and micronutrient deficiencies. Areas with concentrations of vulnerable populations include Micheweni, Wete and Chake Chake district of Pemba and West, Town and North A districts of Unguja. On the whole, rural areas, particularly those along the coast are considered to be highly disadvantaged.

The Policy outlines five strategic areas of intervention including:

1. Improve national food availability through the enhancement of domestic food production and productivity and more efficient food marketing and trade
2. Increased purchasing power and access to food for resource poor households
3. Improved utilization of adequate, nutritious, safe and high quality food to all members of the household
4. Reduced vulnerability to food insecurity and malnutrition for resource-poor population groups through well-targeted social protection measures and effective national emergency preparedness and food emergency measures.
5. Improved management of the environment and of land and marine resources

The third goal, focusing on nutrition security at the household level provides the basis for interventions in support of improving access to clean and safe drinking water and sanitation and strengthening public health and nutrition support services including food supplementation and fortification and nutrition education.

Zanzibar Food Security and Nutrition Act 2011[2]

The Zanzibar Food Security and Nutrition Act 2011 sets out the governance structure and arrangements for issues relating to food availability, food accessibility, food utilization, food stability and the realization of the right to food with the Ministry of Agriculture positioned as the Government lead for matters concerning food security and nutrition in Zanzibar. A National Food Security and Nutrition Council was instituted with the Second Vice President as Chairperson to provide a mechanism for inter-ministerial coordination, decision making on planning and resourcing, to oversee situation and performance monitoring and collaborate with relevant stakeholders.

The emphasis on issues concerning food security and nutrition within the senior administration of Government as well as the inter-sectoral nature of its governance structure provides an important basis for partners to engage on issues concerning nutrition security at the facility and community level.

The Zanzibar Health Sector Reform Strategic Plan II (ZHSRSP II) 2006/07 – 2010/11[3]

[2] SMZ (2011); The Food Security and Nutrition Act accessed on 5/23/2013 at http://faolex.fao.org/docs/pdf/tan108982.pdf

[3] The Revolution Government of Zanzibar Ministry Of Health And Social Welfare Zanzibar Health Sector Reform Strategic Plan II 2006/07 – 2010/11 http://41.73.201.42/hmis/documents/HSRS%20Strategic%20Plan%20II%20Final.pdf **Error! Hyperlink reference not valid.**

Health sector development in Zanzibar is guided by the National Health Policy and the Zanzibar Health Sector Reform Strategic Plan (ZHSRSP) II 2006/07 to 2010/11. The National Health Policy has the overall goal to "improve and sustain health status of all Zanzibar people". The Ministry of Health & Social Welfare leads upon the management and direction given to the health sector in Zanzibar. The Ministry is independent of its counterpart on the Mainland and leads upon overall policy formulation, technical management, and monitoring and supervision.

The Strategic Plan incorporates human rights principles, emphasizing political commitment and engagement with civil society through a multisectoral approach; a commitment to reducing stigma and discrimination associated with HIVAIDs; and overall sensitivity to the socio-cultural context of Zanzibar to ensuring access to health services for all.

The area of nutrition is given profile within the area of Reproductive and Child Health, including priority targets covering access to food, dietary intake, and care of the individual (Table 4).

Table 3: Nutrition Targets and Core interventions HSRP II

Targets	Core interventions
• Increase the proportion of exclusively breastfed infants from 21% to 30%. • Promote micronutrient consumption of Vitamin A from 87% to 95 % • Increase salt iodisation from 25% to 60% on Pemba, and from 65% to 80% on Unguja • Reduce prevalence of stunting among under-five children from 23% in 2005 to 10% by 2010 • Reduce prevalence of wasting among under-five children from 6,1% in 2005 to 2% by 2010	• Counseling on infant and young child feeding • Supplementation of Vitamin A and de-worming of under-fives through both health facilities and Village Health Days • Salt iodisation in Pemba • Routine growth monitoring and promotion • Supplementation of iron foliate to pregnant women

Source: Zanzibar Health Sector Reform Strategic Plan II

Delivery of health services within Zanzibar relies upon a network of Primary Health Care Units (PHCUs), providing basic primary healthcare services; Primary Health Care Centers (PHCC), providing inpatient care in locations characterized by high population density than those served by a PHCU; District hospitals providing second-line referral services; a general referral hospital, a maternity hospital and one hospital specialised in mental health.

ZHSRSP II outlines five core strategies to be addressed over the five-year period:

1. Strengthening human resources for health (HRH)
2. Strengthening decentralised health service delivery
3. Ensuring coverage for vulnerable groups
4. Improving efficiency through integration
5. Improved transparency, accountability and partnership.

The high recognition given to the area of human resources for health is important due to continued challenges with ensuring the availability of sufficiently skilled human resources in the health sector, characterized by an aging workforce, low productivity driven by low salaries and limited career development opportunities[4]. Efforts to explore cost-effective ways to support capacity development are emphasized,

[4] Revolutionary Government of Zanzibar (2011) *Report of the 6th Zanzibar Annual Joint Health Sector Review*, Ministry of Health, Zanzibar

including distance learning and the boosting of information communication technology (ICT) resources for delivery of learning opportunities.

1.3. Maternal Health Situation in Tanzania/Bagamoyo, Pwani Region

Tanzania is very far from achieving the Millennium Development Goal of reducing Maternal Mortality (MDG5). Between 1961 and 1990, the ratio of maternal mortality was on a downward trend from 453 to 190 per 100,000 live births but has since proceeded on an increasing trend, peaking at 578 per 100,000 live births in 2004/2005 and then declining to 454 per 100,000 live births in 2010. Most maternal deaths are attributable to pregnancy, childbirth and the poor quality of health services with more than 80% of maternal deaths considered to be preventable if women have access essential maternal and obstetric care and skilled attendance at childbirth. Despite a high coverage of pregnant women attending at least one antenatal care visit at 96 percent, only 51 per cent of women have access to skilled delivery. Coverage of emergence obstetric services still remains an issue reaching just 64.5 percent of the population and utilization of modern family planning methods is dismally low at 27 percent.

Tanzania has invested however considerable resources to reduce maternal mortality focusing on reproductive and child survival; improving access to skilled delivery; rolling out maternal death audit review mechanisms; and focus on strengthening integration with other areas of maternal and child health services including family planning, malaria interventions, expanded program on immunization and adolescent health and nutrition programmes.

Interventions in support of reducing maternal mortality are challenged by inadequate access to maternal health care services, the low socio-economic status of women, insufficient skilled health workers, a lack of basic equipment and supplies, and long distances from home to health care facilities. Women living in rural areas, particular those from the poorest families, who are often less educated have the least access to skilled attendance at delivery. Women who start having children during their adolescence tend to have more children and shorter spacing between pregnancies – all of which are risk factors for maternal and neonatal mortality. Complications associated with pregnancy increase with the relational effects of HIV/AIDS and malaria therefore, pregnant women attending ANC are entitled to receive intermittent preventive treatment for malaria and ferrous sulphate for anaemia prevention. In addition, screening of HIV and syphilis and prevention of mother to child transmission of HIV (PMTCT) services are provided to all expectant mothers free of charge in public health facilities.

1.4. Policy and Programmes to Address Maternal Health on the Mainland

The Government of Tanzania has supported the development and implementation of different policies, strategies, and interventions to address the core factors contributing to maternal death and ensure provision of maternal health care at all levels on Mainland Tanzania. Indeed, Tanzania was the first country in Sub-Saharan Africa to endorse and adopt the Safe Motherhood Initiative strategy in 1989 and has since introduced new policy documents and guidelines to guide and mobilize additional resources. These include the following:

- Health Sector Strategic Plan III July 2009 – June 2015[5]
- Primary Health Services Development Programme (PHSDP) 2007 - 2017

[5] URT ( ) The Health Sector Strategic Plan III July 2009 – June 2015 accesses on 5/24/2013 at http://www.mamaye.or.tz/sites/default/files/evidence/HealthSectorStrategicPlan.pdf

- Reproductive and Child Health Strategy (2008-2015)
- Road Map for Accelerating the Reduction of Maternal, Newborn and Child Morbidity and Mortality: 2008 -2015

Tanzania Health Sector Strategic Plan III July 2009 – June 2015[6]

The Tanzania Health Sector Strategic Plan (HSSP III) was developed in 2008 by the MoH, serving as the key policy document for the health sector in Tanzania for the period July 2009 – June 2015. HSSP III was developed to guide planning at sub-national levels and for annual planning purposes and includes the following eleven strategies related to health service delivery:

1. District health services
2. Referral hospital services
3. Central level support
4. Human resources for health
5. Health care financing
6. Public private partnerships
7. Maternal, newborn, and child health
8. Prevention and control of communicable and non-communicable diseases
9. Emergency preparedness and response
10. Social welfare and social protection
11. Monitoring, evaluation and research

Priority Reproductive and MNC Health interventions focus on youth, family planning and nutritional services. MNCH improvement is seen as being driven by increasing the number of primary health facilities, increasing the number of competent staff, ensuring adequate equipment and supplies in health facilities, improving the referral system to expand access to emergency obstetric care and recognizes the important role of communities in supporting and promoting reproductive health practices.

Primary Health Services Development Programme (PHSDP) 2007 - 2017[7]

The objective of the Primary Health Services Development Programme (PHSDP) is to accelerate the provision of primary health care services for all by 2012. The main areas of focus will be on strengthening the health systems, rehabilitation, human resource development, the referral system, increase health sector financing and improve the provision of medicines, equipment and supplies.

Reproductive and Child Health Strategy (2008-2015)

The Tanzania Reproductive and Child Health Strategy was introduced by the MoHSW with the objective of reducing maternal, neonatal and child mortality (MNCM) in accordance with targets to achieve MDG 5 by 2015. MNCM is one of the key components of the National Package of Essential Reproductive and Child Health Interventions (NPERCHI) focusing on improving the quality of life for women, adolescents and children.

[6] URT ( ) The Health Sector Strategic Plan III July 2009 – June 2015 accesses on 5/24/2013 at http://www.mamaye.or.tz/sites/default/files/evidence/HealthSectorStrategicPlan.pdf
[7] URT (2007) Primary Health Services Development Programme (PHSDP) 2007 - 2017 accessed on 5/23/ at http://www.unfpa.org/sowmy/resources/docs/library/R222_MOHTanzania_2007_PHC_2007-2017.pdf

Road Map for Accelerating the Reduction of Maternal, Newborn and Child Morbidity and Mortality: 2008 - 2015

The National Road Map Strategic Plan to Accelerate Reduction of Maternal, Newborn and Child Health in Tanzania 2008-2015 (also known as "One Plan") aims at improving coordination of interventions and delivery of services across the continuum of care to reduce maternal mortality by three-quarters from 578 (from 2008) to 193 deaths per 100,000 live births by 2015. Key programmes that were integrated in Maternal and Child Health services include Safe motherhood; Family Planning; Prevention of Mother to Child Transmission; Malaria; Expanded Programme on Immunisation; Adolescent Health and Nutrition.

2. Guidelines and Project Design

The development and introduction of intervention guidelines provides an important mechanism and standard for ensuring quality of care and clinical effectiveness based on principles of evidence-based care and support. The chapter provides an overview of the key guidelines influencing project evolution and design and associated logic model used for project implementation.

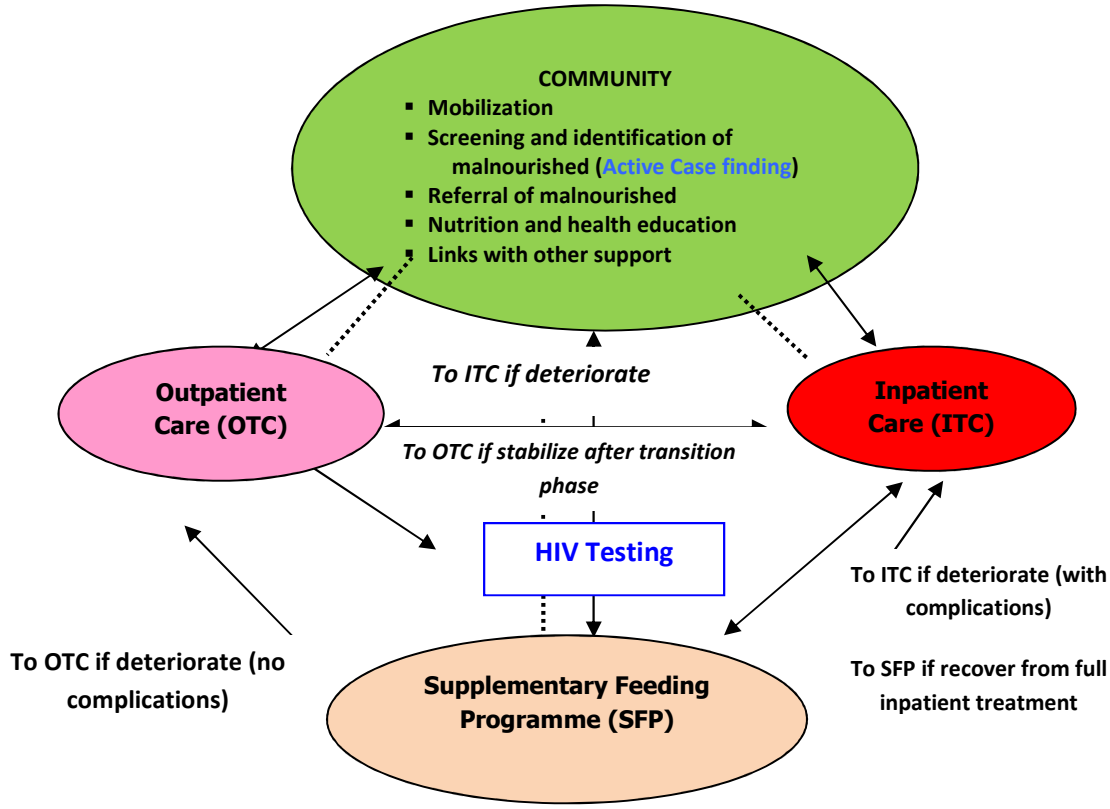
2.1. Guidelines and Protocols for Outpatient Therapeutic Care (OTC)

Outpatient Therapeutic Care is a key component within Zanzibar's overall approach to the Integrated Management of Acute Malnutrition, introduced in February 2010. Prior to the introduction of the Interim Zanzibar Guidelines for the Integrated Management of Acute Malnutrition, no official standards existing to support frontline health workers in the assessment and management of acute malnutrition in Zanzibar with treatment limited to facility based approaches which lacked scale and coverage.

IMAM is a strategy to address acute malnutrition and focuses on the integration of the management of acute malnutrition into the on-going routine health services at all levels of the health infrastructure. Routine nutrition assessment and management should be incorporated in all treatment, care and support services. As depicted in Figure 2 below, IMAM covers four components: Community outreach, Inpatient Therapeutic Care (ITC), Outpatient Therapeutic Care (OTC) programmes and Supplementary Feeding Programmes (SFP).

The Community Outreach component of IMAM involves early identification of severely malnourished clients at community level to enable early detection and referral and to increase the number of Severe Acute Malnutrition (SAM) cases that can access quality treatment. The treatment of the acutely malnourished clients is either done in the Inpatient Therapeutic Care centers or in the Outpatient Therapeutic Care centers depending on the presence or absence of complications. The basis for managing SAM with no complications in outpatient care is that the clients do not require hospitalization and can be successfully treated using ready-to-use therapeutic foods (RUTF). Home-based management and treatment of SAM with no complications make community outreach an essential component of IMAM approaches.

Figure 2: Movement between the components of integrated management of acute malnutrition



Source: Zanzibar Guidelines for OTC of SAM

To provide guidance to frontline health workers on the implementation of outpatient therapeutic care of severely malnourished children without complications, the MoH introduced the Guideline for the Outpatient Therapeutic Care (OTC) of Severely Malnourished Children in October 2010. The MoH piloted the guidelines across the majority of Primary Health Care Units in Zanzibar with training provided to health managers, doctors, nurses, nursing aides, nutritionists and community workers with responsibility for care and treatment of acutely malnourished children in Zanzibar. The guidelines outline the workflow for treatment from screening, clinical assessment, registration and dispensing of medicines and Ready to Use Therapeutic foods.

2.2. eNutrition in Zanzibar: Evolution

D-tree developed a custom Android application using a SQLite database consistent with the OpenMRS concept model for both eNutrition and eMNH to develop electronic decision trees for use by facility-based health workers. In addition, D-tree partnered with Dimagi, a US private technology company, to develop the community component of eMNH using a product referred to as CommCare using open-source software for use on mobile and virtual platforms. D-tree has been working in the area of child health to improve the flexibility and use of Integrated Management of Child Illnesses (IMCI) protocols in Tanzania through the

development of an electronic version of IMCI (eIMCI) for use on cell phones and other mobile devices. The eIMCI application was piloted in rural Tanzania and initial results indicated that clinicians more closely adhere to the IMCI protocol when using eIMCI than without it and were enthusiastic about its use with patients. In addition, D-tree have also developed similar applications for the purpose of triaging HIV/AIDS patients receiving Anti-Retroviral Treatment (ART) in the areas of tuberculosis, diabetes, home based care, malaria and reproductive health.

UNICEF has developed a long standing relationship with the MoH to support scale up of essential nutrition services in Zanzibar, including support to the development of guidelines for IMAM and OTC. Recognizing the challenges within the existing health workforce in Zanzibar, opportunities for collaboration were initiated by D-tree with the UNICEF Country Office to seek innovative ways to test a method for improving adherence by health workers to standard operational guidelines, and thereby improve the quality of care. As the project would be implemented as a pilot, Zanzibar offered a preferred environment due to the higher prevalence of acute malnutrition compared to the Mainland and the recent introduction of national standards and guidelines for IMAM and OTC which could be adapted with the algorithm based protocol for development of the decision support application.

The applications developed for use in Tanzania and Zanzibar by UNICEF is compatible for mid-range and Android-based mobile phones. While the application has the potential to be deployed covering multiple modules, in this specific case, the collaboration with UNICEF has focused on one specific component of supporting the outpatient treatment of children affected by severe acute malnutrition in Zanzibar and does not cover the more complicated Inpatient Therapeutic Care (ITC) component. The application guides health workers to correctly identify, register, examine, follow up and treat children affected by severe acute malnutrition and to support them in identifying those children who are progressing well in the program and those who need to be referred for more specialized treatment or inpatient care. To pilot the technology in a manageable group as the basis for further refinement, six of 158 health facilities in Unguja were equipped with mobile phones and trained on the use of the application by D-tree project staff over a two year period.

2.3. eNutrition Project Design and Implementation in Zanzibar

Logic Model for eNutrition

The **overall goal** of the pilot nutrition project was to improve the timely detection and accurate management of severe acute malnutrition in children aged 6-59 months. The expected project results were:

(i) Phone-based application to correctly manage severe acute malnutrition at the outpatient level in children aged 6-59 months is developed and applied in six clinics.
(ii) Feasibility of a phone based reminder system for caretakers is developed and tested to increase the retention rate of children in the program.

To effectively evaluate the eNutrition project the project planning matrix based on the above results was refined and validated with stakeholders to develop the causal effect chains indicated in Appendix B. The project has been implemented with the logic of effecting change through the development of decision support applications and information systems as the basis for strengthening facility and community based approaches to nutrition. In the absence of a counterfactual and a baseline having been established during the project design, the evaluation focuses first and foremost on the fidelity of implementation i.e. did the project implement what was planned and agreed to be delivered and if so why and if not why not.

The underlying logic for implementation was to strengthen the capacities of health service providers and community health workers to detect, manage and treat children affected by severe acute malnutrition through the OTC component. The health workers through the use of a mobile application are provided with decision support that simplifies the task of assessing and supporting each malnourished child that is seen, leading to more accurate treatment regimens, improved follow up of individual children and better outcomes. Support on counseling would lead to improvements in educating mothers and/or caregivers on nutrition when they visit health facilities or when the community health workers carry out community outreaches. Mothers would acquire new knowledge on the Essential Nutrition Actions and would practice the recommended good practices such as breastfeeding within the first hour of birth, exclusive breastfeeding up to 6 months, follow the recommended child feeding practices for complementary feeding of children above 6 months and for sick children, among other good practices.

The eNutrition application partitions Zanzibar's national guidelines on Outpatient Therapeutic Care (OTC) into several electronic protocols to aid health workers in the Screening and Registration of each child with malnutrition. In elaborating the project's logic models, the following key assumptions were extracted:

- **Existence of national eHealth/mHealth strategy/policy** – Unlike mainland Tanzania, Zanzibar has not progressed with the development of a government-wide eGovernance strategy. The role of health information and the contribution of ICT toward the health sector are however recognized within MKUZA. Developing a mHealth strategy entails defining strategic approach to mHealth that recognizes broader priorities for information and communication technology (ICT), including e-government addressing key questions such as:

    - How can mHealth and ICT improve healthcare?
    - What broader ICT and eGovernment priorities and initiatives have the potential to complement mHealth?
    - What core regulatory and implementation requirements need to be in place such as incentives and financing?
- **Buy-in and ownership of key stakeholders established and maintained** – This includes the establishment of a mHealth Community of Practice in Zanzibar as is in the case on the Mainland.
- **Sufficient funding maintained for all phases covering set-up and recurrent costs** – It was envisaged that UNICEF would fully support the costs related to the piloting according to the project document.
- **Availability of sufficiently literate health workers with capacity to take on new technology as part of their work** – the capacity of health workers to integrate the use of the mobile phones was premised on the basis of their existing capacity and aptitude to take on new tools to support their core work functions.
- **Business continuity systems in place to maintain network coverage and functionality** – business continuity implies availability of backup systems to ensure the continuance of critical operations. In selecting Zanzibar as the site for piloting of the tools, reference to network coverage and availability and backup power were key considerations.
- **Fully functional and operational Outpatient Therapeutic Care programme –** whilst UNICEF through support to MOH Zanzibar provided the initial training, equipment, supplies and tools, it was assumed that all are in place and in use by the respective facilities piloting the mobile phone application.

Other issues outside the domain of the project but are critical success factors for the project include the partner government's strategies and priorities, international, regional or country development goals, strategies and frameworks, the concerned agency's corporate goals and priorities, as appropriate. Most areas are discussed in cross-cutting issues and government priorities were presented in Section One.

Project implementation:

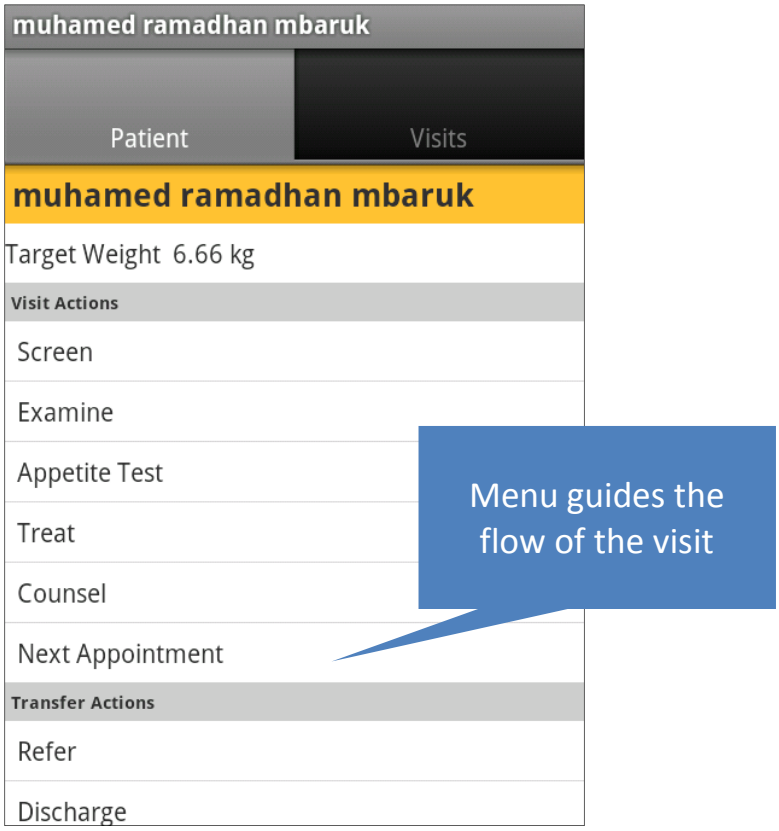
Trained health workers were provided with a mobile handset on which the eNutrition application guides the user through a step by step process for the screening and treatment process. The software, maintains a password protected record of each child that comes to the clinic. The application supports the health worker in the decision making for the management for malnourished children and the follow up of the interventions that the child receives.

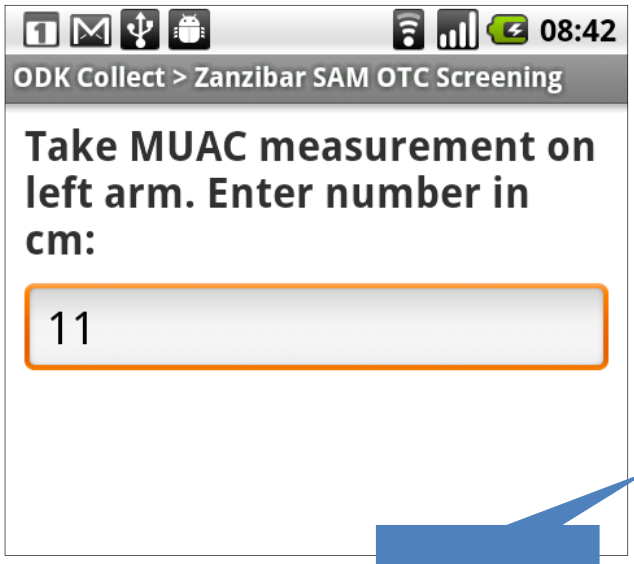
During each visit the enrolled child would receive the following screening by the trained health worker:

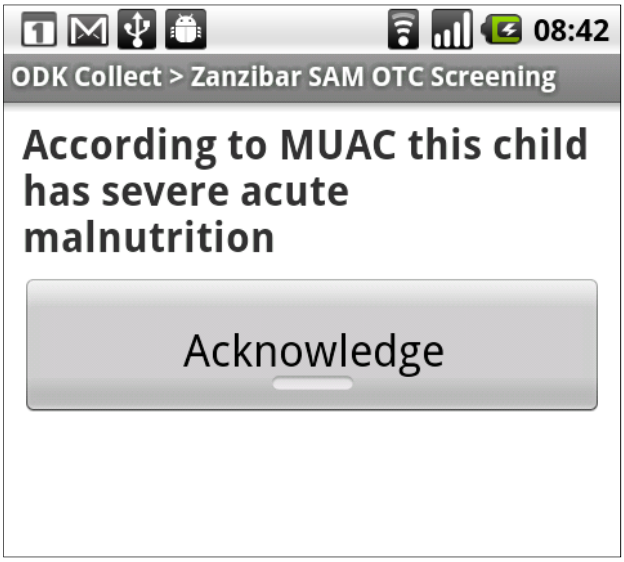
i. Anthropometry: weight and MUAC are taken to assess progress. Static weight or weight loss requires action
ii. Medical history and physical examination to investigate the presence of medical complications and the need for referral to ITC
iii. The appetite test to identify any problems with feeding to assess the need for home visit or referral to ITC
iv. Continuation of drug treatment protocol
v. Supply of RUTF
vi. Individual counseling as well as group health and nutrition education
vii. Assessment of readiness for discharge according to discharge criteria

Sample screen shots presented below provide a graphic overview of the interface as presented to the health worker.

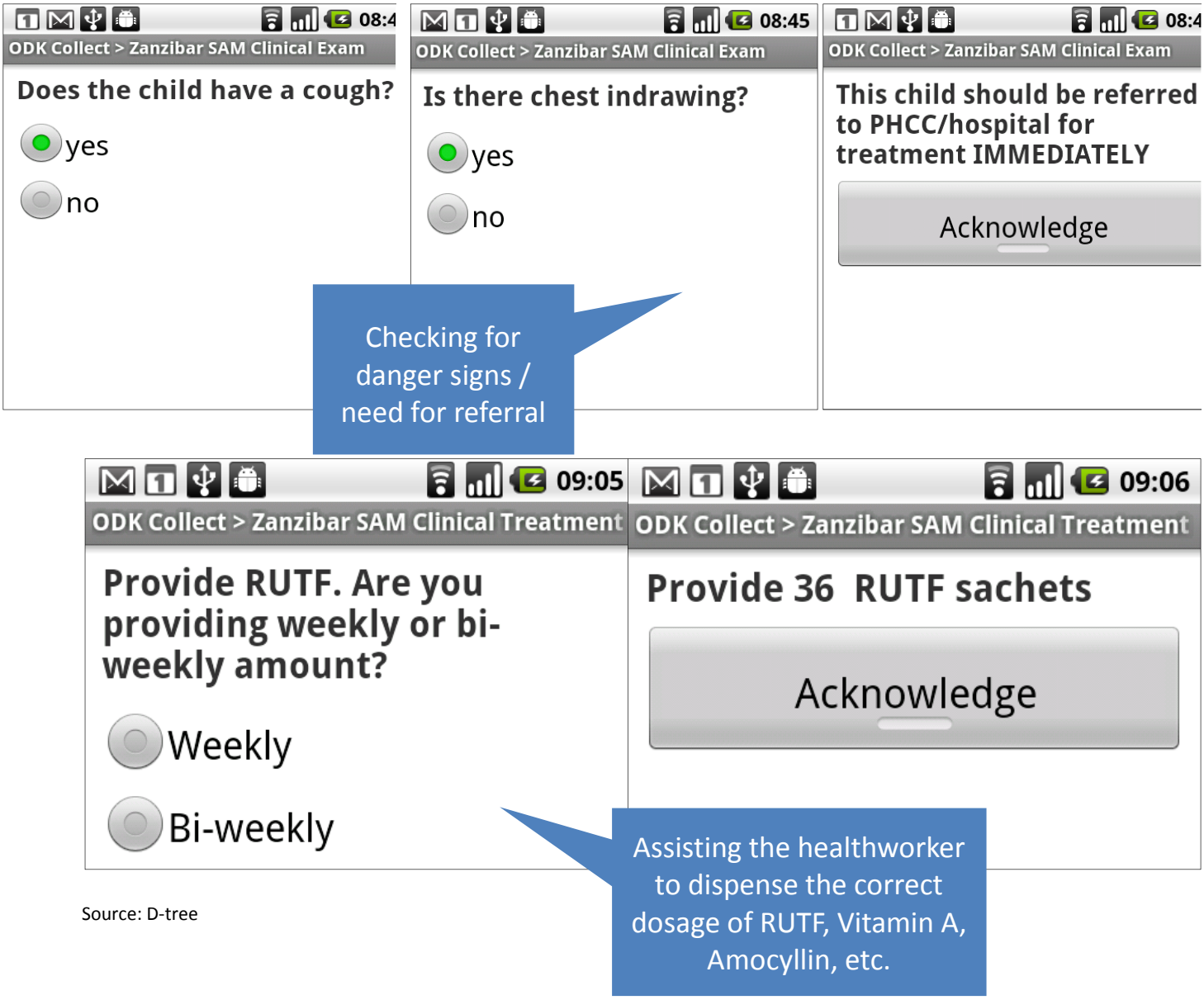
Figure 3: Sample screen shots from e Nutrition


muhamed ramadhan mbaruk
Patient
Visits
muhamed ramadhan mbaruk
Target Weight 6.66 kg
Visit Actions
Screen
Examine
Appetite Test
Treat
Counsel
Next Appointment
Transfer Actions
Refer
Discharge
Menu guides the flow of the visit


08:42
ODK Collect > Zanzibar SAM OTC Screening
Take MUAC measurement on left arm. Enter number in cm:
11


08:42
ODK Collect > Zanzibar SAM OTC Screening
According to MUAC this child has severe acute malnutrition
Acknowledge

screening



Source: D-tree

2.4. Management of OTC and Partnership Arrangements

The management of the OTC project is based on the UNICEF and the United Republic of Tanzania Basic Cooperation Agreement that that was signed on 26 September 1994 (the "BCA") that sets a framework and a platform for UNICEF's work in Tanzania. The UNICEF-Tanzania Programme is part of the Government's overall development strategy and has been established within the context of the United Nations Development Assistance Framework (UNDAF) for Tanzania dated 15 December 2006. This has continued with the United Nations Development Assistance Plan (UNDAP) 2007 -2011 under Health & Nutrition Outcome 5: *MOHSW and LGAs produce, quality and timely data for evidence based planning and decision making* within which UNICEF has committed to supporting the MoHSW and MoH to strengthen health and nutrition M&E and surveillance systems including the development and scaling up of innovative approaches for data and information capturing.

Based on the above, UNICEF on behalf of the Revolution Government of Zanzibar signed a partnership contract with D-Tree that sets the responsibility of each partner. The key partners UNICEF and D-Tree

agreed to manage the project by the designation of Focal Points and a Programme Manager, D-Tree contribution related to technical assistance, supplies and equipment while UNICEF provided technical assistance and the financial support that facilitated D-Tree to procure the equipment, supplies and the technical assistance in developing mobile phone applications, training and oversight of the use of the phones. Coordination involved quarterly meetings that were to be attended by UNICEF, D-Tree and ZMOHSW. The performance of the management and oversight structure is analysed under cross cutting issues.

2.5. Guidelines and Protocols for Maternal Health

The MoHSW adopted guidelines for Focused-Antenatal Care (F-ANC) in 2002 with recognition of that the potential benefits of ANC were not being realized. The F-ANC guidelines provide specific evidence-based interventions for all women, carried out at certain critical times in the pregnancy with reference to the following guiding principles:

- That the number of visits for those identified not to be at high risk, is reduced to four.
- Each of the visit relates to a well-defined set of activities that are essential to monitoring progress and are in following areas:
    - Screening for conditions likely to increase adverse outcomes,
    - Providing therapeutic interventions known to be beneficial, and
    - Educating pregnant women about planning for a safe birth, emergencies during pregnancy and how to deal with the issues identified.

The prominent feature of F-ANC is its emphasis on the provision of sufficient time during each visit for discussion of the pregnancy and related issues with the patient. The checklist used by the health worker is administered according to the stage in the pregnancy cycle as outlined in Table 5.

Table 4: Focused Antenatal Care Checklist

Parameter	First visit (<16 weeks	Second visit 20–24 weeks	Third visit 28–32 weeks	Fourth visit (36 weeks)
1. Registration	✓			
2. History taking				
Personal history	✓			
Family history	✓			
Social history	✓			
Past medical/surgical history	✓			
History of complaints in current pregnancy	✓	✓	✓	✓
3. Examination				
Head to toe (whole body)	✓	✓	✓	✓
Pallor	✓	✓	✓	✓
Oedema (other than anklelespecify)	✓	✓	✓	✓
Breast	✓			✓
Lungs and heart	✓			✓
4. Observation and clinical investigation				
Temperature	✓			

Pulse	✓			
Blood pressure	✓	✓	✓	✓
Weight	✓		✓	✓
5. Obstetric complications				
Fundal height	✓	✓	✓	✓
Foetal presentation and engagement			✓	✓
Foetal heart sound		✓	✓	✓
6. Pelvic (vaginal) examination				
Soft tissue assessment	✓			✓
Bony pelvic assessment				✓
7. Laboratory investigations				
Blood:	✓	✓	✓	✓
Haemoglobin	✓			
Grouping and rhesus factor	✓			
RPR	✓			
HIV testing	✓			
Urine: Protein, sugar, acetone	✓	✓	✓	✓
8. Drug administration and immunization				
Iron	✓	✓	✓	✓
Folic acid	✓	✓	✓	✓
Antimalarials (Fansidar 3 tablets)	✓	✓	✓	
Tetanus toxoid	✓	✓	✓	
9. Client Education and counselling (for the couple)				
Process of pregnancy and its complications	✓	✓	✓	✓
Diet and nutrition	✓	✓	✓	✓
Rest and exercise in pregnancy	✓	✓	✓	✓
Personal hygiene	✓			
Danger signs in pregnancy	✓	✓	✓	✓
Use of drugs in pregnancy	✓	✓	✓	✓
Effects of STI/HIV/AIDS	✓	✓	✓	✓
Voluntary counselling and testing for HIV	✓			
Care of breasts and breast feeding	✓			✓
Symptoms/signs of labour				✓
Plans of delivery (emergency preparedness, place of delivery, transportation, financial arrangements)	✓	✓	✓	✓
Plans for postpartum care			✓	✓
Family planning			✓	✓
Harmful habits (e.g. smoking, drug abuse, alcoholism)	✓	✓	✓	✓
Schedule of return visit	✓	✓	✓	✓

Source: D-tree

2.5. eMNH in Bagamoyo: Evolution

D-tree initiated the collaboration with UNICEF for eMNH in parallel with the development of eNutrition. In contrast to the project in Zanzibar, eMNH was developed for use in both the facility and the community to deliver standard based care to pregnant, postpartum women and newborns along a continuum of care. In consultation and agreement between UNICEF and D-tree, Bagamoyo was nominated to pilot the eMNH application being one of the Seven Learning Districts (7LDs) supported by UNICEF during the Country Programme implemented between 2007 and 2010 and where UNICEF had an existing collaboration with

Population Services International (PSI) to implement an integrated strategy for behavior change communication to promote hygiene and sanitation; malaria prevention and treatment; exclusive breastfeeding; management of diarrhea; newborn care; delivery at health facility; routine child health services, and; management of a sick child.

UNICEF's investments at sub-national level built upon previous achievements in supporting the Government of Tanzania in capacity building for service delivery, including the testing of different and innovative models of for engagement. The 7LDs Strategy sharpened UNICEF's focus towards on supply and demand-driven capacity building as the basis for influencing the policy agenda at national level as well as strengthening child-sensitive planning, resource allocation and delivery of basic services at district and sub-district levels.

2.6. eMNH Design and Implementation in Bagamoyo

Logic Model for eMNH

The overall goal of the eMNH project was to reduce both maternal and newborn mortality by delivering a continuum of care for mothers, newborns that spans both time and place. The expected results of the pilot were:

(i) Phone-based applications for use in the community and health facility to deliver standard based care to pregnant, post-partum women and newborns are designed.
(ii) Feasibility of phone based applications to increase the rates of standards based care to pregnant, postpartum women and newborn at the community and facility level and to improve maternal and neonatal survival is tested.

As in the eNutrition project, the project planning matrix was refined and validated with stakeholders to develop the causal effect chains indicated in Appendix 3. The theory was to strengthen the capacities of frontline health workers including facility based nurses to raise awareness among pregnant and lactating mothers on availability and importance of using proper maternal and child care services provided at health facility level. These staff would be oriented on the eMNH module in line with the protocol for Focused Antenatal Care and other related guidelines and the phone based decision support helps nurses remember to include important tests such as blood pressure, HIV status and hemoglobin as prescribed in these guidelines. Through the community side of the application, Community Change Agents (CCAs) supported by the NGO UKUN, were trained to use the eMNH tool to promote MNCH service uptake through community outreach services at the household level.

The theory of change developed the following assumptions that are briefly described:

- Existence of national ehealth/mHealth strategy/policy – A draft eHealth strategy that was developed with the technical and financial support from Research Triangle Institute (RTI) International and Centers for Disease Control and Prevention (CDC) under the MESI project has been developed and the MOHSW is reviewing the draft Strategy before circulating it to the stakeholders for comment and improvements;
- Buy-in and ownership of key stakeholders established and maintained – The Community of Practice (CoP) is active and it has so far organized three meetings and has an established vision. A section is dedicated to the CoP in cross cutting issues.
- Sufficient funding maintained for all phases covering set-up and recurrent costs – UNICEF contributed the planned funding as requested

- Availability of sufficiently literate health workers with capacity to take on new technology as part of their work – Both the eHealth and the eGovernance strategy recognizes the need of e-literacy. Issues remain however with availability of funds to support such capacity development initiatives.
- Business continuity systems in place to maintain network coverage and functionality – Most of the social entrepreneurs implementing the pilots and through the CoP are seeing pilots as barriers to business continuity and their agenda is to plan for business continuity.

Project implementation

The eMNH is divided in community and facility algorithms as explained below:

- The facility-level application is used by nurses, nurse-midwives, or clinical officers who are seeing pregnant women during antenatal visits. The software runs on mobile phones and provides these health workers with step by step instructions to ensure that each antenatal visit includes all necessary components that support good pregnancy outcome for both mother and newborns.
- The community-level application assists Community Change Agents to promote safe pregnancy practices (e.g. sleeping under ITNs), improve the attendance of antenatal care, encourage facility based deliveries and postnatal care visits. Again using a step by step process to help the CCA know exactly what to do and what to say to the client as the application assists in the registration of new clients, identifies potential problems during the antenatal and postnatal period and use alerts to the CCA just prior to the estimated time of delivery to follow up and encourage facility based deliveries and postnatal visits.
- A third application to integrate the facility and community components was not developed as planned within the project time period. This was subsequently developed with the support of JHIPEGO to share information between CCAs and clinic staff. The software uses the communications ability of the mobile phones to send and receive data and alerts the community health worker of women who are registered or seen for antenatal visits at the clinic so that they can schedule follow up visits with the women at their homes. Clinic staff are supposed to have a record of women seen by a CCA and what problems, if any, were identified during these home visits.

The respective areas covered by the module are outlined in Table 6 below.

Table 5: Protocols/checklists covered by eMNH for community and facility use

Community Application		Facility Application	
▪ sleeps under ITN	▪ deworming tablet	▪ registration of women including information enabling follow up by CCAs;	▪ Iron, Folic Acid, Vitamin A supplements
▪ Iron, Folic Acid, Vit. A supplements	▪ Has birth plan	▪ counseling for facility based delivery;	▪ deworming tablet
▪ Tetanus immunization	▪ tested for HIV, syphilis in last 12 months	▪ blood pressure measurement;	▪ tetanus immunization;
▪ finished tetanus immunization	▪ danger signs during pregnancy and postpartum	▪ urine testing for bacteriuria and proteinuria;	▪ IPT for Malaria
▪ started IPT for Malaria	▪ danger signs in the newborn	▪ blood testing to detect anemia and infection including HIV testing;	▪ if appropriate, PMTCT counseling and
▪ finished		▪ weight/height measurement;	

IPT for Malaria		▪ assessment of fetal growth;	▪ treatment ▪ postpartum assessment

Source: D-tree

The protocols used for the development of eMNH were developed in collaboration with the MoHSW, other development partners, UNICEF, Bagamoyo district health staff, UKUN and the facility and community health workers themselves. These protocols were programmed onto Nokia phones using CommCare and enabled with the capacity to send data to D-tree servers via GPRS for backup, aggregation and reporting. The initial implementation period was supported with frequent monitoring and supervision, providing a basis for continued feedback from end users and enabling for system improvements. This included provisions to allow nurses to update the gestation age based on fundal height, more efficient and timely synchronization, inclusion of an SMS component from the CCAs to the health facilities, and various Swahili language updates.

As with eNutrition, eMNH runs on a password-protected Android operating system. The software is designed to be interactive, taking the health worker step by step through the FANC guidelines using data from past and current visits to determine the pregnant woman progress and treatment. The software captures the data as it is entered into the application so has a secondary benefit of making program data available to health service administrators on a daily basis. Reports developed for the community health workers as the basis for performance monitoring. Additional reports were also designed with key government indicators from the monthly ANC reports for the facility health workers to support evidence based planning and monitoring. All data is stored at the central server located at the University of Dar es Salaam -Computing Centre.

With the support of UNICEF, eMNH was implemented in two facilities at Lugoba and Miono health centers where each facility was allocated two mobile phones loaded with the facility application and a total of eight health workers in the two facilities were trained in the use of the application. For the community component 10 CCAs were trained and provided with mobile phones loaded with the community application.

Since the end of its cooperation with UNICEF, D-tree has worked to extend and modify the functionality of eMNH with the support of other Health Development Partners including JHPIEGO to also cover postnatal/ facility and community components and with World Vision to further expand its geographic coverage. The modifications made to eMNH now enable for more flexible information exchange between facility-based nurses and community workers and vice versa. This additional capability for information sharing is not currently compatible for use on the mobile phones being used by the CCAs in Bagamoyo; extension would require migration to a low end Android phone due to compatibility issues with the Nokia operating system which the CCAs currently use.

2.7. Management of F-ANC and Partnership Arrangements

UNICEF support to maternal health based on the UNICEF and the United Republic of Tanzania Basic Cooperation Agreement that that was signed on 26 September 1994 (the "BCA") that sets a framework and a platform for UNICEF's work in Tanzania. It is also in guided by UNICEF's and the Government of Tanzania programme of cooperation for the period 2007 -2011 to improve the lives of children and women in Tanzania. The UNICEF-Tanzania Programme is part of the Government's overall development strategy and has been developed within the context of the United Nations Development Assistance Framework for Tanzania dated 15 December 2006. UNICEF on behalf of the Government of United Republic of Tanzania signed a partnership contract with D-tree that sets the responsibility of each partner. The key partners UNICEF and D-tree agreed to manage the project by the designation of Focal Points and a Programme

Manager, D-tree contribution related to technical assistance, supplies and equipment while UNICEF provided financial support that facilitated D-tree to procure the equipment, supplies and the technical assistance.

Under the strategy for the 7 Learning Districts, UNICEF collaborated with Population Services International (PSI) to implement an integrated communication strategy focusing on the promotion of hygiene and sanitation; malaria prevention and treatment; exclusive breastfeeding; management of diarrhoea; newborn care; delivery at health facility; routine child health services, and management of sick children. The key objective of the behavior change communications work in these locations was to improve the awareness and practices of pregnant women and care givers of children under five in key survival, growth and development practices. PSI adopted a community change agents approach targeting community volunteers to interpersonal communication and encourage households to improve key behaviours. In each of the 7 Learning Districts, PSI sub-contracted a local NGO to support implementation of this work; in Bagamoyo, the local partner was UKUN. Discussions between UNICEF and D-tree sought to capitalize upon this existing investment by using the same cadre of Community Change Agents (CCAs) and building upon the communications materials developed by UNICEF and PSI for the implementation of eMNH. Funds received from PSI were directed through UKUN to support the 10 CCAs working in the two locations. An additional two personnel within UKUN were trained on how to securely access the reports showing the activity of the CCAs through the global CommCare website.

3. Evaluation Scope and Methodology

In 2013, UNICEF commissioned an external evaluation of the two projects implemented by D-tree International through a competitive bidding process in which Bluwat (Tanzania) Limited were selected to undertake the assignment. The external evaluation is intended to contribute to accountability and learning for key stakeholders including the Tanzania and Zanzibar Ministries of Health & Social Welfare, D-tree International, UNICEF, sub-national health teams and civil society; provide recommendations on future scale up; and inform UNICEF Tanzania Country Office programming strategies linked with the use of mobile technology for different areas of programme implementation and information systems strengthening. Stakeholder meetings and consultation processes have been built into the assignment, including an inception briefing for the eMNH project on the Mainland and for the eNutrition project in Zanzibar, consultations and key informant interviews during the data collection phase, and opportunities for comment on the inception and main evaluation reports. This latter engagement also involved the validation of recommendations by key stakeholders.

The purpose of the evaluation is to assess the relevance, efficiency, effectiveness, and the sustainability of the use of mobile technologies for the screening and treatment purpose in the areas of nutrition and maternal health. Given the pilot nature of the project and duration of implementation over a two year period each, the criteria of impact is not reviewed. Greater weight is given the criteria of relevance, efficiency, effectiveness and sustainability to strengthen the scope of examination on the pilot nature of the projects and their capacity to go to scale within the development context of Tanzania.

This chapter explains the evaluation design covering the evaluation scope, evaluation objectives, methodology, data collection methods, tools and sources of data.

3.1. Evaluation Scope

The primary focus of the evaluation is to determine the degree of success of the D-tree pilots implemented in two project sites in Bagmoyo district, Pwani region and six project sites in Zanzibar compared to non-project sites where existing paper-based methods were continuing to be employed and to generate lessons and recommendations for strengthening and expanding eMNH and eNutrition to other areas. Research questions were developed and examined to determine the pilots' success with respect to relevance, effectiveness, efficiency, and sustainability and scalability. The evaluation gathered lessons learned and examined cross cutting issues including results based planning and management, integration of eNutrition/eMNH in the national health system and local ownership, coordination of mHealth partners and projects, equity and reaching vulnerable populations, capacity development/training and UNICEF technical and organizational support. The research design relied on routine monitoring data used as the basis for reconstructing a baseline and in-depth interviews and focus group discussions.

The evaluation covered all of the eight facilities that were supported by UNICEF and implemented by D-tree for the two projects. As no sites were selected at the time of project commencement to offer a basis for comparison, non-equivalent control groups, or comparators, were selected to control for the counterfactual (and confounding factors by comparing project and non-project sites). The project sites that were covered and their comparators are as below:

- Nutrition: Chaani Kubwa, Tazari, Chumbuni, Nungwi, Gomani, Kivunge health facilities in North A and Unguja Urban districts. These were be compared to Kidoti, Chaani Msingini, Gamba in North A and Sebuleni in Unguja A Districts health facilities
- For the nutrition project in Zanzibar the period under review is July 2010 to present, noting that UNICEF assistance ended in July 2012.

- Maternal Health: Lugoba and Miono health centers and the Community Change Agents associated with them in Bagamoyo district, Pwani Region. These will be compared to Kwaruhondo and Chalinze also in Bagamoyo district.
- For the maternal health the period under review is also July 2010 to present, noting that UNICEF assistance ended in September 2012.

UNICEF completed its assistance to the projects in Zanzibar in July 2012 and for Bagamoyo in September 2012 as per the durations indicated in the Programme Cooperation Agreements (PCA). Since July 2012, D-tree has continued its work in Zanzibar expanding the project to additional sites in Pemba and creating a combined IMCI-nutrition application with support from NORAD, whilst in Bagamoyo alternative funding sources were not available to continue the project beyond September 2012. The evaluation therefore provided a unique opportunity to assess the sustainability of the effects of the projects and to systematically document opportunities and lessons learnt in the project implementation as the basis for understanding the potential for scale up and integration with health (including mHealth) architectures in Tanzania.

3.2. Evaluation Objectives

The summative evaluation of the two pilot projects will contribute to accountability and learning, and provide recommendations for the future scale up of the two projects and UNICEF Tanzania Country Office programming strategies linked with the use of mobile technology for different areas of programme implementation and information systems strengthening.

The specific evaluation objectives included the following:

- To assess the use, applicability of and preference for mobile phone based tools compared to paper-based methods to inform decision support systems in maternal health and nutrition programmes.
- To assess the extent to which mobile phone based tools improve the quality of care provided at the health facilities compared to traditional methods in maternal health and nutrition programmes.
- To assess how information generated by the project is used by beneficiaries, health workers, district health officials, the Ministry of Health, UNICEF and other partners where relevant in maternal health and nutrition programmes.
- To assess the potential for scale up and integration with national health information systems and health (including mHealth) architectures in Tanzania.
- To systematically document weaknesses, strengths, constraints, opportunities and lessons learnt in the project implementation.

3.3. Evaluation Methodology

The evaluation employed a cross-sectional plausibility design using an external control group to rule out other confounding factors which may have resulted in observed effects on the treatment group. Two health facilities were selected in Bagamoyo and four in Unguja with similar socio-economic characteristics but without exposure to the intervention. The evaluation is guided by international evaluation standards established by the UN Evaluation Group and makes reference to the OECD-DAC criteria of relevance, effectiveness, efficiency, impact and sustainability to assess the use of mobile technology for the screening and treatment purposes in the areas of nutrition and maternal health. Given the pilot nature of the project and duration of implementation, less weight has been given to assess the criteria of impact; rather the evaluation reviews the projects in terms of its contributions toward expected impacts. Greater weight is given the criteria of relevance, efficiency, effectiveness and sustainability to strengthen the scope of examination on the pilot nature of the projects and their capacity to go to scale within the development context of Tanzania.

- **Relevance** was assessed in terms of the consistency of the projects with the overall goals, strategies and plans of the MoHSW, the MoH and UNICEF.
- **Effectiveness** was assessed based on an analysis of changes between the project sites and the comparators against two variables:
    - The comprehensiveness of the registration and screening process; and
    - The accuracy of the response/diagnosis.
    - Through a consecutive process of analyses, the evaluation also attempted to demonstrate that:
        1. The comprehensiveness and accuracy of registration and screening processes improved in areas using eMNH/eNutrition (congruency of expected trend);
        2. The comprehensiveness and accuracy of registration and screening processes did not improve in areas not using eMNH/eNutrition (not due to other changes in registration and screening processes in the area);
        3. There was a direct relationship between the intensity of the intervention in the project sites and the comprehensiveness and accuracy of registration and screening processes (congruency of dose-response); and
        4. Coverage of mobile handsets amongst health workers in project sites was compatible with the degree of improvement in the level of comprehensiveness and

accuracy of registration and screening processes (congruency of magnitude of effect on mediating variables).

- **Efficiency** reviewed training coverage of frontline health workers and the proportion of mobile handsets still in use at the end of the project and was complemented by a cost analysis of capital and recurrent costs.
- **Impact** reviewed interim changes produced by the interventions, directly or indirectly, intended or unintended, over the pilot periods. The following was assessed:
    - Trend of referrals, follow-ups with clients and parents/caregivers reached with counseling on good care practices.
    - Client perceptions on service delivery, changes in their knowledge and practices in maternal health and nutrition.
- **Sustainability** assessed the extent of integration of the project with national health systems and the continuity of the project effects upon ending of the agreement with UNICEF.

3.4. Data Collection Methods, Tools and Sources of Data

The evaluation team conducted a desk review of project documents and secondary data sources to better understand available resources and the quality and comprehensiveness therein. The evaluation team selected a mix of **quantitative** and **qualitative** methods to collect data relevant to informing the evaluation question under review. The use of different approaches to data collection allowed for greater opportunities for triangulation. Most of the quantitative data was collected from the records maintained at facility level as well as reporting through the Health Management Information System (HMIS). This includes reference to OTC and RCH cards for individual patients, the case files of eMNH and eNutrition, observation of the trained health workers using the mobile handsets as well as health workers screening clients in the non-intervention sites, detailed interviews with trained workers in project site and a brief short interview with health at comparators facilities were conducted. Complementary data was obtained from the performance reports available to D-tree as well as those provided to the District Health Management Team and the MoHSW on the Mainland and the MoH in Zanzibar. Data were triangulated to ensure validity of conclusions, as outlined in Table 7. In the absence of a counterfactual and a baseline, the evaluation focuses first and foremost on fidelity of implementation i.e. whether or not project implemented according to plan and the reasons contributing or challenging the realization of these planned results.

Table 6: Methods of Data Collection by Sources

Type of Data	Source of Data	
	Primary	Secondary
Quantitative	• OTC cards • eNutrition case files • RCH cards • eMNH case files • Health facility registry	• Project monitoring reports • Sector strategic plans • HMIS • Project budgets • 7LDs baseline survey
Qualitative	• Focus group discussions • Direct observation • Key informant interviews	• Guidelines for IMAM • Guidelines for OTC • Guidelines for F-ANC • 7LDs evaluation • mHealth Community of Practice minutes
Triangulation	• Key informant interviews • Direct observation	• Review of qualitative and quantitative data from project monitoring reports,

	• Review of facility based client records	other reviews/evaluations, project documents

Key informants including D-tree International, the Ministry of Health and Social Welfare Tanzania Mainland and Zanzibar, UNICEF, UKUN, the Centre for Disease Control (CDC) Foundation were interviewed to capture their views on all the key evaluation questions related to relevancy, efficiency, effectiveness, impact, sustainability and scalability.

Secondary source information has been assessed from national and global literature on the topics of eHealth/mHealth as well as their specific application in the health sector, D-tree project documents, training materials, and intervention guidelines covering IMAM, OTC, F-ANC and maternal health. A complete listing of the literature consulted is referenced in Annex 6.

The evaluation team worked to ensure that all fieldwork adhered to internationally accepted ethical standards. In particular, evaluation team respected the rights to consent, privacy, and confidentiality and data collection instruments were designed to ensure anonymity, wherever appropriate. Approval of the study was sought at all levels (national and local government, facility, and individual respondent levels) prior to embarking on the fieldwork. Meetings with district officials were convened in order to explain the scope and relevance of the study to stakeholders as well as make appointments with prospective respondents. All patient data and informant responses which appear in this report have been accordingly anonymised where relevant.

3.5. Sampling Design

The evaluation took a purposive sample of health facilities supported by UNICEF and D-tree for implementation of eMNH in Bagamoyo and eNutrition in Zanzibar with an additional two facilities selected in Bagamoyo district and three centres in Unguja A and one centre in Unguja Urban to serve as comparison sites. These sites were selected based on their proximity to the project locations where similar socioeconomic conditions could be noted but where but with sufficient distance from the treatment sites to prevent any spillover effects from the intervention.

Due to the small numbers of facilities and health workers trained in the use of eMNH and eNutrition, the evaluation made every effort to interview all project participants and related health workers in the comparator sites. A total of 34 health workers were interviewed in Bagamoyo (15 in project sites, 19 in comparator sites) for the eMNH project and 22 health workers were interviewed in Zanzibar (15 in project sites, 7 in comparator sites) for the eNutrition project.

In addition, the evaluation team conducted 66 key informant interviews with representatives from the Mainland MoHSW (Reproductive & Child Health Unit, mHealth and HMIS), Zanzibar MoH (Nutrition Unit and HMIS), the District Health Management Team, project and comparator health facilities, D-tree International, UNICEF programme managers in Health & Nutrition and cross-cutting functions in Planning, Monitoring & Evaluation, UKUN, and the Centre for Disease Control (CDC) Foundation.

At the client level, a total of 292 clients (267 in Bagamoyo and 25 in Zanzibar) were interviewed for both the eMNHl and the eNutrition projects representing a majority of currently available clients.

3.6. Cost analysis approach

For the purpose of estimating the cost for the eNutrition and eMNH projects, the total annual project expenses were disaggregated between fixed and variable costs. As all project costs were included as part of the PCA between UNICEF and D-tree, including the contribution of D-tree, no other additional costs borne by other parties are factored into this analysis. The analysis makes reference to the budgets of the two PCAs, taking into account any under or over-expenditure agreed and documented between D-tree and UNICEF.

The cost analysis factors in the monitoring and supervision provided by D-Tree to the concerned health facilities but do not include salaries of health workers implementing the project, assuming a constant rate across project sites. The assessment is limited to the scope of the project sites, where specific training was conducted on the use of the eNutrition and eMNH applications and where mobiles handsets were provided to health workers for use in implementing the project. On the basis of these assumptions, D-tree management and project salaries, computer programming, site visits, training and sensitization, equipment (mobile phones and laptops), office supplies for set-up, office rent and indirect programme costs were assigned as fixed costs and supervision travel, follow-up meetings, communications, programme management, office supplies for maintenance were assumed as variable costs (Table 8). Disaggregation of costs into fixed and variable removes the onus of accounting for depreciation and has been itemized with a view to understanding the costs that would be necessary for ongoing maintenance and roll-out to other areas. In turn a ratio is derived based on the caseload of the individual projects over the project period.

Table 7: Fixed and Variable Cost Categories for eNutrition/eMNH Implementation

Fixed Costs	Variable Costs
D-tree management and project salaries	Supervision travel
Computer programming	Follow-Up Meetings
Site visits	Communications
Training and sensitisation	Programme management
Equipment (mobile phones, laptops)	Office supplies for maintenance
Office supplies for set-up	
Office rent	
Indirect programme costs	

3.7. Quality Assurance

The evaluation team conducted meetings in Dar es Salaam and Zanzibar during the inception phase to provide key stakeholders with an overview of the scope of the evaluation commissioned and the study protocol proposed for implementation. The meetings provided the evaluation team with the opportunity to clarify some information and sought to validate the approach being defined with the prospective audience for the evaluation. Initial meetings conducted with UNICEF provided an opportunity for further orientation on the UN Evaluation Group standards for quality evaluations, to define and finalise the requirements for the two teams being deployed to Bagamoyo and Zanzibar and to review and refine the work plan for implementation of the evaluation.

Quality assurance for the data collection was supported with one-day enumerator training conducted respectively in Bagamoyo and Zanzibar. This allowed for consultation and final adjustments to the data

collection instruments. The evaluation team was led by Dr Felician Ifunya as team leader, with technical support and field supervision provided by two technical specialists – Dr Reuben Mutakayawa in Maternal Health and Dr Eileen Barongo in Nutrition – to ensure data collected was complete and accurate. In addition a daily debrief was conducted on-site focusing on key information drawn and emerging issues, lessons learned from the feedback of the team, a check on the completeness and accuracy of the data collection instruments and to review the plans for the forthcoming days.

Primary and secondary data collected from the field was entered in excel and SPSS by the technical specialists for the purpose of analysis. Qualitative information gathered from key informant interviews and focus group discussions was translated by the enumerators and transcribed to support further analysis.

3.8. Limitations of the Evaluation

During the cause of implementing the project the consultants experienced the following limitations:

- **Difficult to attribute results to UNICEF** - D-tree has been implementing the project and is continuing to implement the project with other donors in Zanzibar. It was in some instances difficult to attribute such results as the result of UNICEF inputs.
- **Inadequate access to information** – There some legal provision that protects access to patient information. The consultants requested consent from the clients and in some cases responsible authorities were consulted in advance.
- **Difficulties in accessing clients** - The survey was conducted during the rainy and cultivation season this sometimes impeded consultant to reach remote villages especially in Miono district and few caregivers in Zanzibar. In the case of Miono selected clients were replaced with those in the reserve list and in Zanzibar enumerators were supported by local authorities and followed up the caregivers to their farms.

4. Evaluation Findings – eMNH Project

This chapter presents the findings of the eMNH project that was implemented by D-tree in Bagamoyo District in two facilities Miono and Lugoba. According to the terms of reference the relevancy, effectiveness, efficiency, impact and the sustainability and scalability of the implemented project were assessed. The sections are organized in that order.

4.1. Relevance

Under the criteria of relevance the evaluation sought to assess the level and extent of alignment of the pilot project within the priorities and policies of the DHMT and MoHSW as well as their accordance with UNICEF strategic and programme objectives. In the following sections the findings are presented and are organized according to the sub-questions.

Relevance to National and District Strategies and Plans

From the review of the documents and as presented in policies and programmes, the project was designed according to eMNH logical model to i) enable services providers to monitor and track their clients more effectively at the community and facility level, ii) strengthen the capacity of health workers to provide quality services and iii) enable pregnant women and their families to access knowledge and services on

pregnancy. These outcomes have relevance to the central mission of the health sector at both national and sub-national levels to ensure quality health services; improved competences and capacities of staff; strengthened referral system and encouragement of the use of ICT for delivery of public services. The intervention contributes to the Health Sector Strategic Plan (HSSP III) indicator of fostering community involvement in MNHC programmes and the PHSDP (2007-2017) indicator relating to improved systems and community mobilization and empowerment. The project is relevant to the district as it addresses the needs of the mother and child, focusing on the continuum of care for maternal health service provision. Key informants at national and sub-national levels reiterated the relevance and importance of the project and its support in improving ANC attendance and confidence in the health system during the pregnancy and neonatal periods. Key protocols used by facility and community-based health workers were developed in collaboration with MoHSW, other development partners, UNICEF staff, Bagamoyo district officials, UKUN and the facility and community health workers themselves. As the component focusing on strengthening the linkage between the facility and the community was not developed during the project period but subsequently realized with the future expansion of the project, this element is seen as a gap in the duration under review and the intended results of the PCA.

Relevance to UNICEF

Bagamoyo was one of the Seven Learning Districts (7LDs) supported by UNICEF during the Country Programme implemented between 2007 and 2010 and where UNICEF had an existing collaboration with Population Services International (PSI) to implement an integrated strategy for behavior change communication to promote key child survival practices (good hygiene and sanitation; malaria prevention and treatment; exclusive breastfeeding; management of diarrhea; antenatal care, facility delivery, newborn care; postpartum care,; utilisation of routine child health services, care seeking and home care for a sick child). Criteria for the selection of the project sites (Miono and Lugoba) were not established but rather nominated by partners, including D-Tree and UKUN where a CCA cadre had already been established with the support of PSI. Interviews with district health officials could not conclusively verify their level of engagement in the planning process.

Although a review of regional data for Pwani shows the region as achieving above average coverage within the sector (Table 9), cross-referencing with data extracted from the baseline survey of the 7LDs evaluation which provides district level estimates against key sectoral indicators, Bagamoyo can be seen as the district with the highest number of antenatal clinic, delivery, postnatal and under five clinic caseloads for one year preceding the survey. In addition, coverage of trained health workers on MNCH was low at 49 percent and the percentage of clients with positive perceptions of services in visited facilities: a) Maternal b) Newborns c) Child rated the lowest at 66 percent as indicated in Table 10. While Pwani region and Bagamoyo district specifically may not represent the direst in terms of the maternal health situation compared to other areas of the country, within the group of 7LDs considerations of equity in terms of existing coverage and capacities would suggest Bagamoyo as a district meriting focused attention to improve the quality of care, strengthen capacities of frontline health workers and enhance confidence of health seeking individuals in the care and support provided through the health sector.

Table 8: Pwani Region Snapshot of Maternal Health (2010)

Indicator	National	Pwani Region
% receiving antenatal care from a skilled provider	95.9%	99.5%
% who received antenatal care who were informed of signs of pregnancy complications	52.9%	71.6%
% who took iron tablets or syrup	58.9%	69.3%

% who took antimalarial drugs	67.7%	75.3%

Source: TDHS 2010

Table 9: Maternal Health Indicators for 7 Learning Districts (2009)

Indicator	Temeke	Bagamoyo	Hai/Siha	Magu	Makete	Mtwara rural
Proportion of health workers trained on MNCH services	32%	49%	51%	34%	85%	6%
Proportion of first level health facilities (PHC) with at least 2 skilled attendant	100%	100%	100%	75%	25%	83%
Percent of facilities with essential a)equipment b) medicines c)supplies and d) guidelines required for the provision of preventive, curative and promotive maternal and newborn care (Average)	49%	55%	66%	48%	56%	45%
Percentage of clients with positive perceptions of services in visited facilities : a)Maternal b) Newborns c) Child	100%	66%	94%	100%	96%	78%
Antenatal clinic, delivery, postnatal and under five clinic caseloads for the last 1 year	11,544	12,797	1,821	2,916	N/A	7,486
Proportion of supervision visit in previous 6 months	100%	100%	60%	80%	100%	100%
Availability of transport for referral (bicycle or motorcycle or ambulance)	25%	50%	40%	40%	40%	0%

Source: UNICEF Baseline Survey of 7 Learning Districts

Maternal health continues to feature within the programmatic priorities of UNICEF's support to the United Nations Development Assistance Plan (UNDAP) being implemented over a four year period from 2011 to 2015 with focus on the provision of essential equipment and supplies to health facilities and skill-development of health workers to improve the quality of focused antenatal care, emergency obstetric care, neonatal care including new born resuscitation, prevention of mother to child transmission of HIV, adolescent friendly reproductive health services, and integrated management of childhood illnesses - in line with national guidelines and standards.

Key expected results in Maternal Health by 2015 include the following:

- Providing safe motherhood and newborn care to 1.8 million pregnant women through improved antenatal care, reinforcing the skills of health personnel on obstetric care and neonatal care, providing supplies and equipment and knowledge that can save the lives of women and infants.
- Providing long-lasting insecticide treated nets to 8 million children under five and intermittent preventive treatment of malaria for pregnant women.

- Strengthening the capacity of regional and district health systems on evidence based planning, delivery and supervision of essential and good quality maternal, newborn and child health services including emergency obstetric and newborn care, newborn resuscitation, PMTCT, routine under-five immunization services and integrated management of childhood illness.

Support will continue to be provided to the Government to operationalize and strengthen policies and guidelines and develop systems for the training of community health volunteers to encourage adoption of key maternal and child care behaviours.

Relevance to Frontline Health Workers

One of key areas of relevance addressed by the evaluation was from the perspective of the health worker and their capacity and acceptance of the introduction of the new tools as part of their work. In reviewing the responsibilities of the front workers who used the mobile applications, an assessment of relevance is made in terms of the contribution of the tools toward their function and interactions to the clients. Supplementary information was sought from D-tree as the designer of the tool to determine the extent to which the applications "had the user in mind" and UKUN, the NGO supervising the cadre of CCAs in Bagamoyo.

D-Tree introduced Kiswahili language updates based on feedback from MOHSW and nurses. This process was initiated as part of the extension of the project in Morogoro region through support of JHPIEGO, where it seems greater effort was made in creating and sustaining the commitment and ownership of the Reproductive and Child Health Services (RCHS) unit of the MoHSW.

Overall, nurses indicated their satisfaction with the introduction of eMH, having streamlined their job tasks and improved their overall confidence in interacting with clients. The introduction of SMS referral alert capability from the community application worked to strengthen information integration between the facility and community components and provide forward information on expected clients and their conditions. In addition, nurses communicated their satisfaction with the ease of retrieving client data and ready access to key counseling messages which worked to improve the efficiency of the available time for client interaction.

4.2. Effectiveness

Effectiveness in this context tests the fidelity of the implementation using a cross-sectional plausibility based design to attempt to isolate the contribution of eMNH to maternal health service delivery in Bagamoyo. In order to assess this objective the following criteria were assessed and compared to the facilities where paper-based methods were continuing to be used.

Despite the ease of data entry and information management that comes with a tool such as eMNH, for as long as they remain to be pilots, paper based forms and registries will continue to be a requirement of the MoHSW across facilities. For the purposes of the evaluation this presents a useful internal control, providing a basis in which to assess within an individual project site, the extent to which the introduction of the tool has contributed toward recorded registration and screening in the paper based forms. The assessment of effectiveness was conducted using two criteria (1) the comprehensiveness of the registration and screening process and (2) the accuracy of the response/diagnosis. Variables were assessing using a binary yes/no using a combination of secondary source data from patient registries, RCH cards, review of eMNH case files and observation of frontline health workers using the mobile devices to assess the comprehensiveness and the accuracy of the registration and screening process.

For accuracy, parameters which will be assessed include: adherence with appropriate treatment (Malaria-Intermittent Preventive Therapy ITT/ITN, deworming, Tetanus Toxoid (TT) injections, hematenics, HIV-prophylaxis, Anti-Retroviral Therapy (ART)) and related investigations (Venereal Disease Research Laboratory (VDRL), Hb, Weight, BP, Height, Blood Slide (B/S) for malaria, blood sugar, HIV screening. Accuracy of treatment will score a "Yes" if properly administered, for example, F-ANC guidelines subscribe the following plan against diagnosis: provision of Malaria: SP tablets; 20 – 24 wks give 1st dose, 28 – 32 wks give 2nd dose and after 20 weeks repeat after weeks and Mebendazole: ≥ 16wks (500mg stat) and others. Patient records adhering to this plan will be assessed "yes" in terms of diagnosis while non-adherence even when the centre does not have stocks will be assessed "no".

Comparison of accuracy

Built in error checks within the CommCare application requires the uses to enter all necessary information on patient history and status to be able to proceed through the module. Information is recorded and has consistency been demonstrated across project sites (Table 11, 12), however this by no means indicates that the information is accurate. Key informant interviews with health workers across project and comparator sites found consistent challenges in completing albumin/sugar in urine tests due to a lack of reagent kits.

Upon statistical review, a comparison of performance data from project sites in completing the paper based form with those in comparator sites would suggest a negligible contribution to capacity development from the introduction of the tool with an average of 61 percent recorded in terms of accuracy in project sites and 62% in comparator sites. This would however be misleading due to the additional task introduced in the workflow in project sites in using the tool whilst still maintaining the paper-based forms. Other monitoring information gathered by D-tree confirms this notion, with health workers found to be initially enthusiastic about the introduction of the tool and maintaining the same level of focus with completing the paper-based form. This level of performance does however decline over time with health workers perceiving the maintenance of the paper-based forms as an extra burden.

Table 10: Comparison of accuracy between project and comparator sites

Step in Registration & Screening	Project Sites				Comparator Sites	
	Miono		Lugoba		Kwaruhondo	Chalinze
	eMNH	Paper	eMNH	Paper	Paper	Paper
Albumin in urine	100%	0%	100%	0%	0%	0%
Sugar in urine	100%	0%	100%	0%	0%	0%
Hemoglobin (Hb)	100%	15%	100%	20%	10%	12%
Blood pressure	100%	55%	100%	60%	60%	65%
Folic Acid	100%	76%	100%	80%	75%	80%
Weight	100%	80%	100%	75%	85%	80%
Height	100%	80%	100%	75%	85%	80%
SP for malaria	100%	90%	100%	90%	92%	92%
Tetanus Toxoid	100%	92%	100%	95%	95%	94%
PMTCT	100%	90%	100%	92%	94%	95%
Deworming	100%	85%	100%	90%	80%	85%
Average	**100%**	**60%**	**100%**	**62%**	**61%**	**62%**

Source: eMNH, Health Facility Records

Table 11: Comparison of efficiency indicators in project and comparator sites

Indicator	Project Sites	Comparator Sites

	Miono		Lugoba		Kwaruhondo	Chalinze
	eMNH	Paper	eMNH	Paper	Paper	Paper
% of RCH cases accurately treated	100%	60%	100%	62%	61%	62%
% of RCH cases comprehensively screened	100%	69%	100%	74%	73%	74%

Comprehensiveness

In the case of the eMNH project, a contrary response to the criteria of comprehensiveness would be gauged if any the following information was missed from the first registered ANC visit: medical history, details of the patient's physical examination, testing i.e. Blood Pressure (BP)(140/90mmHg), Albumin in urine (+), Hemoglobin (Hb)(8.5g/dl), Gestational age (weeks), Fundal height (weeks), Fetal lie and Ante natal care provision as per FANC specifications, counseling, including birth plan or date of next visit. During subsequent visits, the record should cover interim history, targeted physical examination, testing, care provisioning, counseling, including birth plan and use of Insecticide Treated BedNets (ITNs) (and related information on how client obtained and used the ITNs), as well as the date of next visit.

As with the comparison of accuracy, comparison of comprehensiveness in relaying information gathered from eMNH to the paper based forms found a negligible difference of 2 percent (Table 13). Review of patient registries did however draw attention that not all pregnant women participating in F-ANC were registered using eMNH. At Miono for example, out of the 245 current pregnant mothers 150 (61.2 percent) were registered on eMNH.

Table 12: Comparison of comprehensiveness between project and comparator sites

Step in Registration & Screening	Project Sites				Comparator Sites	
	Miono		Lugoba		Kwaruhondo	Chalinze
	eMNH	Paper	eMNH	Paper	Paper	Paper
Intro: demographics	100%	88%	100%	95%	90%	92%
Past obstetric history	100%	65%	100%	70%	70%	72%
Laboratory blood investigations	100%	55%	100%	60%	55%	62%
Attendance recording	100%	54%	100%	55%	60%	58%
Danger signs	100%	85%	100%	90%	90%	88%
Average	**100%**	**69%**	**100%**	**74%**	**73%**	**74%**

Source: eMNH, Health Facility Records

4.3. Efficiency

The key question that assessed efficiency was to determine whether the pilot in Miono and Lugoba was implemented in the most efficient way compared to the alternative paper based methods. Indicators used as the basis for measuring efficiency are presented in Table 14.

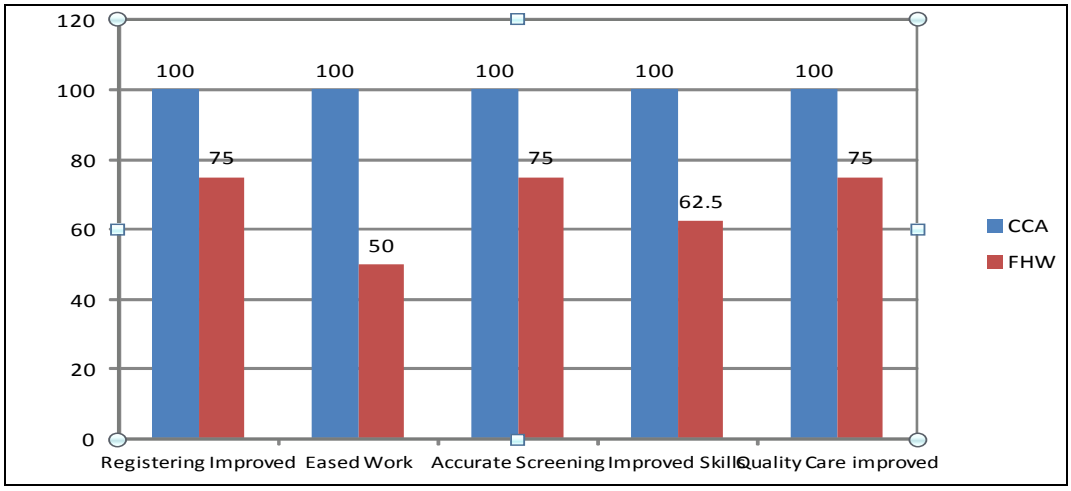
Table 13: Comparison of efficiency indicators in project sites

Indicator	Project Sites	
	Miono	Lugobo
# of mobile handsets distributed in project areas	9	9
# of mobile handsets in use in project areas	7	8
# of health workers trained on eMNH	4 (HWs) 5 (CCAs)	4 (HWs) 5 (CCAs)

D-tree introduced eMNH with UNICEF support between June and September 2011 following an initial development and set-up phase. During the period of support, D-tree project reports recorded 1,030 visits and the registration of an additional 424 women. In addition, CCAs in Bagamoyo completed 1,333 forms, registering 167 additional women and 170 additional children into the program. At the time of the evaluation five remaining trained nurses were found to be using eMNH with other nurses having been transferred to other facilities during the project period.

Key informant interviews conducted with Health workers using eMNH sought greater clarity on how the introduction of the tool had contributed toward their performance in terms of improvements in their capacity to register clients, perceptions of ease of work, improvements in the accuracy of screening, skill enhancement and perceptions with regards to improved quality of care. Figure 8 shows that all CCAs rated the applications favourably in across all categories, whilst facility-based health workers ranked most of the parameters favourably at 75 percent with a lower proportion of facility-based staff perceiving the introduction of eMNH as easing their work reaffirming comments previously made that maintenance of the two systems for information collection and management as double work.

Figure 4: Contribution toward health worker performance

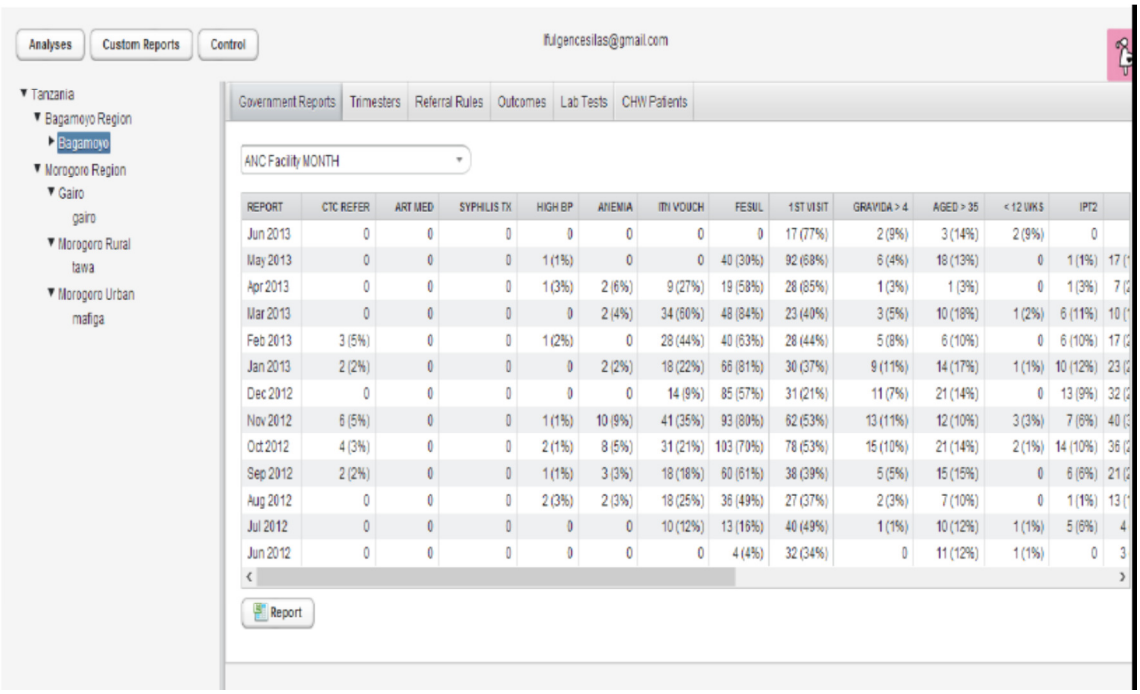


Contribution toward health worker capacity building

eMNH has the potential to contribute toward strengthening evidence based planning and improved performance to the extent that there is a structured mechanism to feedback on performance and health workers are empowered and feel confident to use the information provided as part of their day to day work. Reports were developed by D-tree to show CHW performance on a daily, weekly and monthly basis which were further referred to UKUN and the Bagamoyo DHMT. During the data collection, the evaluation team

observed that most of the health centers were not however making use of the reporting dashboard to support the management of their caseload.

Figure 5: D-tree eMNH performance dashboard



REPORT	CTC REFER	ART MED	SYPHILIS TX	HIGH BP	ANEMIA	ITN VOUCH	FESUL	1ST VISIT	GRAVIDA > 4	AGED > 35	< 12 WKS	IPT2	
Jun 2013	0	0	0	0	0	0	0	17 (77%)	2 (9%)	3 (14%)	2 (9%)	0	
May 2013	0	0	0	1 (1%)	0	0	40 (30%)	92 (68%)	6 (4%)	18 (13%)	0	1 (1%)	17 (
Apr 2013	0	0	0	1 (3%)	2 (6%)	9 (27%)	19 (58%)	28 (85%)	1 (3%)	1 (3%)	0	1 (3%)	7 (
Mar 2013	0	0	0	0	2 (4%)	34 (80%)	48 (84%)	23 (40%)	3 (5%)	10 (18%)	1 (2%)	6 (11%)	10 (
Feb 2013	3 (5%)	0	0	1 (2%)	0	28 (44%)	40 (63%)	28 (44%)	5 (8%)	6 (10%)	0	6 (10%)	17 (
Jan 2013	2 (2%)	0	0	0	2 (2%)	18 (22%)	66 (81%)	30 (37%)	9 (11%)	14 (17%)	1 (1%)	10 (12%)	23 (
Dec 2012	0	0	0	0	0	14 (9%)	85 (57%)	31 (21%)	11 (7%)	21 (14%)	0	13 (9%)	32 (
Nov 2012	6 (5%)	0	0	1 (1%)	10 (9%)	41 (35%)	93 (80%)	62 (53%)	13 (11%)	12 (10%)	3 (3%)	7 (6%)	40 (
Oct 2012	4 (3%)	0	0	2 (1%)	8 (5%)	31 (21%)	103 (70%)	78 (53%)	15 (10%)	21 (14%)	2 (1%)	14 (10%)	36 (
Sep 2012	2 (2%)	0	0	1 (1%)	3 (3%)	18 (18%)	60 (61%)	38 (39%)	5 (5%)	15 (15%)	0	6 (6%)	21 (
Aug 2012	0	0	0	2 (3%)	2 (3%)	18 (25%)	36 (49%)	27 (37%)	2 (3%)	7 (10%)	0	1 (1%)	13 (
Jul 2012	0	0	0	0	0	10 (12%)	13 (16%)	40 (49%)	1 (1%)	10 (12%)	1 (1%)	5 (6%)	4
Jun 2012	0	0	0	0	0	0	4 (4%)	32 (34%)	0	11 (12%)	1 (1%)	0	3

D-tree conducted regular supervision visits over the course of the implementation period, receiving feedback from facility-based nurses using eMNH. This information facilitated systems improvements, including capability to update the gestation age based on fundal height, more efficient synchronization, the addition of an SMS component from the CCAs to the health facilities, and Kiswahili language updates. D-tree also developed reports for use by facility-based health workers and the District Medical Officer, demonstrating progress against key indicators for ANC coverage.

<u>Cost Analysis</u>

The evaluation team used information from D-tree programme documents and progress reports to conduct the cost analysis, using costs incurred by both UNICEF and D-tree for implementation of the project over the two PCA periods. The total fixed costs were determined as TSH 399,669,649 and variable costs as TSH 29,039,992 over 2010 to 2012. The cost categories indicated under the variable category are simplified to provide the MoHSW with an appreciation of the kinds of basic costs that would be required for continuation and expansion of the project to other areas using the existing government staff structure for implementation.

Table 14: eMNH Cost Analysis (2010-2012)

Fixed Costs	Amount (TSH)	Variable Costs	Amount (TSH)
D-tree management and project salaries	185,363,065	Supervision travel	11,609,712
Computer programming	109,575,625	Follow-Up Meetings	6,830,280
Site visits	24,550,000	Communications	6,640,000
Training and sensitisation	16,240,000	Programme management	3,360,000
Equipment (mobile phones, laptops)	15,614,400	Office supplies for maintenance	600,000
Office supplies for set-up	3,360,000		**29,039,992**
Office rent	15,841,416	Number of cases	**1028**
Indirect programme costs	29,125,143	Project ratio (TSH)	**28,249**
	399,669,649	Project ratio (USD)	**17**

On the basis of the review of variable costs, TSH 28,249 was expended per case (approximately $17/case). In the absence of a comparative assessment of similar projects the information is presented for the consideration of key stakeholders as to the relative merits and valuation of such a structure on an ongoing basis.

4.4 Impact

The criteria to assess the impact of the eMNH pilot were whether changes have been produced by the intervention, directly or indirectly, intended or unintended over the pilot periods. Given the substance of the project intervention, the results presented are not intended to provide a conclusive indication of the project's impact but do provide some level of contribution in their individual locations.

Figures 10 and 11 explain and compare the status of admissions and referrals between project and comparator sites pre and post eMNH. Data collected from individual facilities shows a sharp increase in admissions and referrals in Lugoba where eMNH has been introduced and a slow increase in Miono. Compared to the project sites, the number of referrals was found to have declined in Chalinze (comparator site but in the same geographical area with Lugoba) but the rate of admission increased like Lugoba. It can be surmised could be associated with geography and would be difficult to attribute to the project intervention.

Figure 6: Admissions and Referral in Bagamoyo Project and Comparator Sites

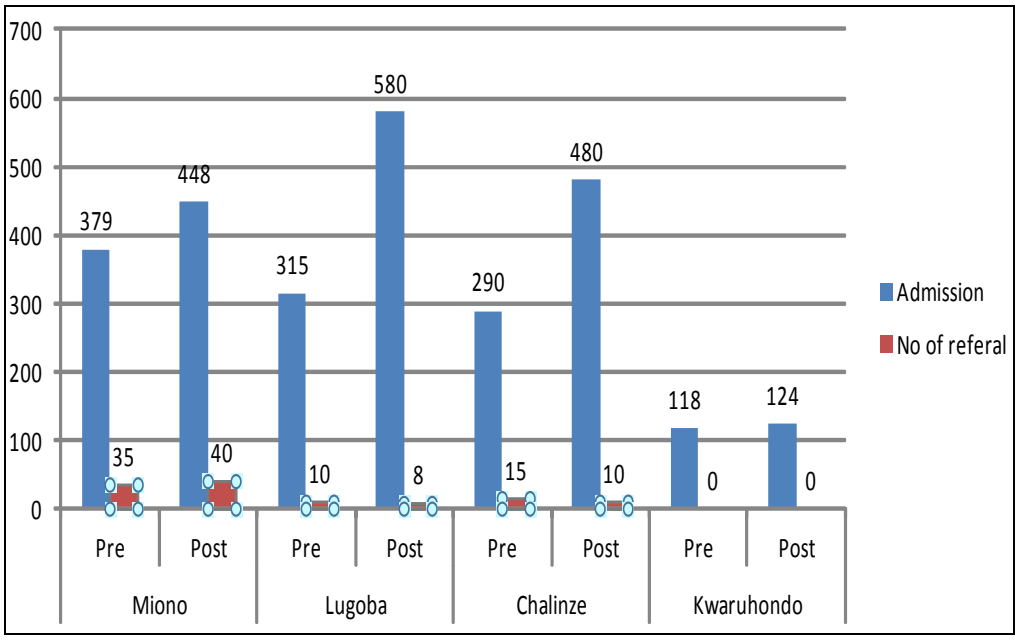
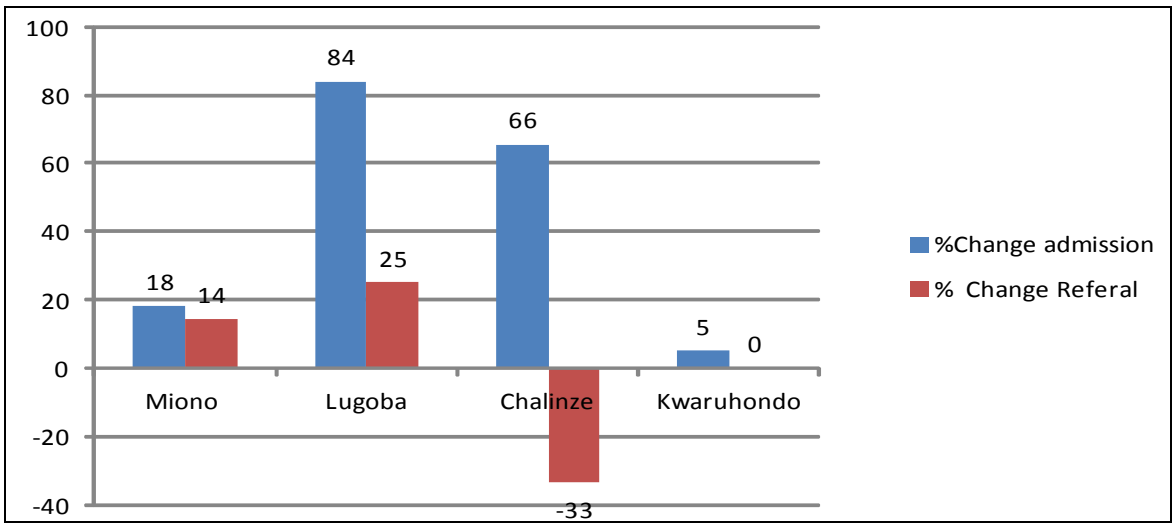
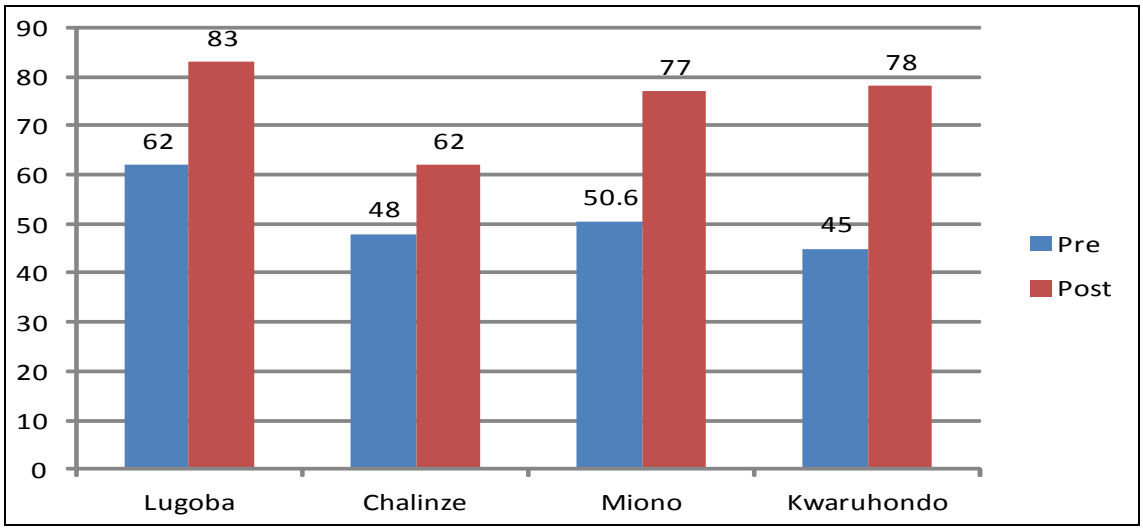


Figure 7: Percentage Change in Admission and referrals



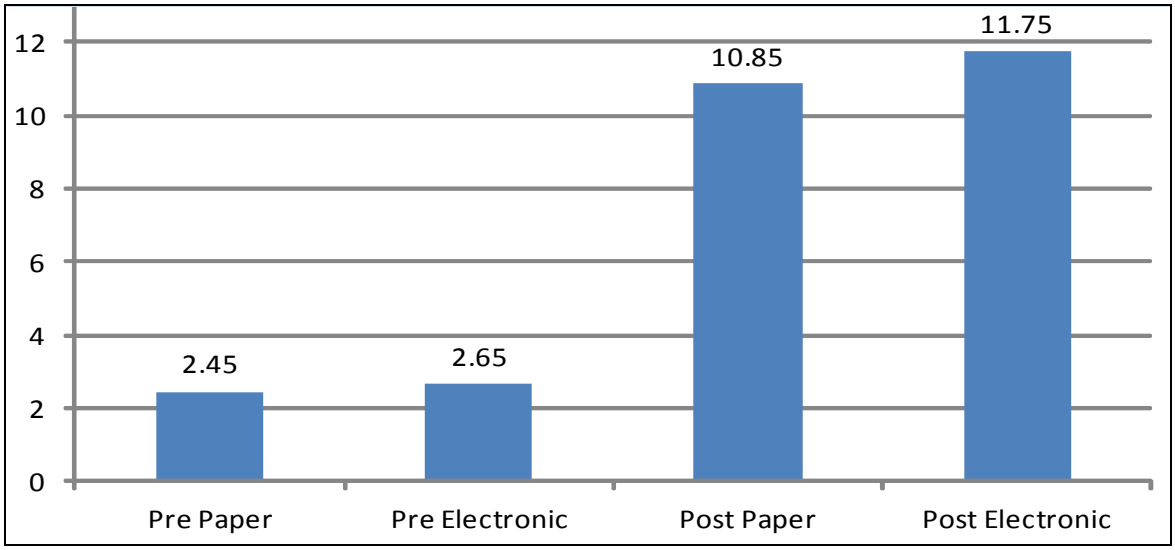
Changes in institutional deliveries were also assessed between project and comparator sites using pre and post data to compare the effect showing increases across both project and comparator sites. Project sites Lugoba and Miono experienced changes of 21 and 26 percent respectively while the comparator sites Kwaruhondo and Chalinze reached 33 and 29 percent respectively.

Figure 8: Institutional Deliveries



Data was collected to determine whether the introduction of mobile application has improved the adherence to the recommended four ANC visits during the pregnancy period. The results are as in figure 13.

Figure 9: Comparison of four ANC visits between project and comparator sites



Average time for client screening

The FANC guidelines recommend a standard time of 42 minutes for registration and screening for new patients and approximately 30 minutes for a follow visit. The evaluation team compared data from project and comparator sites using health worker recall to estimate the duration of time for client interaction (Table 16). Though such a method has an inherent level of bias, the evaluation team did note that current client interaction in project sites as averaging 41.25 minutes, close to FANC standards. This is validated by D-tree

project monitoring, noting health workers making better use of the counseling cards and covering more topics within individual sessions than previously, suggesting a greater emphasis on client service and confidence in imparting information on good care practices. Overall improvements in capacity are noted in an overall increase in client interaction from an average of 22.5 minutes before introduction of the project to 33.75 minutes after introduction of the project, and an increase in the comparator sites from an average of 20 minutes to 33.75 minutes with health workers. Indeed, the 7 Learning Districts evaluation confirmed UNICEF support to capacity development in Bagamoyo with an overall increase in the number of health workers trained in MNCH at community, dispensary, health facility and hospital levels.

Table 15: Average Clinician Time for Client Interaction

Facility	Pre	Average	Post	Average
Miono	30 – 40 mins	35 mins	45 – 60 mins	52.5 mins
Lugoba	15 mins	15 mins	30 mins	30 mins
Project Sites		**25 mins**		**41.25 mins**
Kwaruombo	20 – 30 mins	25 mins	30 – 45 mins	37.5 mins
Chalinze	15 mins	15 mins	30 mins	30 mins
Comparator Sites		**20 mins**		**33.75 mins**
All Sites		**22.5 mins**		**37.5 mins**

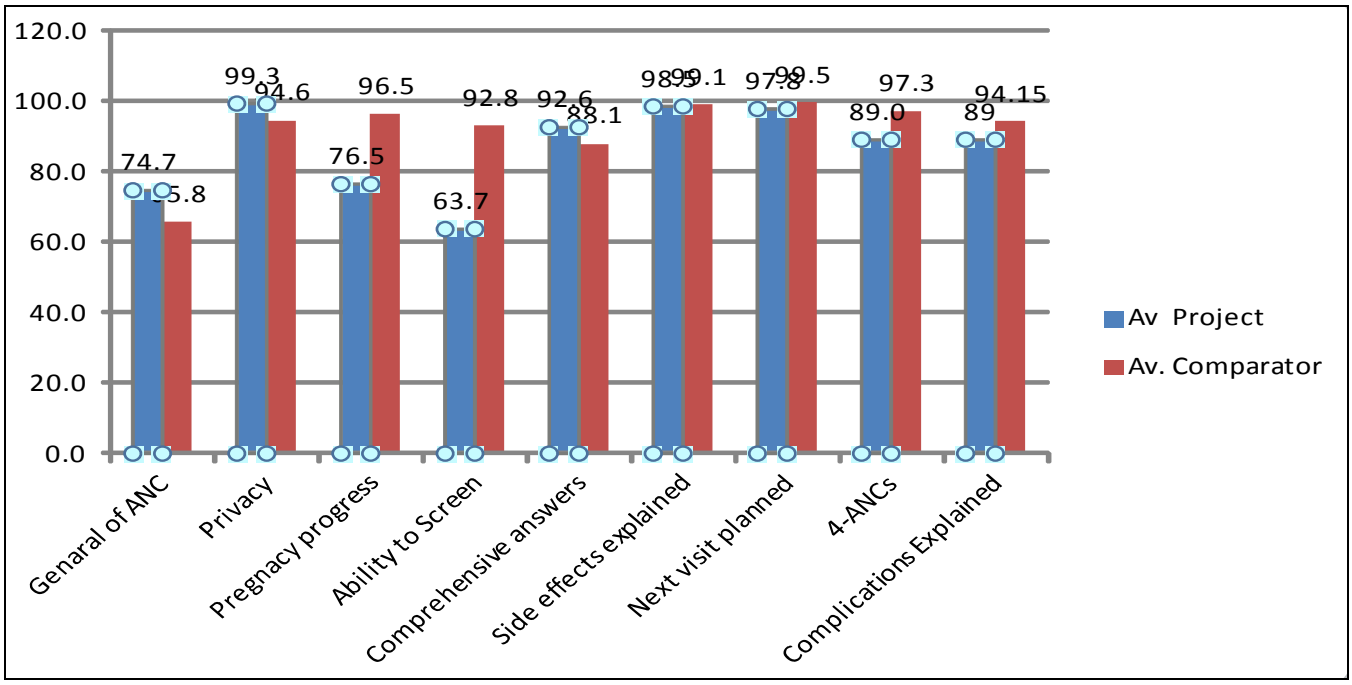
Client Satisfaction

The purpose of the client questionnaire was to measure the perception of pregnant women attending antenatal care to measure how they perceive the treatment and the counseling they are receiving from community and health worker. The questionnaire asked similar questions to clients that are served by health workers of project sites and comparators. The assumption was that the introduction of eMNH would contribute toward improvements in quality treatment and counseling care. The questionnaire was divided into two main parts one was on counseling and the other part was on treatment. The results of the client perception are presented in the following two sections.

Client perceptions on counseling

In Figure 14 project sites perform well in advising clients on the importance of ANC (by 8.9 percent), providing a privacy environment while counseling clients (4.7 percent), offering comprehensive answers (4.5 percent). On the other hand, comparator sites are performing better in advising on pregnancy progress (20 percent) ability to screen (29.1 percent) explanation of pregnancy side effects (0.6 percent), setting appointments for the next visits (1.7 percent), advising on the importance of four ANC visits (12.3 percent) and explaining pregnancy complications (3 percent). All put together, and according to the perception of the clients as captured by the questionnaire comparator sites had higher levels of client satisfaction compared to project sites.

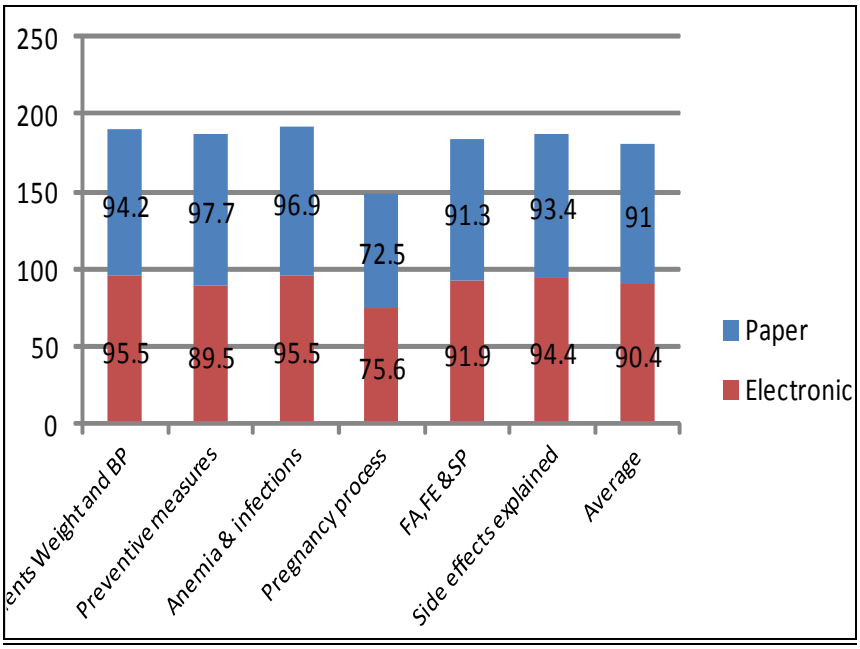
Figure 10: Client satisfaction paper and Electronic a Comparison



Perception of client on the quality of treatment

The client satisfaction questionnaires also asked clients to what extent they were are satisfied with the antenatal care treatment they received from the facility health workers. The same questions were asked to both project and comparator facility and the results are in figure 15.

Figure 11: Perception of clients on the quality of treatment



On average clients serviced by the comparator facilities provided more positive feedback with a small margin of 0.6 percent where comparator sites were performing in preventive measures (8.2 percent margin) and diagnosing and treatment of anemia and infections (1.4 percent margin). Project sites showed better results in the area of client interaction for weight and BP measurements (1.3 percent margin), pregnancy processes (3.1 percent margin), FA, FE and SP treatments (0.6 percent margin) and explanation of side effects and what are the remedies (1 percent margin).

4.5. Sustainability

The evaluation team made reference to ExpandNet's "Checklist for assessing the potential scalability of pilot projects or other programmatic research" to assess the degree of difficult for project sustainability and scale-up.

Questions related to potential scalability	Yes	No	More information/ Action needed
1. Is input about the project being sought from a range of stakeholders (e.g. policy-makers, programme managers, providers, NGOs, beneficiaries)?	X		
Are individuals from the future implementing agency involved in the design and implementation of the pilot?	X		MoHSW, D-tree and UNICEF were involved throughout the course of the project
Does the project have mechanisms for building ownership in the future implementing organization?		X	Mechanism not explicitly clarified as part of project design
2. Does the innovation address a persistent health or service	X		

	delivery problem?			
	Is the innovation based on sound evidence and preferable to alternative approaches?		X	No locally derived feasibility assessment conducted with consideration of alternatives
	Given the financial and human-resource requirements, is the innovation feasible in the local settings where it is to be implemented?	X		Feasible for implementation within current resourcing arrangements
	Is the innovation consistent with existing national health policies, plans and priorities?	X		Aligned with relevant national policies and strategies
3.	Is the project being designed in light of agreed-upon stakeholder expectations for where and to what extent interventions are to be scaled-up?		X	Scale up plan developed as part of project implementation rather than as part of project design. Costing for different scale up scenarios not available
4.	Has the project identified and taken into consideration community, cultural and gender factors that might constrain or support implementation of the innovation?		X	Analysis of community, cultural and gender factors not undertaken
	Have the norms, values and operational culture of the implementing agency been taken into account in the design of the project?	X		Extensive interaction between MoHSW, UNICEF and D-tree conducted.
	Have the opportunities and constraints of the political, policy, health-sector and other institutional factors been considered in designing the project?		X	A comprehensive baseline also understanding human resourcing and other aspects important for service delivery including supplies would have been beneficial.
5.	Has the package of interventions been kept as simple as possible without jeopardizing outcomes?	X		Modules scoped for manageability
6.	Is the innovation being tested in the variety of sociocultural and geographic settings where it will be scaled-up?		X	

Is the innovation being tested in the type of service-delivery points and institutional settings in which it will be scaled-up?		X	No evidence provided however scale up has taken place to other sites on the Mainland with other partners
7. Does the innovation being tested require human and financial resources that can reasonably be expected to be available during scale-up?		X	
Will the financing of the innovation be sustainable?		X	Heavily dependent on donor resources
Does the health system currently have the capacity to implement the innovation? If not, are there plans to test ways to increase health-systems capacity?	X		With external support
8. Are appropriate steps being taken to assess and document health outcomes as well as the process of implementation?	X		Linked with project evaluation
9. Is there provision for early and continuous engagement with donors and technical partners to build a broad base of financial support for scale-up?	X		Ongoing, facilitated by D-tree
10. Are there plans to advocate for changes in policies, regulations and other health-systems components needed to institutionalize the innovation?	X		Policy advocacy an integral part of mHealth CoP function chaired by D-tree
11. Does the project design include mechanisms to review progress and incorporate new learning into the implementation process?	X		Included as part of periodic review but also on an ongoing basis to improve the design for implementation
Is there a plan to share findings and insights from the pilot project during implementation?	X		Linked with periodic review meetings with MoHSW and UNICEF
12. Is there a shared understanding among key stakeholders about the importance of having adequate evidence related to the feasibility and outcomes of the innovation prior to scaling up?	X		Future resourcing from UNICEF has been made conditional upon completion of project evaluation

The above stocktaking gives an indication of the conditions and capacities for the project to go to scale. Implementation of a product such as eMNH and eNutrition requires a substantial resource investment both in terms of human resources for technical support and in terms of financial resources making it difficult to conceive of a model where the applications could go to any significant scale or foresee for future cost-sharing scenario with Government. The huge investment for the extremely limited scale of coverage in just two facilities in Bagamoyo also limits the ability to advocate for investment on the basis of value for money. Analysis of different solutions and alternatives based on needs would have been beneficial in understanding how the decision support application is being integrated within a broader package of support.

5. Evaluation Findings – eNutrition Project

5.1. Relevance

Under the criteria of relevance the evaluation sought to assess the level and extent of alignment of the pilot project within the priorities and policies of the DHMT and MoH as well as their accordance with UNICEF strategic and programme objectives. In the following sections the findings are presented and are organized according to the sub-questions.

Relevance to National and District Strategies and Plans

The overall goal objective of the project is to improve the timely detection and accurate management of severe acute malnutrition in children aged 6-59 months while the overall objective of the nutrition department in Zanzibar is to reduce child mortality. These objectives are compatible to the strategic objectives of the Revolution Government of Zanzibar:

> *"Malnutrition is an important public health problem, particularly for children under five years. It is responsible for one third of deaths in children under five years and is a major cause of ill health. Many child lives can therefore be saved every year by ensuring that severe acutely malnourished children are* ***identified early*** *and* ***referred for appropriate treatment****"*[8].

Through the review of literature the appropriateness of the project activities and outputs were assessed to understand whether they were in consistent with the overall goals of the Ministry of Health & Social Welfare and the district health team and the attainment of its objectives. The project was designed when the MoH was implementing the Zanzibar Health Services Reform Strategic Plan II (ZHSRSP II 2006/07 – 2010/11)[9]. The core themes of the strategy are i) Strengthening human resources for health (HRH), ii) Strengthening decentralized health service delivery, iii) Ensuring coverage for vulnerable groups iv) Improving efficiency through integration and v) Improved transparency, accountability and partnership. The project partially corresponds to the **strengthening support systems for quality care** objective of the strategy.

Relevance to UNICEF

The implementation of the second phase (implemented between July 2011 and July 2012) corresponds with the UNICEF/UNDAP Tanzania Country programme (2011-2015) under activity 5.1.2.*Develop and scale up innovative approaches for data and information capturing, including mobile phone technologies, Scale-up of*

[8] Revolutionary Government of Zanzibar , Ministry of Health and Social Welfare (2010); Zanzibar guideline for the Outpatient Therapeutic Care of Severely Malnourished Children

[9] Ministry Of Health And Social Welfare Zanzibar Health Sector Reform Strategic Plan Ii 2006/07 – 2010/11 accessed on 14/5/ 2013 at http://41.73.201.42/hmis/documents/HSRS%20Strategic%20Plan%20II%20Final.pdf

innovative data collection approaches prioritise low performing regions both Mainland and Zanzibar[10]. The assumption is that the country program is developed based on the government priorities and consultation.

There was a mix of reasons referred to as to why an eNutrition for OTC was chosen for the pilot other than alternatives such as RCH, IMCI or IMAM given the consistently low client caseload. Proponents from UNICEF and D-tree contend that nutrition when bundled under other health issues is usually given less priority. In addition, piloting a limited scope provides greater opportunities for getting the model right for implementation and simplifies the process of synthesizing lessons learned. Some respondents have indicated that more lessons and cost-effectiveness would have been learned by piloting IMCI or through a strategy such as the Child Health Days. Focus group discussions at the facility level prioritized drug supply, access to water and sanitation, availability of adequate human resources (numbers and quality) and the care for the environment as priorities.

Relevance to Frontline Health Workers

During the initial set-up phase of the project, adherence with standard protocols and guidelines was found to be variable across and within project sites. Reports of site visits conducted by D-tree found many health workers guided by instinct than to standards, including the timing for follow up appointments and amount of RUTF for distribution. In December 2010 and January 2011 prior to the introduction of eNutrition, health workers in Fuoni health center were recommending follow up appointments after only 3 days rather than the standard 7 or 14 days prescribed by the national guidelines, subsequently leading to all of the 19 children defaulting. Parents in turn considered the treatment to be ineffective and stopped bringing their children back. The introduction of a tool such as eNutrition therefore offers tremendous scope for reinforcing national guidelines and standardizing the support provided to children affected by severe acute malnutrition and the advice given to caregivers to support their rehabilitation and ongoing care. The two-day training provided by D-tree was found to be relevant to the health workers capacity building and a much needed support in their daily activities. In addition, using the eNutrition tool as the basis for completing the paper forms was found to reduce errors with data transfer and record keeping.

5.2. Effectiveness

Effectiveness in this context tests the fidelity of the implementation using a cross-sectional plausibility based design to attempt to isolate the contribution of eNutrition for the management of severe acute malnutrition amongst children under five in Zanzibar. In order to assess this objective the following criteria were assessed and compared to the facilities where paper-based methods were continuing to be used.

As with eMNH, despite the ease of data entry and information management that comes with a tool such as eNutrition, for as long as they remain to be pilots, paper based forms and registries will continue to be a requirement of the MoH across facilities. For the purposes of the evaluation this presents a useful internal control, providing a basis in which to assess within an individual project site, the extent to which the introduction of the tool has contributed toward recorded registration and screening in the paper based forms. The assessment of effectiveness was conducted using two criteria (1) the comprehensiveness of the registration and screening process and (2) the accuracy of the response/diagnosis. Variables were assessing using a binary yes/no using a combination of secondary source data from patient registries, OTC cards, review of eNutrition case files and observation of frontline health workers using the mobile devices to assess the comprehensiveness and the accuracy of the registration and screening process.

[10] http://tz.one.un.org/phocadownload/united_nations_development_assistance_plan_july_2011-june_2015.pdf

Missing details from patient records on aspects relating to the screening process, for example, missing weight measurement or missing appetite test in the case of OTC screening would result in a "no" response on comprehensiveness. A contrary response/diagnosis would be gauged based on the available information in the OTC/RCH/handset, for example, if a child above 6 months fulfills one of three criteria for SAM: WFH <-3 Z Score and/or MUAC < 11.5cm and/or nutritional oedema but is not provided with the recommended amount of RUTF and medication, a "no" response would be elicited.

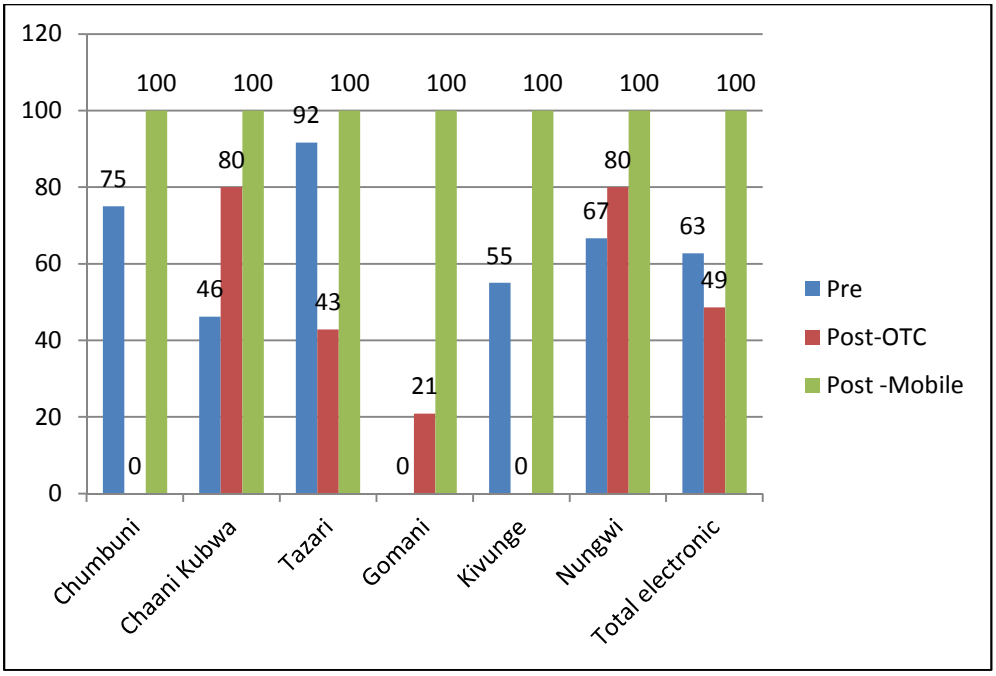
Comparison of accuracy

The commencement of the project coincided with the introduction of IMAM and OTC guidelines that mandated the inclusion of other measurements based on international standards and norms to determine SAM status. These factors expanded from only MUAC of <11.5 cm (red band tape) to include one of the following:

- WHZ<-3 SD,
- Bilateral pitting Oadema and
- infant < 6 months with visible wasting.

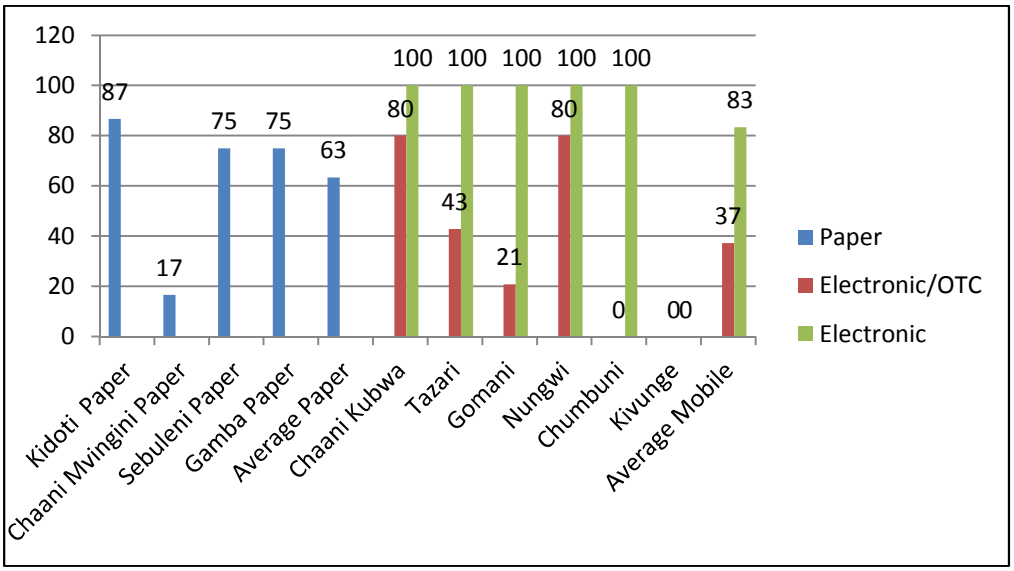
Built in error checks within the CommCare application requires the uses to enter all necessary information on patient history and status to be able to proceed through the module. As with the introduction of eMNH in Bagamoyo, a comparison of data assessing the accuracy of the diagnosis from project sites saw a decline of 12%, from 63% to 49% after the introduction of mobile applications. As with eMNH, key informant interviews with health workers using eNutrition indicates some level of frustration in having to maintain the additional work of completing the paper-based OTC cards. At times when the workload in the facility is busy, going back to completing the paper based tools was found to be often neglected as other tasks became pressing. Substantive improvements in the accuracy of the diagnosis were however noted in Chani Kubwa and Nungwi (increasing to 80 percent respectively).

Figure 2: Comparison of Response/Diagnosis Accuracy Pre-Post



The accuracy of the response/diagnosis in project sites where eNutrition had been introduced was also reviewed against the comparator sites. On average the project sites tended toward more accurate diagnosis (20 percent higher) when compared with comparator sites using the paper-based OTC cards only. This works toward confirming the congruency of magnitude of effect on mediating variables based on the assumption that coverage of mobile handsets amongst health workers in project sites was compatible with the degree of improvement in the level of comprehensiveness and accuracy of registration and screening processes and in confirming the congruency of expected trend based on the assumption that the accuracy of registration and screening processes improved in areas using eNutrition.

Figure 12: Paper to Mobile a Comparison of Response/Diagnosis Accuracy

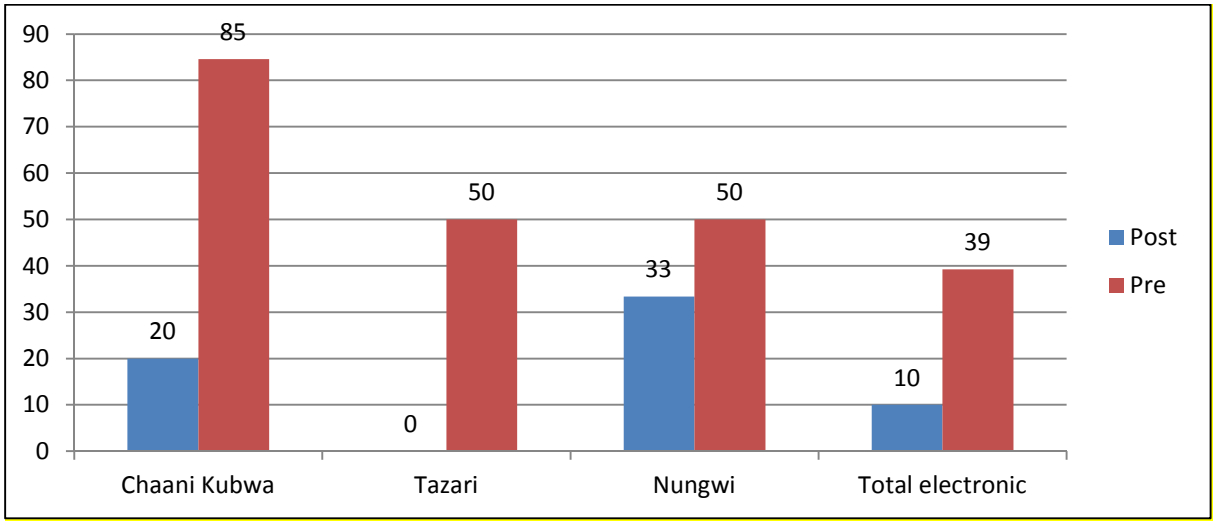


However, that data transferred from the mobile to OTC cards the average rate of accuracy in comparator sites was 63 percent while completion of OTC cards in project sites was 32 per cent, a difference of 29 percent. This occurrence disputes the variable assessing the congruency of lack of impact in the absence of the intervention. The assumption that the level of comprehensiveness and accuracy of registration and screening processes amongst those who were not able to benefit from the intervention (non-accepters) in the programme area was similar to that of the control area is false as Kidoti facility as a comparator was found to be performing better than all project facilities with the accuracy of completing the OTC card. Issues of performance were affected by variable levels of capacity building (training on OTC supplemented in project sites through orientation on eNutrition), staff turnover, and availability of RUTF and basic medicines.

Comprehensiveness

Comprehensiveness measured the extent to which all relevant information had been recorded on the OTC card. Figure 3 compares the status of comprehensives of documentation before the project (Pre) and after the introduction of mobile applications (post). The overall picture depicts that the comprehensiveness has dropped by 29 points from 39% pre to 10% after introduction of the tools. As with the accuracy criteria, Chaani Kubwa was recording an a level of comprehensiveness at 85% which subsequently dropped by 65% to 20% after introduction of the tool, followed by Chumbuni that also fell by 60% and Tazari 50% and Nungwi of 17%. As with eMNH, maintenance of the dual systems for information collection and management was seen as the main contributing factor for this decline.

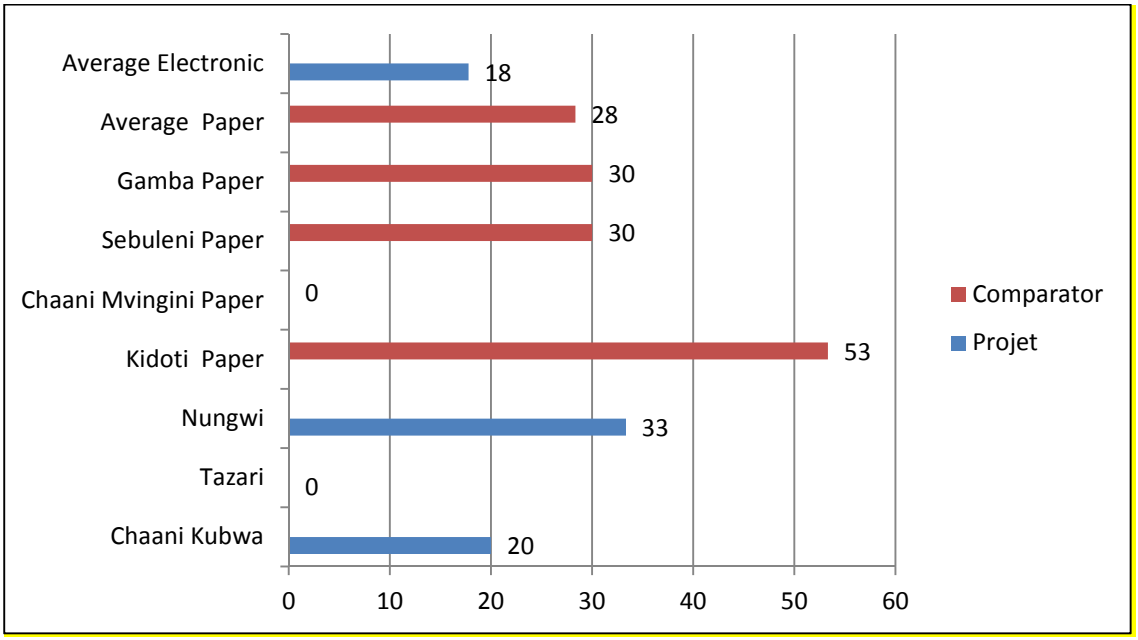
Figure 13: Comparison of project comprehensiveness of Documentation Pre and Post



Before the commencement of the project, the level of comprehensiveness of the documentation was compared to after the introduction of the project. Overall comprehensiveness of documentation decreased from 39% to 10%. The highest drop is noted at Chaani kubwa who dropped by 65% while Nungwi had a lowest change with 23% drop, with no improvement noted.

In figure 14 we compare project sites with comparators in terms of the comprehensiveness of documentation as measured by the use of OTC cards noting that case files recorded in eNutrition has all information fields recorded. On average, 28 percent of cases in comparator facilities recorded comprehensive completion of OTC cards, while 18% of cases in project sites were noted for comprehensiveness in completion of the OTC cards.

Figure 14: Comprehensiveness of Documentation Comparison of Mobile and Paper



The difference in comprehensiveness is 10% for comparator facilities (paper) and this has been due to 53% comprehensiveness from Kidoti paper. Otherwise, the comprehensiveness of documentation is poor in all paper and electronic.

The low scores in comprehensiveness for the project sites were found to primarily attributable to the following reasons:

- **Non-completion or inadequate completion of OTC cards** – documentation of SAM worsened in a number of facilities as some health workers stopped manual documenting/ record keeping altogether in favour of managing with the electronic records stored on the mobile phone. A case in point is the facility in Chumbuni where they stopped completing the OTC cards seeing it as a double burden.
- **Time demands due to peak patient loads** – in Kivunge for example the evaluation team found that situations where there were a high number of patients could easily overwhelm health workers creating time pressures for the completion of OTC cards. In addition, the transfer of two health workers who had been trained by D-tree increased the work load of other staff.
- **Limited computer literacy** – Application users were unaware that the mobile phone had the capacity of summarizing data into usable government reporting. Health workers indicated that the training provided by D-tree could have been longer to extend their capabilities beyond data entry to also provide for capacity building in report production and data analysis. D-tree has contended that the scope for this kind of training was prioritized for DMOs who were trained on how they could access reports from the D-tree server.

OTC Guidelines, HMIS and its relation to eNutrition

eNutrition is based on the Outpatient Therapeutic Care of SAM guidelines that were developed by the MoH. Through interviews, users of eNutrition revealed a lack of prioritization treatment for acute malnutrition with many steps of the work process for screening ignored, and the calculation of weight-for-height z-score (WHZ) and associated prescription of the correct does of RUTF consistently inaccurate. With the introduction of eNutrition and the built in error checks contained within it which includes calculation of WHZ, the mobile takes away the onus on the health worker of responsibility from the health worker. In this way the correct dosage of RUTF is made based on the information input by the health worker.

According to the programme document, D-tree was to create a password that will be revealed to the District Medical Officers and other authorized people to access reports that are saved on central D-tree computer dashboard so as to monitor the real-time information. It was further agreed that the report would be automatically generated from the data reported by eNutrition and that the reports will fit into the required government norms. However in the field the evaluation team noted that the application was not able to display the WHZ score based on the inputted data which created difficulties for the health worker to then fill in the OTC card. Data is then manually transcribed from available records (eNutrition or the OTC cards) as the basis for completing monthly reports for to the District Health Management Team (DHMT) as presented in the table below.

Table 27: Data collected by the OTC and the HMIS on Nutrition

Data collected by OTC Card					Data compiled by HMIS on Nutrition
Anthropometry					Children weighed 0 - 11 months
Weight (kg)					Children weighed 12 - 23 months
Weight Loss (y/N)					Children weighed 24 - 35 month
Height(Cm)					

WHZ					Children weighed 36 - 59 months
MUAC (cm)					Malnutrition _OPD
Oedema + ++ +++)					Mebendazole for pregnancy woman
History					
Diarrhea					
Vomiting Y/N (#					
Fever					
Cough					
Physical Examination					
Temperature					
Respiratory rate					
Anemia=Pallor					
Skin Infection					
Appetite test					
Action Needed					
Other medication					
Amount of RUTF to provide(3 Sachets)					
Examiner					
Discharge CRITERIA					

Outreach to CORPS and other community health workers to screen children and follow up on defaulting children varied dramatically between sites. Implementation of the SMS reminder system helped somewhat, but continuous advocacy is required with the government as well as UNICEF and other funders to support community activities surrounding nutrition.

5.3. Efficiency

The key evaluation question to measure efficiency was whether the pilot project was implemented in the most efficient way compared to alternative (paper-based method) or other potential applications.

Table 18: Comparison of efficiency indicators in project sites

Indicator	Project Sites					
	Chaani Kubwa	Tazari	Gomani	Nungwi	Chumbuni	Kivunge
# of mobile handsets distributed in project areas	2	2	2	2	2	2
# of mobile handsets in use in project areas	2	2	2	1	2	0
# of health workers trained on eNutrition	2	3	3	3	3	3

A total of 17 health workers were reported to have been trained on the use of eNutrition across the six facilities supported. In addition, representatives of the DHMT were trained on other aspects of report generation and analysis using the eNutrition project dashboard. Key informant interviews with health

workers found situations where SAM clients were being rescheduled to come to the facility during the slack time due to the additional time needed for screening and data entry using eNutrition. On average health workers were taking 45 minutes during each client interaction for screening and/or follow up. The evaluation team was not able to collect data on the number of cases and if rescheduling always lead to clients returning however there is an inherent risk in using such a method in affecting demand for treatment and increasing the level of defaulters in the event that timely care cannot be provided.

Client Follow-Up

A system for client follow up through SMS was devised and launched in one of the pilot facilities (Chaani Kuibwa) in May 2012 where an existing strong network was in place between health facility staff, sheha officials, and CORPS. Messages were developed through a participatory process involving this network targeting mothers and caregivers, fathers and CORPS alerting them on dates for appointments. Due to pipeline issues with RUTF, the SMS system was refined to be user controlled rather than server controlled (automatic) based on the date of the missed appointment date. In this way, the health staff could adjust the frequency so as to avoid clients returning and going away disappointed due to lack of RUTF. This does however have other implications upon compliance with the treatment plan advised by the health worker. The SMS reminder system was extended at the end of the project period to Tazari and Gomani however due to the short period of implementation this is outside of the scope of the evaluation.

Cost Analysis

The evaluation team used information from D-tree programme documents and progress reports to conduct the cost analysis, using costs incurred by both UNICEF and D-tree for implementation of the project over the two PCA periods. The total fixed costs were determined as TSH 350,292,034 and variable costs as TSH 35,400,000 over 2010 to 2012. The cost categories indicated under the variable category are simplified to provide the MoHSW with an appreciation of the kinds of basic costs that would be required for continuation and expansion of the project to other areas using the existing government staff structure for implementation.

Table 19: eNutrition Cost Analysis (2010-2012)

Fixed Costs	Amount (TSH)	Variable Costs	Amount (TSH)
D-tree management and project salaries	190,250,305	Supervision travel	18,000,000
Computer programming	86,258,200	Follow-Up Meetings	5,760,000
Site visits	23,401,020	Communications	7,080,000
Training and sensitisation	3,060,000	Programme management	3,360,000
Equipment (mobile phones, laptops)	5,700,000	Office supplies for maintenance	1,200,000
Office supplies for set-up	3,360,000		**35,400,000**
Office rent	14,055,888	Number of cases	**199**
Indirect programme costs	24,206,621	Project ratio (TSH)	**177,889**
	350,292,034	Project ratio (USD)	**109**

On the basis of the review of variable costs, TSH 177,889 was expended per case (approximately $109/case). In the absence of a comparative assessment of similar projects the information is presented for the consideration of key stakeholders as to the relative merits and valuation of such a structure on an ongoing basis.

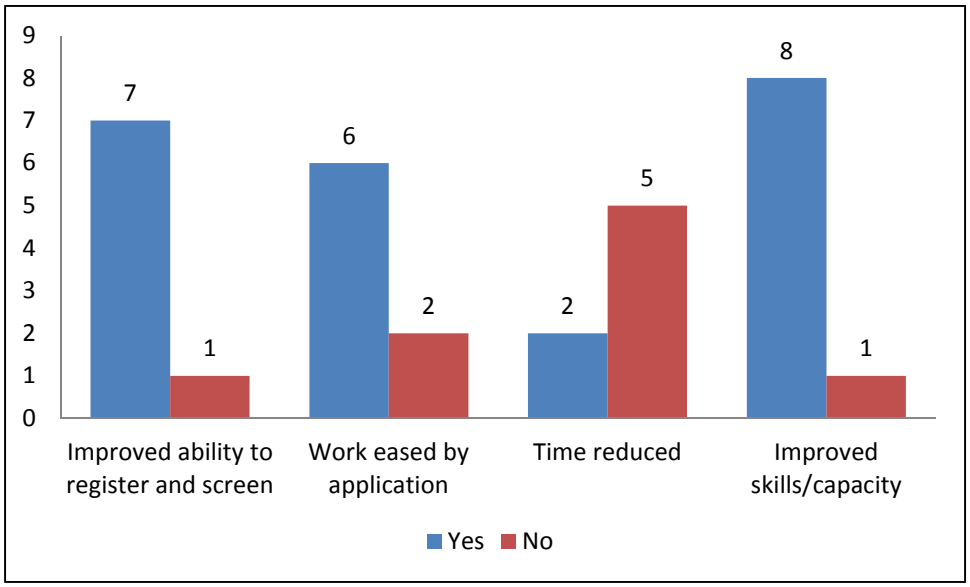
5.4. Impact

As per the theory of change, eNutrition was intended to contribute toward strengthening the quality management of outpatient care for SAM children 6 to 59 months. The key question that guided the evaluation was to assess what changes could have occurred as a result of the project and whether any unintended consequences (positive or negative) occurred. This includes a review of the perception of health workers on to what extent to which eNutrition has helped them perform their duties and improved the overall quality of care provided by the facility; the perceptions of clients as to the quality of treatment and counseling between project and comparator sites, examined the perceptions of the DHMT and assessed case outcomes over the project period.

Contribution toward health work capacity

Interviews were conducted with health workers to assess whether there were notable changes in i) their ability to register and screen patients, ii) whether the application has eased their work and iii) whether the mobile has enabled them to adhere to the guidelines and whether they are spending more time to asses clients as compared to pre-project. Fugre 15 summarises these results.

Figure 15: Perception of Health Workers on Contribution of eNutrition



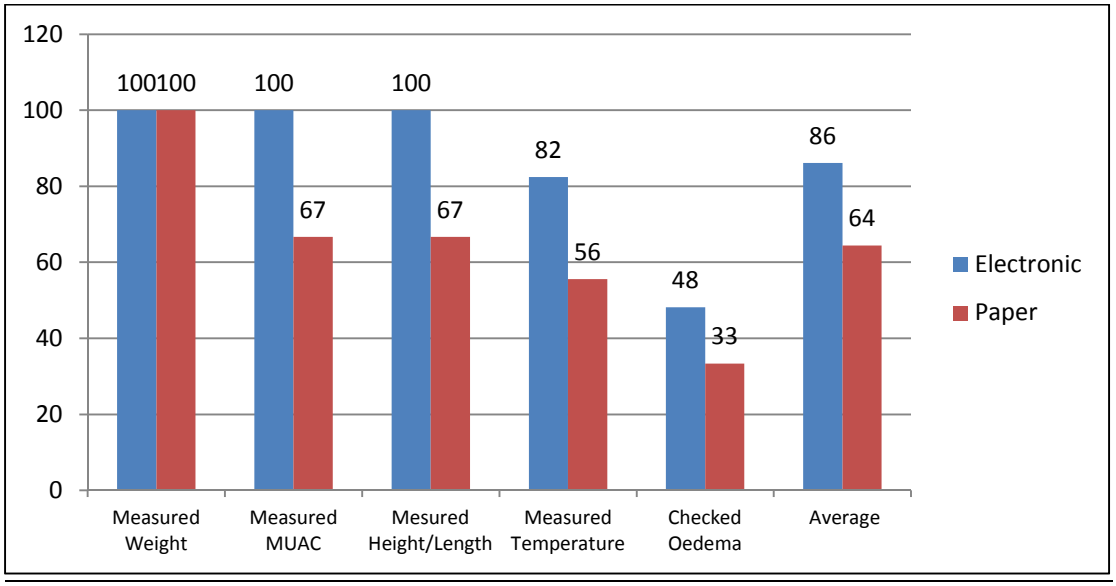
The evaluation found eight instances where the introduction of eNutrition had contributed toward perceptions of improved skills/capacity, seven instances where eNutrition had contributed toward improving the process of registration and screening and six instances where eNurition had eased the workload of health workers involved with OTC. For those health workers who indicated that time required for registration and screening had increase explained that with the introduction of eNutrition, they are compelled to pass through all the processes that are in the guidelines confirming other accounts that prior to the introduction of OTC guidelines and eNutrition they would skip many steps.

Contribution to Improved Facility Service Delivery

The evaluation team also sought to compare the quality of treatment between project and comparator sites using the OTC guidelines as a reference for the standard steps to be covered within a routine visit. Figure 11 compares these results between the two groups. On average, perceptions with regards to the quality of care

in project sites was higher at 86 percent while in the comparator sites this was much lower at 64 percent with noticeable variances in the screening of bilateral pitting odema. More routine procedures Electronic facilities were handling very well the measurement of MUAC and height/length at 100%.

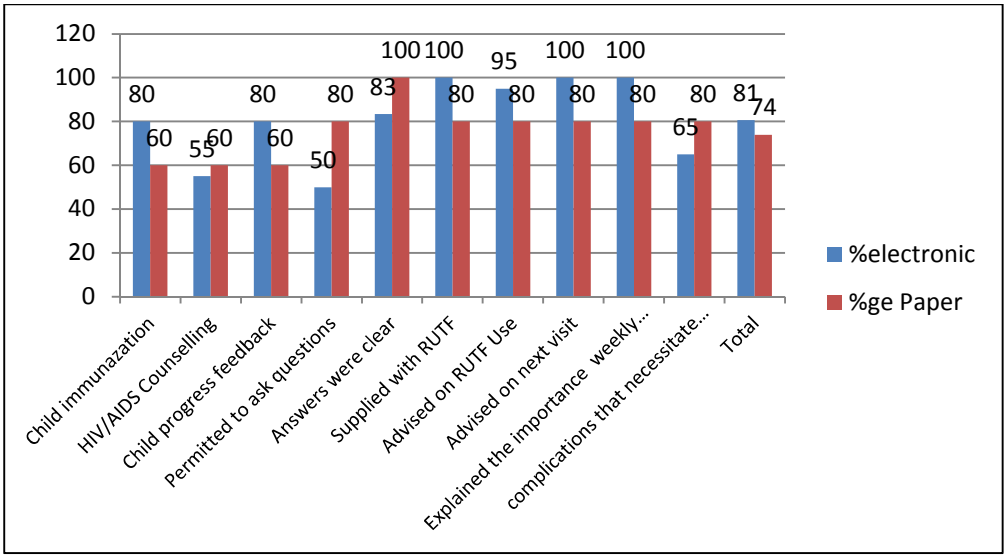
Figure 16: Client satisfaction between project (Electronic) and Comparator Sites (Paper)



Contribution toward Counseling

The evaluation team examined the level of satisfaction with the counseling services clients received from health workers between project and comparator facilities. The responses are as in figure 12 below:

Figure 37: Perception of Clients on the quality of counseling a comparison paper and electronic



Again as in treatment the client in project sites perceived the counseling services provided to be better compared to the comparator sites by 7 percent. This includes more focused counseling on other health areas including child immunization and feedback on child progress as well as more consistent provision of RUTF (where available) and the importance of the next visit.

SAM Case Outcomes

The table below provides a representation of exit indicators with reference to the Sphere Standards. There were a total of 199 exits consisting of those individuals no longer registered with the programme which includes those who have defaulted, recovered (including those who are referred) and died. The overall rate of recovery over the project period was therefore 34 percent, significantly lower than the Sphere reference point of 75 percent. In addition, a further 36 percent defaulted, 30 percent were referred for ITC but no deaths were recorded over the project period.

Table 20: Exit Indicators against Sphere Standards

Total Recovered	Total Died	Total Defaulted	Total Referred	Total exits
68	0	71	60	199
Proportion of exits recovered	**Proportion of exits died**	**Proportion of exits defaulted**	**Proportion of exits referred to ITC**	
34%	0%	36%	30%	
OTC Average Recovered	**OTC Average Died**	**OTC Average Defaulted**		
60%	0%	40%		
Sphere Standard for recovery rate	**Sphere Standard for death rate**	**Sphere Standard for defaulter rate**		
>75%	<10%	<15%		

Issues with the capacity of health workers, the quality of supportive supervision and the availability of a consistent supply pipeline among other factors can be seen as key contributory factors for the high proportion of defaulters. Key informant interviews with clients and health workers also attest to this issue and the resultant effect on caregiver's confidence in OTC treatment.

The eNutrition project succeeded in ensuring IMAM programme data was included in the monthly HMIS reporting tool and thus is being captured centrally and is accessible online despite quality of data. D-tree worked with the MoHSW Nutrition Unit and the HMIS unit to advocate and facilitate the process of having OTC data added to the DHIS as of January 2012. In addition, focused meetings were conducted with MoHSW Nutrition Unit and the North A District management team (DHMT) in January and February 2012 focusing on data supervision for malnutrition and capacity building on the use of the D-Tree dashboard for programme monitoring.

5.5. Sustainability

The evaluation team made reference to ExpandNet's "Checklist for assessing the potential scalability of pilot projects or other programmatic research" to assess the degree of difficult for project sustainability and scale-up.

Questions related to potential scalability	Yes	No	More information/ Action needed
1. Is input about the project being sought from a range of stakeholders (e.g. policy-makers, programme managers, providers, NGOs, beneficiaries)?	X		
Are individuals from the future implementing agency involved in the design and implementation of the pilot?	X		MoH, D-tree and UNICEF were involved throughout the course of the project
Does the project have mechanisms for building ownership in the future implementing organization?		X	Mechanism not explicitly clarified as part of project design
2. Does the innovation address a persistent health or service delivery problem?	X		
Is the innovation based on sound evidence and preferable to alternative approaches?		X	No locally derived feasibility assessment conducted with consideration of alternatives
Given the financial and human-resource requirements, is the innovation feasible in the local settings where it is to be implemented?	X		Feasible for implementation within current resourcing arrangements
Is the innovation consistent with existing national health policies, plans and priorities?	X		Aligned with relevant national policies and strategies
3. Is the project being designed in light of agreed-upon stakeholder expectations for where and to what extent interventions are to be scaled-up?		X	Scale up plan developed as part of project implementation rather than as part of project design. Costing for different scale up scenarios not available
4. Has the project identified and taken into consideration community, cultural and gender factors that might constrain or support implementation of the innovation?		X	Analysis of community, cultural and gender factors not undertaken
Have the norms, values and operational culture of the implementing agency been taken into account in the design of the project?	X		Extensive interaction between MoH, UNICEF and D-tree conducted.
Have the opportunities and constraints of the political, policy, health-sector and other institutional factors been considered in designing the project?		X	A comprehensive baseline also understanding human resourcing and other aspects important for service delivery including supplies would have been beneficial.
5. Has the package of interventions been kept as simple as possible without jeopardizing outcomes?	X		Modules scoped for manageability
6. Is the innovation being tested in the variety of sociocultural and geographic settings where it will be scaled-up?		X	
Is the innovation being tested in the type of service-		X	No evidence provided

delivery points and institutional settings in which it will be scaled-up?			however scale up has taken place to other sites in Zanzibar
7. Does the innovation being tested require human and financial resources that can reasonably be expected to be available during scale-up?		X	
Will the financing of the innovation be sustainable?		X	Heavily dependent on donor resources
Does the health system currently have the capacity to implement the innovation? If not, are there plans to test ways to increase health-systems capacity?	X		With external support
8. Are appropriate steps being taken to assess and document health outcomes as well as the process of implementation?	X		Linked with project evaluation
9. Is there provision for early and continuous engagement with donors and technical partners to build a broad base of financial support for scale-up?	X		Ongoing, facilitated by D-tree
10. Are there plans to advocate for changes in policies, regulations and other health-systems components needed to institutionalize the innovation?	X		Policy advocacy an integral part of mHealth CoP function chaired by D-tree
11. Does the project design include mechanisms to review progress and incorporate new learning into the implementation process?	X		Included as part of periodic review but also on an ongoing basis to improve the design for implementation
Is there a plan to share findings and insights from the pilot project during implementation?	X		Linked with periodic review meetings with MoH and UNICEF
12. Is there a shared understanding among key stakeholders about the importance of having adequate evidence related to the feasibility and outcomes of the innovation prior to scaling up?	X		Future resourcing from UNICEF has been made conditional upon completion of project evaluation

As with the eMNH project, the above stocktaking gives an indication of the conditions and capacities for the project to go to scale. Implementation of a product such as eNutrition requires a substantial resource investment both in terms of human resources for technical support and in terms of financial resources making it difficult to conceive of a model where the applications could go to any significant scale or foresee for future cost-sharing scenario with Government. The huge investment for the extremely limited scale of coverage in just six facilities in Zanzibar also limits the ability to advocate for investment on the basis of value for money. Analysis of different solutions and alternatives based on needs would have been beneficial in understanding how the decision support application is being integrated within a broader package of support. The evaluation team does however note that the project has already been expanded to other districts and facilities in Zanzibar with initial development costs and support structures arguably achieving economies of scale as the beyond the initial set up phase supported by UNICEF.

In addition, government commitment and prioritization of the issue of child malnutrition was found to be an issue in Zanzibar despite the existence of policy documents and strategies for food security and nutrition. Key informant interviews with DHMT and MoH representatives suggest a limited capacity and prioritization of mHealth initiatives within government budget discussions. Integration of mHealth initiatives across the sector remains an issue, under-exploiting the potential of the medium. As key informants have argued,

prioritization of a broader area such as IMCI may offer greater opportunities for integration across the flow of care and thereby strengthen government buy-in. Despite the concerns about scalability, there continues to be funding from multiple donors and development partners to further extend and expand the reach of the D-tree in Zanzibar and on the Mainland.

6. Analysis of Cross-Cutting Issues

In this section, issues and principles which support the implementation of eMNH and eNutrition are discussed in terms of quality of planning and implementation and their relevance, effectiveness, efficiency and sustainability. These are results based planning and management, information and monitoring systems, integration with the national health system, coordination of mHealth partners, equity and reaching vulnerable populations, capacity development and training, and UNICEF's technical and organizational support.

6.1. Results-based planning and management

Results-based planning and management requires UNICEF and its implementing partners to clearly define the expected results of programmes during the planning phase. This includes articulation of the relevant indicators for performance monitoring; the necessary resources to achieve planned results; and mechanisms to facilitate regular review of implementation progress with structures to make adjustments as required. Baseline survey and feasibility assessments are recommended prior to commencement of a pilot mHealth project to facilitate a more rigorous basis on which to evaluate a proof of concept.

The evaluation team failed to generate evidence that the planning of the projects passed through a rigorous problem identification process and that consensus was achieved that the application of decision tree was the best possible option to address programme needs. Indeed, there were no additional documentation provided by UNICEF to demonstrate the consideration of alternatives to meet programme objectives nor was a comprehensive baseline conducted before the initiation of the pilot to facilitate systematic assessment. That being said, a specified duration for the pilots were established from the outset with the duration of UNICEF assistance focused on the successful or unsuccessful demonstration of the hypothesis being tested. To ensure future sustainability, these kinds of research projects should be better integrated within the broader IMAM programme to understand how different elements contribute toward improved outcomes for children.

Instead of using a logical framework, the project was designed based using a project planning matrix and the results ended at the output level. While this may be a matter of semantics, guidance on the management of pilot initiatives should include clear and testable hypotheses in order to provide the evidence for subsequent advocacy and in order to capture knowledge in a thorough and systematic manner. The eNutrition project's expected result to test the feasibility of a phone based application to increase the detection rate of malnutrition and improve the health outcomes of malnourished children and the eMNH project's expected result to test the feasibility of phone based applications to increase the rates of standards based care to pregnant, postpartum women and newborns at the community and facility level and to improve maternal and neonatal survival, would seem appropriate in the first instance but overly ambitious in the second instance. Indeed, the performance indicators outlined for implementation monitoring of the eMNH project from the agreed PCAwould seem better aligned to first half of the result focusing on increasing standards based care than overall improvements in maternal and neonatal survival. Similarly in the case of eNutrition, performance indicators in the PCA suggest greater capacity for monitoring improvements in but only within the scope of facility service delivery.

The importance of an integrated mechanism for community management of acute malnutrition has been referred to elsewhere and cannot be under emphasized. Emphasis on regulating for an official cadre of CORPs to extend the capacity of the health system into the community has the potential for more systemic, long-term benefits for the sector. Furthermore, linkage of the project with a broader health systems strengthening initiative also addressing other aspects of capacity development, surveillance, community management of acute malnutrition, supply chain management (across key health and nutrition interventions) would have provided a more robust basis for integration and alignment with Government priorities.

Table 21: D-tree Performance Indicators for Project Monitoring

eMNH Performance Indicators	eNutrition Performance Indicators
• Computable medical algorithms available. • e-MNH prototype available. • Plan for integration of mobile telephone based protocols into clinics available. • Number of trained e-MNH staff. • Number of HW and CHW actively using electronic algorithms in the community and health facility to deliver standard based care to pregnant women and newborns are designed. • Scale up plan for use of mobile telephone based applications to deliver standard based care to pregnant women and newborns in clinics and communities in Tanzania.	• Computable medical algorithms available. • e-Nutrition prototype available. • Plan for integration of mobile telephone based protocols into clinics available. • Number of trained e-Nutrition staff. • Number of HW actively using electronic algorithms to detect malnutrition cases. • Scale up plan for use of mobile telephone based screening protocols for clinics in Tanzania.

Routine project monitoring by D-tree, UNICEF and the MoHSW/MoH were articulated in the programme document are established and progress documented. Regular visits were conducted by D-tree to support site selection, monitoring and supervision and adjustment to the eMNH and eNutrition modules based on end-user feedback. An initial plan for self-evaluation of the project by D-tree was subsequently removed from the scope of the PCA and commission by UNICEF. The evaluation team did however find that qualitative monitoring was not tracked systematically to cover areas such as:

- The number of repeat screenings as a proportion of total screenings;
- Qualitative data on, the effectiveness of existing community outreach activities, reasons for default, and effectiveness of counselling;
- Programme performance with respect to children affected by moderate acute malnutrition.

As the project is expanded, opportunities to broaden the scope of monitoring opportunities to encompass these kinds of indicators should be explored to provide additional information relevant for programme management.

6.2. Integration of eNutrition/eMNH in the National Health System and Local Ownership

The Health Management Information System (HMIS) is critical for evidence-based policy and informed decision-making at all levels from national to district levels. The system requires all health facilities, regardless of ownership, to report to the district health authority on quarterly basis. The HMIS in many developing countries is often however, characterized as being inefficient and unreliable as a result of underreporting, distorting estimates of disease and treatment burdens. The issue of data quality is associated with insufficient analysis skills, training and lack of initiative for using information at lower administrative levels.

The Revolutionary Government of Zanzibar and Government of Tanzania are directly accountable for managing the Health Management Information System (HMIS). In the case of Zanzibar, significant progress has been made by the Government to establish a fully electronic HMIS system which compiles data from all facilities and is centralized and accessible online. The eNutrition project succeeded in ensuring IMAM programme data was included in the monthly HMIS reporting tool and thus is being captured centrally and is accessible online despite issues of data quality. D-tree worked with the MoHSW Nutrition Unit and the HMIS unit to advocate and facilitate the process of having OTC data added to the DHIS as of January 2012. In addition, focused meetings were conducted with MoHSW Nutrition Unit and the North A District management team (DHMT) in January and February 2012 focusing on data supervision for malnutrition and capacity building on the use of the D-Tree dashboard for programme monitoring. For the project in Bagamoyo, data integration was not pursued during the period of cooperation however discussions were initiated between the DHIS unit at the University of Dar es Salaam to assess the feasibility for direct data transition from the eMNH server to the DHIS system.

In the absence of a specific government policy on mHealth, integration of data and information generated by mHealth projects and the implications on maintaining existing manual systems for information managed are yet to be clarified. In addition, a clear framework for addressing issues such as hosting environments, data ownership / privacy and investment priorities will be an important step in moving toward considering a more long-term view of mHealth. D-tree International is currently storing patient data on their own servers, and it is not clear that the MoHSW/MoH has progressed with developing its technical capacity to take on management. Many mHealth pilot projects are established in the absence of a clearly articulated government plan outlining a framework for the hosting of databases and protocols for accessing information.

As D-tree have reiterated:

> "*One of the main advantages of using the mobile application is the storage and speed of gathering and using data. D-tree will create dashboards and reports to monitor the real-time information. This report will be automatically generated from the data reported by e-Nutrition.* ***The reports will fit into the required government norms.*** *D-tree will work with the MoHSW and UNICEF to identify an appropriate server in Tanzania on which to store the data. Any data collected will be the property of Ministry of Health and Social work and UNICEF and available at all times to MOHSW and UNICEF."*

6.3. Coordination of mHealth partners and projects

On the Mainland and in Zanzibar, D-tree co-leads the mHealth Community of Practice (CoP) with the MoH to strengthen overall coordination between mHealth partners and projects, sharing of project results and

lessons learned, promotion of non-exclusivity to individual mobile networks or devices, consideration for ownership of source codes and reproduction as well as planning for scale up of mHealth initiatives. The group brings together stakeholders in the field of mHealth from government, research and academia, development partners, the private sector and NGOs, amongst others. According to CDC Foundation, the CoP is based on the shared values of Public Private Partnerships:

> *"The CoP is not a club (an exclusive collection of individuals/companies who only look at profit maximization or to collude for example to set prices) but an instrument to promote mhealth as a driver of health development outcomes. Our prime agenda is to scale up the pilots as pilots are now a disease 'Pilotitis*". *It is a unique organization that comprises of international and Local NGOs, corporate (TIIGO, Zantel, Push Mobile, Vodacom, etc) , government and the academia – University of Dar es Salaam (UDSM) and our last meeting attracted more than 60 participants."*

The strategic plan of the CoP outlines the following key areas with regards to their scope and direction:

Vision
Be a leading community in improving health care delivery to Tanzanians

Mission
Through the use of mobile technologies expand access to and strengthen the health care systems in Tanzania

Purpose

- Use of mobile technology
- Coordinate and channel
- Sharing and creating recognition

Values

- Efficiency
- Impact focused
- Transparency
- Collaboration

The following strategic objectives will enable the COP to achieve the planned mission:

1. Improve national health system by use of mobile phone technologies
2. Reduce redundancy of mHealth projects
3. Strengthen mHealth Governance and coordination
4. Improve knowledge sharing, linkage and strengthening sustainable CoP

The mainland CoP shows great momentum amongst a crowded playing field. These structured partnerships have the potential for in generating political will through coalition building however a mapping initiated by the CoP in 2012 referred to approximately 40 ongoing mHealth pilots, the majority of which have not managed to move forward beyond the pilot stages. Within government, there are formalized positions for eHealth/mHealth Coordinators for both the Mainland and Zanzibar although they continue to face challenges in a largely donor-driven environment. UNICEF's positioning within this group also remains unclarified despite their investment in the area and experience in supporting technology projects in other sectoral areas such as education and birth registration.

In Zanzibar, the mHealth CoP is also co-chaired by D-tree with the MoH but has largely been inactive since its formation in January 2012 beyond one meeting held in collaboration with UNFPA. Capacity challenges the continuity of the group which is largely driven by development partners. Having said that, D-tree have been instrumental in leading upon the conceptualization of a proposal with the MoH and DANIDA for support the mobile operator, Zantel for all Zanzibar mHealth activities. As with the Mainland, the CoP will require a more sustained engagement of partners such as UNICEF, UNFPA and WHO which all have presence in Zanzibar and experience in the area of mHealth.

6.4. Equity and reaching vulnerable populations

As outlined in earlier sections, the national policies guiding nutrition in Zanzibar and Maternal Health in Mainland Tanzania are aligned with key human rights principles and norms to ensure equitable access and coverage of health services. National policy documents do not however make explicit reference to gender and project documents agreed between UNICEF and D-tree did not distinguish the need for provision of gender disaggregated data.

Although advances have been made in closing the gender gap in education, approximately a third of Tanzanian women aged 15-45 years are illiterate over a third of married women report that their husbands make decisions about their healthcare. A very large proportion of women do not have the discretionary power within the household unit to visit a clinic or to access healthcare for their children without obtaining permission and resources to do so from their husbands. The low status of young women in particular are significant factors undermining the adoption of care-seeking behaviours that can improve maternal and neonatal status, ensure timely treatment for malnourished children, encourage breastfeeding and influence other childcare choices and decisions over where women give birth. The impact on women's workload on care-seeking behaviours is not clear including how travel to collect RUTF may have interfered with other chores and household responsibilities. The poor and disadvantaged may have been less willing to participate in the programme and provision of services within the community in Zanzibar in particular require strengthening.

In gauging a future expansion of eMNH and eNutrition, consideration should be given to strengthening the equity focus of the programme, in particular:

- Feasibility assessments and programme design documents should contain specific information on gender and socio-economic factors which may influence equity, access to and utilization of the programme.
- Provide greater definition of the most vulnerable groups as well as details on how, by what means and with what resources would be required to reach them.
- Strengthening links with the community as a means of bringing the project closer to the community and thereby increasing access to the most disadvantaged.
- Monitoring tools and performance reports should include disaggregated data to facilitate further analysis of gender and equity-related issues.

6.5. Capacity Development/Training

The eMNH and eNutrition pilot projects organized training and made concerted efforts to follow up the training, however all of the participants expressed their feeling that the training was short leading to the inability of the health worker not to exploit to the maximum the features that are offered by the mobile

applications. Manuals that can guide health workers on the use of the mobile applications were unavailable to provide a reference for trouble shooting and peer mentoring for other users.

The main objective of the training was to introduce facility members towards a phone based application tool to make sure they can correctly manage severe acute malnutrition in children aged 6-59 months and to increase the rates of standards based care to pregnant, postpartum women and newborns at the community and facility level as the basis for improving maternal and neonatal survival. The training targeted health facility members (nurses, clinical officers, nutritionists at central level, and others) on the assumption that the relevant health workers would have already received comprehensive training on OTC/IMCI or F-ANC by the MoHSW/MoH which was not always the case. The cascade model of training used for most national capacity building exercise has been shown to have diminishing returns at the local level[11]. National trainers were offered the initial rounds of training at district level, after which the district ToTs cascaded the trainings to sub-district cadres at ward, sheha and village levels.

According to the MoHSW, OTC training for health workers could not reach all targeted participants due to a lack of resources. It was however observed that Health workers in all sites who attended the OTC training were conversant with SAM causes, were able to distinguish MAM from SAM, were competent to determine SAM using the MUAC tape and managed well the process of registering and screening a patient as in the OTC guidelines. Most had difficulties in using the conversion table to determine the WHZ and in detecting Odema in children. All facilities expressed a need for further training through refresher courses. It is not easy to compare the coverage of training between the project facilities band comparator facilities as the CommCare training provided by the project only related to the use of mobile application and therefore not extended to non-project sites. However, in all the facilities both project and comparators, capacity was found to be an issue. In Zanzibar, sustaining the motivation of health workers who continue to receive half of the salaries of their Mainland counterparts will continue to be a challenge.

On the Mainland, as part of the 7LDs strategy over 2007 to 2010, UNICEF supported capacity building in a range of MNCH packages including Focused Antenatal care (FANC), Basic and Comprehensive Emergency Obstetric and New-born care (BeMONC and CEmONC), Postnatal care, comprehensive Post Abortion Care (PAC), Essential New-born Care (ENC) and new-born resuscitation (helping Babies Breathe), PMTCT using revised guidelines, EPI courses; community Integrated Management of Childhood Illnesses (cIMCI); and training of CHWs to conduct Behaviour Change Communication (BCC) for MNCH. The multiplier effects expected from cascade models of training do however need to be supplemented with district level resource allocations to ensure the necessary refresher sessions can be conducted.

6.6. UNICEF's Technical and Organizational Support

UNICEF's roles in implementing the project are specified in the Programme Cooperation Agreement (PCA). The roles and responsibilities included: i) commencing and completing the responsibilities allocated to it in the PCA Programme Document in a timely manner (assuming all necessary reports and other documents are available); ii)undertaking and completing the on-going monitoring, oversight and evaluation of the PCA Programme; iii) liaising on an on-going basis, as needed, with the Host Government, other members of the United Nations Country Team in Tanzania, donors, and other stakeholders in connection with the PCA Programme; and iv) giving overall guidance, oversight, technical assistance support, and leadership for the implementation of the PCA Programme, as part of the implementation of the UNICEF-Tanzania Programme, and making itself available for consultations as requested.

[11] External Evaluation of Government of Tanzania/UNICEF 7 Learning Districts Strategy (2007-2011), p. 118

UNICEF played a key facilitation role to introduce and initiate the pilots through the MoHSW and MoH. Supporting the provision of other key complementary inputs including critical medical equipment, drugs and supplies, Ante Natal Clinic (ANC) cards and clinic cards for under-fives, national guidelines and training materials and other equipment in support of MNCH on the Mainland and support to the procurement of RUTF and some equipment (length boards, weighing scales, updated MUAC tapes). Maintaining a consistent pipeline in Zanzibar for essential commodities such as RUTF and antibiotics was however a key challenge which requires a more focused analysis to better understand the service bottlenecks which are unique to the area.

Despite field visits having been made to project sites, documentation of ongoing technical support by UNICEF could have been improved with no field monitoring reports available for review by the evaluation team to give further account to the quality assurance function played by UNICEF towards its partners. Indeed, the evaluation of the 7LDs strategy found that UNICEF had insufficient capacities and competing priorities between its commitments at the "upstream" policy-level compared with its implementation at the "downstream" level affecting its ability to sustain planned quarterly joint monitoring visits[12]. In Zanzibar, where UNICEF has a field office, staffing time is stretched between maintaining support across a broader range of programme priorities within the health and nutrition sector. As the project was being managed by the UNICEF team in Dar es Salaam, interaction between D-tree and the MoH primarily involved nutrition colleagues from the UNICEF Country Office rather than the field office. This limited the ownership of the UNICEF Zanzibar team toward the project and the potential for more immediate support and supervision which could have been provided. UNICEF should considering clarifying a more specific role and function for Zanzibar based staff for projects being implemented within its geographic jurisdiction to strengthen its oversight and supervisory function. This would also have the benefit of enhancing programme integration with other sectors which have an impact upon the health and nutrition sector, including education and water and sanitation.

7. Good Practices, Lessons Learned and Opportunities

The purpose of the chapter is to systematically document good practices achieved and sustained due to the project, account for lessons learned during the phases of implementation and draw attention to specific opportunities to inform future programme strategies in these areas.

Good Practices

1. Introduction of eMNH and eNutition contributed toward improvements in information management at the facility and community level

    - Since the introduction of the tools, health workers in Bagamoyo and Zanzibar reported the applications as providing a more readily accessible information source of client records to support them in their work.
    - Maintenance of electronic records was also reported to be more durable with files maintained centrally, able to be recalled and less likely to be eaten by rats.

2. Introduction of eMNH and eNutrition improved reporting between different levels of administration

[12] External Evaluation of Government of Tanzania/UNICEF 7 Learning Districts Strategy (2007-2011), p. 172

- Introduction of the mobile applications was found to a positive contribution toward monthly reporting from individual facilities to the district and national level compared with existing paper based methods.
- The eNutrition project facilitated integration of IMAM data into HMIS in Zanzibar allowing IMAM data to be accessible online.

3. Development of eMNH and eNutrition was guided by principles of usability and user friendliness

    - Health workers in both Bagamoyo and Zanzibar found the applications to be easy to use and navigate.
    - D-tree continued to modify the applications based on the feedback of users including numerous updates to the Kiswahili script.

4. Capacity building in eMNH/eNutrition and its associated reporting dashboard supports overall capacity development

    - Despite its focus on capacity building in the specific tools being introduced, training had the indirect benefit of improving overall capacity in the respective areas of MNCH and IMAM/OTC. The longer health workers were using the application, the greater was their knowledge across areas such as the recommended dosage of RUTF and key counseling messages for ANC.

5. Investment in proactive technical supervision was important and appreciated

    - D-tree made numerous site visits over the project period to identify and trouble short issues and solicit input from users as the basis for improving and updating the applications, and providing ongoing capacity building in the field during the regular course of health workers performing their duties.

Lessons Learned

1. The importance of having fully functional programmes including maintaining a continuous supply pipeline for essential commodities and equipment cannot be under-estimated, otherwise diminishing the contribution of the mobile applications toward improved quality of care.

    - On the Mainland and in Zanzibar, the evaluation team noted that health workers do not always have the supplies they need to perform their duties creating disincentives for future care-seeking practices and contributing toward demoralizing health workers. Intermittent stockouts were noted for key items such as folic acid and Ferrous Sulfate as well as lab reagents needed for various blood and urine tests, as well as RUTF, antibiotics and OTC cards needed for OTC treatment. Strengthening the mechanism for supply and logistics is critical for projects in MNCH and Nutrition to be successful.

2. Integration between facility based service delivery and community outreach and support pays dividends in strengthening access to health and nutrition services and reducing the burden of facility based care

    - Inconsistent coverage of CORPs or other CHW structures limits the effectiveness of the programme and the ability of reaching vulnerable children, reduce the number of defaulters and prevent maternal deaths in the community. Ensuring a more structured interaction

between facility-based workers and CORPs/CHWs multiplies the benefits gained through facility-based service delivery through supervision and follow-up of affected children. Increasing channels for communication through community level meetings, SMS reminders or phone calls works toward enhancing the outreach components and reducing barriers to treatment.

3. Assessments of network coverage and system requirements should be established as part of programme/project design

    - Weak network coverage and systems capacity are important factors for programme functionality in developing countries, not least in Tanzania despite the high penetration of mobile phones and networks operating in the country. Conducting a thorough assessment of network requirements and capacities provides the necessary due diligence for informing decisions on programme design and systems integration. Despite the roll-out of internet connectivity to the districts, the evaluation team noted issues with internet connectivity at the DHMT offices limiting the potential for more proactive use of data from the D-tree dashboard for supervision and monitoring.

4. Identifying an area of intervention with the potential for high coverage creates a more substantive evidence base for advocacy and leverage of resources

    - The monthly caseload of children affected by SAM in Zanzibar is small, with an average of 13 clients per month in project sites over the project period consisting of new and re-enrolled children. Noting that the community outreach component is still relatively weak in Zanzibar, there remain unknown numbers of children that are routinely undetected if they do not seek out support from a facility.

5. Maintaining a rolling training plan to address staff turnover

    - The evaluation team confirmed the reports of D-tree and the 7LDs evaluation of the high levels of staff turnover on the Mainland and in Zanzibar for transfer and redeployment to other areas. D-tree provided extensive support through short two-day training packages, refreshers and on the job support and supervision. Advocacy with the MoHSW/MoH to assist with staff retention and continuity planning is necessary to avoid service gaps and strengthen knowledge transfer.

Opportunities

1. Growing momentum and experience in supporting mHealth interventions in Tanzania has great scope for improving the maturity of enabling structures and regulatory frameworks.

    - This evaluation has been limited to the scope of assessing the two decision support systems applications supported by D-tree however the breadth of the mHealth field creates numerous opportunities for building more integrated solutions to cover a range of interventions areas across a continuum of care cover different strategies such as disease surveillance, supply chain management, public health promotion, patient tracking and early warning.
    - The development of an eGovernance strategy and drafting of an eHealth policy in 2012 has started the process of institutionalizing a framework for mHealth in Tanzania. Presidential commitment toward championing for the use of ICT in government service delivery also gives senior representative influence on the area. In addition, the MoHSW/MoH has appointed mHealth coordinators who work in close contact with the respective HMIS units for Mainland

and Zanzibar. Support to mHealth CoPs need to be sustained to see dividends of improved coordination and accountability amongst partners in the sector.

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8. Conclusions and Recommendations

The TOR stipulated to use the Organization for Economic Co-operation and Development – Development Assistance Committee (OECD-DAC) criteria to assess the relevancy, effectiveness, efficiency, impact and sustainability of the project.

Relevance – Overall the project objectives were found to be relevant and in accordance with the priorities and policies of the MoHSW on the Mainland and in Zanzibar. Implementation in Bagamoyo supported UNICEF existing commitments to the 7 Learning Districts to promote programme convergence in geographic areas of need. Maternal health and Nutrition continue to feature within the programmatic priorities of UNICEF's support to the United Nations Development Assistance Plan (UNDAP) being implemented over a four year period from 2011 to 2015. Investment in a decision support system works to address capacity challenges in adherence to standard protocols and guidelines and work towards improving information management at the facility and national level. Nurses using eMNH expressed satisfaction with the introduction of the new tool, contributing toward streamlined their job tasks, easing the process of retrieving client data and improving their overall confidence in interacting with clients. In Zanzibar, the introduction of eNutrition was found to have contributed towards reinforcing national guidelines, standardizing the support provided to children affected by severe acute malnutrition and the advice given to caregivers to support their rehabilitation and ongoing care.

Effectiveness – Overall the project sites where eMNh and eNutrition had been introduced had improved the accuracy and comprehensiveness of treatment. With built in error checks and skip logic designed as part of the application, the user is only required to input the necessary information to make a complete registration and screening to then be instructed of the necessary course of action. In these same facilities however, the accuracy and comprehensiveness of completion of the existing paper based systems for data gathering declined even below the levels of the comparators due to the additional burden of work in completing the task twice on the device and on paper.

Efficiency – Cost analysis of the eMNH project finds fixed costs to a total of TSH 399,669,649 and variable costs as TSH 29,039,992 ; for eNutrition project finds total fixed costs at TSH 350,292,034 and variable costs as TSH 35,400,000 over 2010 to 2012. On the basis of the review of variable costs, TSH 28,249 was expended per case (approximately $17/case) for the eMNH project as a result of the higher caseload for ANC over TSH 177,889 was expended per case (approximately $109/case) for eNutrition due to the smaller number of client interactions over the project period. In the absence of a comparative assessment of similar projects the information is presented for the consideration of key stakeholders as to the relative merits and valuation of such a structure on an ongoing basis. The cost categories indicated under the variable category are simplified to provide the MoHSW with an appreciation of the kinds of basic costs that would be required for continuation and expansion of the project to other areas using the existing government staff structure for implementation.

Impact – Clients of both project noted positive interactions with health workers using the eMNH and eNutrition tools compared with the experience of clients in comparator sites. Compared to the Sphere standards for nutrition however, the projects sites underperformed in terms of recovery and default rate.

The death rate is low but it is difficult to measure as most of the complicated cases are referred to ITC and we were unable to track at what seriousness the patients at the time of referral. Other complementary factors are contingent upon the impact of the project including the capacity of health workers, quality of supportive supervision and the availability of a consistent supply pipeline among other factors.

Sustainability – The huge investment for the extremely limited scale of coverage in just six facilities in Zanzibar and two facilities in Bagamoyo limits the ability to advocate for investment on the basis of value for money. Implementation of a product such as eMNH and eNutrition requires a substantial resource investment both in terms of human resources for technical support and in terms of financial resources making it difficult to conceive of a model where the applications could go to any significant scale or foresee for future cost-sharing scenario with Government. In addition, building and sustaining government commitment and prioritization on these issues is extremely important in determining future resource allocations from public funds and motivation for building technical capacity at the Ministry level to address other aspects such as data storage.

1.2. Recommendations

The following recommendations have been developed on the basis of the findings of the evaluation and consultation with partners to ascertain feasibility, practicality and accordance with evolving priorities and strategic direction.

Recommendations for UNICEF	
No.	**Recommendation and Rationale**
Immediate priority	
1.1	*Strengthen process and evidence to inform problem identification for programme design* Baseline survey and feasibility assessments are recommended prior to commencement of a pilot mHealth project to facilitate a more rigorous basis on which to evaluate a proof of concept. Analysis of priority needs as the basis for guiding the type of mHealth solution should be logical in the context of existing programme priorities and the work of other partners. Consideration should be given on the extent to which projects have sustained buy-in and ownership from Government and other national stakeholders and ensure a more structured process is initiated as the basis for feasibility assessment and building the evidence base for demonstrating the value of pilot projects on a broader scale.
1.3	*Ensure a consistent and active presence is maintained in the mHealth CoP* The mainland CoP shows great momentum amongst a crowded playing field. These structured partnerships have the potential for in generating political will through coalition building. UNICEF's positioning within this group needs to be clarified to ensure a more active and consistent presence, also harnessing the potential for advocacy from other investments in the use of mobile technology s in education and birth registration.
Medium-term priority	
1.2	*Improve linkages between the use of mHealth initiatives such as eNutrition and eMNH with other health systems strengthening initiatives* mHealth projects have tremendous potential to contribute towards sector wide strengthening initiatives to the extent that these projects are aligned with broader programmes of support. UNICEF, in its capacity as a key development partner of the Governments of Tanzania and Zanzibar, plays an important role in feeding back the evidence from pilot projects such as eNutrition and eMNH to strategic policy discussions in the health sector; in ensuring the

functionality and continuity of other complementary components which have the potential to impact upon implementation, such as the supply pipeline of essential commodities and equipment; as well as in ensuring a sound programme logic where projects are being implemented by different partners. UNICEF should continue to strengthen its convening and facilitating role to bring these different elements together in support of the MoHSW/MoH.

Recommendations for D-tree	
No.	**Recommendation and Rationale**
Immediate priority	
2.1	*Ensure plans for scale up factor in the requirements of other complementary interventions and resourcing requirements* Use of CommCare requires substantial investment in both financial and technical resources to support implementation at facility and community level. Ensuring different models for scale up and factored into project design provides development partners with greater foresight on the capacity and investment required for a particular project to be expanded and/or scaled up to other areas.
2.2	*Strengthen programme design and evidence base to improve project evaluability* As with the recommendation to UNICEF, a comprehensive baseline survey and feasibility assessment is recommended prior to commencement of a pilot mHealth project to facilitate a more rigorous basis on which to evaluate a proof of concept. Analysis of needs as the basis for guiding the type of mHealth solution should be logical in the context of existing programme priorities and the work of other partners. Consideration should be given on the extent to which projects have sustained buy-in and ownership from national stakeholders and ensure a more structured process is initiated as the basis for feasibility assessment and building the evidence base for demonstrating the value of pilot projects on a broader scale.

Recommendations for Tanzania MoHSW and Zanzibar MoH	
No.	**Recommendation and Rationale**
Immediate priority	
3.1	*Strengthen mHealth Community of Practice in Zanzibar* The communities of Practices in Tanzania and Mainland are at different stages of development. While the Tanzania Community of Practice has reached a stage of vibrancy with the plethora of partners and projects operating on the Mainland, their counterparts in Zanzibar have met once during the project period. Strengthening the coordination of mHealth initiatives has the potential to reduce duplication and better promote synergies between projects and partners as well as in contributing toward fostering new partnership opportunities through such networking structures. Strengthening of the Community of Practice does however require sustained commitment of development partners, particularly those without a local presence in Zanzibar, to ensure local ownership is fostered and to facilitate improved leadership by the MoH.
Medium-term priority	
3.2	*Strengthen regulatory environment for mHealth in Zanzibar to promote integration with national health information systems* Enhancing government ownership and stewardship of mHealth initiatives should be a long-term goal of the Ministry. mHealth initiatives continue to be largely donor-driven exercises and often maintaining parallel databases from the national health information systems. Greater capacity is

	required at the Ministry level to improve its ability to lead and coordinate the work of development partners in accordance with clear standards to ensure interoperability, privacy of patient records and ownership of project data.
3.4	*Strengthen community outreach components of health and nutrition service delivery* Emphasis on regulating for an official cadre of CORPs/CHWs to extend the capacity of the health system into the community has the potential for more systemic, long-term benefits for the sector. Furthermore, linkage of the project with a broader health systems strengthening initiative also addressing other aspects of capacity development, surveillance, community management of acute malnutrition, improvements in supply pipeline for RUTF and routine medicines, would have provided a more robust basis for linkage with broader health outcomes.

Annex 1: Terms of Reference

Evaluation of the mobile application technologies implemented by D-tree International to support the provision of screening, examination, and treatment of Severe Acute Malnutrition (SAM) and Maternal and Child Health services in Tanzania.

Background:

Nutrition situation

Malnutrition is a disease that threatens the lives of children worldwide, not least Zanzibar where approximately 12% of children suffer from acute malnutrition (TDHS 2010). Although acute malnutrition is a treatable condition, data from Zanzibar up to 2009 showed that between 20to 30 percent of children who are admitted with severe acute malnutrition (SAM) died, despite receiving treatment. If children with SAM are treated according to the WHO/UNICEF standard treatment recommendations, case fatality can be reduced to as low as 5 per cent.

In recognition of the problem of acute malnutrition, the Zanzibar Ministry of Health and Social Welfare (ZMOHSW) with the support from UNICEF organized a workshop in 2009 to review current practices and standards in the treatment of SAM. Following this workshop, guidelines were developed for screening and treatment of acute malnutrition. Health workers throughout Zanzibar received training on these guidelines as part of a systematic roll-out of new procedures to address the problem.

Maternal Health

Tanzania has made great strides in reducing infant and child mortality during the past decade, however similar progress has not been achieved in maternal and neonatal mortality. The current maternal mortality rate is estimated at 454 deaths per 100,000 live births despite significant efforts by the government to improve maternal health care. While the majority of pregnant women (96%) make at least one maternal clinic visit, about one half of them deliver at home (49%). Home deliveries contribute to the continuing high numbers of maternal and neonatal deaths as life threatening conditions in mother and newborn are not recognized early enough and /or promptly to a health facility for correct management.

The Ministry of Health and Social Welfare (MoHSW) with support from UNICEF/WHO/JHPIEGO and other partners has developed several guidelines aimed at improving quality of care provided to newborns and women during pregnancy, labor, and postpartum. These include focused antenatal care, emergency obstetric care, postnatal care; essential new born care, community IMCI and more recently community maternal and new born care (draft). These guidelines are paper based and require the health care workers to navigate through the information and determine appropriate treatment/counseling regimens.

Introduction of mHealth Tools

UNICEF contributes towards the United Nations Development Assistance Plan (UNDAP) priorities of Health and Nutrition within which it works to support the Ministry of Health and Social Welfare to strengthen monitoring and evaluation systems. As part of this effort, UNICEF has been seeking innovative ways to improve adherence of health workers in the use of paper based guidelines and protocols, and thereby improve the quality of care they provide. To achieve this, UNICEF has been working with D-tree International NGO linked to with the Harvard School of Public Health, to develop approaches to facilitate the use of clinical guidelines, developed and promoted by the Government of Tanzania and UNICEF. D-tree specializes in the development of electronic decision trees to assist front-line, in –community healthcare workers determine the appropriate course of action for patient treatment and referral and have demonstrated the

effectiveness of health workers in adhering to electronic guidelines on mobile devices as a means of improving the quality of care[13] .

Specifically, in the area of Nutrition, D-tree International has worked with UNICEF and the zMOHSW to develop a mobile phone application for use by nurses providing care to children with severe acute malnutrition. The application guides health workers to correctly identify, register, examine and treat children and support them in identifying those children who are progressing well in program and those who need to be referred for more specialized treatment. The project has been implemented as a pilot in 2 sites during 2010-2011 and an additional 4 sites in 2011-2012, to cover a total of 6 facilities in the North A and Unguja Urban districts of Zanzibar

In the area of Maternal health, D-tree International together with various partners, supported the development of protocols and software tools to increase to Tanzanian standards of care for antenatal and postnatal care by providing step by step instructions to the health workers of needed procedures and examinations. The phone based tool registers pregnant women either when they are identified by health workers or when they come for their first antenatal visit at a health facility. Once registered at either a clinic with a health worker, the tool works to prompt heath workers to monitor the progress of these women and encourage them to receive antenatal care at a clinic and go to a health facility when they are due to deliver. The project has been implemented in two health facilities (Miono and Lugoba) in Bagamoyo district of mainland Tanzania.

Purpose of the study

Mhealth/ehealth is a burgeoning field with numerous projects and platforms operating within Tanzania supported by different partners. While coordination efforts are being pursued by the Tanzania Ministry of Health & Social Welfare through the mHealth alliance, issues of scalability and interoperability remain, with many projects remaining at a pilot phase, offering limited grounds for sustainability.

UNICEF is commissioning an evaluation of the two D-tree implemented pilot projects to assess the relevance, efficiency, effectiveness, impact and sustainability of the use of mobile technology for the screening and treatment purposes in the areas of nutrition and maternal health.

Specific Objectives include the following:

- To assess the use, applicability and preference of mobile phone based tools compared to paper based methods to inform decision support systems in maternal health and nutrition progrmmes.
- To assess how information generated by the project is used by beneficiaries, health workers, district health officials, the Ministry of Health, UNICEF and other partners where relevant in maternal and nutrition programmes.
- To assess the extent of care to which mobile phone based tools improve the quality of care provided at the health facilities compared to traditional methods in maternal care and nutrition programmes
- To assess the potential for scale up and integration with the national health information systems and health (including m health) architectures in Tanzania.
- To systematically document weaknesses. Strength, constraints, opportunities and lessons learnt in the project implementation

[13] Mitchell M, Lesh N, Hedt B et.al,, Using ECTRONIC Decision Support to expand access to AIDS treatment in South Africa (presented at IAS, Mexico city, August2008)

The summative evaluation of the two pilot projects will contribute to accountability and learning, and provide recommendations for the future scale up of the two projects and UNICEF Tanzania Country Office programming strategies linked with the use of mobile technology for different areas of programme implementation and information systems strengthening. As the number of formal evaluations of Mhealth initiatives remains quite few globally, the exercise may be useful for other countries in piloting and integrating the use of mobile technology within national systems.

Scope and Focus

The evaluation will apply the standard DAC evaluation criteria of relevance, effectiveness, efficiency and sustainability and impact. Against each project (nutritional and Maternal health, the evaluation will examine the degree to which the desired results have been achieved, or expected to be achieved (effectiveness); how economically they were achieved and how efficient was the engagement (efficiency); and the contribution to the improvements, if any towards health outcomes for women and children. The evaluation will also assess the positive and negative changes by UNICEF'S engagement in piloting the projects, directly or indirectly, intended or unintended and the probability of continued long-term benefits from the interventions made (sustainability).

The geographic scope of the two projects is as follows:

The geographic scope of the two projects is as follows:

- Nutrition: Chaani Kubwa, Tazari, Chumbuni, Nungwi, Gomani, Kivunge health facilities in North A Unguja and Unguja Urban.
- Maternal Health: Lugoba and Miono health Centers and CCA associated with them in Bagamoyo district, Pwani Region.

Specific evaluation question below:

Relevance: The extent to which the pilot project is suited to the priorities and policies of the of the concerned health facilities, district/regional health administrations, Ministry of Health and UNICEF. In evaluating the relevance of the project it is useful to consider the following questions:

- To what extent are the objectives of the project still valid?
- Are the activities and outputs of the project consistent with the overall goal and attainment of its objectives?
- Are the activities and outputs of the project consistent with the intended impacts and effects?

Effectiveness: A measure of the extent to which the project attained its objectives. In evaluating the effectiveness of the project, it is useful to consider the following questions:

- To what extent were the objectives achieved/are likely to be achieved?
- What were the major factors influencing the achievement or non-achievement of the objectives?

Efficiency: Efficiency measures the outputs…qualitative and quantitative.. in relation to the inputs. This generally requires comparing alternative paper-based approaches to achieving the same outputs, to see whether the most efficient process has been adopted. When evaluating the efficiency of a programme or a project, it is useful to consider the following questions:

- Were activities cost-effective

- Were objectives achieved in time?
- Was the programme or project implemented in the most efficient way compared to alternative paper based methods?

Impact: The positive and negative changes produced by the intervention, direct or indirectly, intended or unintended, noting the duration of the pilot period. The examination should be concerned with both intended and unintended results and must also include the positive and negative impact of external factors, such as changes in terms of trade and financial conditions. When evaluating the impact of a programme or a project, it is useful to consider the following questions:

- What has happened as results of the project?
- What real difference the activity made to the beneficiaries?
- How many people have been affected?

Sustainability: When evaluating the sustainability of the programme or a project, it is useful to consider the following questions:

- To what extent will the benefits of the project be expected to continue after donor funding is discontinued?
- What are the major factors which are expected to influence the achievement or non-achievement of sustainability of the project?
- What is the project's scalability on a broader regional/national scale?

Process and methodology

The evaluation will employ a mixed –method approach, including desk reviews, stakeholders meetings, analysis of key performance data, and site visits , to assess the impact of the introduction of the mobile technology compared with traditional paper –based methods. During the inception phase, the evaluation team will review relevant national policy documents to give an overall context of the pilot projects. The team will also consider any thematic studies/papers on child nutrition and maternal health, as well as documentation and studies relating to mobile phone access and usage behaviors in Tanzania, Mobile phone industry and network coverage, mobile phone trends and application in health and nutrition data collection, and data on the manual paper based assessment and screening system. Relevant statically data will be assessed, Stakeholders consultation and involvement is envisaged.

The evaluation will be comprised of desk study/interviews and field visits including:

Meeting with the district medical officer (DMO and mhealth coordinators at the MoHSW and zMOHSW for both the maternal and nutrition components

a) Meeting with health facility in charge for all right facilities i.e. Lugoba and Miono
b) Site visits to all facilities and observations/interviews with health facility staff and beneficiaries
c) Analysis of key performance data from the facilities and project management provided by D-tree and AKUN (who supported the identification and training of Community Change Agents (CCAs) in Bagamoyo for the maternal health project

The evaluation will go through the following interrelated processes : preparatory phase, inception phase, and field phase, final reporting phase and , dissemination and follow up.

Preparatory Phase

Preparatory work at the local level will be carried out in advance to provide substantive background for the evaluation team. The preparatory phase involves the identification of an evaluation reference group that will act as the main profession interface between the evaluation team, UNICEF Tanzania Country Office and the GOVERNMENT OF Tanzania. The group's principal function will be;

- To provide the evaluation team with available information and documentation about the objectives of the evaluation:
- To review the draft evaluation report;
- To provide a judgment on the quality of work of the evaluation team.

Inception Phase

Upon selection of the evaluation team, the evaluation will move to the structuring stage, which leads to the production of the evaluation design plan. The main part of the inception work will conduct a desk review and evaluability assessment as the basis for elaborating a theory of change and selecting an appropriate evaluation design, As no baseline was conducted during the projects inception nor any comparison identified, the evaluation should also reconstruct a proxy baseline from secondary information.

On the basis of this ToR, additional information collected and discussions, the evaluation team will propose in its evaluation design plan including the following:

a) Any refinements to the evaluation questions, and clarity at the outset any limitations that can be foreseen in adequately responding to the questions.
b) Elaborate an evaluation matrix, that details sub-questions ageist the questions, indicators, and data collection methods that will be used. Details to the extent feasible, the analytical frameworks that will be used to respond to the evaluation questions
c) Elaborate a detailed weekly calendar for the duration of the evaluation. This detailed calendar will establish more precise deadlines for consultations and submission of outputs.
d) Include pre-pilot data collection tools that will be used for gathering primary data

The inception report should specify the evaluation design, evaluation framework for analysis, approach to sampling to answer the evaluation questions, data collection tools and data management methods including how the quality data and outline of the report.

Field Phase

Following the acceptance and signing off of the evaluation design plan, the evaluation team will undertake the necessary data collection activities as per the agreed schedule. If during the course of the fieldwork any deviations from the agreed methodology and/or schedule are perceived necessary, the evaluation team must receive approval of UNICEF before they can be applied.

A mix of quantitative and qualitative methods will be used including techniques such as direct observation, informal and semi structured interviews and focus group discussions were feasible and appropriate. Visits to project areas will help validating findings and triangulating them with the community views through household survey and focus group discussions. The evaluation team will interview UNICEF staff and partners in Government and CSOs etc. about aspects of the programme over the duration of the implementation period.

Final Reporting phase

The evaluation team will submit the final draft report in conformity with UNICEF standard and guidelines and present preliminary findings to the technical reference group, the evaluation team will make

appropriate amendments. The UNICEF Monitoring and Evaluation Specialist will facilitate the process of consolidating the comments from the office. On the basis of the comments received, the evaluation team will prepare the final report. UNICEF will prepare a management response to the evaluation recommendations.

Dissemination and follow-up

After approval of the final report, the PME unit in consultation with other UNICEF sections will proceed with the dissemination of the results of the evaluation.

Stakeholders Participation

A number of stakeholders will be closely be involved in the peer review of the evaluation mission through briefings and debriefings. Some will be involved in the peer review of the evaluation outputs) in Particular draft reports). Stakeholders include:

- UNICEF country office (Health and Nutrition and Planning, Monitoring and Evaluation sections) and Zanzibar Office
- Relevant MDA and LGAs
- MOHSW, zMOHSW, Director of Preventive Services, HMIS
- D-tree International
- UKUN
- Edesia
- Zantel
- Beneficiaries

Study Team Composition

An institution will be engaged for the evaluation. The Evaluation team leader will be responsible for managing and providing overall leadership and direction in the proposed evaluation. The Team leader is expected to have specific competencies in planning and carrying out evaluations and performance measurements, including use of both qualitative and quantitative methods. The team leader should have proven experience of previous assignments with development and implementation of evaluation plans and performance measurement in the field of mhealth.

The Institution will be responsible for supporting field data collection, based on a set of key indicators established during the inception phase, Data collection will assess the relative contribution of UNICEF support taking into consideration the interventions of other development partners, government counterparts and other exogenous factors. The institution is expected to have an in-depth knowledge of the Tanzania health system, local governance issues, and ethical considerations.

Team Leader Competencies

- PhD or advanced university degree in social science or public health
- At least 10 years of experience in research, data collection, monitoring and evaluation including specific experience in the field of mHealth
- Thorough knowledge of conducting formal surveys, sampling techniques and participatory methodologies
- Strong analytical and reporting skills
- Good communication skills and report writing abilities
- Good knowledge of English

Institution Experience

- At least 8 years of experience in research, data collection, monitoring and evaluation including specific experience in the field of mHealth
- Thorough knowledge of conducting formal surveys, sampling techniques and participatory methodologies
- Strong analytical and project management skills
- Good communication skills and report writing abilities
- Good knowledge of English and Kiswahili

Accountability

Team Leader: Overall management, leadership and technical oversight, lead analyst and report writer, Design, review of data collection tools.

Institution; Translation of survey instruments, Training of field staff, data collection, data compilation and cleansing, Liaison with the district offices, logistical arrangement and team supervision.

Stakeholders' role and responsibilities are reflected through the process/methodology and stakeholders participation. The UNICEF M&E specialist will be responsible for supervision of the consultancy including approval of intermediary and final products, in consultation with the Knowledge Management Specialist, Health & Nutrition section and senior management as outlined in the TOR

Procedures and Logistics

UNICEF is planning to sign a contract based on the following conditions:

- No work may commence unless the contract is signed by both UNICEF and the Institution.
- Should the Institution require specific assistance/materials from UNICEF office and/or national partners, he/she should make a request at least 10ndays prior to the start of the mission.
- Where necessary UNICEF and government counterparts will direct and or facilitate necessary access to specific data/institution/personnel/location for the purpose of this exercise.
- The institution will be in regular communication with UNICEF designated local person for the assignment, the Monitoring & Evaluation Specialist.
- UNICEF will provide venue and facilities for meetings with the Technical Reference Group, D-tree will provide notice to the districts for which data collection will be conducted.

Evaluation Outputs and Timing

The evaluation is scheduled to start during the last quarter of 2012 for a planned period of seven weeks. The detailed evaluation outputs and timing include the payments schedule or shown in the table below. The payment schedule for the proposed evaluation consultancy is linked with the satisfactory delivery of the related outputs.

Outputs	Timing	Payment Schedule
Contract signing	1st wk November	
Draft Evaluation Plan prepared including theory of change , proxy baseline and field data collection instruments	2nd wk November 2012	20% of contract value
Field dataset collection undertaken	3rd wk. November 2012	
Final dataset cleansed and shared with	4th wk. November	

UNICEF	2012	
1st draft of main evaluation report shared	2nd wk. December 2012	40% of contract value
Final evaluation report submitted (integrating comments from technical committee technical reference group) with set of power points slides with key findings	3rd wk December 2012	40% contract value
Evaluation management response prepared and disseminates by UNICEF	January 2013	

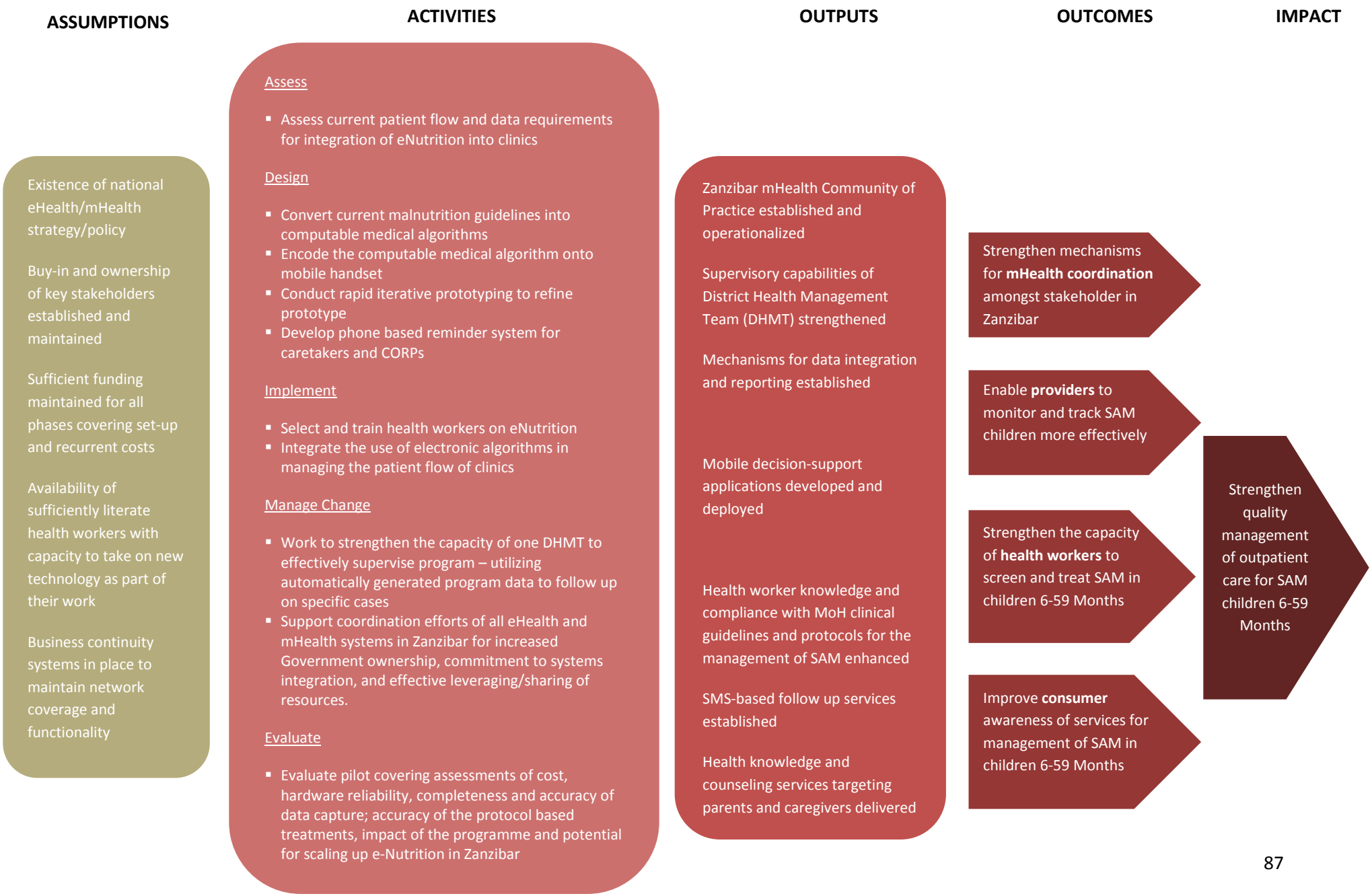
Reporting Framework

The final report should include the following elements: an executive summary, background to the design of the two mHealth projects, a profile of the evaluated activities, and description of the evaluation methods employed, the main findings in line with the DAC evaluation criteria, conclusions, recommendation and lessons learned.

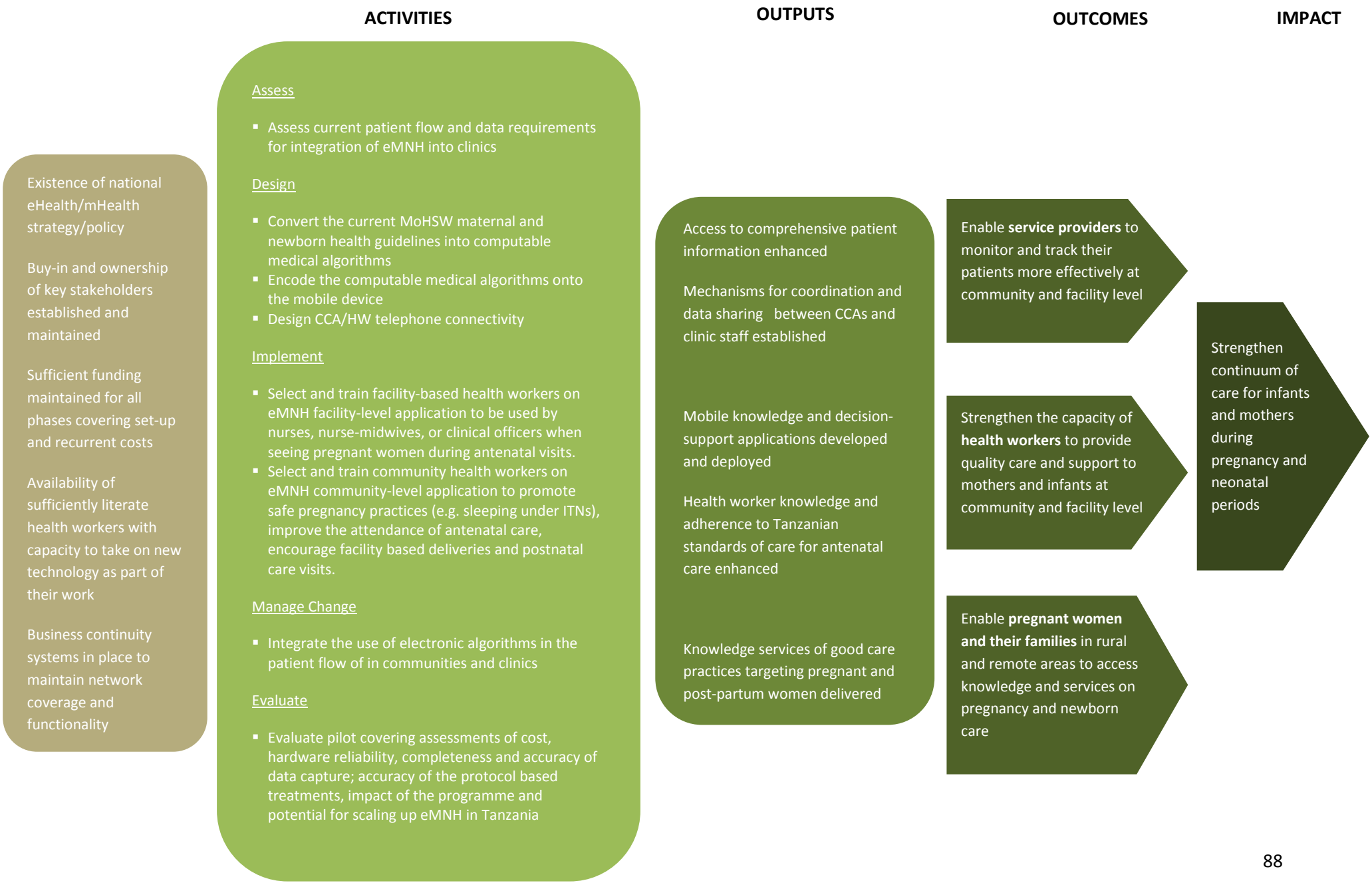
Data should be presented in different forms to facilitate reading and understanding. Boxes may be useful to highlight key issues.

Conclusions, recommendations and lessons learned should be firmly based on evidence and analysis, be relevant and realistic, with priorities for action made clear. The team should avoid making that are too general or impossible to implement. Ideally recommendations should be grounded by intended users, such as programme sections national stakeholders as well as partners.

Annex 2: eNutrition Logic Model



Annex 3: eMNH Logic Model



Annex 4: Evaluation Matrix

Relevance:

- To what extent does the pilot project fit within the priorities and policies of the Ministry of Health & Social Welfare and UNICEF?

Sub-Questions:

- Are the activities and outputs of the project consistent with the overall goals, strategies and plans of the Ministry of Health & Social Welfare and the district health team and the attainment of its objectives?
- What are the profile, characteristics and responsibilities of the FLWs?
- Highlight the gaps in the program that are being address with the use of the eMNH/eNutrition application. Why were these areas chosen for the pilot over others?
- What process and evidence was used as the basis for selecting the pilot locations?
- Are the activities and outputs of the project consistent with the intended impacts and effects?

Effectiveness:

- To what extent were the objectives achieved / are likely to be achieved?

Sub-Questions:

- What health areas does the eNutrition/eMNH application specifically address? Are there existing guidelines or paper forms that the applications are modelled after? How is the data generated by the applications integrated into the current program?
- How is the performance of the FLWs monitored and supervised?
- What were the major factors influencing the achievement or non-achievement of the objectives?

Efficiency

- Was the programme or project implemented in the most efficient way compared to alternatives (paper-based methods, other potential applications)?

Sub-Questions:

- Who lead the design of the content of the proposed modules? Who is the project coordinator that oversees field testing of the system with the FLWs? What are the responsibilities of the project coordinator?
- Does the system provide feedback to the health workers involved in screening and data entry on their work and the status of clients?
- Does each staff have sufficient time to devote to this project? Does this project link with their current roles?
- Has the government been involved in planning for this intervention? What is the level and extent of government ownership in the projects?
- Were activities cost-efficient in terms of set-up and recurrent costs?
- Were objectives achieved on time?

Impact

- What changes have been produced by the interventions, directly or indirectly, intended or unintended, over the pilot periods?

Sub-Questions:

- How is success measured during and after the project?
- What has happened as a result of the project? Are there any unintended consequences (positive or

negative)?
- How many people have been affected?

Sustainability

- What are the major factors which are expected to influence the achievement or non-achievement of sustainability of the programme or project?

Sub-Questions:

- Do the mobile applications empower FLWs and increase the provision of health-related information to pregnant women and caregivers of the participating children?
- How were the Central government and local staff capacitated and involved in the data analysis to ensure sustainability? (Where does data analysis typically take place – at the central government level or also sub-national? Is feedback followed/complemented by supportive supervision by district-level supervisors?)
- Is there local capacity in software programming to develop the platform as necessary?
- How and to what extent is project data being integrated with national health information systems?
- Are there any connections to or other programmes that will benefit from this project?
- Is there a business continuity plan in place to address issues of network disruption in rural and remote areas? Is there an enterprise-level UPS or a fuel-powered electricity generator?
- Has someone been trained at the national level in Government on how to monitor incoming data from the eNutrition/eMNH platform? Is there someone at the national level dedicated to training district and local-level FLWs using eNutrition/eMNH?
- Did the pilot identify other areas for training support?
- Is there a mechanism in place to systematically document weaknesses, strengths, constraints, opportunities and lessons learnt in the project implementation? How is this information used?
- What is the project's scalability on a broader regional/national scale?

Annex 5: List of Persons Consulted

Ministry of Health & Social Welfare (Mainland)

1. Claud Kumalija – HMIS Contact Person
2. Dr. Mwendwa Mwenesi – mHealth Coordinator
3. Dr Nshihu – Reproductive & Child Health
4. Dr. Kolhtela Winani – Safe Motherhood
5. Marco Mzeru - Ag. ICT Chief/System Analyst in Mhealth

Ministry of Health (Zanzibar)

6. Asha Hassan – Acting Head of Nutrition
7. Shemsa Nassor – Nutrition Officer
8. Shaib Mzee – MoH Pemba
9. Salama M. Ashrak – Environmental Health Officer
10. Salama Bakari Mohammed – District RCH coordinator
11. Shaame Shindo Bakari – HMIS
12. Fatma Khatib – HMIS
13. Suleiman Saleh Hemed – HMIS

Unguja North A DHMT

14. Khamis Haji Ukasha – District Surveillance Officer
15. Khadija Ali Makame – Health Education Officer
16. Zainab Juma Mohammed – Public Health Officer-TB.HIV and Leprosy
17. Haji Jabir Hamza – Health Officer in charge District

Bagamoyo Council Health Management Team

18. Sikujua Mturo – Assistant RCH Coordinator
19. Dina Atinda – District Nursing Officer
20. Joyce Shishiri – Deputy RCH Coordinator
21. Dr.Eyubu Mwenda – Dentist
22. Laurent Thadea Kalindima – DHLT

UKUN

23. Charles Njonjole – Project Manager

Miono Health Centre

24. Rosemary Mtesigwa – Enrolled nurse
25. Audaxia Temba – Registered nurse
26. Onesmo Kateule – Dentist/Ag. Clinical Officer in-charge
27. Renatus Ngalanga – Assistant laboratory technician
28. Mwamvita Makamba – Nurse attendant
29. Issa Hussein – Clinical officer
30. Gabriella Mtwalla – Registered nurse (in-charge nurse)
31. Hadija Chamzimu – Enrolled nurse
32. Flavian Ludovick – Clinical officer

33. Sharifa Mwelungwi – Nurse attendant

Kwaruhondo Health Centre

34. Bwire John - C.O, in charge
35. Anna Mzeru – Registered nurse, in charge
36. Rose Manyama – Nurse attendant
37. Laisa Kitamayo – Nurse Attendant
38. Hassan Ibrahim – CCA
39. Rehema Issa – CCA

Lugoba Health Centre

40. Rehema Deluwa – In charge Clinical Officer
41. Moshe Edward – Clinical Officer
42. Joyce Kyaruzi – In charge Enrolled Nurse
43. Atupakize Solomon – Enrolled Nurse
44. Manyam Yunis – Enrolled Nurse
45. Amedi Nendoro – Laboratory Technician

Tumbatu Gomani- Zanzibar

46. Asha Haji Juma – Community Health Worker
47. Ali Ali – Community Health Worker
48. Selemani Bakili Selemni – Community Health Worker
49. Mamdeme Mdungi – Clinical Officer In charge

Chaani Kubwa Health Centre

50. Chumu Hussein Juma- Secretary – Kinyasini Sheah
51. Msima Sisima Machano – Community Health Worker –Leader Chaani Kubwa
52. Rayuu Isihaka Kombo – Health Worker – Kongeni
53. Salima Khamis Khamis – Representative Sheah
54. Fatuma Juma – Representative
55. Khamis Mohamed Ali – Board Member Health Centre
56. Haji Ashura Abdallah – Board Member Health centre
57. Stara Haji Juma – Community Health Worker – Kisongoni

Nungwi Health Centre

58. Zuena Ame Salum – Nurse Midwife, in-charge
59. Siti Juma Musa – Community Health Worker
60. Halima Machu Kombo – Community Health Worker
61. Mtumwa Makame Mohammed – Community Health Worker
62. Ghulam Vuaiame – Board Member Health Centre

mHealth Community of Practice Tanzania

63. Janiter Ferentinos – Communication Partner to mHealth Tanzania Public-Private Partnership
64. Mutasingwa Saulo – Project Analyst, CDC

D-tree Dar es salaam

65. Lucy Fulgence Silas – Country Director
66. Gayo Mhila – Technical Manager
67. Peter Lubambi – Technical Manager

D-Tree Zanzibar

68. Julia Reuben – Project Manager
69. Haji – Technical Officer
70. Jalia Tibaijuka – Technical Officer

UNICEF Tanzania Country Office and Zanzibar

71. Roselyn Joseph – Monitoring and Evaluation Specialist
72. Brenda Muwaga – Nutrition Specialist
73. Dr. Asia Kassim Hussein – Maternal & Child Health Specialist
74. Hawi Bedasa – Knowledge Management/Innovations Specialist
75. Dr. Eliphase Kamugisha – Child Health Specialist

Annex 6: List of Documents Consulted

Black, R. E., et al., (2003). Where and why are 10 million children dying every year? The Lancet, Volume 361, Issue 9376, Pages 2226 – 2234.

Blaschke, S., (2013). Mission Report: Technology for Development Opportunities in Tanzania.

Chassin MR, Brook RH, Park RE, Keesey J, Fink A, Kosecoff J, et al. Variations in the use of medical and surgical services by the Medicare population. N Engl J Med. 1986;314:285–290

Collins, L. M. et al., (2011). The multiphase optimization strategy for engineering effective tobacco use interventions. Ann Behav Med 41: 208–226.

Chuck S., (2013).Scaling Mobile Health Solutions the Hard Way.
Accessed from: http://skollworldforum.org/debate-post/scaling-mobile-health-solutions-the-hard-way/

D-tree (2010,2011) Programme Documents

Douglas, E.W. et al., (2011). Mobile Health Evaluation Methods: The Text4baby Case Study visited on 4/1/ 2012 at http://www.tandfonline.com/doi/full/10.1080/10810730.2011.649157

Evaluation Office, (2010). UNICEF-Adapted UNEG Quality Checklist for Evaluation Terms of Reference.
_____ - Adapted UNEG Evaluation Reports Standards.

Free, C. et al., PLOS Medicine: The Effectiveness of Mobile-Health Technologies to improve Health – Page 1 of 13.

Greenhalgh, T. and Russell, J., (2010). Why Do Evaluation of eHealth Programs Fail? An alternative Set of Guiding Principles. PloS Med 7 (11); e1000 360, dol: 10.1371/journal.pmed.1000360.

Improving the Research, Evidence for Mobile health.
visited on 4/1/2013 at http://www.atkearney.com/documents/10192/687794/GSMA+Evidence+for+Mobile+Health_v20_PRINT+HIRES.pdf/691847bc-3a65-4710-87eb-cc4753e8afce

Heerden, A. V. et al., (2012). Point of Care in Your Pocket: A research Agenda for the Field of m-Health.

Heider, F. and Simmel, M., "An experimental study of apparent behavior". *American Journal of Psychology*, 13, 1944.

Interim Zanzibar Guidelines for the Integrated Management of Acute Malnutrition, February 2010.

Interim Zanzibar Guidelines for the Outpatient, Therapeutic Care of Severely Malnourished Children, October 2010.

Introduction to the mHealth Community of Practice. Power Point Presented on the Workshop in Dar as salaam and Bagamoyo, by Ministry of Health and Social welfare.

Kochi, E., (2013). MHealth: Moving Beyond Pilots to Scale and Impact.

Accessed from: http://skollworldforum.org/debate-post/mhealth-moving-beyond-pilots-to-scale-and-impact/

Leon, N. et al., (2012). BMC Medical Informatics & Decision Making: Applying a framework for Assessing the Health system challenges to Scaling up mHealth in South Africa.
Accessed from: http://www.biomedcentral.com/1472-6947/12/123 on 4/13/2013.

MacFarlane, A. et al., (2011). The e-health Implementation Toolkit: Qualitative Evaluation Across Four European Counties. Licensee Bio Med Central.

Maddalena Fiordelli et. Al 2013( ) Mapping mHealth Research: A Decade of Evolution Institute of Communication and Health, Faculty of Communication Sciences, University of Lugano, Lugano, Switzerland accessed at http://www.jmir.org/2013/5/e95/

MaryAnn Hemmed (MD, Mimed, Mac). Wired Mothers - "Mama Manado": Use of Mobile Phones to Improve Maternal and Neo Natal Health in Zanzibar.

Mettle, T. and Vimarlund, V., (2011). Evaluation of E Health Strategies: A Portfolio Approach. Proceedings of the 5th International Symposium on Health Information Management Research – I SHIMR 2011.

Ministry Of Health And Social Welfare Zanzibar Health Sector Reform Strategic Plan Ii 2006/07 – 2010/11 accessed on 14/5/ 2013 at http://41.73.201.42/hmis/documents/HSRS%20Strategic%20Plan%20II%20Final.pdf

Mitchell, M. et.al., Using ECTRONIC Decision Support to Expand Access to AIDS Treatment in South Africa - Presented at IAS, Mexico city, August 2008.

OECD (2002); Glossary of Key Terms in Evaluation and Results Based Management accessed on 5/31 at http://www.oecd.org/development/peer-reviews/2754804.pdf

Ollis, S., (2011). Tanzania mHealth Project Locations-Google Maps: Get Google Maps on Your Phone Text the Word "GMAPS" to 466453. Created on November 3, 2011.

_____ ( ). mHealth in Tanzania: Introduction to mHealth in Tanzania; Improving Access to High Quality Health Care.

Ollis, S., and D-tree International/mHealth Community of Practice, (2011). Development of National mHealth Strategy Framework in Tanzania-mHealth in Tanzania. Presented in mHealth Working Group Meeting December 1st, 2011, 9:00 – 11:00 am EDT Held at Deloittle Consulting, 555 12th Street NW, 5th Floor, Room 5001, Washington , DC.

PWC mHealth (2013): What do patients, doctors and other stakeholders say about it ?
http://www.pwc.com/gx/en/healthcare/mhealth/report-findings.jhtml

Revolutionary Government of Zanzibar (2011) Report of the 6th Zanzibar Annual Joint Health Sector Review, Ministry of Health, Zanzibar

Revolutionary Government of Zanzibar , Ministry of Health and Social Welfare (2010); Zanzibar guideline for the Outpatient Therapeutic Care of Severely Malnourished Children

Revolution Government of Zanzibar (2008); Zanzibar Food Security and Nutrition Policy accessed on 5/23/ 2013 at http://www.kilimoznz.or.tz/images/policies/zfsnpolicy.pdf

Rotheram-Borus, T.M., et al., (2013). Scaling Up mHealth: Where Is the Evidence? PLoS Med 10(2): e1001382. doi:10.1371/journal.pmed.1001382 visited at http://www.plosmedicine.org/article/info:doi/10.1371/journal.pmed.1001382 on 3/28/2013

Saskatchewan Ministry of Education (2008) Excerpts from Review of Evaluation Frameworks; accessed on 4/14/2013 at http://www.idmbestpractices.ca/pdf/evaluation-frameworks-review.pdf

Shapiro DW, Lasker RD, Bindman AB, Lee PR. Containing costs while improving quality of care: the role of profiling and practice guidelines. Annu Rev Public Health. 1993;14:219–241

Slabodkin, G., (2013). Fierce Mobile Healthcare: For mHealth Success in Developing Nations, Don't Overwhelm your Audience.
Accessed from: http://www.fiercemobilehealthcare.com/story/mhealth-success-developing- nations-dont-overwhelm-your-audience/2013-01-2PTvetobi visited on 4/4/2013.

Torraco, R. J.(2002). Evaluation and Feedback Within the Change Process. Organization Development Network Omaha- November 16, 2005.

UNEG United Nations Evaluation Group, (2008). UNEG Ethical Guidelines for Evaluation.

United Nations in Tanzania - Millennium Development Goals, 2011.
Accessed from: http://tz.one.un.org/index.php/core-commitments/millenium-development-goals
United Republic of Tanzania: The Tanzania Development Vision 2025 , Planning Commission. http://www.tanzania.go.tz/pdf/theTanzaniadevelopmentvision.pdf

Union Republic of Tanzania (2015), Tanzania Demographic & Health Survey 2004-2005, Dar es Salaam, Tanzania

Union Republic of Tanzania (2010), Tanzania Demographic & Health Survey 2010, Dar es Salaam, Tanzania

Union Republic of Tanzania (2009) The Health Sector Strategic Plan III July 2009 – June 2015 accesses on 5/24/2013 at http://www.mamaye.or.tz/sites/default/files/evidence/HealthSectorStrategicPlan.pdf

Union Republic of Tanzania (2010) The National Strategy for Growth and Reduction of Poverty (NSGRP II accessed on 5/23 at http://www.tz.undp.org/docs/MKUKUTA.pdf

Union Republic of Tanzania (2007) Primary Health Services Development Programme (PHSDP) 2007 - 2017 accessed on 5/23/ at
http://www.unfpa.org/sowmy/resources/docs/library/R222_MOHTanzania_2007_PHC_2007-2017.pdf

URT (2006) Ministry of Planning, Economy & Empowerment (MPEE). Millennium Development Goals, Progress Report. December 2006. Available at
http://www.povertymonitoring.go.tz/WhatisNew/MDG%20Report%202010.pdf

Valeri, L. (2010). Business Models for e Health: Final Report. Prepared for ICT for Health Unit DG Information Society and Media European Commission.

Watson, P. G. L., et al., (2013). The Effectiveness of Mobile-Health Technologies to Improve Health Care Service Delivery Processes: A Systematic Review and Meta-Analysis. PLoS Med 10(1): e1001363. dol:10.1371/journal.pmed.1001363.

. World Bank (2012). Mobile for Health at http://siteresources.worldbank.org/INFORMATIONANDCOMMUNICATIONANDTECHNOLOGIES/Resources/mHealth_report_(Apr_2012).pdf

World bank, Public Private Dialogue handbook accessed on 5/27 at http://www.publicprivatedialogue.org/tools/PPDhandbook.pdf

WHO/SIDA (2009) Cross Cutting Issues in Health- an analytical tool Human rights and Gender Equality dimension in Health Sector Pland and policies; accessed on 4/15/2013 at http://www.who.int/hhr/news/Flyer_WHO_Sida_tool.pdf

World Health Organization, (2011) Beginning with End in Minds: Planning Pilot Projects and other Programmatic Research for Successful Scaling Up. WHO Press, World Health Organization, 20 Avenue Appia, 1211 Geneva 27, Swizerland.

World Health Organization (WHO) (2005) e-Health Report by Secretariat, 58 th World Health Assembly A58/21, April.

World Health Organization and International Telecommunication Union 2012.
National eHealth Strategy Toolkit. Part 3: Monitoring and Evaluation.

World Health Organization and International Telecommunication Union 2012. Part 1: eHealth Vision
Yun, Y., et al., (2010). Evaluation of e-Health in China: Implications for the Individual, Enterprises and Society. 23rd Bled e Conference e Trust, June 20 – 23, 2010; Bled, Slovenia.

SMZ (2011); The Food Security and Nutrition Act accessed on 5/23/2013 at
http://faolex.fao.org/docs/pdf/tan108982.pdf

ZMC (2009) Zanzibar Human Development Report Towards Pro Poor Growth accessed on 5/27 at http://zifa.ac.tz/data/ZPHDR.pdf

Annex 7: Information on the evaluation team

BluWat Tanzania Limited is a professional services organization that helps its clients build value and image, manage risk, and improve overall performance. The evaluation team was led by Dr Felician Ifunya as team leader, with technical support and field supervision provided by two technical specialists – Dr Reuben Mutakayawa in Maternal Health and Dr Eileen Barongo in Nutrition – to support the respective programmatic components and oversee data collection in Bagamoyo and Zanzibar respectively.

A breakdown of the roles and responsibilities of the evaluation team are outlined below in Table 22.

Table 22: Evaluation team functional responsibilities

Function	Name	Responsibilities
Team leader	Dr Felician Ifunya	Overall management, leadership and technical oversight. Design, review of data collection tools and database design. Supervise and support data collection. Lead analyst and report writer. Liaison with UNICEF and contract management.
Technical Specialist (Maternal Health)	Dr Reuben Mutakayawa	Technical oversight for maternal health component. Responsible for development and translation of data collection instruments for maternal health component. Area supervisor for field work in Bagamoyo (Site 1)
Technical Specialist (Nutrition)	Dr Eileen Barongo	Technical oversight for nutrition component. Area supervisor for field work in Zanzibar (Site 2)
Data Entry Operator	Angela Daniel	Responsible for all data entry in prescribed database