Reaching Every Child with Effective Child health interventions in Eritrea**.**

A thesis submitted in partial fulfilment of the requirement of the degree of Master of Public Health

by

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Declaration:
Where other people's work has been used (either from a printed source, internet or any other source) this has been carefully acknowledged and referenced in accordance with departmental requirements.
The thesis "Reaching every child with effective child health intervention in Eritrea" is my own work.

Signature……..

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ABBREVIATION

ACT	Artimesnin based Combination Therapy
ANC	Ante Natal Care
AFP	Acute Flaccid Paralysis
AIDS	Acquired Immune Deficiency Syndrome
BCG	
CBMIS	Community Based Management Information System
CHWs	Community Health Workers
CHOICE	Choosing Intervention that are Cost Effective
CMR	Child Mortality Rate
DALY	Disability Adjusted Life Years
DFID	Department for International Development
DPT/HEP	Diphtera Pertusis Tetanus/ Hepathitis
EBF	Exclusively Breast Feeding
FCHV	Female Community Health Volunteer
FGM	Female Gential Mutulation
GDP	Gross Domestic Product
HAART	Highly Active Anti Retro Viral Therapy
HDI	Human Development Index
HH&c-IMCI	Household & Community Integrated Management of Childhood Illness
HIV	Human Immuno Virus
HMIS	Health Management Information System
HRH	Human Resource for Health
IMCI	Integrated Management of Childhood Illness
IMR	Infant Mortality Rate
ITN	Insect Treated Nets
KIT	Royal Tropical Institute
LBW	Live Birth Weight
MDG	Millennium Development Goal
MNCH	Maternal Neonatal and Child Health
MPH	Master of Public Health
NGOs	Non Governmental Organization
NMR	Neonatal Mortality Rate
ORS/T	Oral Rehydration Salt/Therapy
UNICEF	United Nations Children Fund
USAID	United States Agency for International Development
VCT	Voluntary Counseling and Testing
WHO	World Health Organization

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ABSTRACT

Problem/Background

Eritrea is one of the least developed countries in Africa. After gaining its independence from Ethiopia child mortality decreased from 160/1000live births (in 1991) to 93/1000live births (in 2002). Fast reduction was observed from 1990-1999; the mortality figure is declining slowly after 1999 which calls for pragmatic solution.

Objective

To study factors hampering the survival status of children in Eritrea & review the evidence of effective coverage of child health interventions by household and community integrated management of child hood illness(**HH&c-IMCI**) programme and identify requirements for scaling up so as to come up with policy, research and programme recommendation.

Methods

A review of data from health management information system, demographic health survey, and studies conducted by Ministry of Health was undertaken. Child survival determinants are analysed using Mosley and Chen model, framework for HH&c-IMCI is used to analyse implementation, Tanahashi/Knippenberg model is used to analyse effective coverage of two indicator diseases.

Results

The majority of children live under the poverty line in Eritrea and do not receive effective child health interventions because of barriers generated by poverty, culture, and gender as well as health system. Universal coverage of nutrition interventions and integrated case management of childhood infections can reduce child mortality considerably. Community based interventions have the potential to provide equitable coverage by reaching families with children who may not adequately utilize the services of the health system as evidenced from cases of Nepal, Tanzania and Eritrea however cannot achieve neonatal death reduction alone hence strong linkage of community and health facility intervention is necessary. Scaling up these interventions requires increase funding, strong district health management team and resolving cross cutting health system constraints.

Conclusion and recommendation

Eritrea needs to have strong community program to improve child mortality situation because improved child care practices in the family can reduce child mortality considerably. Reaching every child with effective intervention requires complementary effort of community and health facility.

Key words

Child survival, effective coverage, interventions, inequity, household, community, integrated management of childhood illnesses, Eritrea

Introduction

Eritrea is one of the sub Saharan African countries with high child mortality of 93/1000 live births (NSEO and ORC Marco 2003). After the independence from Ethiopia, the Eritrean government has revitalised the health system and considerable effort was made to put up primary health care services to all rural areas. At the moment access to primary health care with in 10km distance is 70% from 46% before independence in 1991(World Bank 2004). Hence fast reduction of mortality among under five was observed from 1991 to 2002 (160/1000 LB[1] to 93/1000 LB).

Major causes of death among children younger than five years in Eritrea are neonatal causes, pneumonia, diarrhoea, and malnutrition is associated with 35% of all the deaths that occur.

UNICEF has been a key partner of the Eritrean government, among other partners, working in child health and nutrition. I joined UNICEF Eritrea office in 2001 at the capacity of assistant project officer in the water and sanitation section. My responsibility was to work with the Zonal and Sub Zonal ministry of health offices to mobilise the community to improve sanitation and hygiene using the participatory hygiene and sanitation transformation methodology. I was impressed to see the power of participation and how the community can bring a change in their own development if well stimulated and motivated. In 2003, I was given a new post of project officer for child survival where I was responsible for the IMCI[2] project particularly the household and community IMCI component. A pilot household community IMCI project was implemented in 17 villages in 2005. Step by step process of community participation was undertaken to get the community buy in and ownership of the programme. Though the process was lengthy the out come of the intervention was remarkable and appreciated by the community as well as the health staff. Outpatient health facility record show that childhood illnesses in the pilot areas reduced by 25% (MoH 2007a).

After joining my MPH studies at Royal Tropical Institute in the Netherlands, I realised that other countries are also implementing the same intervention and have managed to implement the programme nationally. I thought of dedicating my thesis towards this cause. I like to study why children are dying and what we can do to reach every child with effective child health interventions. I would like to explore the experiences of community health interventions from other developing countries and what we can learn from there. I like to formulate a set of recommendations to strengthen community health programmes in Eritrea

The thesis will be shared with Ministry of health, UNICEF, WHO offices in Eritrea and other NGOs.

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[1] Live Births
[2] Integrated Management of Childhood Illness

Chapter I

1.1 Background

1.1.1 General information

Eritrea is located in the horn of Africa. Along its history, it has often remained a conflict zone. Eritrea got its independence from Ethiopia in 1991 after a bloody war of 30 years. The first eight years of independence was peaceful and the government embarked in reconstruction and rebuilding of devastated social infrastructures. Unfortunately another border conflict broke out with Ethiopia claiming many lives and destroying the rebuilt infrastructures. (World Bank 2004).

In 2001 a peace agreement was signed in Algiers and independent commission was set up to determine the border lines between the two countries. In 2002 the border commission made its final decision that was binding and final. The decision could not be implemented because of Ethiopia's refusal to accept.

1.1.2 Geography

Eritrea is divided into 6 administrative Regions. The total area of Eritrea, including the Dahlak archipelago of Massawa, is 124,320 square kilometres. Eritrea shares a 1,626-kilometer border with three nations: Sudan to the north and west (605 kilometres), Ethiopia to the south (912 kilometres), and Djibouti to the southeast (109 kilometres). The coast line of the Red Sea is 1200km long (SoE 2005a). The environment in Eritrea is naturally fragile. The climate is semi-arid and water is very scarce. Eritrea faces continued deforestation, desertification, soil erosion, overgrazing, and considerable size of land loss as a result of the presence of hundreds of thousands of land mines (SOE 2006).

1.1.3 Demography

Eritrea's population reached 4.3 million in 2006, with an annual growth rate of 2.6 percent. Total fertility rate per woman is 4.8. Life expectancy at birth for both sexes is 60 years (SoE 2005a). Twenty percent of Eritreans lived in urban areas, which experienced an average annual growth rate of 5.8 percent between 2000 and 2005. Population density was 36.7 persons per square kilo-meter, with the greatest concentration in the highlands and the lowest along the Red Sea coast. (SoE 2005a).

1.1.4 Socio-economic context

Eritrea has an annual per capita GDP[3] of 130$ which makes it one of the low income countries. The annual GDP growth rate of GDP 2007 estimate is 2%, agriculture generates 21.7% , services 55.7%, and industry 22.6% of the GDP. The economic climate has also been compounded by recent

[3] Gross Domestic Product

years' droughts and shrinking development assistance. Eritrea ranked 157th among 177 countries in the Human Development Index, according to the Human Development Report 2007, with a HDI[4] of 0.483, which improved from 0.454 in 2006 despite the economic constraints (UNDP 2007).

1.1.5 Socio cultural and Gender situation

Eritea has nine ethnic groups of which Tigrinya 50%, Tigre and Kunama 40%, Afar 4%, Saho 3%, Hidareb, Bilen and Biniamr 3%(SOE 2005a). The gap between boys and girls in net enrolment is small, at 55.2% and 49.8%. The gender gap is more pronounced in secondary education, where gross enrolment ratio was 31% for boys and 18% for girls in the 2003/04 school year. Learning achievement for girls at grade 5 is 21% less than for boys, indicating gender gap not only in access, but in learning (UNICEF Eritrea, 2007).

1.1.6 Poverty level

Key socio-economic and demographic parameters indicate very low standard of living, income and lack of basic social services in health, education and social protection. The poor constitute about two-thirds of the population of Eritrea and slightly more than one third are extreme poor, below the food poverty line (2000 calories per capita per day) (SOE,2005). Over the last five years, Eritrea's economy was hindered due to the border war with Ethiopia, compounded by drought, resource constraints, and human capacity gaps and shrinking development assistance (SoE 2006).

1.1.7 Health situation and health services in Eritrea

The health indicator for maternal mortality is 450/100000 Live births which is quite high and the child mortality rate is 74/1000 live births(UNICEF 2007a). According to countdown[5] 2008 assessment report, Eritrea is on track to achieve MDG goal for child mortality but not on track to reduce maternal mortality.

Access

After gaining independence from Ethiopia, the health sector in Eritrea has been revitalised. Between 1993-2000, 48 new health centres,119 new health stations were constructed and upgraded

Despite the increase in health facilities geographic access to facilities is still limited. One health centre has to serve 10,000 people but on average 24,000 people are in the catchment area of one health centre. Furthermore, health facilities are not fairly distributed across zones; there are high and low concentration of health stations in some Sub Zones (for

[4] Human Development Index

[5] Count down to 2015 for maternal newborn and child survival

example there are places in Anseba Region where the distance to a health facility is more than 100km). Most health facilities are concentrated in urban cities of Asmara. Ministry of Health estimated that access to health service (within 10km radius or 2 hours walk) has improved from 46% in 1991 to 70% in 1999 (World bank 2004).

Health Policy

The national health policy is based on the concept and principles of primary health care (PHC), and is designed and developed in such a way that it serves the interest of the majority of the population (MoH 1998). The public sector is the major provider of health care. Private clinics exist only in major towns serving only limited proportion of the population. At the village and district levels, the PHC network consists of health stations and health centres staffed with one or more nurses. Health centres have a laboratory and limited in-patient and delivery facilities.

Ministry of health is responsible for public health sector management, planning, and health care delivery and financing to those who cannot afford it. In addition government regulates and controls the provision of private and NGO[6] operated health services. Though ministry of health is committed to decentralization, as the government adopted a policy to decentralize its operations, the implementation of the policy has been hampered by lack of skilled human resources at the zonal level. Zonal governments cannot reallocate funds between sectors or retain revenues collected from health facilities (World Bank 2004).

Health financing

Fee for service is the most common payment method used for health care. However health care fees are heavily subsidized by the Government at public health facilities. Health insurance is almost non existent.

Budget allocation for health

The budget allocation is not transparent but it is assumed that large proportion of the country's budget was allocated for military purposes, tying up tens of thousands of able-bodied men and women and other national resources for national service purposes, and restricting the scope and efficiency of domestic production (World Bank 2004). Per capita total expenditure on health is 27$, general government expenditure on health as percentage of total government expenditure on health is 4%, out of pocket expenditure as percentage of total expenditure on health is 61%, official development assistance for child health per child is 4$, official development assistance to maternal and neonatal health per live birth is 2$(Countdown 2008)

[6] Non Governmental Organziation

Human Resources for Health (HRH)

Like other African countries there is shortage of skilled medical personnel. In 2005, each physician covered a population of 23,030 persons, or 0.43 physicians per 10,000 and each nurse covered 5,057 persons. There were 4.7 nurses per physician and 7.5 health assistants per physician (or 1.6 health assistants per nurse) in the MoH system (MoH 2006e). The yearly HMIS[7] report (MoH 2006a) indicates increased turn over of medical personnel since 2005 mainly due to change of profession and migration.

[7] health management information system

Chapter II

2.1 Problem statement

Every day 26,000 children die in developing countries, which Eritrea is one of them. More than one third of these children die during the first month of life and most of the deaths occur at home. (UNICEF 2007a)

From 1995-2002 Eritrea has reduced Infant Mortality Rate (IMR) from 72/1000LB in 1995 to 48/1000LB in 2002 and Child Mortality Rate(CMR) from 136/1000 LB in 1995 to 93/1000 LB in 2002 below Sub-Saharan African average, the MDG target is 49/1000 LB. Estimate of child mortality by UNICEF in 2006 is 75/1000LB. However neonatal mortality had remained the same 25/1000LB from 1995 to 2008. Half of infant mortality is due to neonatal causes (Countdown 2008).

Further analysis of the EDHS 2002 data reveals inequity in mortality rate between socio economic classes; babies from poor families have 20% more risk of dying from neonatal complication than the rich ones (Victora et al. 2005). Furthermore WHO fact sheet indicates the inequity of child health indicators between the different rank of wealth as well as urban and rural population (WHO, 2006).

The disparities between rural and urban areas are reflected in the pronounced differences in IMR and CMR. In 2002, the IMR was 48/1000LB for urban and 62/1000LB for rural areas. Under five mortality for urban areas remained 86/1000LB while in rural areas the rate was 117/1000LB. Under five mortality rates of over 100 were reported for four of the six zones (Debubawi Keih Bahr, Semenawi Keih Bahr, Gash Barka, and Debub regions) (NSEO & ORC Marco 2003).

Unsafe water, poor sanitation and inadequate hygiene also contribute to child mortality and morbidity. Low effective coverage of health services (promotive, preventive and curative), poverty, conflict, draught, lack of education, poor awareness at community level as well as harming practices (e.g uvulactomy, FGM[8]) related to maternal and child care interact at various level leading to a complex tree of problems and issues, please refer problem tree in annex 2.1.

Effective interventions exist to reduce child mortality. The challenge is how to deliver the interventions and achieve effective coverage. A series on child survival in the lancet[9] raised provocative issues about how to reach sufficient coverage of effective interventions because most of the child survival interventions are not reaching those who need them most. It concluded that we need to work not only through the health system but also at the household level. Improving breast feeding and complementary

[8] Female Genital Mutulation
[9] Lancet volume 362:65-71,159-164, 233-241,323-327

feeding, oral rehydration therapy, the use of insecticide treated materials, and other family child care practices that directly affect children's health could jointly prevent more than one third of all deaths. Increasing the coverage of community interventions-including access to immunizations, antibiotics for pneumonia, anti-malarial, and micronutrients- could prevent additional deaths (Jones et al., 2003).

Eritrea has been implementing interventions at the community level since the struggle for independence time by training community health workers[10] (**CHWs**) to work with the community in prevention of diseases and treatment. After independence, the malaria programme has been training and deploying CHWs to mobilise the community in malaria control and provide treatment. The success to malaria programme is due to usage of multiple strategies and one of them is community based intervention (MOH 2007 c).

Further more Ministry of Health has launched the Household & Community Integrated Management of Child hood Illnesses **(HH&c-IMCI)** as a strategy to improve coverage of effective interventions and bring about change in the care of children at home. The implementation of the community component of IMCI started in 2005. The Ministry of Health, UNICEF, USAID and other partners supported a pilot integrated community health approach carried out by multi sectoral working groups in Zoba Debub. Three sub-regions developed working groups which carried out participatory diagnosis and action planning with communities in 17 villages and facilitated the selection and training of village health committees and CHWs. The CHWs have been trained to assess children under-5 and to manage uncomplicated cases of diarrhoea, pneumonia, and fever using an integrated algorithm. They dispense anti-malarials, antibiotics, paracetamol, ORS[11] and also counsel mothers on feeding and hygiene practices. In addition, they refer children when severely ill or require treatment with drugs they themselves do not keep in stock; the CHWs fill in the referral slip and recording formats (MoH 2006a).

I believe that community programmes can be complementary and supportive to the weak health system of Eritrea so as to subsequently increase effective coverage of child health interventions in equitable manner. I have seen the contribution of community health workers backed by active community participation during the pilot implementation of HH&c-IMCI programme.

The aim of the thesis is to provide advice for successful scaling up of

[10] CHWs are members of communities, are selected by the community, are supported by health system and are part of its organization in Eritrea but are not paid salary; they have much shorter training than professional workers.

[11] ORS= Oral Rehydration Salt

HH&c-IMCI programme in Eritrea. I intend to do that by analysing the child survival status of children in Eritrea and reviewing the evidence of increasing effective coverage by community programs from experience of Eritrea, Nepal and Tanzania and by discussing the challenges and opportunities for scaling up HH&c-IMCI program in Eritrea.

2. 2 Objectives

To study factors hampering the survival status of children in Eritrea & review the evidence of effective coverage of child health interventions by household and community integrated management of child hood illness programme and identify requirements for scaling up so as to come up with policy, research and programme recommendation.

2.3 Specific objectives

2.3.1 Study the trend of child morbidity and mortality in Eritrea

2.3.2 Analyse the determinants of child mortality in Eritrea

2.3.3 Review the evidence of increasing coverage of effective child health interventions by community programmes and discuss the challenges, shortcomings, failures and best practices by taking country examples.

2.3.4 Discuss what is needed for scaling up HH&c-IMCI in Eritrea

2.3.5 Develop recommendation that will be helpful for guiding policy, practice and research.

2. 4. Methodology

The main method used in this document is literature review and analysis using models.

In chapter three I have analysed the child survival status of children in Eritrea using a model I adopted from Mosley and Chen (1986) frame work refer section 2.4.5 & 2.4.6. I have used data mainly from the last DHS[12] of 2002 and last report of Health information system 2006, annual report of Ministry of health for 2007, report of national malaria control program 2007 and studies conducted by Ministry of health. Further more I used published literatures on child health, peer reviewed articles, and journals published in English. I limit my literature review to community based child health hence I reviewed the efficacy of interventions that can be delivered at community level.

The first part of chapter four have analysed the implementation of HH&c-IMCI in Eritrea, Nepal and Tanzania using the frame work for implementation of HH &c-IMCI (please refer section 2.4.6).

[12] Demographic and Health survey

For Eritrea, the finding of KPC[13] study that compared the HH&c-IMCI intervention villages with non HH&c-IMCI villages as well as assessment of the pilot intervention and my personal experience was my source of information.

For Nepal and Tanzania, internet based resources and publications from UNICEF and WHO was my source of information.

The second part of chapter four have analysed effective coverage of antibiotic treatment for pneumonia management and coverage of for diarrhoea management in HH&C-IMCI villages using Tanahashi and Knippenberg model. I chose these indicators to get a grip on what the effective coverage of the program is; therefore I did not do calculation for all indicators. The data (six month report sent to health facilities) was extracted from assessment report of Ministry of health(MoH 2006b). I also analysed effective coverage of the same interventions in Nepal.

2.4.1 Search strategy

I searched internet resources and KIT library for referenced materials and peer reviewed articles and journals. I searched major databases including PUBMED and Google Scholar search engine and identified referenced sources & documents. The WHO, UNICEF, World Bank, as well as other organizations such as DFID, USAID websites were searched for relevant reports, articles and documents. I used printed documents (published and unpublished) from Ministry of health Eritrea which I brought with me. Systematic reviews in Cochrane library was searched for systematic reviews on effectiveness of interventions and I tried to carefully review meta-analysis of studies and paid attention to potential confounding factors and biases that might have tempered with the findings.

2.4.2 Limitations

The calculation of coverage in this document may not be accurate as I did not have primary data to make the correct calculation; especially calculation of antibiotics for pneumonia, due to the reporting of all ARI cases not specifically pneumonia by community health workers.

The community based interventions for neonatal care are trials and have not been scaled up in most countries which will make generalisation to my country situation a bit difficult.

The health situation data presented in this paper are mainly from findings of DHS 2002, which is the last population based survey on child health from Eritrea. The government reports are still quoting the figures however

[13] Knowledge Practice Coverage

I have tried to update the figures based on estimates from WHO and UNICEF –for example child mortality rate, maternal mortality rate.

2.4.3 Key words

Various combination of the following terms were used
child health, child survival, Eritrea, Nepal, Tanzania, household, community, integrated, management, childhood, illness, neonatal health, malaria, pneumonia, diarrhoea, health system, health policy, socio cultural, economic, determinants, effective coverage, personal illness control, nutrient deficiency, maternal factors, injury, environmental contamination, breast feeding, complementary feeding, micro nutrients, essential newborn care, hygiene and sanitation, antibiotics, ORT, community health workers, volunteers, social justice, inequity.

2.4.4 Mosley and Chen Framework for the study of child survival

The model was first presented in 1984 by Mosley and Chen. The objective of the model was to provide an integrated research approach from a social science and medical science perspective for studying child survival. Social science researchers have been focusing on association of socio economic determinants (such as culture, economy, and maternal education) with child mortality and did not link it to the proximate causes of death. On the other hand, the medical science researchers have been focusing on diseases (morbidity) and cause of death and gave little attention to the root causes of child death (Boerma 1996).

The conceptual core of Mosley and Chen framework was the idea that all background (socio-economic and cultural) variables have to operate through a limited set of proximate determinants that directly influence the risk of disease and the outcome of disease processes. Proximate determinants in the first four groups affect the rate at which children move from healthy to sick, whereas factors in the last group influence both this rate (through prevention) and the rate of recovery (through treatment(Hill 2003). In 2003, WHO republished the widely circulated article of Chen and Mosley and reviewed it as one of the classic frameworks that have been tested right with time

2.4.5 My version of Mosley and Chen model

I have made changes in the Mosley and Chen model due to the following reasons:-

- Culture is not part of socio economic determinants in the Mosley and Chen model but I have analysed 'socio cultural and economic determinants' instead of 'socio economic determinants'.

- The fifth proximate determinant which is personal illness control is influenced by healthy behaviour and health seeking behaviour. Health seeking behaviour is a result of the ability of the health

system to make interventions accessible, acceptable, with good quality, therefore I have added 'health systems' as a six proximate determinant and as underlying factor for 'personal illness control' which includes prevention and treatment.

- Furthermore Mosley and Chen argue that growth faltering should be an indicator for health status, just like death, because both child mortality and child growth are affected by the same set of underlying nutritional and infectious conditions, such that weight-for-age can be regarded as a measure of health status rather than solely of nutritional status. On the other side the cause of death model by WHO judges under nutrition to be an underlying cause of most infectious illness; rejects the idea that a few deaths can be singled out as exclusively attributable to nutritional deficiencies (Bryce etal. 2005). Hence I did not discuss how growth faltering can lead directly to mortality instead I have indicated the synergistic effect of growth faltering and sickness by putting two arrows locating to both sides and subsequently leading to mortality.

2.4.6 Analysis of household and community IMCI implementation

Three elements of the HH&c-IMCI implementation framework are used to compare implementation of the three elements in Nepal, Tanzania and Eritrea. Please refer annex2.2

Element one: Improving partnership between health facilities and the community they serve.

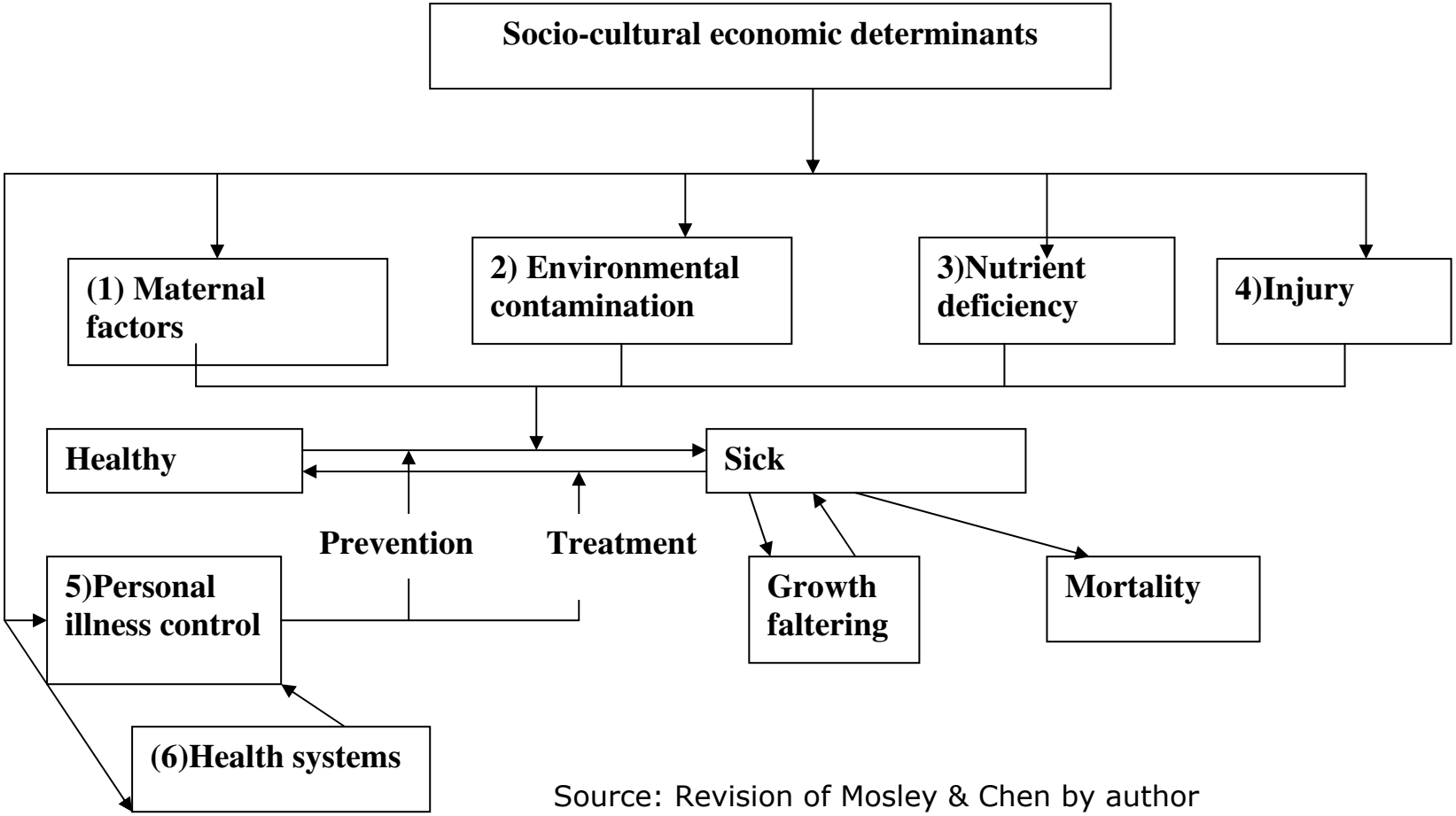
Element Two: Increasing appropriate care by Community Based Care Providers.

Element Three: Promotion of key child care practices critical for child health and nutrition

2.4.7 Tanahashi and Knippenberg model.

Effective Coverage is influenced by the ability of the health system to transform the intention to serve people into actual successful intervention for health, which involve a variety of factors, such as availability of resources and man power, supply logistics and peoples attitude to health and health care (Tanahashi 1978 & Knippenberg et al. 1990).
The main factors in this model are availability, access, utilization, coverage and effective coverage.

Figure 2.1 Operation of the Six groups of proximate determinants on the health dynamic of a population



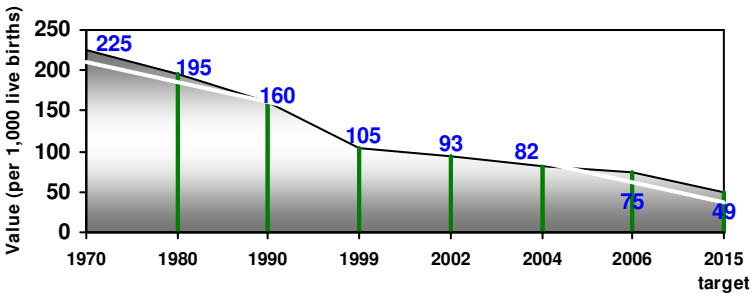
Source: Revision of Mosley & Chen by author

Chapter III
Results/ Findings

3. 1 Overview of child morbidity and mortality trend

Eritrea has made consistent progress over 20 years in reducing child deaths with an average annual reduction of around 4% over the last decade through a focus on reaching high coverage of basic public health services (Countdown 2008). The trend may not be accurate because it is based on population based surveys and UNICEF estimates. The accurate estimate can only be determined by proper registration of births and deaths.

Figure3.1:- Trends in under 5 mortality rates (U5MR) 1970-2004



Source: NSEO 2006, SOE 2005b, UNICEF 2007a: adopted from UNICEF Eritrea power point presentation.

The sharp decline between 1990 and 1999 could be attributed to the revitalisation of the health system and community based health programs after Eritrea got its independence in 1991; which result to increased coverage of immunization, ITN, treatment for pneumonia, and diarrhoea. The momentum of the decline is showing a slowing trend that requires innovative measures to achieve the MDG target of child mortality.

In the absence of epidemiological studies and vital registration system in Eritrea, I have adopted the WHO cause of death estimate to show the cause specific mortality rates.

Table 3.1:Distribution of causes of death among children below five years

Causes of death	Deaths[b]	Sub Saharan Africa average
	(%)	(%)
Neonatal causes[a]	27	26
HIV/AIDS	6	7
Diarrhoeal diseases	16	17
Measles	3	4
Malaria	14	17
Pneumonia	19	21
Injuries	3	2
Others	13	6

a. Included neonatal death due to diarrhea
b. The sum total will not be 100% due to rounding of estimates

Source: WHO Mortality country fact sheet2006

The major killers of children below five years of age in Eritrea are neonatal causes, pneumonia, malaria; diarrhoea associated with malnutrition. However, child deaths occur from synergistic cause of co-morbid situation where more than one illness is involved hence it may not be a realistic assumption to assign a single situation as the cause of death of a child; which is a reason to why Eritrea have scaled up health facility IMCI and is going to scale up HH&c-IMCI. By end of 2007, all health facilities had at least one IMCI trained person and 30% of health facilities have trained 60% of health staff on IMCI (MoH 2007 a).

Neonatal causes

Neonatal causes remained 25/1000 live births unchanged for the last 15years (Countdown 2008).*Globally*, 86% of all neonatal deaths are due to 3 main causes; infection (36%), preterm (27%) and asphyxia (23%). Infection, the largest single cause of death, is composed of deaths from sepsis and pneumonia (26%), tetanus (7%) and diarrhoea (3%). Sixty to ninety percent of neonatal deaths are in low birth weight babies, mostly preterm babies (Lawn et al. 2005). Neonatal tetanus is not a cause of mortality in Eritrea due to its elimination since 2003 (WHO 2005).

Fifty percent of infant mortality in Eritrea is due to neonatal causes (NSEO &ORC Marco, 2003). Many neonatal deaths occur at home where home delivery is common in Eritrea and is not reported. Newborn mortality rates are not evenly distributed but are heavily skewed towards the earliest days and even hours of life. While deaths in the first hour usually reflect congenital anomalies and complications of pregnancy and child birth, including delayed recognition, referral and management of obstetric complications, failure to appropriately assist the newborn in temperature control and breathing, deaths later in the neonatal period are largely due to failure to identify and treat early and late postnatal sepsis(Lawn et al. 2005). There is a clear gap in newborn care in both health facilities and at home. Although the risk of child mortality is the highest on the day of delivery, in the first week and first month of life, essential new born care program coverage is also the lowest (almost zero) in the immediate postpartum period in Eritrea.

Organized new born care is nonexistent in most health facilities of Eritrea. In rural areas, 90% of the deliveries were at home, whereas 62% occurred in a health facility in urban areas. Only 10% of births were attended by a skilled attendant in rural areas, compared to almost 90% in the capital and about 37% nationwide(MoH 2007a).

Approximately 2% of women who delivered outside a health facility attended postnatal care within 2 days of delivery.

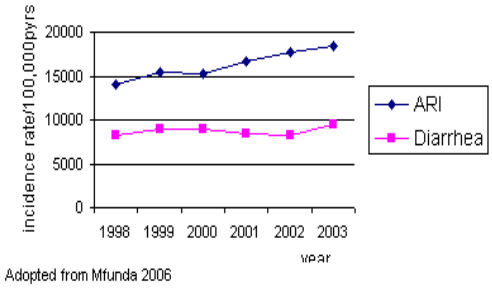
Pneumonia and Diarrhoea

Globally childhood pneumonia and diarrhoeal disease cause almost half of all child deaths (Rudan et al. 2006). Pneumonia accounts for nearly one fifth of childhood deaths world wide with approximately 2 million children dying every year (WHO/UNICEF 2004). Acute severe infection of the lower respiratory tract clinically manifested as pneumonia and diarrhoea have remained the major killers of children in Eritrea. A retrospective study based on the national health information data from 1998 to 2003 showed that incidence of pneumonia had increased by 30% from 1998 to 2003 while diarrhoea remained unchanged (Mfunda et al. 2006). A comparison of six months health information data by WHO Eritrea from 2003 to 2007 also shows similar increasing trend of pneumonia and diarrhoea among children younger than five please refer to figure 3.2 & 3.3 below.

Further more the retrospective study show that the case fatality rate for both diarrhoea and pneumonia declined by about 50% which shows better treatment and quality of care in the health facilities but poor prevention (Mfunda et al. 2006). It is also worth to note that inpatient mortality of children younger than five years were due to pneumonia(31%) and diarrhoea(16%) in 2005 (MoH 2006a).

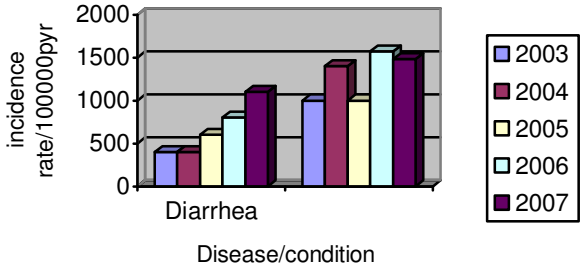
The possible explanation for the increasing trend could be the increase in population size, increase in use of services, and better diagnostic accuracy and better reporting of health facilities. If the increase is real then the contributory factors might include high child malnutrition, stress, and poor living environment and poverty.

Figure3.2 Trend of Pneumonia and Diarrhea



Source: continuing communicable disease burden by Mfunda etal (2006)

Figure 3.3 six month trend of pneumonia and diarrhea (2003-2007)



Source: Eritrea health update (2007)

In Eritrea only 47% children were taken to appropriate care provider when having cough or difficult breathing in 2002(NSEO&ORC MARCO 2003). Considering the fatality of pneumonia, it is evident that many children are dying at home before receiving any treatment. The case is worse in hard to reach areas where the conventional health service is not reaching.

Measles & vaccine preventable diseases

Measles is considered as underlying cause of death among children due to its tendency to decrease the immune and non-immune host defences leading to a high rate of infectious diseases, and also to a higher case fatality rate when they do occur (Black et al. 2003). Globally an estimated 1 million under 5 children die from measles every year in the world (Huiming et al. 2005).

In Eritrea vaccine preventable diseases have been rarely reported; all suspected 46 measles cases tested negative for measles in 2007 (MOH 2007d). Polio case was last reported in 2005, and WHO has temporarily certified Eritrea for elimination of neonatal tetanus after undertaking assessment in 2003 (WHO 2005a). Homophiles influenza B vaccine was just introduced in 2008 if this vaccine could reach every child the incidence of pneumonia will reduce (Mullholland 2006). It is also worth to note the active surveillance system of Eritrea which is linked with the community networks for reporting of AFP[14] cases and any suspected measles outbreak.

Immunization coverage for DPT/Hep3 and measles is showing a declining trend in Eritrea. According to coverage survey in 2001, DPT/Hep3 [15] coverage was 90% declined to 80% in 2006 while Measles coverage reduced from 93% to 86% (MoH 2007b).The reason for the decline is due to reduced outreach activities because of fuel rationing in the country. This declining trend requires a serious attention as gains achieved in the past can be lost.

Malaria

In Eritrea 67% of the population live in malaria endemic areas of which 18% are children (MoH 2007c). The burden of death from malaria has reduced considerably as shown by the number of reported malaria cases dropped from 126,700 in 2001 to 10,150 cases in 2006 (January –September data), and malaria-related deaths among children below five years age declined from 50 deaths in 1999 to 10 deaths in 2006. During January-September 2007, only 8,485 cases were reported, and malaria is no longer among the top ten causes of in-patient mortality in the country (MOH 2007c)

[14] Accute flaccid paralysis

[15] Diphtera Petusis Tetauns/ Hepatitis

Figure 3.4 Annual Malaria outpatient cases Source: (MOH 2007c)

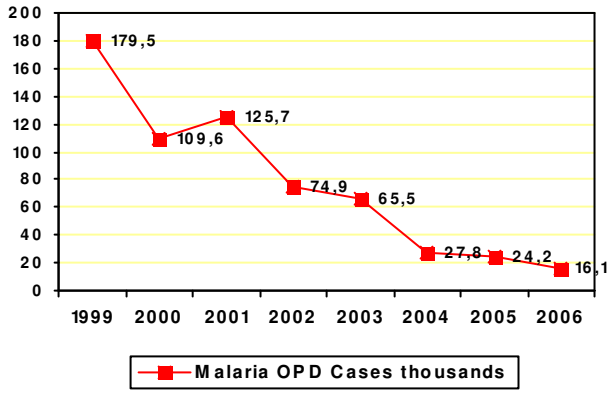
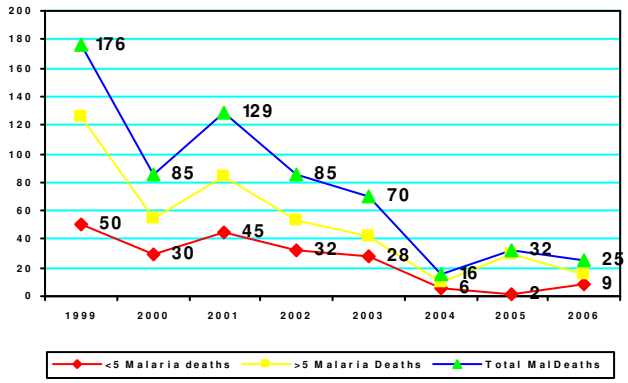


Figure 3.5 Annual Malaria deaths 1996-2006. Source:(MOH 2007c)



The success in rolling back malaria is due to combined strategies of prevention; efficient distribution of ITN[16] due to the government's free policy to all pregnant women, people living in high malaria endemic area and internally displaced population and military. In the period 2000-2004, approximately 81% households owned bed nets which 73% were ITNs and 58.6% of children younger than five years slept under a net (Eisele et al. 2006). Furthermore, Effective participation of communities in environmental management; and selective indoor residual spraying with Malahaton as well as effective treatment of cases by community health workers (over 50% were treated by them) are the reasons to the success of the program (MoH 2007c).

The sudden increase of case fatality rate among under five children in 2006 may also be due to the increasing resistance to first line drugs (sulfadoxine prymithamine) however further investigation of the situation may be necessary .

HIV

The official figure of HIV[17] prevalence in Eritrea declined from the highest 4.2% in 1999 to 2.8 in 2001, 2.41 in 2003 and 2.38 in 2005 ANC(Antenatal care) sentinel surveillance (MoH 2006d). The reduction could be due to behaviour change, and expansion of VCT[18], and HAART[19]. HIV is also considered as underlying cause of death due to its increased susceptibility to diarrhoea, pneumonia, tuberculosis, and other infections as well as high case fatality rate

[16] Insecticide treated nets
[17] Human Immune Virus
18 Voluntary Counselling and Testing
19 Hyper Active Anti Retroviral Therapy

due to these infections among people with AIDS[20] (Black et al. 2003).

Malnutrition

Malnutrition is responsible for about 35% child deaths and 11% of the total global disease burden (Black et al. 2008). Prevalence of [21]moderate to severe wasting[22] or acute malnutrition in Eritrea is very high ranging from 21.1% in Gash Barka region to 11.1% in Maakel region(refer annex 3.1) while stunting[23] is 44% also considerably high. Underweight prevalence among women of reproductive age is also high, 40% of them have body mass index[24] less than 18.5(MoH 2005).

The high malnutrition prevalence is unacceptably high and is declared as emergency condition by WHO (MoH 2005) raising a concern to urgent response. The reason for high child malnutrition could be due to high poverty level, low child spacing leading to low duration of breast feeding and sub optimum child care as well as maternal malnutrition and low coverage of water supply & sanitation which is a factor for pneumonia and diarrhoeal diseases and subsequently malnutrition. Please refer to section *3.2.2.(1)* for more analysis of nutrient deficiency

[20] Acquired Immune Deficiency Syndrome
[21] moderate Wasting: -2<Zscore<-3 weight for height
[22]severe wasting -3<Zscores
[23] Stunting: low height for age
[24] Body mass index: weight divided by height square.

3.2 Analysis of determinant for Child Survival in Eritrea

3.2.1 Socio cultural economic determinants

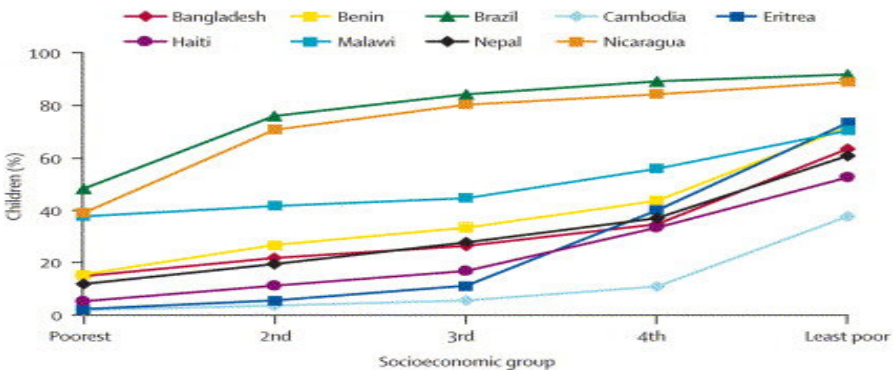
Mosley and Chen model put socio economic determinants as an overarching factor for child survival, I have added culture. The reason is that all socioeconomic determinants influence the proximate determinants to cause sickness and death in children. Below I would like to discuss some of the socio economic determinants affecting child survival in Eritrea:-

(1) Inequity

Analysis of determinants of mortality among the poor and the rich by Houweling et al. (2005) indicated that, children from poor families are exposed to disease through limited opportunity for water and sanitation, indoor air pollution, crowding, poor housing conditions, and high exposure to disease vectors. They are also more likely to have lower resistance to infectious diseases because they are undernourished. This fact is true in context of Eritrea where children from lowest quintile have 1.5 more probability of dying comparing to children from highest quintile (WHO 2008).

Further more analysis of the the DHS 2002 suvey by Victora et al (2005) revealed high inequity in Eritrea which shows that only few children(refer figure 3.7) who are from the highest quintile, are receiving essential child health intervention[25] hence there is a need to promote universal coverage with effective interventions. Victora et al (2005) argue that packaging interventions in one delivery mechanism tends to intensify inequity unless the coverage of intervention is more than 90% because children from low socio economic status tend to miss out.

Figure 3.6 Percentage of children receiving six or more child-survival interventions, by socioeconomic group and country (*Source: Victora et al. 2005)*



[25] (BCG, diphtheria-pertussis-tetanus, and measles vaccines), tetanus toxoid for the mother, vitamin A supplementation, antenatal care, skilled delivery, and safe water

The majority of children in Eritrea are poor hence when introducing new child survival interventions, it has to be ensured that the poor could access, afford and utilize it.

(2) Female education

Many studies have shown that female education is an important determinant to child survival (Dessai,1998). The EDHs was impressive in showing that women with secondary school education have fertility rates 44% lower than those with no education, their children are twice as likely to be well fed and seek care for pneumonia (NSEO&ORC MARCO 2003). Habtom & Ruys (2007) also indicate the observed differences of results; educated women have correct knowledge about HIV/AIDS. Eritrea has a very low female literacy rate of 47.3% compared to male literacy rate of 69.9% (UNICEF Eritrea 2007)

(3) Cultural belief/ traditional harmful practices

Harmful cultural practices such as FGM and uvulactomy exist to date in Eritrea posing treat to maternal and neonatal survival 89% of girls were circumcised as per the 2002 DHS (NSEO & ORC MARCO 2003). A cohort study that compared outcome of delivery among circumcised and uncircumcised women show that women with type 2&3 mutilation were significantly more likely to have caesarean section, postpartum haemorrhage, and long stay in hospitals after delivery. Furthermore, the circumcised women were also more likely to have babies that need resuscitation; more still birth or early neonatal death was also observed among this group of women (Glasier et al. 2006).

Furthermore, cultural beliefs among the Tigre and Tigrigna ethnic groups of Eritrea, for instance, discourage delivery at health facility because they believe, "it is unlucky for primigravidas to deliver at health facility" and "newly delivered mother and new born should not be exposed to the outside to protect them from evil spirits '' (Habtom and Ruys 2007pp 10).

(4) Gender

Gender relations also affect the extent to seek care and control over resources in the family including food, and money. In India for example a girl is 40% more likely to die than a boy due to sub optimal care and treatment in the family (Victora et al. 2003).
I have not come across of any study that shows about gender based inequity and differences in mortality indicator among boys and girls in Eritrea. From my experience I tend to generalize that boys are better treated and are favoured more than girls because boys replace the next of kin.

Though I have not come across with any study to show the decision making dynamics at the house hold level, I know that men are bread winners in Eritrea hence they tend to control the decision making for health care spending and other resources. Women have a low socioeconomic status than their men counterparts in Eritrea.

(5) Life style (Nomadic)

The population in the two coastal Regions of Eritrea are nomadic; though the migration pattern is seasonal and is predetermined, it is still a challenge to reach this population with effective health service. It is estimated that 14% of the population which is about 82,000 in NRS region and 28% which is also about 16, 963 in SRS region are Nomadic.

Not only the nomadic life style makes access to health service difficult but also the poor roads and bridges that hamper healthcare delivery. This inadequate infrastructure increases the time and money spent on delivering health. Many patients or their families, have to walk long distances (sometimes more than 30 km) to reach a health centre or walk to the main road to get a lift to the nearest hospital. (WHO 2007)

(6) Economy

Slow economic growth and poverty are deep rooted determinants for child survival in Eritrea. Findings from country analysis of correlation between GDP and child mortality show that- a 10 times increase in average GDP/capita leads to 1.95 times lower risk of child deaths (Houweling 2005). At the present, out of pocket expenditure as percentage of total health expenditure on health is 61%(WHO 2008). Considering the level of poverty in the country, out of pocket payments to such extent can be burdensome

(7) Government commitment

Public expenditure on health as a proportion of general expenditure for health is 4% for Eritrea much lower than the 15% target as declared in Abuja. Too low budget allocation for health limits the extent of reaching children with effective child health interventions.

Eritrea has no child survival strategy, which may be an indicator for low government commitment.

3.2.2 Proximate determinants

Mosley and Chen have shown the biological interactions of the proximate determinants by showing how 'nutrient deficiency' makes the host susceptible to diseases and how the consequence of 'environmental contamination' can cause illness depending on the host's ability to resist infection. In some cases host resistance is compromised by 'injury', low birth weight, or immaturity at birth due to 'maternal factors'. On the other hand host defences may be strengthened by 'personal control' (Mosley and Chen 1986)
I have added a sixth proximate determinant of health systems and health policy as a factor for personal illness control.

(1) Nutrient deficiency

Under nutrition is the underlying cause of over one third of deaths occurring among children under age five globally. Twenty one percent of deaths and 21% of DALYs[26] in children younger than five years old are attributed to stunting, severe wasting and intrauterine growth restriction (Balck etal 2008). Prevalence of moderate to severe wasting or acute malnutrition in Eritrea is very high ranging from 21.1% in Gash barka region to 11.1% in Maakel region while stunting is 44% also considerably high (MoH 2005) .

Globally 22% of all child deaths are attributed to severe wasting, stunting and intrauterine growth restriction[27] - largely due to its synergistic relationship with infection. A malnourished child has lower immunity to fight infections as findings show that mild underweight doubles the risk of death due to infection while moderate and severe underweight increases the risk of death to 5-8 folds (Black et al. 2008). Furthermore, Black (2008) shows that infection due to respiratory illness and malaria result in growth faltering while diarrhoea seems to be particularly a risk factor for stunting mainly because of its association with mal absorption of nutrients. Furthermore malaria in pregnancy is associated with intrauterine growth restriction which increases the risk of death in infancy and infection at the end of pregnancy seems to be particularly harmful (Luxemberg 2001)

WHO (2003) recommended practice of infant feeding is breast feeding up to 6 months exclusively and two years with complementary food. Only 54% are exclusively breastfed to the age of 6 months with a median duration of 2.6 months (MoH 2005). Nationally, the median duration of any breastfeeding is 22 months,

[26] Disability Adjusted Life Years
[27] low birth weight for full term gestational age

but gradually it is declining especially in the urban areas. The proportion of children breastfed at 12-24 months in the rural areas was about 70% with variation ranging from 68-75% between the different zones (MOH 2005).

Infants that are not exclusively breast fed have high relative risk of getting infection especially diarrhoea compared to non breast fed infants. Meta analysis findings by Black(2008) show that non exclusive breast fed infants have 14.4 relative risk of dying from all causes of child hood diseases than exclusively breast fed infants. Sub optimal breast feeding such as giving pre-lacteal feeds, water and tea while breast feeding also have risk for mortality and incidence of diseases as shown on the table below.

Table 3.2: Relative risk of sub optimum breast feeding compared with exclusive breast feeding from 0-5 months[28] ,*Adopted from Black etal 2008.*

Outcome	0-5 months			6-23 months
	Predominant[30] breastfeeding	Partial [30] breastfeeding	Not breastfeeding	Not breastfeeding
All cause mortality	1·48 (1·13–1·92)	2·85 (1·59–5·10	14·40 (6·09–34·05)	3·68 (1·46–9·29)
Diarrhoea mortality	2·28 (0·85–6·11)	4·62 (1·81–11·77)	10·53 (2·80–39·64)	2·83 (0·15–54·82)
Pneumonia mortality	1.75(.48-6.43	2.49(1.03-6.04)	15.13(.61-373.63)	1.52(.09-27.06)
Diarrhoea incidence	1·26 (0·81–1·95)	3·04 (1·32–7·00)	3·65 (1·69–7·88)	1·20 (1·05–1·38)
Pneumonia	1·79 (1·29–2·48)	2·48 (0·23–27·15)	2·07 (0·19–22·64)	1·17 (0·37–3·65)

Key words[29]

Infant feeding guideline by WHO (2003), recommends the introduction of complementary feeding from 6months onwards to support the nutritional need of the active growing infant. Complementary feeding includes giving adequate amount of energy-nutrient-rich foods and continue breast feeding up to two months. Children can become stunted if they do not receive adequate

[28] Data are point estimates

[29] Predominant breast feeding: only water or teas in addition to breast milk. *Partial breast feeding*: other liquids or solids in addition to breast milk

quantity and quality of food after 6 month even if they are breast fed optimally (Black 2008).

In Eritrea most children get malnourished during introduction of complementary feeding due to lack of access to food, poor diet especially to mothers and children; only 43% of infants are introduced to complimentary food at 6-9 months of age. The traditional complimentary food for infants is cereal-based mainly starchy cereals made into porridge, usually bulky with less nutrient density. Very few families feed their children protein rich foods (MoH 2005). Child malnutrition (stunting) is irreversible once the child reaches two years hence any intervention has reach the child before two years (Bhuta et al. 2008).

Micronutrient deficiencies are important for survival of children. Especially zinc and vitamin A deficiency results in increased risk of infections. The evidence from many randomised placebo-control trials done in various populations in all regions of the world show that Vitamin A deficiency in newborn babies, infants, and children resulted in about 6% of under-5 deaths, & 5% of under-5 DALYs. Zinc deficiency resulted in about 4% of under-5 deaths and 1% of total DALYs (Black et al. 2008). Vitamin A supplementation coverage twice a year in Eritrea is 38% and once a year 95%(WHO 2008).

(2) Environmental contamination

Children living in unhygienic and unsafe environments are at risk of death. According to (WHO 2002), ingestion of unclean water, in adequate availability of water for hygiene, and lack of access to sanitation, contribute to about 1.5 million child deaths and around 88% of deaths from diarrhoea. Coverage of sustainable and clean water supply in Eritrea is 72% in urban areas and 54% in rural areas. Access to improved sanitation is 34% for urban area and 3% rural. Diarrhoea is a major killer of children in Eritrea as 16% of the deaths in children below five years in Eritrea is attributed to diarrhoea. High incidence of malaria in many tropical countries is due to poor management of the environment and vector control.

Exposure to extreme levels of indoor air pollution from mainly burning of biomass fuels for cooking and heating is a risk factor for pneumonia. Furthermore poor housing and crowded homes are risk factors for pneumonia (Mullholand 2006). In Eritrea, 80% of the population use solid fuel for daily consumption (NSEO&ORC Marco 2003). Pneumonia is one of the top killers of children in Eritrea,

19% of the deaths among children below five years is due to pneumonia.

In Eritrea draught has become a chronic emergency, greatly exacerbating poverty food insecurity, limited access to water and sanitation and high morbidity due to communicable diseases and malnutrition of children. The recent food crisis evidences the threat of global warming and declining food production in many countries.

(3) Maternal factors

Motherhood is supposed to be a happy event for mothers, families and communities for it is a normal life enhancing process of procreation. The tragedy is that every year about half a million mothers and four million neonates die because of pregnancy and child birth complication in the world (WHO 2005b). The adjusted maternal mortality rate (MMR) level in Eritrea is 450/100,000 live births which means that 1 in 44 women have a life time risk of dying from complication of pregnancy and child birth (countdown 2015 MNCH, 2008). The health of the mother and the baby are inseparable. Especially the neonatal conditions are complicated by the maternal condition; most of neonatal deaths occur in the first week of life. (WHO 2005b)

Mothers who get children at a young age suffer from prolonged labour which results into complication and consequently death of the mother and foetus. The death of a mother threatens the survival of her new born. A study in Gambia show that all new born babies who lost their mother during labour died with in one year of birth (Greenwood et al. 1987). While the risk of early child bearing is still existent in Eritrea adolescent fertility shows a decline trend in the EDHS 1995 from 19% and 2002 to 11% (NSEO &ORC Marco 2003).

Pre existing health condition of the mother influences the birth outcome. Untreated reproductive tract infection, syphilis, malaria, and TB are all causes for the high incidence of infections, pre-maturity, and congenital abnormalities (Lawn et al. 2005); though congenital abnormality is low in Eritrea in proportionate terms. Increasing coverage of focused ANC[30] for pregnant women can be a good opportunity to identify and treat pre-existing health conditions, in Eritrea ANC coverage 4 times during pregnancy is 40% (WHO 2008).

[30] Ante Natal Care

Complication during labour is an important determinant of foetal and neonatal survival and health. Mal presentation of the foetus for example needs skilled care; if not attended there is a high risk to complication of asphyxia or infection. Skilled assisted delivery is 37% while the met need for Emergency Obstetric Care in Eritrea was 14% in 1998, and 35% in 2006 (MoH 2006a). Most (70%) of the deliveries in Eritrea occur at home in unhygienic environment. Most of the neonatal infection is due to absence of clean delivery clean cloths, clean hands, and clean blades (Lawn et al. 2005).

Furthermore research revealed that birth intervals of 9-14 months are associated with increased risk of maternal and neonatal death when compared to 27–32 month birth intervals (Campell et al. 2006). About 8% of the births in Eritrea occur in the birth interval of 9-14months which shows the existence of the risk factor for neonatal mortality (NSEO &ORC Marco 2003).

The association of maternal body size with size of new born children is strong. Many cohort studies in developing countries show that undernourished girls tend to become short adults having narrow pelvic and thus are more likely to have low birth weight children operating through intrauterine growth restriction (Black etal 2008). Poor foetal growth is rarely a direct cause of death, but rather can contribute indirectly to neonatal deaths particularly those due to birth asphyxia and infections (sepsis, pneumonia, and diarrhoea), which together account for about 60% of neonatal deaths (Black et al. 2008). In Eritrea 40% of the Women in reproductive age have low body mass index (MoH 2005) indicating chronic energy deficiency (malnutrition). These women, in addition to their ill health, are prone to deliver babies with low birth weight, LBW[31] rate in Eritrea is 14% (MoH 2006a).

(4) Injury

Deaths from injuries are becoming proportionally more important as other causes of death are being reduced in the developing world and yet few programs have been directed to preventing it (Freedman et al. 2005). Among children below five years drowning is the major cause of injury death; representing 60% of all injury cause of death (Freedman et al. 2005). Furthermore, Children in the age of 2-5 years are prone to risk of burns and injury from sharp objects therefore proper child care at home is very important. Additionally injury due to road traffic accident is becoming one of the main concerns in many developing countries especially Sub-Saharan Africa including Eritrea (Odero 2004).

[31] low birth weight

Most injries in Eritrea are reported from health facilities and yet many injuries occur in communities but not reported due to inexistence of vital registration system. There is no surveilence data on injury except land mines in Eritrea. Most of the victims of land mine are children above five years. Eritrea is affected by landmines and unexploded ordnance, largely as the result of the country's long struggle for independence (1962-1991) and its border war with Ethiopia (1998-2000).

(5) Personal Illness Control

Mothers (care takers) need to have knowledge to provide the necessary care for their children to prevent illness, also need to know how to recognize the signs of serious illness, how to treat an illness at home and where to seek care when care outside the home is required. They also need to understand the importance of complying with prescription advice and counselling.

A survey done in 30 villages of Debub region Eritrea, show that about 75% mothers know at least two signs of childhood illness that indicate need for treatment, however, only 20% seek treatment with in 48 hours after noticing the child had cough and fast breathing (MoH 2006c). Awareness alone does not lead to proper health seeking; there need to be a supportive environment from fathers and grandmothers to seek care. In addition a mother (care taker) will take into consideration physical access to health service, the cost of those services, their quality and the reception she will receive, hence responsiveness of the health system as well as organization and financing are major underlying factors for personal illness control.

About 2/3 of child mortality can be reduced by effective home based preventive and curative interventions (Jones etal 2003). The second child survival series article[32] estimated the number of child hood deaths that could be prevented assuming 100% coverage is achieved with this interventions(Jones et al. 2003)- nutrition interventions such as breast feeding, complementary feeding, zinc and vitamin A supplementation prevents 2.4 million of child deaths every year in the world. On the same note, quality integrated case management of childhood infections (diarrhoea, pneumonia and neonatal sepsis) could save 3.2 million children each year globally. Please refer table 3.3 page 29 .

Furthermore, more than one third of all deaths in the world can be prevented by interventions that can be delivered at the household

[32] Lancet 2003; 362:65-71

level (promotion of breast feeding, oral dehydration therapy, education on complementary feeding and insecticide treated materials) (Jones etal2003). In addition the authors note that their estimates of lives saved are conservative, since they include only interventions for which cause-specific mortality prevention data are available. The potential impact of birth spacing for example was not analyzed in the report (Jones etal 2003).

The 2005 Lancet neonatal survival series has pointed that among other interventions, home-based neonatal care has proven to impact significantly the NMR[33]. On the other side, WHO (2005), estimates that 15-20% percent of neonates require special care and 3-5% requires intensive care indicating the need to strengthen health facilities.

Figure 3.7

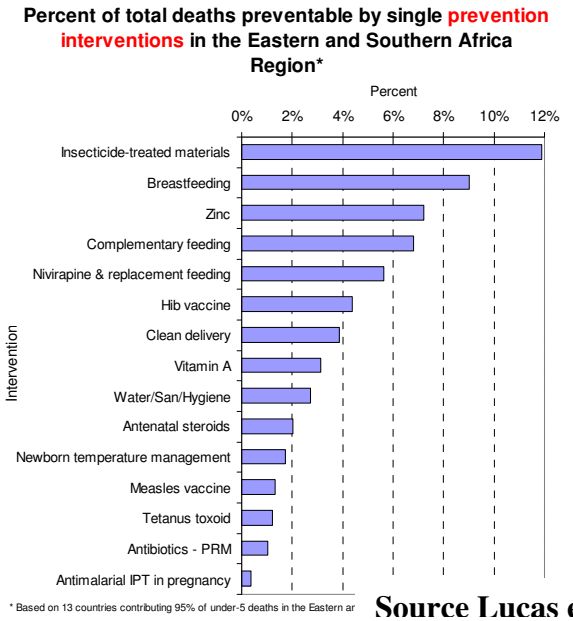
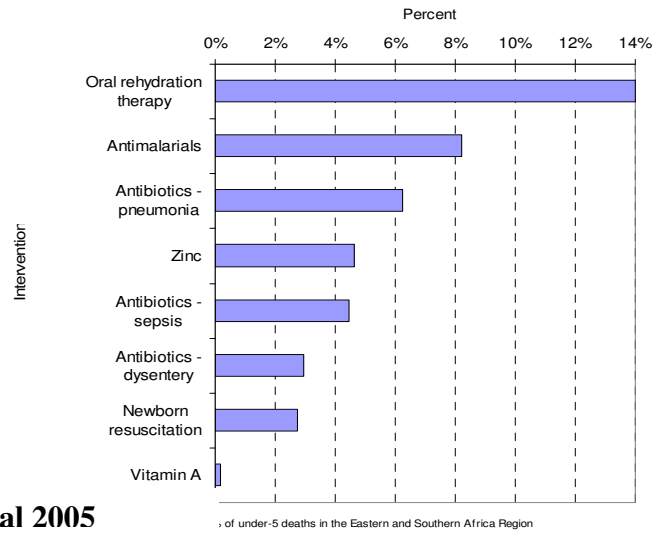


Figure 3.8



Source Lucas etal 2005

According to WHO CHOICE[34] evaluation, all the interventions that are mentioned below are cost effective except water supply and sanitation and can be scaled up with less technology (Evans Etal 2005).

[33] Neonatal Mortality Rate
[34] choosing interventions that are cost effective

Table3.3: Summary of the evidence of effective child health intervention that can be delivered through community based strategies.

Intervention	Evidence on reducing morbidity and mortality	Source
Educational promotional strategies for breast feeding	Universal implementation assumed to improve breast feeding practices up to 12 months of age and reduce risk of death. Peer counselling at the community level improves breast feeding by 6-64%	Systematic review by Bhuta etal (2008) Meta analysis of 35 studies Green 1999
Complementary feeding support including education with food supplements	Implementation of this intervention in countries with food scarcity assumed to increase linear growth (reduce stunting and subsequent risk of death) and increase height by 3.6 cm at 36 months if intervention delivered before child is two years old.	Meta analysis of **RCT**(randomised control trials) by Bhuta et al 2008
Insect Treated bed nets	Associated with a reduction of all causes of death of children under 5 by 17%.	Meta analysis of 4 RCT by Lengler et a.l 2001
Vitamin A supplementation	Assumed to have no effect on stunting but to reduce risk of mortality by 12% (one dose) and 22% two doses in children aged 6-59 months.	Meta analysis of RCTs by Bhuta et al 2008
Zinc supplementation (preventive and theraputic	Preventive zinc supplementation assumed to reduce odds of stunting (by 15%) and mortality risk by 19%	Meta analysis of RCTs by Bhuta et al. 2008
Hygiene and sanitation	Assumed to reduce incidence of diarrhea by 30% hence reduce stunting. Each diarrhea episode increases odds on stunting by 4% (OR 1:04)	Review of three systematic reviews by Bhuta et al. 2008
Essential new born care* at community level.	Neonatal Mortality reduced (in Gadchiroli distict, Maharastra India) by 50% in 3 years period.	Field trial by Bang et al 1999
Pneumonia case management by trained community health workers.	Management of pneumonia by oral antibiotics at community level Assumed to reduce total mortality by 24% and mortality due to pneumonia by 36%	Meta analysis of 8 studies in South Asia and 1 study in Africa by Sazawal etal 2003
Malaria self treatment by mothers or CHWs	Reduced malaria related mortality by 40%	1 study in Northern Ethiopia by Kidane et al. 2000
Oral Rehydration Therapy	Steady and some times sharp reduction in hospital admission	No study done Victora et al. 2000
Measles vaccination	Assumed to bring reduction in mortality up to 30-80%.	Meta analysis Aaby et al. (1995)
hand washing With soap and water	Randomised control trial in Pakistan show reduction incidence of pneumonia by 50% and that of diarrhoea by 34 %.	Randomised control trial by Luby 2003

*Drying the newborn and keeping the baby warm, initiating breastfeeding as soon as possible after delivery and supporting the mother to breastfeed exclusively, giving special care to low-birth weight infants, and diagnosing and treating newborn problems like asphyxia & sepsis

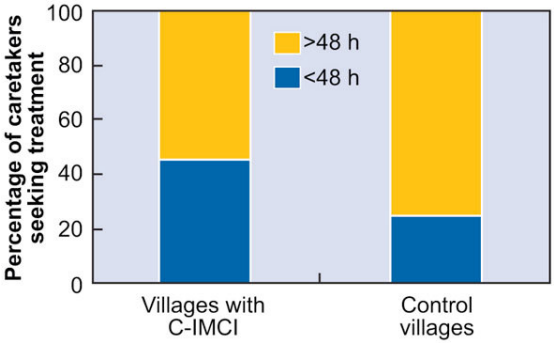
(6) Health systems

The way the health service is distributed, organised, financed and delivered is a major factor for health seeking behaviour and reduction of child mortality in Eritrea.

Accessibility

The Eritrean society lives in predominantly rural areas with limited access to health care, as some communities have to walk 7 hours to reach the health facility. Even if the payment to public health care is nominal, the poor have difficulties in affording health care. In addition the waiting time, opportunity cost and the distance to health facilities are additional barriers to utilization of health service (World Bank 2004). The pilot HH&c-IMCI evaluation shows that communities who live in the pilot village seek care more than the non HH&c-IMCI villages mainly due to easy access from community health care provider indicating that bringing interventions closer to people can improve health seeking behaviour (MoH 2006c).

Figure 3.9: Caretakers' response to the question, "How long after you noticed the child had cough and fast breathing did you seek treatment?"



Source MoH 2006c

Availability

Lack of skilled personnel is one of the most important impediments in scaling up clinical care in Eritrea. The country faces shortage of health workers which is critical for the health system and child survival. The country is not training and deploying sufficient number of health care providers.

Furthermore erratic supply of drugs and commodities in the periphery health centres also interrupts the delivery of services and de-motivates care seeking. The 2003 health facility survey show improvement in availability of supplies for child and maternal health from that of 2001 in health facilities yet more need to be done (MOH 2003). However supply of necessary drugs for HH&c-IMCI villages has been interrupted regularly which make it difficult to

provide care (MoH 2006 b). On the same note supervision and outreach activities have been slowed down since year 2005 due to rationing of fuel in the country. Immunization coverage is going down due to reduced outreach activities (MOH 2007b) and low budget allocation from government and donors.

Acceptability

Social distance between mothers and health worker especially when the health worker is a man might be a barrier to care seeking. In the 2002 EDHS, about 37% of women (aged 15–49) responded that they consider not finding a female health worker, in health facilities, as a big problem in accessing health care (NSEO & ORC Marco 2003). Further more, many health staff assigned to rural health facilities are not from the ethnic group they serve hence experience cultural and language barriers, which prohibits effective communication with their clients. The health staff's general lack of interpersonal communication skills added with the cultural and language barriers become serious obstacles in the effort to promote health education and subsequent increases in health service utilization (Habtom and Ruys, 2007).

Quality care

Quality care is necessary for effective coverage. Interventions that are delivered sub optimally will not bring about any change in the health status of a population hence ensuring good standard quality service is a factor for reducing child mortality (Boerma 1996).Health workers are a key to delivery of health services hence their motivation is critical and they need to have appropriate knowledge and skills in order to be able to provide high quality care to children. In addition, they need a clear understanding of norms and standards of care.

Chapter IV

4.1 Analysis of HH&c-IMCI Implementation in Eritrea, Nepal and Tanzania

4.1.1 Element 1: Improving partnership between health facilities and the community they serve

The experience of Pilot HH&c-IMCI is attached in annex 4.1

The first element of HH&c-IMCI framework emphasizes optimal community involvement to make health services responsive particularly to the poor and marginalized. Discourteous, abusive and uncaring behaviour of health workers is common when attending to the poor, women and ethnic minorities. This behaviour is possible because disciplinary procedures are weak and protracted in many developing countries health systems (Seagal 2003).

The partnership between health facility and the community could be realised by creating advisory group of community members to make recommendation and proposals for service improvement for example- Opening hours, reduction of waiting time, and planning of out reach activities. Accountability is two sided also that the community should fulfil its duties and responsibilities.

Strong linkage of health facility and the community is a solution to the barriers of utilizing health care. The socio-cultural-and economic determinants mentioned in chapter two need to be tackled by dialogue with the community, also barriers to seeking health care may be resolved if the community is given a chance to discuss and find solutions on its own health problems. Furthermore the concerted effort of the community and the health facility also brings change in environmental contamination.

Eritrea

The community entry process in the pilot intervention was quite systematic and was able to involve women and men refer annex 4.1. The community selected the volunteers based on its own criteria, 70% of the selected volunteers were women. During the assessment of the pilot intervention, the CHWs expressed their motivation due to the respect and encouragement they get from the community (MoH 2006b) .The other interesting out come of this process was that the community initiated a regular collective action to clean the environment refer annex 4.4.

On the other side community participation is used as a means to undertake certain activities in Eritrea- as example, the pilot HH &c-IMCI was initiated through dialogue with the community to get a buy in of the community and to shift responsibility of remunerating volunteers and to pool fund for emergency transportation however this plan was not implemented in many villages. The explanation for this scenario could be that the community dialogue process was directed by the mobilization team than the community and the plan was not owned by them, it was imposed from outside.

The culture of claming right is not yet developed in Eritrea and there are no institutions that can support the community to get organized and challenge the systems that are marginalizing them. There is no system where the health facilities are held accountable to the poor in particular or the community in general. There is no mechanism of assessing client satisfaction, no joint regular meetings. Recently a maternal audit system is being introduced (personal experience).

Low budget allocation for health from government (4% of public expenditure) and donors (4$ per child and 2$ for maternal and newborn) are the major challenges of the health system in ensuring responsiveness to the people served and reaching the hard to reach. As example, one village in the pilot remote villages requested for outreach service from health facility however the plan could not be materialized due to in availability of fund.

Tanzania

In Mukuranga district of Tanzania the linkage with the community is strong during planning and delivering of village health days. During this village health day, resource teams (eg community owned resource persons and health committees) interacted directly with many families to use immunization services during outreach and gave information on how, when and where they could receive the services. At the same time utilization was supported by improving the response of the health system to deliver immunization service by providing more access through outreach, cutting waiting times, improving safety and missing fewer opportunities. The coverage of EPI in this district increased from 89-99% for BCG, 89-93% for DPT3, 90-92% for OPV3, 85-83% for measles. The village health days were also a forum to undertake social marketing of ITN, supplementation of vitamin A and hygiene promotion (Lucas et al. 2005).

Further more the government introduced recently CBMIS[35] where community health workers register vital information on births, deaths and cause of death using verbal autopsy, and is linked to health management information system (Lucas et al. 2005). The introduction of CBMIS is very crucial to trace the children that are not reached by the formal health delivery system and to guide right decision of the health system to target areas that need to be given priority.

Nepal

The only clustered randomised trial on the effect of participation approach showed a result that the women in the intervention villages had more antenatal care, institutional delivery and hygienic cord care than the control villages. The out come showed the power of community participation and responsive health system in improving neonatal health outcome. Health volunteers were convening regular discussion with pregnant women to prepare them for delivery and to utilize health services. The health services were improving their services by getting feed back from the community. Health workers were trained in providing neonatal care and, ambulance was available for referral (Manadhar et al. 2004). It is not clear whether the outcome of this intervention may be different, if implemented where health system is weak; however the outcome of the trial explains the complementarily of community intervention for improving coverage of health care.

4.1.2 Element two: Increasing appropriate care by community based care providers

The second element of HH&c-IMCI framework is improving the quality and methods of treatment provided by community based providers and referral of serious cases to health facilities. Community Based Provision functions mainly as an extension of the health service delivery system and is performed by trained community health volunteers. The Focus is on training of community health workers in managing child hood illness and following up children to comply with treatment and referral.

[35] community based management information system

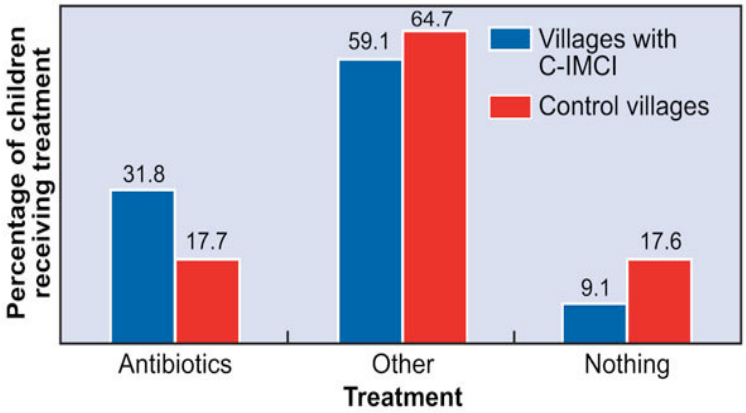
Eritrea

For Eritrea, CHWs have played a major role in reducing malaria[36] case fatality rate though there was no study done to support my argument. However the national malaria control program report shows that, more than 50% of malaria cases were presumptively (based on fever symptom) treated by community health workers from 2001-2004 (MoH 2004). The quality of care by these community health workers could not be monitored as rapid test kits were not used however the case fatality of malaria have reduced considerably over the last years please refer figure 3.6 page 17

However due to the spread of malaria drug resistance in Eritrea recently, chloroquine and sulfadoxine pyrimithamine treatment may not be as effective as it was before. Eritrea is revising its drug policy and will do a trial of administering ACT[37] by CHWs in villages implementing HH&c-IMCI (MoH 2006 b).

After one year implementation of the pilot HH&c-IMCI, a KPC survey was conducted to assess the difference of antibiotic coverage for pneumonia in villages implementing and not implementing HH&c-IMCI. As the figure below shows there was statistically higher difference in the use of antibiotic for pneumonia in HH&c-IMCI village. The survey finding is inline with the calculation I made (40% coverage) in section 4.2.

Figure 4.1: Caretakers' response to the question Which medicines were given to treat cough and fast breathing? (source 2006c)



Community health workers have contributed to early treatment of children in the pilot villages by providing prompt treatment. A total of 896 patients were seen by community health workers for

[36] The program was implemented by the national malaria control program before pilot HH&c-IMCI implementation

[37] Artimesnin based combination treatment

pneumonia, diarrhoea and fever, 13 were referred to health facilities and all complied with the referral (MoH 2006 b).

The performance of the CHWs was assessed after one year based on record review and case scenario exercise however direct observation was not done which makes it difficult to confidently conclude that the CHWs skill is excellent. Nevertheless, the findings show that CHWs performance was quite good after one year of training and they were dispensing drugs correctly please refer graph below. The cascaded form of training where CHWs were trained on management of one disease at a time and the continuous refresher training in monthly health facility meeting might have been the reason for the retention of the knowledge.

Figure 4.2 : performance of (31) CHWs on case management of childhood diseases based on record review (Source MoH 2006c)

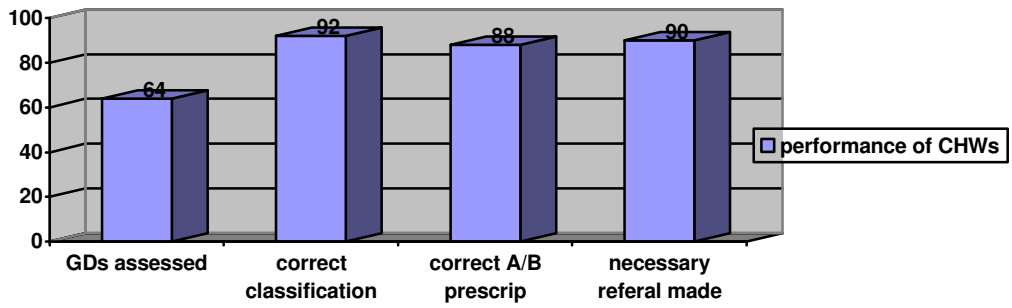


Table 4.1 performance of (31) community health workers with correct knowledge in answering questions after one year of training

Problem	Percent who answered correctly
Management of diarrhea with sunken eyes	88.6
Four general danger signs	91.4
Chest indrawing? referral	94.3
Bloody diarrhea? referral	100
A convulsing child? referral	100
Diarrhea with out dehydration- administer ORS	100

Source MoH 2006 c

Nepal

Nepal is on track to meet the millennium development goal of reducing child mortality by 2/3, since 1990 it managed to reduce child mortality by 50%. One of the reasons for its successes is the introduction of HH& c-IMCI especially the management of pneumonia by female community health volunteers (Dawson et al. 2008). The HH&C-IMCI program includes essential new born care in

the program. These essential interventions include drying the newborn and keeping the baby warm, initiating breastfeeding as soon as possible after delivery and supporting the mother to breastfeed exclusively, giving special care to low-birth weight infants, and diagnosing and treating newborn problems like asphyxia and sepsis. The majority of the essential interventions are home care practices that families can provide themselves. Findings of a Meta analysis on treating neonatal sepsis with oral antibiotics proved a 27% reduction in neonatal mortality rate (Sazawal et al. 2003).

During the 2005 count down to child survival conference, Dr Pardhan, the honourable Minister of Health, said that openness to research finding and new ideas, testing and refinement of local implementation models , gradual expansion with quality control, willingness to delegate preventive and designated curative services to non professional Female FCHVs[38] continued education of FCHV and other health workers, good government and partner collaboration and coordination were the reason to the success of the programme.

4.1.3 Element 3: Promotion of key child care practices critical for child health and nutrition

The third element focuses on behaviour change. It aims to improve key family and community practices that are likely to have the greatest impact on a child survival growth, and development. The set of key family practices that have been identified by HH & c-IMCI are evidence based. This include practices to **(1)**promote growth and development, **(2)**prevent disease **(3)** provide effective home care for a sick child, **(4)**seek care and comply with treatment and **(5)**provide an enabling environment (Lucas et al. 2006) Annex4.3 describes 17 behaviours promoted by HH&c-IMCI.

Eritrea.
Even though the CHWs report promotion of breast feeding and complementary feeding and hygiene, the findings of the KPC survey did not show significant difference in the coverage of above practices in HH &c-IMCI villages from the villages with out intervention, please refer annex4.8 (MoH 2006b). Behaviour change is very difficult to bring and it requires special skill and continuous follow up. Negotiation, counselling, and good communication skill are important for the CHWs to convince and bring about behaviour

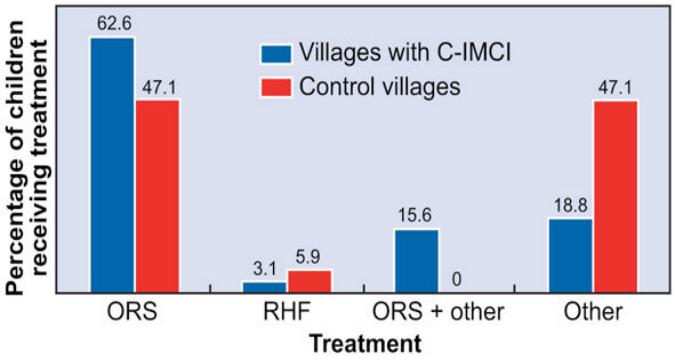
[38] FCHV – female community health volunteers

change in home child care practices. The training of CHWs in the pilot HH&c-IMCI experience focused on prevention, diagnosis and treatment of disease but not on counselling and negotiation skill.

Availability of IEC[39] materials supports the CHWs to provide quality counselling and accurate messages however there was no counselling material given for promotion of these key practices.

Mean while the proportion of children presenting with diarrhoea in the previous two weeks to the survey and who received ORS and/or recommended home fluids, according to the KPC survey, was higher in villages where HH&c-IMCI had been introduced (81%) than in the villages with out intervention (53%) as seen on the graph below.

Figure4.3: Caretakers' response to the question what was given to treat the diarrhoea? MoH 2006c



Tanzania

Promotion of key child care practices during child health days have been a good forum to promote child care and that have contributed to improved use of bed nets in Tanzania (Shellenberg et al. 2001).

Nepal

The findings of cluster randomized trial in Nepal show that follow up and negotiation skills of community health workers have contributed to improvement of behaviours among child care takers (Mandahar et al. 2004) .

[39] Information and Education and Communication

4.2 Analysis of coverage for selected Indicator diseases

Eritrea HH&c-IMCI implementation sites

In the 17 villages where HH&c-IMCI was implemented the target of children were 1847 children, due to trained community health workers they have access to pneumonia and diarrhoea treatment with in 5 km distance. During the survey **37%** of CHWs did not have **ORS** sachet and **60%** did not have **co-trimaxazole** tablet.

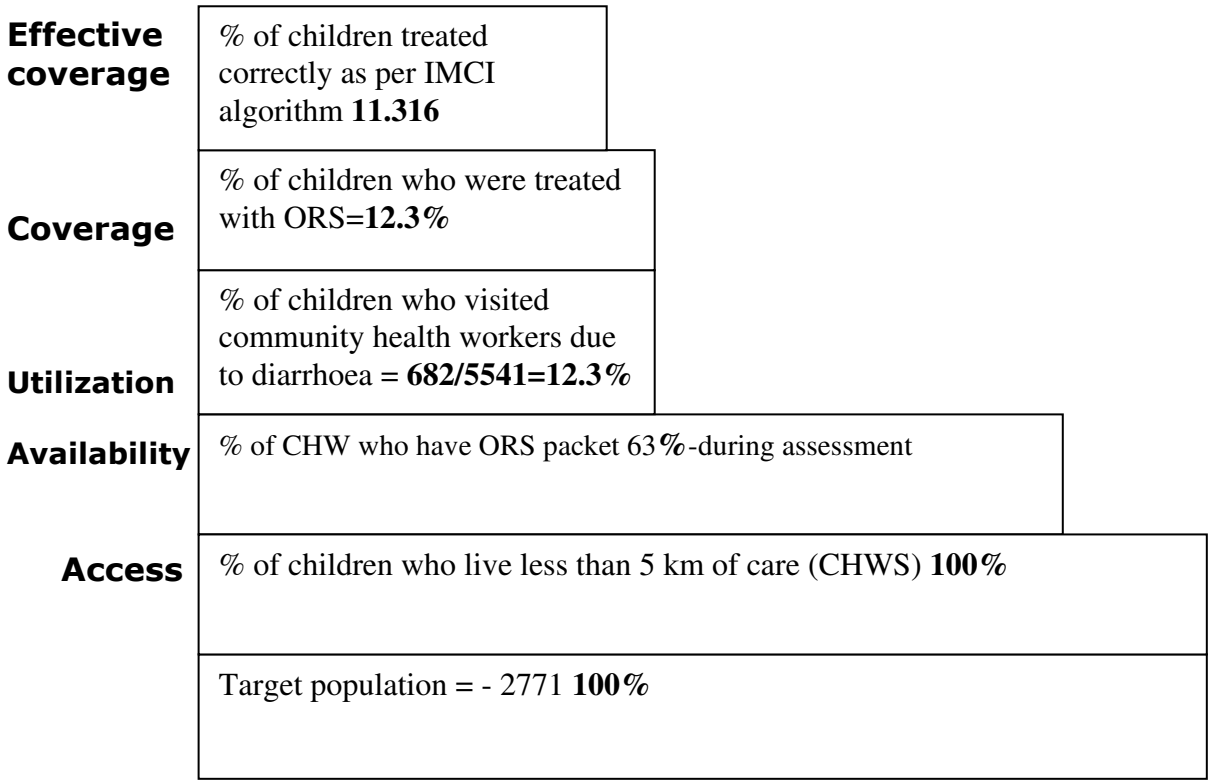
Table 4.2: Report of HH&c-IMCI activities /cases seen from January to June 2006 for all three intervention sites in Debub zone villages, Eritrea

Health center	ARI	Diarrhoea	Fever malaria
Mai Edaga	84	75	71
Segheneity	115	41	39
Kudobur	232	226	--
Total	**431**	**342**	**110**

Source MoH 2006b

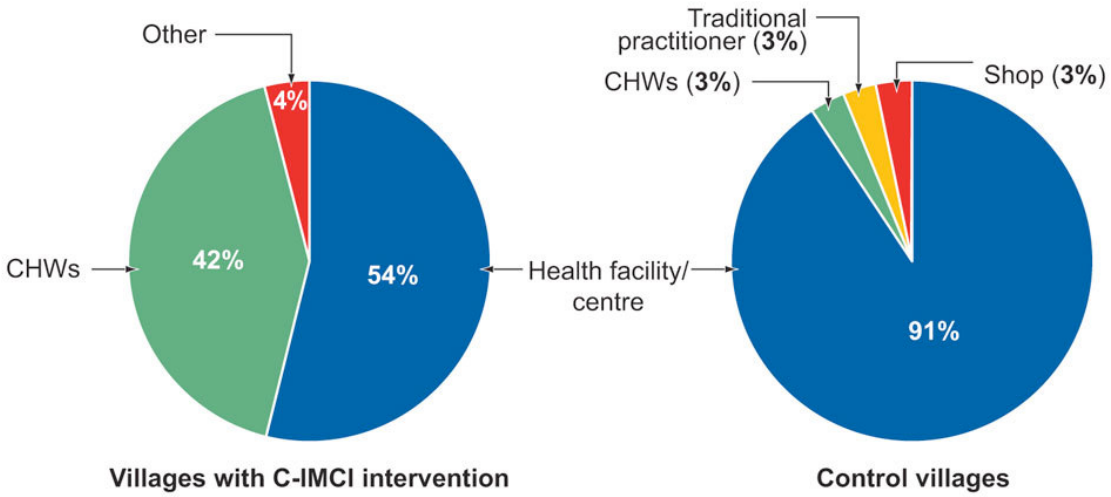
*WHO estimates that there are 3 diarrhoea episodes per child per year hence the target population for diarrhoea treatment for 1 year is 1847 *3= **5541cases***
***342** diarrhoea cases were treated by CHWs with ORS during **six month**, double or **682 cases** would be assumed to be seen in one year, **92%** of community health workers demonstrated correct classification as per HH&C-IMCI algorithm.*

Figure 4.4 Coverage of ORS treatment for diarrhoea episodes in HH&c-IMCI sites



Access to health care with in 5km distance has improved from 0% to 100% because all implementation villages of HH&c-IMCI were between 5.6-10.6 km distances from health facility or any pharmacy (MoH 2006b). The utilization of health care for diarrhoea episode is very low showing a probability that the knowledge of care takers on seriousness of diarrhoea is low. Additional reasons could be due to stock outs of the necessary supplies, the care takers could loose confidence in using the services of community health workers if there is regular stock out of essential supplies. Never the less, the KPC survey conducted during the assessment of 1 year implementation of the pilot experience showed that 42% of child care takers go for advice or treatment to community health workers (MoH 2006b). This finding reveals that indeed the community values the services of community health workers and seek care but may not be motivated to use it often due to stock out of supply.

Figure4.5 Care takers response to the question where did you first go for advice or treatment. Source (MoH 2006b)



Even if the figure shows that the control villages may seek care from health centres, the other finding I presented in chapter 3 show that the control villages do not seek care within 48 hours after the on set of illness as the intervention villages; refer section 3.2.6 page 30.

Coverage of antibiotic treatment for pneumonia

Unfortunately the data I have includes cases of ARI all kinds including pneumonia. The assessment of pilot HH&c-IMCI documented the correct classification in **92%** of cases hence I am going to take the target of children that need pneumonia treatment as if they have all visited CHWs because the number of all ARI

reported cases exceeds the number of targeted children for pneumonia.

*Pneumonia episode per child per year according to WHO estimate is **.29** cases/per year*
*Number of under five children **1847***
*Target cases for 1 year 1847 * .29 / year =**536***
*Number of children visited by community health workers for ARI for **6** months are **431** – in one year would be **862**. Correctly classified **92%***

Figure 4.6 coverage of antibiotic treatment for pneumonia in HH&c-IMCI sites

Effective Coverage	% of children treated correctly as per IMCI algorithm **36.8%**
Coverage	% of children who were treated with antibiotics by CHWs **40%.**
Utilization	% of children who visited community health workers due to pneumonia = **100%** I assumed that all of them might have been seen by CHWs because **432 ARI cases per 6 month (862 cases per year)** are seen by CHWs.
Availability	% of CHW who have co-trimoxazole drug **40%- during assessment**
Access	% of children who live less than 5 km of care (CHWS) **100%**
	Target cases = **536 cases = 100%**

The utilization of CHWs for diagnosis and treatment of pneumonia is actually very good. This shows the awareness of care takers about the seriousness of the disease. The access for antibiotic treatment for pneumonia cases could have improved from 0% to 100% due to availability of CHWs. However availability of supplies has a strong negative effect on the successfulness of prompt treatment at community level! Attention to increase coverage of antibiotics for pneumonia is needed!

The calculation of coverage might not be accurate due to assumptions however the analysis is very clear that HH&c-IMCI program can improve the coverage of antibiotic treatment for

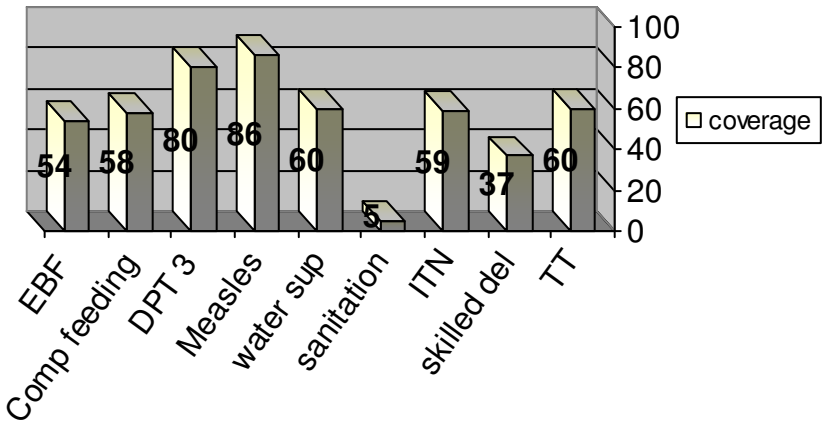
pneumonia particularly with consistent availability of supplies and motivated CHWs.

This analysis also shows that the community health workers need to be trained to report pneumonia cases separate from all forms of ARI cases. Furthermore availability of essential drugs and equipment is critical for pneumonia case management implying that the programs need to work on regular supply of drugs.

Indicators showing a high coverage of child health interventions are linked to mortality reduction. The 2008 report on count down for MNCH[40], have clearly documented that countries with high coverage of preventive and curative interventions reduced child mortality considerably.

While coverage is a good indicator to show the trend in improving child survival, it has to be disaggregated by wealth quintile to ensure that children from poor families also receive the interventions.

Figure 4.7 Coverage of interventions in Eritrea
Source[41]



Nepal

The percent of children below 5 years with suspected pneumonia taken to appropriate provider increased from 26-43% from 2001 to 2006, however only 25% percent of children with suspected pneumonia received antibiotics (Countdown 2008). This could be

[40]MNCH Maternal New born and Child Helath
[41]Source MoH (2005) for EBF and Comp feeding, MoH (2007 c) for the rest

,

due to stock outs of antibiotics. Community based programmes that treat pneumonia in Nepal have shown that monitoring the quality of care to ensure that antibiotics are being used appropriately is effective and feasible. In Nepal quality of care is monitored through record reviews and direct observation of community health based workers assessment. Treatment of sick children in 80 percent of cases was appropriately given and correct regimen was used while in less than 3 percent of cases antibiotics was incorrectly recommended (UNICEF&WHO 2004).

4.3 Discussion

Neonatal death is major public health concern in Eritrea as there has been almost no reduction for the last 15 years while a considerable reduction was observed in child mortality. Underweight is underlying reason for 35% of all cause of mortality, pneumonia-19% of child death, diarrhea-16% of child deaths and malaria- 14% of child death. Death due to malaria has reduced considerably from 50 deaths in 1999 to 9 deaths in 2006. Eritrea has to sustain the success of malaria program to further reduce child deaths. On the same note the declining trend of immunization coverage also requires a serious attention as gains achieved in the past can be lost, unless we maintain the successes achieved.

The root causes of child mortality in Eritrea are: - low female literacy, inequity, harmful traditional practices, nomadic life style, slow economic growth and low government commitment. Low female literacy results into suboptimum child care in the family. Existences of harmful traditional practices (FGM and uvulactomy) are still threats to mothers and babies survival in Eritrea. Women have difficulty of accessing health care because of their gender or because of barriers generated by poverty, language and culture. The health facilities in Eritrea are not able to reach the nomads and those children living in hard to reach areas. The slow economic growth and persistent poverty is limiting the wellbeing of children and mothers. The public expenditure on health is too low, 4% to reach all children with effective interventions. Inter sectoral action and a concerted effort of the community as well as sectors other than Ministry of health is very crucial to improve child health in Eritrea.

Furthermore the limited coverage of potable water and sanitation as well as poor housing and contaminated environment are factors for increasing incidence of diarrhoea, and pneumonia in Eritrea. Injuries are additional proximate determinants of child survival.

Effective interventions exist and interventions as- antibiotic for pneumonia, ORT, breast feeding, complementary feeding, vitamin A and Zinc supplementation and ITNs are cost effective and feasible to do with less technology and less technical expertise, and immediate strategy may be to see how this interventions could reach every child while working on human resource for health and system development and strengthening.

Eritrea is making slow progress to achieve universal[42] coverage of child health interventions due to weak health systems. Pragmatic solution is necessary to reach every child where ever they are. The priority intervention to treat children can be delegated to trained CHWS which evidence has proofed that it works. Community interventions have the potential to provide equitable coverage by reaching families with children who may not adequately utilize the services of the health system. Though enough evidence is not available to show the contribution of community programs in reducing inequity, the increase in coverage of interventions from HH&c-IMCI program in Nepal and Eritrea shows some evidence.

Community based maternal and neonatal services alone can only achieve 18-37% reduction in neonatal deaths (Darmstadt et al. 2005). Therefore it is very important to strengthen the linkage of community based strategies with health systems. There are considerable demands on the health care system to expand and upgrade facilities to give neonatal services because technological support is a key to the survival of preterm and low birth weight babies. The Nepal program is a good model for provision of continuum of care from home, community and health facility where community health workers prepared pregnant women for delivery, promoted pregnancy care and facilitated timely referral while responsive health facilities provided timely care.

From the Tanzania experience we learn that CHWs are best able to carry out clearly defined, concrete tasks over a short and specific time period such as child health days, (vitamin A distribution, polio and measles campaigns) rather than carrying out broad-based activities such as health education. Community health workers need to be given sensible assignments, if they have too many tasks, or feel overwhelmed by too much information, their motivation can go down. In addition there should be clear target of how many households and children they should be responsible for.

Community health workers (CHWs) are the main players in HH&c-IMCI programme. Involvement of community members in selecting CHWs and using their services appears to be critical to successful community programs as seen in cases of Nepal and Eritrea.

[42] Universal coverage is defined as 99% of the population in need for all interventions, except exclusive breastfeeding among children younger than 6 months for whom the target was set at 90%.

Sustaining a high quality of performance of all the actors in a community intervention is a challenge, similar to sustaining the quality of performance of health workers after training in IMCI. Like wise, the factors that maintain quality in the health system are similar to those needed to maintain quality in community interventions. Quality of care provided by community health workers may be sub optimal unless they are supervised and monitored regularly. The most important point in supervision is to facilitate two way flow of information and encourage supervisees to give their ideas.

Sustaining quality requires a continuous supply of needed items (e.g. brochures, registers and drugs, such as anti-malarial for home based management of malaria, antibiotics for management of pneumonia). The rapture of supplies and stocks observed during the pilot experience will even be worse unless a mechanism for supply delivering and monitoring is created during expansion. The absence or irregular availability of essential supplies terminates a community activity, de-motivates community health workers and reduces the confidence of the community to use the CHW's services.

The challenge of sustainability remains in community programs. Highly committed volunteers can loose motivation or move to employment. The original energy of village health committees and other community groups can burn out. Unmotivated community health workers cannot deliver quality service. Motivating them should be one of the main concerns of the program.

Start up cost of community programs is high due to series of trainings, developing and printing of guidelines, teaching aids, and promotion materials. Additional financing is not only required for initial costs, but also the recurrent cost for training, management, logistics, supervision, assessment and remuneration or other incentives. High commitment from government and other partners is necessary to meet financial requirement of expanding community program. Expanding community program should be incorporated in health sector development plan and resources should be earmarked for implementation. The plan should also take into account how to sustain community programs.

The lessons learnt from community programmes of Nepal Tanzania and Eritrea is that there is no blue print to implementation and expansion of community programs therefore flexibility and creativity and learning by doing approach is very necessary in materializing community programs. The Nepal program expanded phase by

phase evaluating and documenting every experience and drawing lessons for next phase of expansion.

Additionally high level commitment and political will is very necessary for successful scaling up of HH&c-IMCI. Nepal scaled up HH&c-IMCI due to the strong leadership and high level commitment. The Nepal program is run by Director of child health division.

Is scaling up of HH&c-IMCI in Eritrea possible?

Scaling up requires funding. WHO 2005 estimates that 3.68$[43] per capita/per year should be spent per child with average increase of 12% reaching to 12.31$ in 2015 to achieve universal coverage with effective interventions[44] for child health, however in Eritrea this target can't be reached with the amount of money allocated for health and donor spending on MNCH (maternal newborn and chilld health) refer page 4.

Child survival strategy that identifies the targets to be achieved and costed plan is necessary so as to mobilise resources and bring partners on board. The absence of child survival strategy has resulted to duplication of interventions. As an example in Eritrea – the pilot implementation of HH&c-IMCI was not part of the big picture because there was no strategy for child survival. Though primary health care in Eritrea is integrated at the health facility, the planning implementation and monitoring is vertical. Programs like EPI, Malaria, Nutrition, Maternal Health, Environmental Health and Child Health have their own units and their own way of reaching the community and the efforts are fragmented (MoH 2006 b).

A strong district health management team is necessary to ensure good planning, monitoring and supervision of implementation of interventions at community level and also to monitor coverage of effective interventions and identify gaps. In Eritrea, we do not have strong district health management teams. During the pilot intervention, gaps were observed, in the capacity of districts to undertake supportive supervision and use data for planning and monitoring (MoH 2006 b).

Cross cutting health system constraints (human resources for health, availability of transport, drugs, and supervision) need to be addressed to scale up interventions. Delivery of drugs and maintaining drug stocks at the community level for example requires planning and well functioning health system. In Eritrea

[43] cost include numeration of volunteers (50% of salary of nurses)
[44] Please refer annex 3.2

there is no clear guideline on who should supply drug to HH &c-IMCI villages. During the pilot experience the health facility in the respective areas has been supplying from their quotas and was really difficult to sustain it.

Developing and strengthening health system to provide continuum of care in the life cycle of a woman is critical for achieving child survival goals. As explained in chapter three, the health facilities in Eritrea are not providing continuity of maternal, new born and child health care and hence upgrading them appears to be urgent priority.

Cultural Revolution is necessary to have strong linkage of health facilities and communities in Eritrea (WHO 2005). Health workers need to change their approach and have to respect communities as partners in the struggle for health and to look at children not merely as collection of diseases.

The retention of competent volunteers is difficult unless there is some kind of numeration. In many community programs there is high attrition of community volunteers hence a lot of cost is incurred due to continuous training (Haines etal 2008).
The community value curative care and the CHWs also focus more on curative than promoting health. It is going to be a challenge to keep the role of CHWs in balance between prevention, and curative.

Scaling up community based interventions requires many partners other than Ministry of Health. During the pilot intervention, the community mobilization process was undertaken with intersect oral team led by Ministry of health. Though it was supportive to have the team undertaking community mobilization, the in availability of NGOs -due to government restriction- made implementation difficult. The Nepal programme was able to scale up HH&c-IMCI due to good collaboration with NGOs.

Chapter V

5.1 Conclusion

In conclusion, Eritrea needs to have strong community program to improve child mortality situation because improved child care practices in the family can reduce child mortality considerably. Additionally reaching every child with effective child health intervention can only be achieved by complementary effort of community and health facility intervention. Based on this review I have made recommendation for policy, programme and research so as to scale up HH&c-IMCI in Eitrea.

5.2 Recommendation

Policy

- Developing child survival strategy should be given priority as many interventions are implemented with out a framework. The process of developing the strategy should involve all programme units in Ministry of health and other public and private sectors that may contribute to improvements of the socioeconomic and proximate determinants of child health.

- The experience of HH&c IMCI has to be documented in a way that it can be understood by different (intersectoral) political leaders as high level leadership and commitment is very crucial for scaling up of HH & c-IMCI. The increase of financial commitment from donors and Government will be crucial to scale up HH&c-IMCI. This financial commitment must include as well a planned incentive or salary scheme to increase the retention of CHW.

- The expansion plan of HH &c-IMCI programme should be incorporated in health sector development plan so as to mobilize required funding.

- The HRH[45] policy should assess the requirement of community health workers as part of the overall human resource need. Assessment should include the number of CHWS to be trained, the level of skill they should have and the most appropriate ways to remunerate the CHW through salaries or other incentives such as

[45] Human resource for health

motorcycles, bag, gown, certificate, and lunch & transportation allowances during outreach and meetings

- The training curricula of health assistants, nurses, and doctors need to be revised to guarantee a community based approach and to ensure competency in community based work, and skills to help communities identify their needs, and plan for solution.

- The participation of private sector especially NGOs in implementation and supervision of the HH&c-IMCI programme can really be supportive to the health system because thousands of civic society organizations have practiced participatory approaches towards development in all sectors, and many would be able to implement a more focused health component. A policy should be devised to encourage NGOs.

- Ministry of Health needs to play its oversight function of the policies and progress of implementation in other sectors. Ministry of Health should advocate for improvement of water and sanitation coverage, female education, and should be part and parcel in designing and implementing poverty reduction strategies.

Program

- Ministry of Health has to set the priority for bringing down the child mortality figure. Based on the cause specific mortality situation neonatal mortality has to be given a priority. The medium to long term strategies for neonatal health improvement, include the upgrading of clinical-care services, including increased deployment of midwives and improved obstetric care and clinical care of ill neonates. The immediate strategy could be to improve home care of neonates and promote health facility delivery. The HH&c-IMCI program need to incorporate neonatal issues and equip community health workers with skills to promote essential neonatal care at home and promote health facility delivery.

- Documenting every experience is very necessary for reviewing what works and what does not work. Research oriented work should be introduced. The pre-intervention situation needs to be documented (for example, knowledge, practice and coverage of effective intervention) so as to compare it with post intervention situation.

- Expanding HH&c-IMCI should be done phase by phase. First phase can take few samples and learn how to implement

community based integrated maternal, neonatal and child health intervention. Second phase could be pre scaling up and work should focus on strengthening systems for monitoring and evaluation. The last phase could be the introduction of HH&c IMCI in the overall Strategic Health Plan of Eritrea. Every phase should be a learning experience and quality control should be ensured with gradual expansion.

- Health workers should be equipped with necessary skills and user friendly check lists to undertake proper supervision. The necessary transportation facilities also need to be available to support supervision.

- The way the health system operates needs to encourage open discussion, dialogue and accountability to the people. The community has to be given opportunity to discuss the issues of health and participate in planning and delivery and monitoring of health services. The health system should be responsive to the needs of the people and work hand in hand.

- Institutionalize child health days where health facilities and communities can work together to promote and deliver health.

- Health personnel need to receive training to enable them assess community needs and interact and negotiate with people in groups as well as with individual using participatory techniques.

- Districts with low coverage of effective child health intervention need to be given priority during initial phases of HH&c-IMCI expansion. In addition, synergy between health facility and community intervention has to be ensured to strengthen the complementary role of CHWs.

- A system to monitor progress during expansion and scaling up has to be set. The reports of community health workers need to be incorporated in the national health management information system.

- The roles and responsibilities of CHW need to be clearly defined and accountability system need to be established mainly by active participation of the community.

- The training curriculum of CHW needs to be revised to ensure that they get skills to negotiate, counsel and communicate better with child care takers.

- Capacities of district health management team need to be strengthened to enable them to use their own data to monitor coverage of effective interventions and identify gaps.

Research

The following research questions need to be answered in large scale community health program implementation in Eritrea.

- What factors could motivate and increase retention of CHW?
- What roles are CHW able to do well with proper training and supervision?
- To what extend are the poor reached by a community health programme and is such a programme able to reduce the inequity in access to quality health care?
- How best can routine supplies be made available at the community level and how can we make sure equitable access of supplies?

- Is there rational drug use by community health workers? What is the impact of drug use on resistance patterns?

- Is it possible to operationalise referral in hard to reach places where transportation and communication is difficult to get?

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Annex 1.1

Table 1: Country Profile Eritrea

No	INdicator	SOE	WHO	UNICEF	MOH
	Geography & Demography				
1	Surface area	124,320Sq km			
2	Total population	4.3 million			
3	Total fertility rate per woman	4.8	5.1		
4	Annual population growth	5.8			
5	Life expectancy at birth	60			
6	Population density per person per square killometer	36.7			
	Health and Nutrition				
	Maternal mortality rate		450		630
	Infant mortality rate			48	48
	Neonatal mortality rate			25	25
	Under five mortality			78	93
	Under five deaths caused by pneumonia			19	
	Under five deaths caused by diarrhea			16	
	Under five deaths due to neonatal causes			27	
	Under five deaths caused by Malaria			14	
	Contraceptive prev. rate				8
	Antenatal care four visits during pregnancy		41		70 one visit
	Skilled birth attendant				37
	Population with access to clean water	60			60
	Population with access to sanitation				5
	Under 1 children vaccinated against DPT3/Heb3		97		80
	Children <1year immunized against measles		95		86
	TB incidence/100000 popn		94		

No	Indicator	SOE	WHO	UNICEF	MOH
	Under 5 children receiving ORT during diarrhea %		68.4		
	Population using ITNs%				59
	Infants 0-6months exclusively breast fed				54
	Infants receiving complementary food at 6month				58
	Under 5 children wasted				10-22
	Under-5 childern under weight				40
	Under 5 children stunted				44
	Under 5 children receive vitamin A supplementation twice a year		38		
	Budget allocation for health				
	Government health expenditure as % of total gov. expenditure		4%		
	Out of pocket expenditure as % of total expenditure on health		61%		
	official development assistance for child health per child		4$		
	official development assistance to maternal and neonatal health per live birth is		2$		
	Education and economy				
	HDI rank	157 from 177			
	Female literacy			47.3	
	Male literacy			69.9	
	Early marriage % women				
	GDP/capita $	130			
	GDP annual growth%	2%			
	Population living with less than 1dollar/day	1/3 of the popn			

ANNEx 2.2 The household & community IMCI framework

The urgency to implement intervention at household level to complement the IMCI facility approach was emphasised in Santa Dominigo in September 1997 (CORE group power point presentation). The house hold c-IMCI frame work approach defines three elements as seen in the diagram below.

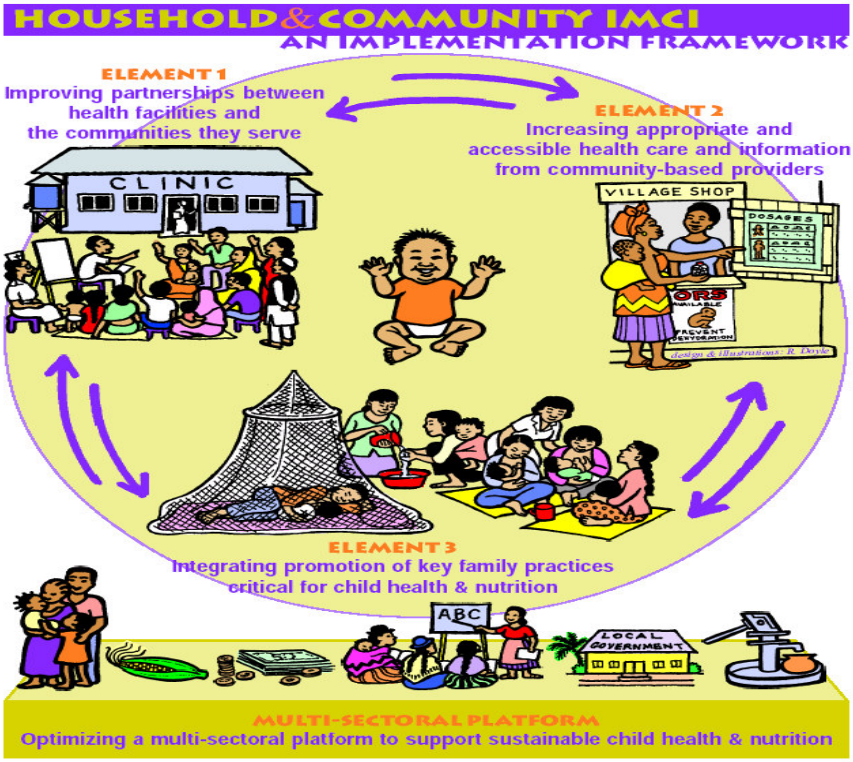


Figure 1: Framework of HH& c-IMCI describing the three elements; adopted from CORE group power point presentation.

Household c-IMCI approach is based on multisectoral platform in order to tackle the socio economic determinants of child mortality hence social mobilisation is the main strategy in implementation of the approach.

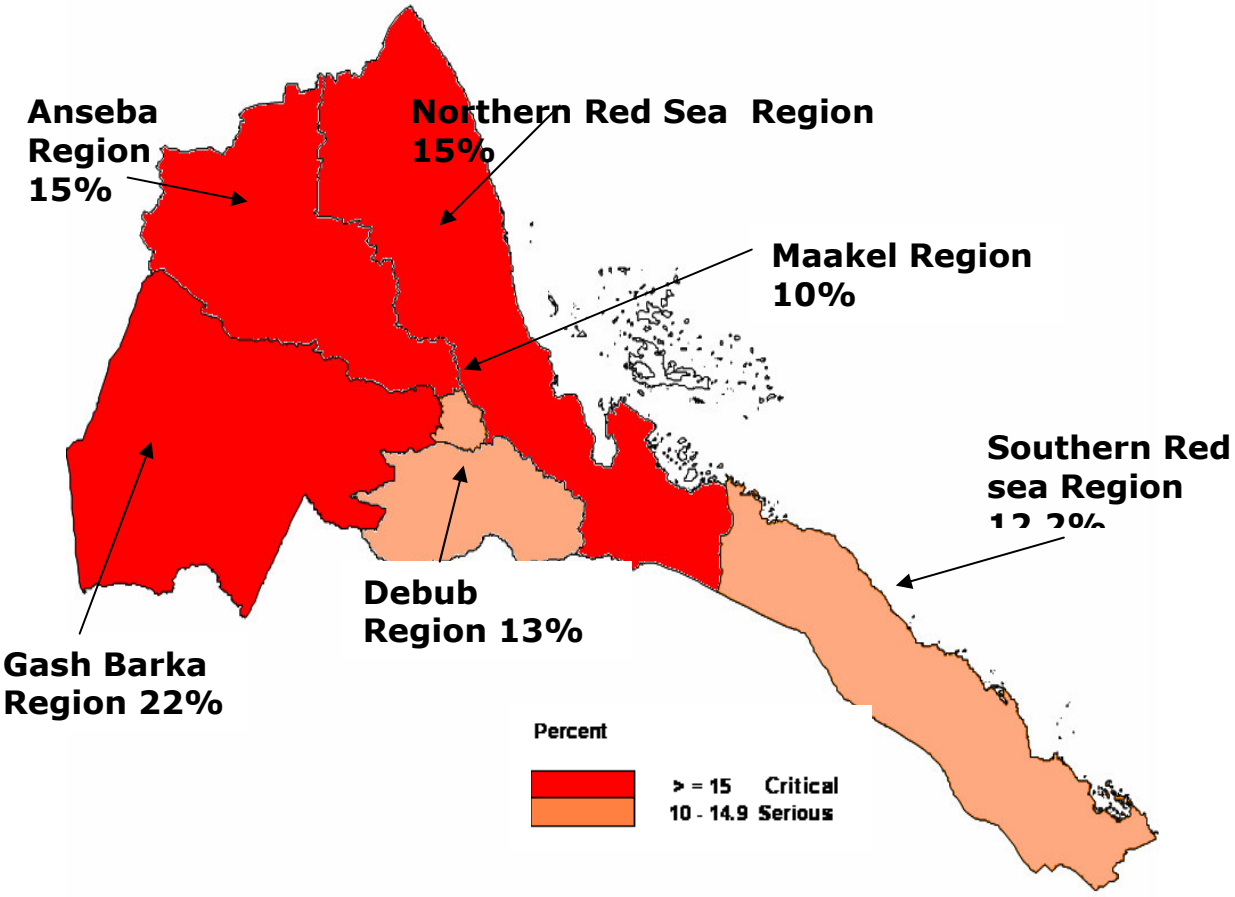
The first element emphasizes optimal community involvement to increase use of health facilities.

The second element tends to improve the quality and methods of treatment provided by community based providers.

The third element focuses on behaviour change.

Annex 3.1

Figure 2: Map of Eritrea
Prevalence of wasting (moderate and severe)-GAM



Source:

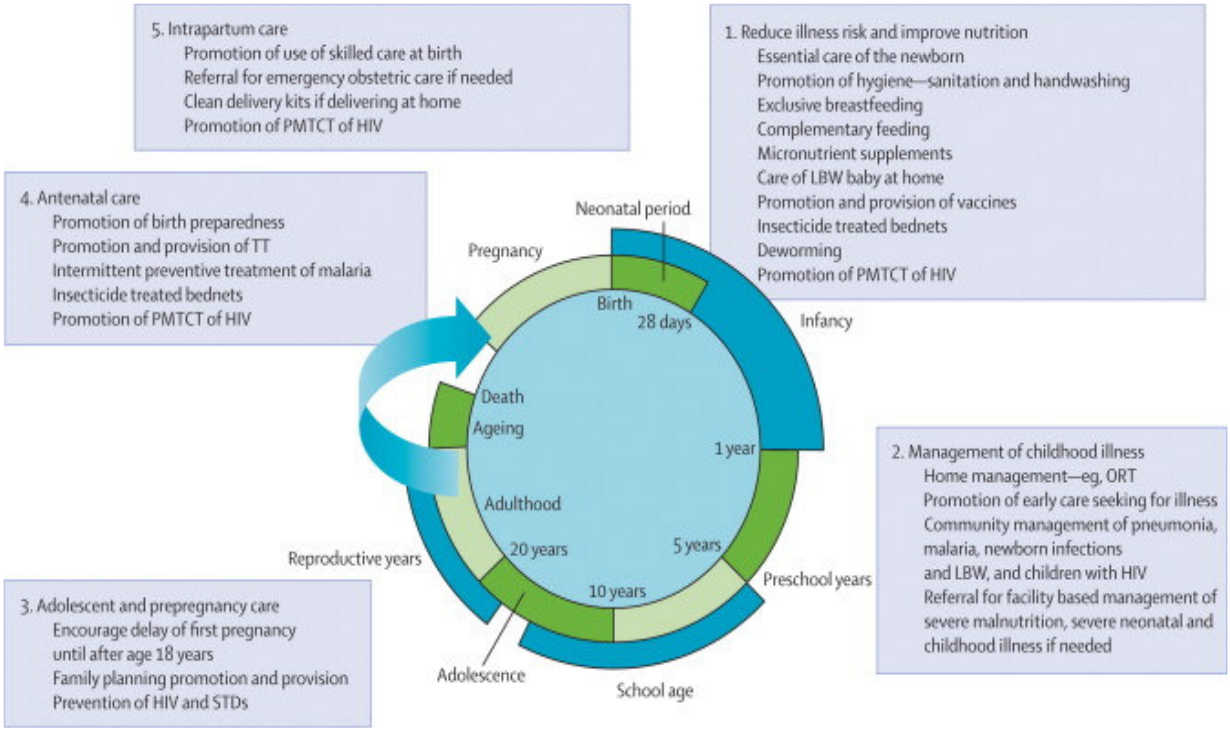
ERI_NNS[46], December 2005- January 2006 Gash Barka Zoba
ERI_NNS, February 2006 Maekel and Southern Red Sea Zobas
ERI_NNS, July 2005 Anseba and Northern Red Sea Zobas
ERI_NNS, Sept 2006 Debub Zoba

Adopted from Unicef Eritrea power point presentation

[46] Eritrean National nutrition surveilance

Annex 3.2

Figure 3: Child health interventions through out the life cycle which are feasible at the community level.



Source: Haines 2008.

LBW=Low birth weight ORT= Oral Rehydration Therapy TT= tetanus toxoid Sexual transmitted diseases PMTCT= prevention of child transmission

Annex 4.1:

Eritrean Household community IMCI pilot experience(community mobilization process

The pilot project was organized to gain experience on how to implement HH/c-IMCI in Eritrea before country wide implementation. The implementation approach build on existing experience of malaria and nutrition program so as not to repeat the same mistake. In the villages where malaria program community health agents and growth promoters exist they were selected as volunteer to work.

The pilot implementation followed the framework described above and included all elements. The pilot implementation was in 17 villages' population of 12310. A consultant was hired by unicef Eritrea office to support Ministry of Health develop guidelines for community entry process and to assist in pilot experience. While developing the guidelines intersect oral team was created at sub regional level (district level) from local government, Ministry of

Health, Agriculture, and Youth and Women association. The team was trained on a step by step approach of community mobilisation and entry process. The process has three phases:-

Orientation phase: the sub regional working group introduces the programme to the community through mini plays and discussions. The responsibilities of supporting volunteers as well as other responsibilities are clearly described. During this phase, every member of the community participates in one day meeting. At the end of the meeting the community is given a chance to decide to be part of engagement process, if agreement is sought the village representatives will come to health facility to sign a memorandum of understanding. The signed document has information on the responsibility of the working group and the community (supporting community health workers). During the pilot one out of the 18 villages refused to participate in the process because they said that they do not need community health workers as their village is near; less than 5km from health facility.

The organisation phase: the community selects representatives men, women, young, old, and meet in the village in a workshop setting to identify the problems of health among women and children. By the end of the workshop the data from health facility is presented causes and possible solutions are identified and planned. During this phase the community would have decided how the implementation of the programme should be carried out. A committee is formed that oversee the overall implementation of the activities, such as selecting volunteers, coordinating implementation of village action plan, setting up village fund to motivate volunteers etc. see sample of community plan above.

Box ??: Solutions planned by Adi-Hasero village

Raise funds to finance emergency transportation to health facilities as needed
Select VHCs and CHWs to provide services
Identify and prepare a place for CHWs to conduct their activities
Distribute ITNs for those who do not have them and re-impregnate the old ones
Conduct environment and sanitation campaigns
Cover and protect the wells
Conduct awareness raising sessions

Sample village plan Adopted from final report of consultant for HHc-IMCI Eritrea

The implementation phase : community health workers are selected and trained. The community sets criteria for selecting the volunteers and takes full responsibility in motivating them either in cash or kind. Seventy percent of the volunteers selected during the pilot interventions were females.

Annex 4.2 Box 1 :Annex The Nine Steps Community Mobilization For Health

PHASES	STEPS	OBJECTIVES	TOOLS
A. ORIENTATION	**1**. First contact with villages **2**. Village meeting **3**. Village representatives meeting	Collect some administrative, demographical and geographical information Establish a formal contact with the village and discuss the intervention's goals and its process Register the official commitment of each village and plan the next phase	Data collection guide Role playing and meeting guidelines Meeting guidelines and planning table
B. ORGANIZATION	**4**. Problem identification and prioritization **5.** Problem analysis **6**. Development of solutions **7.** Work plan development	Identify the village's health problems and do prioritization of problems Identify the problems' root causes Propose some solutions Develop an implementation plan	Brainstorming Village story Village mapping Matrix for decision-making Brainstorming Pocket chart Three pile sorting Matrix for decision-making Pocket chart Gantt diagram
OPERATIONAL	**8**. Work plan implementation **9.** Progress monitoring and evaluation	Help community to be better organized (either confirming or selecting volunteers) Build capacities of community volunteers and organizations Support community to undertake health education and promotion activities Support community volunteers to offer health services within communities Develop a community based monitoring system Support community to measure the progress made Learn from current experience and plan another one	Meeting guidelines Training curricula Supervision tools Performance monitoring plan Activity mid term and annual review guidelines

Annex 4.3:

Box 2: Key Family And Community Practices To Promote Child Survival Growth And Development **Source Lucas etal 2005**

Growth promotion and development

- Breastfeed infants exclusively for the first 6 months, taking into account policy and recommendations on HIV and Infant feeding.
- From 6 months of age, feed children freshly prepared energy and nutrient-rich complementary foods, while continuing to breast feed up to 2 years or longer.
- Ensure that children receive adequate amounts of micronutrients (vitamin A, and Iron in particular), either in their diet or through supplementation.
- Promote mental and social development by responding to child needs for care, and through taking, playing, and providing a stimulating environment.

Disease prevention

- Dispose of faeces, including those of children, safely; and wash hands after defecation, before preparing meals, and before feeding children.
- Take children as scheduled to complete a full course of immunization before their first birth day.
- Protect children in malaria-endemic areas, by ensuring that they sleep under insecticide treated bed nets (ITNs)
- Provide appropriate care for HIV/AIDS affected people especially orphans, and take action to prevent further HIV infections.

Home care for a sick child

- Continue to feed and offer more fluids, including breast milk to children when they are sick.
- Give sick children appropriate home treatment for illness.
- Protect children from injury and accident, and provide treatment when necessary.

Care seeking and compliance

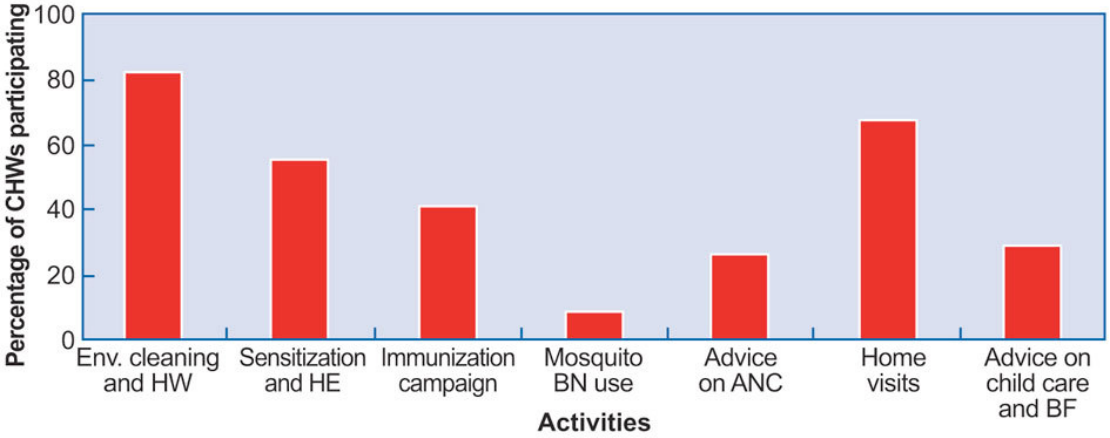
- Recognize when sick children need treatment outside the home and seek care from appropriate providers.
- Follow health workers advice about treatment, follow-up and referral.
- Ensure that ever pregnant woman has at least 4 antenatal care visit.

Providing supportive and enabling environment

- Prevent child abuse and neglect, and take action when it does occur.
- Provide care to orphans and vulnerable children.
- Ensure that men actively participation in provision of child care.
- Ensure that every pregnant and lactating woman gets time to rest
- Register every child as soon as possible after birth

Annex 4.4

Figure 4: Additional Activities Other Than Clinical Work Done By Chws Source MoH 2006c



HW,handwashing; HE health education; BN, bednet; ANC antenatal care; BF, breastfeeding

Annex 4.5

Box 3: Description of the pilot HH &c-IMCI activities in Eritrea

Name of community workers: Community health workers & village health committee
Selection: Community health workers and Village health committee selected by the community
Training: Interrupted, competency-based serial training course of 1weeks duration. Provision of tools including job aids and patient management algorithms. Actions are taken to maintain performance after competency based training, including supervision and support. One–day monthly refresher courses are offered.

Feed back: is provided based on monitoring and evaluation

Disease managed: pneumonia, malaria, diarrhoea, general danger signs(DGS) and malnutrition. Community health workers to provide a basic package of health services to remote areas including simple pneumonia case management and diarrhoea management with oral rehydration salts (ORS) and malaria management.
Integrated preventive and curative activities of CHWs: 70% preventive 30% curative.
Community participation: is the main interest of the component
Assessment: The main assessment tasks done by CHWs are

- Systematic detection of signs of the major causes of mortality among under fives.
- Management of multiple diseases using an integrated algorithm to classify children sick with pneumonia, malaria, diarrhoea or other conditions
- A broader physical examination, including counting of respiratory rate and identification of signs of dehydration and chest in drawing.

Treatment performed by CHWS:

- Dispensing antimicrobial drugs, animalarials and cotrimoxazole (CTMX) for presumptive treatment for fever and simple uncomplicated pneumonia, as well as basic treatments such as ORS and antipyretics. CHWs provide treatment for all of the conditions identified.
- Counselling the care giver of the sick child on how to administer all of the treatments provided on feeding problems.
- Home visit follow up done after two days.

Referrals by CHWS:

- Referring a child if the child is severely ill or requires a treatment drug that the CHW does not keep in stock.
- Deciding when to do referral from communities to first level health facilities. The procedure for referral are facilitated to increase compliance, including good counselling and giving of referral slips.
- Monitoring of referrals.

Providing incentive to CHWs: CHWs are volunteers, allowances given for transport, training and attending meetings community is responsible for incentive.
Supply of drugs: drug is provided through the respective health facilities.
Additional responsibilities and activities: breast feeding and child feeding counselling, distribution and re impregnation of bed nets, tracing EPI drop outs and mobilising the community during outreach sessions, biannual vitamin A distribution.
Supervision:- is an important element. Health facility staffs do most of the supervision. Recording on a checklist is used for the supervision exercise.

Health information system: CHWs collect and maintain data and report to the health facility

Annex 4.6
Box 4: Nepal HH&c-IMCI Experience

eNepal

Nepal is on track to meet the millennium development goal of reducing child mortality by 2/3, since 1990 it managed to reduce child mortality by 50%. One of the reason for its successes is the introduction of c-IMCI especially the management of pneumonia by female community health volunteers(Dawson etal 2008) Nepal started community based pneumonia management in 1986-1989 in remote mountainous district of Jumila with the support of USAID. The program trained female community health volunteers to identify and manage pneumonia using antibiotic and refer sever cases to health facility. At baseline, the infant mortality in Jumla was 184 per 1000 live births and pneumonia incidence was 800 cases per 1000 children per year. The Jumla research reported a 28% reduction in under-five mortality through active case finding and management of pneumonia by trained community-based project workers using oral antibiotics. Child mortality in Nepal in 1991 was 121/1000LB nationally and 147/1000LB in rural Nepal. The government was encouraged by the findings from Jumla research project hence decided to replicate it nationally in collaboration with WHO, UNIEF, USAID, JSI and other partners. In 2005 child mortality is 59/1000live births.

The programme built on existing Female Community Health Volunteers Programme which was operating in many rural areas of Nepal. The female volunteers are selected by their community and were distributing vitamin A supplementation as well as promoting healthy behaviours. The CB-pneumonia initiative built on the FCHVs' positive experience gained from the vitamin A programme. The volunteers are trained for seven days and strong linkage with health facility exists to refer severe cases. The programme expanded phase by phase testing and refining local models. Nepal is following decentralized system, 75 districts, 4000 village development committees and 35,017 wards, in every ward there should be a trained female volunteer who is responsible for 80 households. The volunteers are not numerated for the work they do. They receive the standard government allowance for time spent in training and review meetings, but no other compensation other than ad hoc in-kind community support. Non-financial incentives that include increased social status and public recognition by their community remain the most important motivators. Nepal had documented the experience very well and is able to show result unlike many countries. By 2005 25/75 districts are fully covered by this program

According to Dr Pardhan presentation in 2005 conference for countdown to 2015 in London the key to success of this programme is:-
''openness to research findings and new ideas, development, testing and refienement of local implementation models, gradual expansion with quality control, willingness to deligate preventive and designated curative services to non professional FCHVs, continued education of FCHV and other health workers, good government and partner collaboration and coordination. '' Nepal's challenge now is to sustain its achievement and expand program to other districts.

Source: (Nepal count down 2005 presentation, (WHO/UNUICEF, 2006, Dawson etal, 2008)

Annex 4.7

Table 2. Caretakers' responses on 10 priority indicators and four additional indicators pertaining to prevention and management of childhood illness in Zoba Debub, Eritrea in 17 villages implementing C-IMCI and 17 control villages

Priority Indicators (*and additional indicators*)	**Percentage responses in Pilot Project (range)**	**Percentage responses in Control Villages(range**
PREVENTION OF ILLNESS AND DEATH		
1. Children aged 0–23 months who were born at least 24 months after the previous surviving child	74.8 (66.2–82.2)	73.7 (62.3 – 83.1)
2. Children aged 0–6 months who were exclusively breastfed during the last 24 hours	54.1 (40.8–66.9)	47.6 (32.0–63.6)
3. Children aged 6–9 months who received breast milk and complementary foods during the last 24 hours	38.7 (33.3–44.3)	27.5 (22.0–33.6)
3a. Households with an improved source of drinking water	71.4 (66.0–76.3)	60.7 (54.2–66.8)
4. Children aged 12–23 months who were fully vaccinated before the 1st birthday.	75.5 (65.8-83.6)	63.4 (51.1-74.5)
5. Children aged 12–23 months who received a measles vaccine	87.0 (78.3–93.1)	94.2 (85.8–98.4)
6. Children age 0–23 months that slept under an insecticide-treated net the previous night	8.3 (4.9–13.0)	18.1 (12.1–25.6)
6a. Percentage of children whose mother reported the presence of a bednet in the house	*75.5* *(69.0–81.2)*	*73.9* *(65.8– 81.0)*

ANNEX 2.1
Problem Tree of Child Survival in Eritrea