THE INFLUENCE OF POSITIVE DEVIANCE APPROACH ON NUTRITION (POS GIZI) OUTCOMES IN CHILDREN UNDER FIVE YEARS (CU-5) IN ACEH BESAR DISTRICT, ACEH PROVINCE, INDONESIA

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The Influence of Positive Deviance Approach on Nutrition (Pos Gizi) Outcomes in Children Under Five Years (CU-5) in Aceh Besar District, Aceh Province, Indonesia

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

by

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Declaration:
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LIST OF ABBREVIATION

ARI	:	Acute Respiratory Tract Infection
BPS	:	*Badan Pusat Statistic* (Statistic Bureau)
CORE	:	Child Survival Collaborations and Resources Group
CRS	:	Catholic Relief Services
DHO	:	District Health Office
EBF	:	Exclusive Breastfeeding
EPI	:	Expanded Program on Immunization
FGD	:	Focus Group Discussion
GAM	:	*Gerakan Aceh Merdeka* (Free Aceh Movement)
GDP	:	Gross Domestic Product
GMP	:	Growth Monitoring and Promotion
GNI	:	Gross National Income
HAZ	:	Height-for-Age Z score
IDHS	:	Indonesia Demographic Health Survey
IMR	:	Infant Mortality Ratio
IRI	:	Islamic Relief International
ITN	:	Impregnated Treated Net
IYCF	:	Infant and Young Child Feeding
LSRO	:	Life Sciences Research Office
MCH	:	Maternal and Child Health
MDG	:	Millennium Development Goal
MOH	:	Ministry of Health
MoU	:	Memorandum of Understanding
NGO	:	Non Governmental Organization
ORS	:	Oral Rehydration Solution
PD	:	Positive Deviance
PDI	:	Positive Deviance Inquiry
PD-NERP	:	Positive Deviance-Nutrition Education and Rehabilitation Program
PHO	:	Provincial Health Office
SC	:	Save the Children US
SKN	:	*Sistem Kesehatan Nasional (*National Health System)
TOT	:	Training of Trainers
TRP	:	Tsunami Response Program
U5MR	:	Under five Mortality Ratio
UNFPA	:	United Nations Population Fund
UNICEF	:	United Nations Children Fund
WAZ	:	Weight-for-Age Z score
WHO	:	World Health Organization
WHZ	:	Weight-for-Height Z score
WVI	:	World Vision International

LIST OF ACRONYM

Askes   : *Asuransi Kesehatan* (Health Insurance)
Askeskin   : *Asuransi Kesehatan Masyarakat Miskin* (Insurance for the Poor)
Jamkesmas : *Jaminan Kesehatan Masyarakat* (Community Health Guarantee)
Jamsostek : *Jaminan Sosial Tenaga Kerja* (Employee Social Security)
Polindes   : *Poliklinik Bersalin Desa* (Village Maternity Post)
Posyandu   : *Pos Pelayanan Terpadu* (Integrated Health Post)
Puskesmas : *Pusat Kesehatan Masyarakat* (Health Center)
PUSTU   : *Puskesmas Pembantu* (Subordinate Health Center)
Riskesdas   : *Riset Kesehatan Dasar* (Basic Health Survey)
Susenas   : *Survey Sosial Ekonomi Nasional* (National Socioeconomic Survey)

ACKNOWLEDGEMENT

ABSTRACT

Background: Child's malnutrition remains a problem in Aceh Besar District which caused by many determinants. Positive Deviance approach in nutrition (*Pos Gizi*) is a model of intervention to improve child's nutritional status by tackling the determinants using locally available behaviors and resources.

Objective: This paper will identify the determinants of child's malnutrition and analyze the implementation of Pos Gizi program in Aceh Besar District along with recommendations to improve future implementation of Pos Gizi.

Methods: Literature review is used to analyze the determinants of child's malnutrition based on UNICEF (1992) malnutrition framework. Analysis of primary data from project internal database is done to assess the implementation of Pos Gizi in Aceh Besar District.

Results: Determinants of child's malnutrition in Aceh Besar District are: Inadequate dietary intake, diseases, household food insecurity, inadequate maternal and child care, insufficient health services and unhealthy environment, potential resources, economic and political structures. Among children in the baseline, 27.3% were underweight, 45.1% were stunted, and 7.4% were wasted. Pos Gizi implementation in Aceh Besar shows that 38.1% children could gain catch up growth and 28.6% children could gain normal growth. Problem with drop out and loss of follow up might influence the outcomes.

Conclusion and Recommendations: Pos Gizi could be a community based solution to improve child's nutritional status. Improvement in the baseline, documentations, tracking mechanism, evaluation and also collaboration with local stakeholders are needed. Cost effectiveness analysis needs to be done to adopt Pos Gizi as a national strategy. Nutritional surveys are needed to identify the most significant malnutrition determinants, to see adoption of new behaviors and the sustainability of the outcomes.

Keywords: Child's malnutrition, undernutrition, positive deviance, nutrition intervention, Aceh Besar District, Indonesia.

Word count: 14,548

INTRODUCTION

Child's malnutrition is a real problem in Aceh Besar District where prevalence of underweight, stunting and wasting as the three anthropometric indicators for child malnutrition show higher finding compared to the average in national level (MOH, 2008c). Many determinants might contribute to this high prevalence given also the context that Aceh Besar District is part of Aceh Province which has suffered from prolonged conflict and also the massive tsunami disaster makes it become more complex.

I am a medical doctor and I was working with CARE International Indonesia for a health project which also includes nutrition programs. We were implementing Pos Gizi as one of strategy to address child's malnutrition in the area of work in Aceh Besar District. Pos Gizi is designed as a practical and affordable strategy to improve child's nutritional status based on local resources and practices (Sternin *et al*., 1998). I am interested to analyze to what extend Pos Gizi in Aceh Besar District has influence the child's nutritional status.

This thesis aimed to identify determinants of malnutrition among children under five years using UNICEF (1992) malnutrition framework and also to analyze the implementation of Pos Gizi in Aceh Besar District. This thesis will also try to provide recommendations to improve the implementation of Pos Gizi in the future.

This thesis is organized in 5 chapters. Chapter I will describe background information about Indonesia, Aceh Province and Aceh Besar District where this study takes place. Chapter II will describe about problem statement, objectives, methodology and limitation of the study. Chapter III will analyze the various determinants of child's malnutrition in Aceh Besar District. Chapter IV will analyze the implementation and results of Pos Gizi in Aceh Besar District. Chapter V will discuss Pos Gizi in Aceh Besar District compared to the other project in Indonesia and other countries and also provide conclusions and recommendations.

CHAPTER I   BACKGROUND INFORMATION

1.1. GEOGRAPHY

Indonesia is a large country in South East Asian region. Indonesia is comprised of more than 17,000 islands and covers an area of 1.937.179 km^2. Indonesia is also crossed by the equator line and is located between Asian and Australian continents and also between Indian and Atlantic oceans (MOH, 2009a) (*See annex 1 for map of Indonesia*).

Aceh Province is located at the north tip of Sumatera Island. The province has 57,811 square km area with population density is 75 inhabitants per km^2 (Aceh PHO, 2008). Aceh Besar is one of the 23 autonomous districts in Aceh Province attached to Banda Aceh as the capital city of the province. Geographically the district covered 2.974,12 km^2 of coastal and inland area. In the north this district bordered by Malacca strait, in the south by Aceh Jaya district, in the east by Pidie district and in the west bordered by the Indian Ocean. Administratively Aceh Besar divided into 23 sub districts with 604 villages (Aceh Besar DHO, 2007) (*See annex 2 for map of Aceh Besar District*).

1.2. DEMOGRAPHY AND SOCIO-ECONOMIC

The total population in Indonesia is 218.868.791 people as recorded in the last census in 2005 and projected to become 231.369.500 people in 2009 (BPS, 2009a). According to the World Bank report, population annual growth rate was 1.2% in 2007. The GDP was 432.82 billion USD and the GNI per capita in Indonesia was 1.650 USD in 2007 (World Bank, 2009a).

Based on the latest population census done in 2005, the total population in Aceh Province was 4.031.589 and total population projection in 2009 estimated to reach 4.363.500 (BPS, 2009a; BPS 2009b). Agriculture is the most common livelihood sector in Aceh along with fisheries and also breeding live stocks. Rice farming is common as rice is the staple food for Acehnese and they also plant palm tree, cacao, and other industrial commodities. According to data released in 2007, the per capita regional income in Aceh was USD 1.659 (BPS Aceh, 2009a). Total population in Aceh Besar district according to the last population census in 2005 was 296.541 inhabitants or equivalent to 92 inhabitants per km^2 (BPS, 2009c). Similar to the other districts in Aceh, most of the people are working on agricultural sector with dominant commodities are palm tree, cacao, coconut, nutmeg, etc (Aceh Besar District, 2009).

Poverty in Aceh Province is a chronic problem in Aceh which mainly found in rural areas where 30% of households are living under poverty line compared to 15% in urban areas (World Bank, 2008). This great disparity is mainly caused by the insecurity caused by the civil conflict and added by tsunami disaster. According to IDHS for Aceh Province, 47.6% of male have completed primary school and 22.9% completed secondary or higher, meanwhile for female 45.6% completed primary school and 18.5% completed secondary or higher (BPS, 2008). This is showing that women education is still lower compared to men. *Shariah* law based on Islamic principles in Aceh has been started in 1961, but the implementation become wider in 2001 since local authority decreed that *shariah* must be implemented in daily life practices. Even though the reason behind this law is to improve people dignity that has been destructed by prolonged civil conflict, but many concerns have been raised on how this law being strictly implemented especially among women (UNFPA, 2005; Munir, 2009).

1.3. HEALTH SYSTEM

The health system in Indonesia is framed by the national health policy The National Health System or SKN *(Sistem Kesehatan Nasional)* has the aim to improve the health status of all the citizens through involving all the potential resources available (MOH, 2009b). As shown in **Figure 1**, the structure of health system in Indonesia consisted of Ministry of Health as the highest structure which is responsible for the whole of programs and policies at the national level. At the provincial level there is the Provincial Health Office (PHO) and at the lower level there is District Health Office (DHO). Health Centers (Puskesmas) are responsible for the sub district level with some assistance from sub-ordinate health centers (*Puskesmas Pembantu/Pustu*) and at the bottom level there are Health/Maternity Posts managed by village midwives and also the Integrated Health Post (*Posyandu*) (WHO Searo, 2009).

In 2007 there are 8.234 Puskesmas distributed in 440 districts in Indonesia. The average ratio was 3.46 Puskesmas per 100.000 people or nearly 1 Puskesmas for 29.000 people which are meeting the national target of 1 Puskesmas for 30.000 populations (MOH, 2008a). The basic programs in Puskesmas consisted of health promotion, environmental health, maternal and child health (MCH), nutrition, communicable disease control and curative care/general clinic services (MOH, 2001).

Figure 1. Health System Structure in Indonesia

(WHO Searo, 2009)
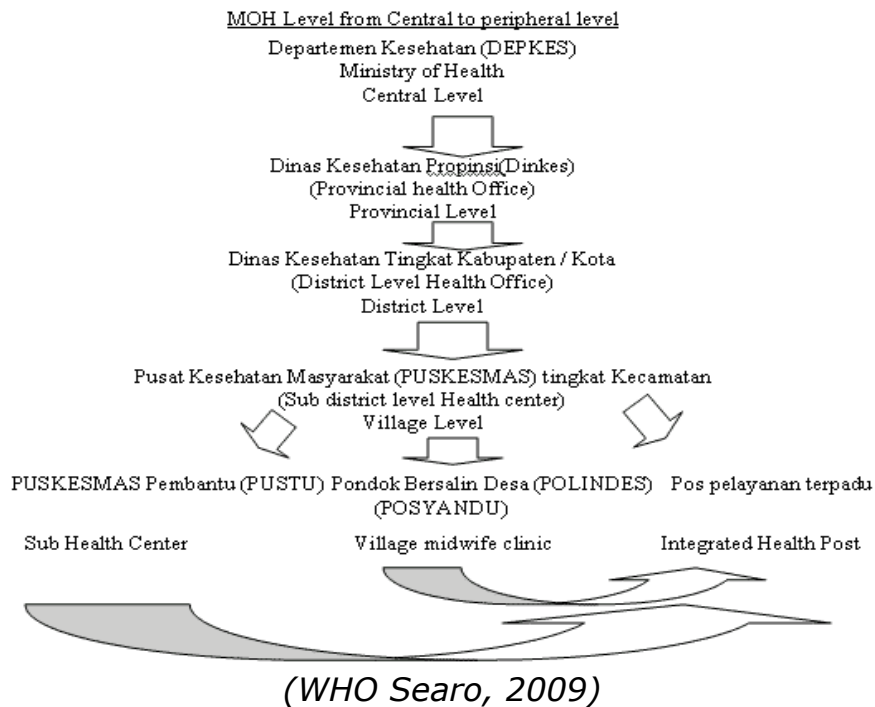
At the community level there are village maternity posts (Polindes) which run by village midwives provide MCH services include delivery and family planning. In 2006 there are 25.754 Polindes or 1 for 3 villages. Integrated health posts (Posyandu) run by trained community volunteers called "cadres" with the assistance of health staffs. Posyandu have 5 priorities that are MCH services including GMP, family planning, nutrition improvement, immunization and also diarrhea control. Up to 2006 there are 269.202 Posyandu registered or in average equal to 4 Posyandu in every village (MOH, 2008a).

Human resource is still a major concern in Indonesia. In 2006 there are 44.456 medical doctors or equal to 19.93 per 100.000 inhabitants, and 79.152 midwives or equal to 35.4 per 100.000 inhabitants with disparities among regions (MOH, 2008a). To deal with this situation, government implements short term compulsory programs for doctors and midwives for 2-3 years with some incentive scheme applied for remote and underserved areas (World Bank, 2009b). It is also found that the human resource policy was not based on real demand in the field (Rokx *et al* 2009).

Total expenditure on health in Indonesia in 2006 was 2.2% of GDP where public share contributed to 50.4% and private share was 49.6% of the total. Household out-of-pocket spending contributed to 66.7% of private share or 33% of total spending. Total expenditure on health per capita was USD 87 in international dollars rate. The share of health expenditure

to total expenditure was 5.3%. Since 2004 national health insurance for the poor called *Asuransi Kesehatan Masyarakat Miskin* (Askeskin) has been introduced and in 2008 changed into health insurance scheme for the population or called *Jaminan Kesehatan Masyarakat* (Jamkesmas) which covers more than 76.4 millions of poor or almost 30% of the total population (Rokx *et al* 2009).

1.4. HEALTH SITUATION

The main health indicators in Indonesia are currently improving compared to the previous years. The life expectancy is rising from 62 years in 1992 to 69 years in 2002. The fertility rate decreased to 2.6 births per woman. Infant mortality rate (IMR) and under 5 mortality rate (U5MR) are 34/1000 and 45/1000 respectively. If this progress is maintained in the same pace, perhaps Indonesia will only slightly miss the MDG-4 targets 17/1000 for IMR and 23/1000 for U5MR in 2015. The maternal mortality rate (MMR) is also decreasing more than half from 465/100.000 live births in 1992 into 228 per 100.000 live births although it is still far from MDG-5 targets of 102 per 100.000 in 2015 (Bappenas, 2007; BPS, 2008; Rokx *et al*, 2009).

Some indicators of health situation in Aceh from IDHS 2007 shown that total fertility 3.1 births per woman, IMR is 25/1000 live births, under five mortality rate 45/1000 live births, births took place at health facility is 24.8% and complete immunization coverage is 39,6% (BPS, 2008). The low proportion of births took place in the health facilities might be is the potential caused of low IMR. These indicators are difficult to be compared with the previous years to see the progress since the previous surveys didn't include Aceh Province due to security reason. Under reporting due to security reasons also might be the cause of low health indicators in Aceh Province.

Child's malnutrition in Indonesia is still a problem. The latest data from Basic Health Survey (*Riskesdas*) in 2007 shows that the prevalence of underweight in Indonesia was 18.4% with 13% are moderate and 5.4% are severe underweight. Prevalence of stunting was 36.8% with 18% of moderate and 18.8% of severe stunting. Prevalence of wasting was 13.6% with 7.4% are moderate and 6.2 % are severe wasting. Although the prevalence of underweight has reached below the national target of 20% and the MDG target of 18.5%, there is still a problem where in some districts the prevalence are higher than in the national (MOH, 2008b).

1.5. CIVIL CONFLICT AND TSUNAMI DISASTER

Armed civil conflict in Aceh is one of the worst conflicts in Indonesia. The conflict started since 1976 with the formation of "Free Aceh Movement (*Gerakan Aceh Merdeka/GAM*)" which aimed to gain independence from Indonesian government. The conflict has led to thousands of civilian were

killed during the periods and led the rest were suffering from insecurity and living in uncertainty (Sherlock, 2003; Aspinall, 2005). By the signing of Memorandum of Understanding (MoU) between GAM and Government of Indonesia in August 15th 2005 in Helsinki, the 30 years historical civil conflict in Aceh was end (Aspinall, 2005).

December 26th 2004, massive tsunami swept coastal areas in several countries, including Indonesia. Aceh Province and Nias were the worst region affected with the estimated 130,000 people was dead, 37,000 were missing and more than 500,000 thousand others were displaced. Tsunami was not only taking lives, but also causing massive destruction on vital infrastructures including health facilities. Since then, government assisted by national and international agencies hand by hand working on the reconstruction and rehabilitation of Aceh Province and Nias in all sectors including health (GOI, 2005; BRR Aceh-Nias, 2006).

CHAPTER II PROBLEM STATEMENT, OBJECTIVES AND METHODOLOGY

2.1. PROBLEM STATEMENT

Child's malnutrition remains a problem in Aceh Province where the Basic Health Survey (*Riskesdas*) in 2007 revealed that the prevalence of undernutrition is still high. Prevalence of underweight in Aceh province was 26.5% with 15.8% of moderate and 10.7% of severe underweight. Prevalence of stunting was 44,6% with 17.7% of moderate and 26.9% of severe stunting. Prevalence of wasting was 18.3% with 9.1% of moderate and 9.2% of severe wasting (MOH, 2008c). All of these three indicators of undernutrition shown higher prevalence compared to the national findings. Data regarding Aceh Besar District shows that the prevalence of underweight is 20.1% where 12.5% is moderate and 7.6% is severe underweight. The prevalence of stunting is 39.4% where 14.4% is moderate and 25% is severe stunting. The prevalence of wasting is 23.2% where 9.6% is moderate and 13.6% is severe wasting (MOH, 2008c). The underweight and stunting prevalence are lower compared to at provincial level. No specific information about the cause of high wasting prevalence but the impact of tsunami which destructed the livelihood and economical sector in Aceh Besar might give contribution to the ability of family to provide sufficient food for their children. These findings indicate that child malnutrition is an important public health problem in Aceh Besar District.

Positive Deviance approach in nutrition education and rehabilitation program (PD-NERP) is a model of intervention to address child malnutrition by ensuring community involvement to achieve sustainable nutritional improvement. PD-NERP is based on the local resources to improve the nutritional status of malnourished children. PD children are defined as children from low socioeconomic families who can grow and develop adequately in the middle of situation where many of children are malnourished. These families called PD families which proven to be succeed in taking care of their children with the all constraints. Their practices seem to be good references for other families with the same condition to improve the nutritional status of the children in a sustainable way. Mothers who have malnourished children then learn how to adopt the positive behaviors found from positive deviance in daily practices (Sternin *et al*, 1998; CORE, 2002).

The concept of PD-NERP in Indonesia is known as "Pos Gizi". *Pos Gizi* in Aceh Besar was implemented by health project of CARE International Indonesia as part of Tsunami Response Program (TRP). The implementation carried out gradually in selected 6 villages in 5 sub districts during January 2007 to June 2008 periods. PD intervention was

done using a model adopting from the original Hearth framework (see *Annex 3*) with some adjustments.

2.2. STUDY OBJECTIVES

2.2.1. General Objective
The overall objective of this thesis is to identify the determinants of malnutrition among children ≤ 59 months (under-5) and to analyze the implementation and the result of Positive Deviance approach in nutrition intervention in Aceh Besar District, Aceh Province, Indonesia in order to give recommendation to improve the future work.

2.2.2. Specific Objective
- To identify particular determinants of malnutrition among children ≤ 59 months in Aceh Besar District.
- To analyze the implementation and the results of Positive Deviance in nutrition intervention in Aceh Besar District, Aceh province, Indonesia.
- To formulate recommendation to improve the implementation of Positive Deviance in nutrition intervention for children ≤ 59 months

2.3. METHODOLOGY

This thesis is an evaluation of Positive Deviance project in Aceh Besar District over the periods of implementation January 2007 to June 2008. In this thesis, author will try to describe the underlying reason of the project, process of the implementation and results of the activity. Term of 'malnutrition' used in this thesis will only refer to undernutrition reflected by underweight, stunting, and wasting. The term 'child malnutrition' will refer to undernutrition among children under five years.

In order to achieve abovementioned objectives, the author will use two different methods which are:

1. Literature review.
A literature review will be done to analyze the determinants of malnutrition using UNICEF's Malnutrition Framework and also to analyze the implementation of Positive Deviance. Literatures will be selected from articles from printed or online journals, books, reports, official publications, and other reliable sources. Key words used for the searching are: child's malnutrition, undernutrition, nutrition intervention, positive deviance, *Pos Gizi*, Indonesia, Aceh Province, Aceh Besar District. Literature search is done through internet using search engines such as PubMed, Scopus, Scirus and Google scholar. Author also use websites such as WHO, Gizi net, BPS, etc.

2. Analysis of Primary Data

Primary data collected during the GMP sessions in the areas of work and data collected during Positive Deviance implementation from an unpublished internal database will be analyzed using SPSS®. Data outcome will be presented as frequencies, tables, charts and quantitative analysis values. Data will be interpreted based on the literature reviews and also personal observations and experiences.

2.4. LIMITATION OF THE STUDY

Regarding the literature searching point of view, only few articles or reliable information from Aceh Province and Aceh Besar District are available in the internet to support the analysis so author rely most on data from national and international level added by personal observation and experiences.

Regarding the primary data: This study is limited to the fact this project was not designed properly for scientific research thus not all necessary steps were taken and not all of data are available in the project database. Selection of the target area was on the project purpose not random. GMP data were collected for surveillance purposes and only those who attended were measured. This might be a source of selection bias for the group thus the results for this analysis is not meant to be generalized to represent all children in the area of work. Small number of children and also incomplete data set especially in PD intervention group may also become a source of bias in drawing a conclusion in order to find associations between interventions or associating factors with the outcome. The fact that the project already closed in June 2008 also becomes a challenge especially in situation where some issues that need to be clarified.

CHAPTER III   DETERMINANT OF MALNUTRITION

Malnutrition is a result of various determinants which are related to each other in different levels of causation. In order to explain these determinants better, UNICEF has developed a framework to analyze all related determinants from 3 different layers started from immediate causes, underlying causes and basic causes of malnutrition (see **Figure 2**) (UNICEF, 1992).

Figure 2. UNICEF's Malnutrition Framework
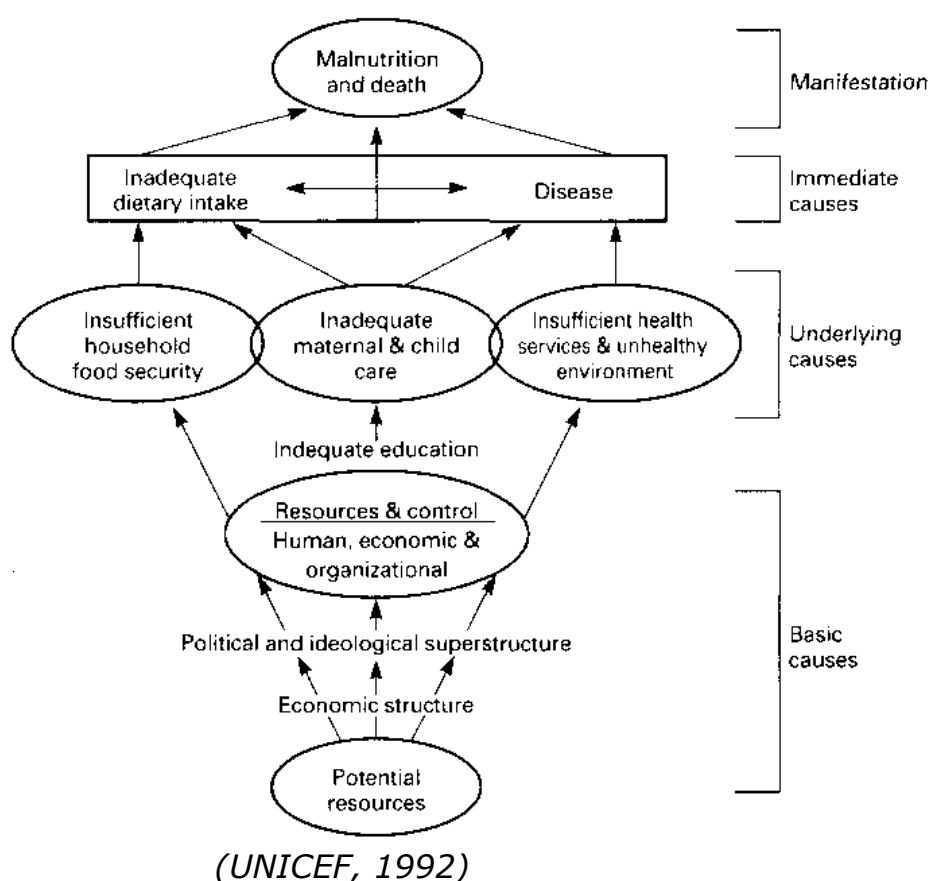
(UNICEF, 1992)

3.1. IMMEDIATE CAUSES

Malnutrition in children is considered as the immediate manifestation of various factors which are often related to poor quality of food and/or inadequate food intake and the presence of diseases, or combined (UNICEF, 1992; de Onis and Blossner, 1997). These two factors are closely influenced by each other and have two ways relationships.

3.1.1. Inadequate dietary intake

Inadequate dietary intake is one of immediate determinants for child malnutrition (UNICEF, 1992). No particular dietary intake information for

children available during the literature searching, but the dietary intake per capita from *Riskesdas* might be used to give brief view of the situation (see **Table 1**). Data from Aceh Besar district shows higher average energy consumption with 1976,6 kcal but slightly lower in protein with 64,2 grams compared to the provincial average, but both are higher than the national average (MOH, 2008c). Compared with the recommended daily energy requirements and protein intake, the energy intake in Aceh Besar is still below the recommended 2,100 kcal, but the protein intake is higher than the 46 grams as recommended (WHO, 2000). Further analysis also shows that 43.4% and 39% households with lower consumption of energy and protein compared to national average respectively which can be a significant contributor to child malnutrition (MOH, 2008c).

Table 1. Average energy and protein per capita per day

consumption per capita/day	WHO standard	National	Aceh Province	Aceh Besar District
Energy (kcal)	2,100	1735,5	1805,3	1976,6
Protein (grams)	46	55,5	69,3	64,2

Dietary patterns also play an important role in determining the adequacy of food intake. Food composition and variety are also important to assure that children get enough nutrients needed for growth. Data in **Figure 3** shows the food intake reflected by composition of household food consumption taken from serial socioeconomic surveys (*Susenas*) (Atmarita, 2005).

Figure 3. Food consumption variation at household level
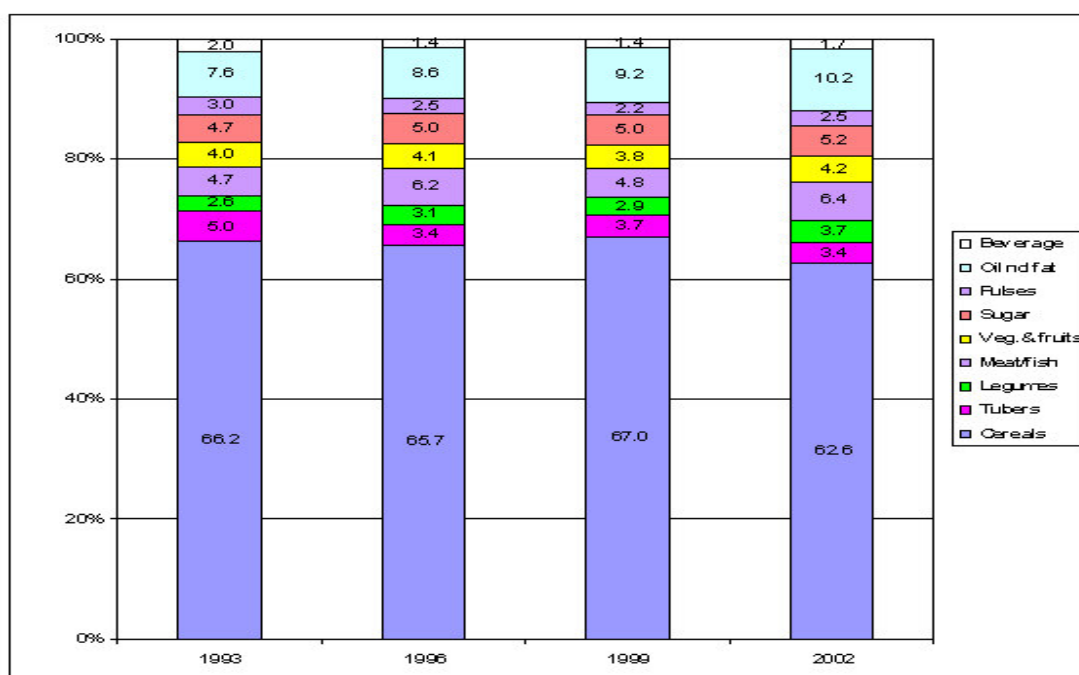
The figure shows the trend of food variation over the years but still showing that households consumed more cereals and less protein which may be as one of the causes of malnutrition. It is also shown that people in the rural areas consume higher proportion of cereals compared to people in urban areas (Atmarita, 2005). This might be due to the price of cereals is cheaper compared to protein sources as meat or fish.

3.1.2. Diseases

Infectious diseases have been known to affect the nutritional status and growth of children through various ways. Acute and chronic disease may lead to undernutrition through reduction of food intake, vomiting, damaging the absorption process of nutrients, losses of micronutrients and also increasing catabolic processes (Stephensen, 1999; Fotso *et al* 2005).

Table 2. Top ten diseases in Aceh Province in 2007

No	Disease	Number of case	% of Total
1	Acute Respiratory tract Infection (ARI)	117.434	63.78
2	Diarrhea (non-bloody)	41.344	22.46
3	Clinical Malaria	6.386	3.47
4	Bloody diarrhea	4.877	2.65
5	Suspect TB	4.528	2.46
6	Malaria *(vivax, falciparum* and *mixed)*	2.344	1.28
7	Pneumonia	1.671	0.91
8	Clinical typhoid	1.601	0.87
9	TB	1.342	0.73
10	*Others*	2.586	1.39
	Total	**184.113**	**100**

The report from Aceh PHO shows that pneumonia, diarrhea and malaria are listed in the top 10 diseases in health centers in Aceh province as shown in **Table 2** (Aceh PHO, 2008). Although the data presented here are cases from health centers among general population and no details data for children. Finding from the IDHS also shows that diarrhea, pneumonia and fever mostly due to malaria are the top three causes of morbidity and mortality among children in Aceh Province (BPS, 2008).

Diarrhea

In Aceh Province, outpatient data from the health centers in 2007 shown that non-bloody diarrhea is the second highest which contributes to 22.5% of the total visits. The similar finding in outpatient data from hospitals shown that non-bloody diarrhea is the highest of all visits with 19.3% of total visits. Half of these diarrhea cases occurred in children under five. In 2007, there are 1883 of cases reported by health facilities

out of the total 28,778 children (6.5%) in Aceh Besar District (Aceh PHO, 2008). The lower finding could be bias since the report only counted children with diarrhea who came to health facilities, so it didn't cover other children with diarrhea but not visiting the health facilities.

Acute respiratory tract infection (ARI) and Pneumonia
Acute respiratory infection is a common disease widespread in Aceh Province with the prevalence 36.6% and has very wide variations among districts with the lowest 11.7% to the highest 48.7%. 14 districts found to have the prevalence over 30% including Aceh Besar with 38.8%. The prevalence for ARI in within the last 2 weeks in children under one year and under five years participated to the survey are 46.4% and 49.1% respectively which are much higher compared to the older groups (MOH, 2008c). Even though most of the ARI are mild, but repetitive infections may affected the nutritional status of children as explained above. The prevalence of pneumonia among children under one year and under five years in Aceh Province are 2.1% and 3.4% respectively (MOH, 2008c). Although the prevalence of pneumonia is much lower compared to ARI, but pneumonia usually more severe and may lead to child's death.

Malaria
Malaria prevalence in Aceh Province in 2007 was 3.7% with variation among districts where the lowest is 0.5% and the highest is 11.8%. Prevalence for Aceh Besar District was 3.7% or the same as provincial prevalence (MOH, 2008c). Aceh province is one of region considered as malaria where in 2007 clinical malaria ranked as the third highest cases of outpatient visits in health centers with total 6386 visits or 3.47% of all visits meanwhile confirmed malaria *vivax* was 1.122 cases (0.61%), malaria *falcifarum* was 987 cases (0.54%) and malaria mixed was 235 cases (0.13%) (Aceh PHO, 2008).

Malaria prevalence in children under 1 year and children aged 1-4 years in Aceh Province is 0.2% and 1.2% both respectively which are considered the lowest compared to the other older age groups (MOH, 2008c). The low prevalence among children under five might be due to children are more protected especially during night sleep. Data from IDHS shows that 57.9% children under five in Aceh Province are sleeping under any type of bed nets and 32.4% amongst them are sleeping under impregnated bed net (ITNs). This is rather high compared to the other provinces. Overall there are 69.4% of households in Aceh have at least 1 of any type of mosquito net and 39.6% households have at least one ITNs (BPS, 2008).

3.2. UNDERLYING CAUSES

In addition to the immediate factors there are several other factors such as limited supply of food in the household (food insecurity), inadequate maternal and child care practices, insufficient health services and

environment factors which may underlay the immediate causes of malnutrition (UNICEF, 1992).

3.2.1. Insufficient household food security

As cited from LSRO in 1990, food insecurity is defined as "*limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways*" (Bickel *et al*, 2000). Household food security related access of food and the capacity of family to produce and acquire food in order to fulfill their need. It is also considering how the food being distributed in the family looking closely into disparities or any discrimination on the food distribution among family members (UNICEF, 1992). In the fourth category of food insecurity or the worst category we might find hunger among both adults and children in the family so in this group we may found more hunger and malnourished children (Bickel *et al*, 2000). Globally, it was estimated that more than 800 million people were living with food insecurity where most of them are in developing countries (FAO, 2004).

Food security in Indonesia related closely to the rice price and availability as rice is the staple food for most of the citizens. Sufficient production and affordable price is the key of securing food security in the household level. To ensure this can be achieved government tried to expand the rice production and improving the efficiency through technological change, better farm management and improved marketing system in all provinces including Aceh Province (Mew *et al.*, 2002).

Insufficient food production
Agriculture contributes to 21.2% of total provincial income and related directly to people who are living with poverty. Agriculture sector also absorbed more than 50% of workforce especially in rural areas (World Bank, 2008). Rice is the main staple food in Aceh province, so the production of rice will remain as the most important component of the food security.

Agriculture contributes to 45% of the total income in Aceh Besar District which consisted of several subsectors which are food crops, plantation, livestock, forestry and fishery (Aceh Besar DHO, 2007). The food crops in Aceh and Aceh Besar consisted of wetland and dry land with the main products are rice, ground peanut, soybean and maize (see **Table 3**) (BPS Aceh, 2009b). From the total area of Aceh Besar District, 44.17% are hilly area with slope >40 degrees which is not appropriate for farming due to the risk of landslides. In the other hands drought is also a threat looking to the situation where the total non fertile lands is increasing due to tsunami or poor drainage system from 6.870 acres in 2000 into 32.888

acres in 2005. A significant increase of almost 5 times which may lead to significant reduction of food crops production (Aceh Besar DHO, 2007).

Table 3. Food crops production in 2007.

Type of commodity	Production in Tons (2007)	
	Aceh Province	**Aceh Besar District**
Rice	1.533.369	158.034
Maize	125.154	655
Soybean	19.027	90
Ground peanut	7.971	406
Cassava	41.557	4.543
Sweet potato	15.188	1.731

(Adopted from BPS Aceh, 2009b)

Economic inaccessibility to food
The massive efforts for tsunami and post conflict reconstruction and rehabilitation programs delivered by government and major donor and implementing agencies has increased significantly the price of goods including food crops (World Bank, 2008). This is somehow creating barriers for poor people to purchase sufficient foods for their family. Poverty in Aceh is a long term problem where in 2004 before tsunami, 28.4% of households were living under poverty line, higher than the national figure of 16.7%. This might be due to the prolonged civil conflict. After tsunami disaster, this situation shortly worsened with 32.6% in 2005 but in 2006 the poverty level improved significantly into 26.5% due to the reconstruction and rehabilitation programs but is still considerably high (World Bank, 2008).

3.2.2. Inadequate maternal and child care

According to UNICEF (1992) inadequate maternal and child care is considered to be one of the underlying causes for malnutrition. Exclusive breastfeeding practice, Infant and young child feeding (IYCF) practices and health care seeking behaviors will be analyzed to represent this determinant.

Low Exclusive Breastfeeding practice
A study carried out by Hellen-Keller International (HKI) in rural and urban in several provinces in Indonesia found that the proportion of babies aged less than 2 months exclusively breastfed is very low ranged from 27% to 40%. The proportion on older babies aged 4-5 months exclusively breastfed is even much lower with less than 10%. This is due to the early introduction of non breast milk foods where data found that 37% - 41% babies aged less than 2 months received solid foods in addition to breast milk or other liquids (de Pee *et al*., 2002).

The last IDHS showed that although 95% of children under five years in Indonesia having been breastfed for some periods of time. 44% of babies got early initiation during the first hour and a total of 62% of babies begun breastfeeding within the first day. It is also showing that only 48% of infants below 2 months of age are exclusively breastfed and this figure dropped at age 4 to 5 months with just 18%. For the overall only 32% of them was having been exclusively breastfed for six months or less, much lower than the previous finding in 2002-2003 IDHS with 40%. As shown in the same report that the decrease of babies who are exclusive breastfed followed by significant increase of babies who are bottle-fed (See **Figure 4**) (BPS, 2008). This might be due to massive campaign from baby food companies during the last years especially about formula milk for young babies through mass media or by giving free sample in hospitals of in private maternity clinics.

Figure 4. Percentage of children under 6 months who are exclusively breastfed and bottle-fed
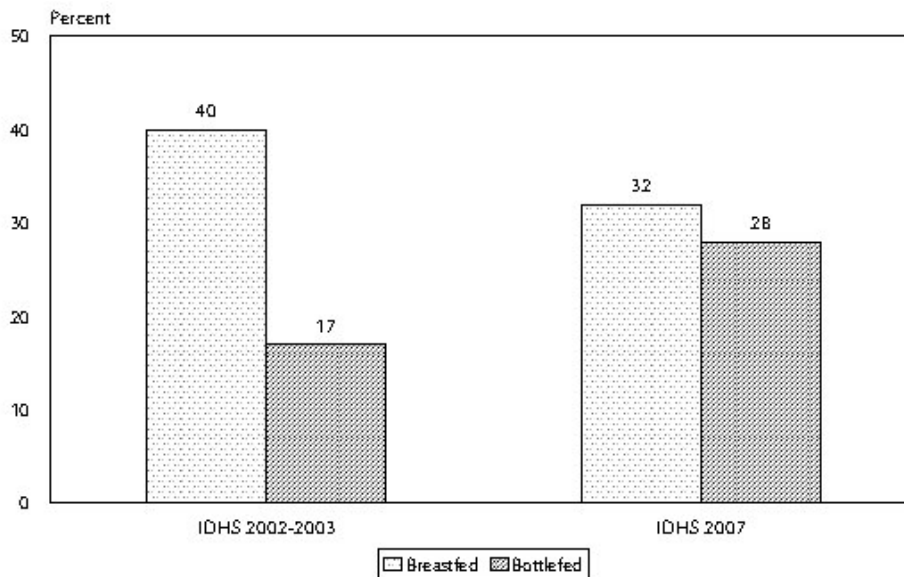
(BPS, 2008)

The proportion of babies exclusively breastfed for six months in Aceh Besar District is 44.9%, higher than the provincial with 14.55% (Aceh PHO, 2008). This may due to after tsunami disaster many of humanitarian agencies were working intensively for breastfeeding issue in Aceh Besar by conducting trainings, campaigns and also supporting the establishment of lactation clinics in the health center level. But the other possibilities such the reliability of the data sources might be also questioned. Several studies done in Indonesia revealed that low practice of EBF found to be influenced by many factors such as mother's knowledge on EBF, introduction of pre-lacteal foods, early introduction of complementary foods, influence of family members especially grandmothers and husbands, working mothers, and also lack of support from health

providers and massive campaign from milk substitute's companies (de Pee *et al.*, 2002; Februhartanty *et al.,* 2006; Februhartanty, 2008).

Poor infant and young child feeding (IYCF) practices
As cited from WHO, IYCF practice includes the timely introduction of solid or semisolid foods started from age of six months by giving the food in small portions and increasing the frequency and the amount of foods along with the child grow older. In the same time, breastfeeding has to be maintained until the children aged 23 months old (< 2 years) to optimize the child's growth. For solid/semisolid food, the recommended frequency is 2-3 times a day for 6-8 months babies and 3-4 times a day for older children 9-23 months (BPS, 2008). Findings from IDHS in Aceh Province show that among children age 6-23 months who are still breastfed, 64.3% of them received complementary foods with recommended groups of food and 65.7% with recommended frequency. Meanwhile compared to breastfed group, children who are not breastfed are received more variety of food (73.4%) but less likely to received foods in recommended frequency (9.6%) (BPS, 2008).

Child's feeding practices during sickness also plays important role in determining nutritional status of children. For this issue, information that is in IDHS in Aceh Province regarding to feeding practices during diarrhea shows that majority (74.5%) of children under five received the same as usual or more liquid during period of illness and 21% are received less and 2.5% are not received any liquids. In regards of the amount of food, more than a half (53.7%) received the same or more amount of food, meanwhile 44.2% are received less and 2.1% are not received any food during diarrhea (BPS, 2008). These are shown that majority of the care takers are aware that they have to give more liquids and foods to support the child's recovery from illnesses although some of them are still not aware and still practicing harmful habits like not giving any liquid or food during diarrhea which may worsen the child's condition.

Poor health care seeking behavior
As described above, health status is one of the immediate causes of malnutrition for children (UNICEF, 1992). Health care seeking behavior is an essential thing that determined the outcome of child's health status from illnesses and this relies much on the behavior of the mothers and care takers. As an indication of health seeking behavior data from IDHS in Aceh Province shows that 2/3 of children (66%) with ARI or fever symptoms and more than a half (51%) of children with diarrhea were taken into health facilities or health provider to receive proper treatment (BPS, 2008). This also means that there is still high percentage of children with symptoms of diseases that were not taken to health facilities and might received treatment from traditional healers or self medication. This will lead to insufficient treatment that may also become an

underlying of the occurrence of repetitive or chronic infections that may give implication to child's nutritional status.

Mother's education
Mother's education has been known for long to have significant influence in child nutritional status through various ways. A most recent study done in Indonesia and Bangladesh studied about the relationships between parental formal educations with stunting on children under five. The study found that the higher education completed the lower prevalence of stunting among their children. Mothers with higher educational level might have better care giving behaviors such as having completed immunization for their children, vitamin A, provide better sanitation and the utilization of iodized salt (Semba *et al.*, 2008). According to IDHS results among ever married women in Aceh Province participated to the survey, the biggest group is completed primary with 29.3% followed by some secondary 24.7%, completed secondary 17.7%. There are small number of women who were having more than secondary education (8.9%), not completed primary (13.6%) and having no education at all (5.9%). This is shown that there are still 19.5% of mothers who have lack of education (BPS, 2008). This low education level might influence the ability of mothers to take care of their children in proper way and to absorb information on child care and health care.

3.2.3. Insufficient health services and unhealthy environment

Problems in accessing health services
In terms of geographical access to health services, most of households (99.7%) in Aceh Besar District are living in the coverage range of health facilities where 81.4% and 18.3% are living within 1 km and 1-5 km coverage respectively. Concerning to the time, majority (94.8%) of households can reach the health facilities within 30 minutes or less (MOH, 2008c). Only small proportion of households which are out of health facilities coverage and usually because they are living in very remote areas and often scattered in small communities. They often out of reach by health facilities due to obvious problems with the infrastructures, human resources and also logistics.

Financial accessibility of health services is still becoming a dilemma for people living in Aceh Besar. For the payment, majority of the outpatients (69.3%) and inpatients (86.8%) have to pay by out of pocket for the cost either for all cost or some portions. Only 7.5% of outpatients and 26.4% of inpatients are covered by insurance scheme either by insurance scheme for the poor (*Askeskin*) or by insurance scheme for public servants or private employee (*Askes/Jamsostek*) (MOH, 2008c). This high out of pocket payment proportion and high cost of services and drugs might create barriers for poor people to access health services.

Immunization coverage
As a preventive measure, vaccination is an essential component to avoid the incidence of preventable diseases. Indonesia adopted the Expanded Program on Immunization (EPI) launched by WO in 1997 by providing vaccines to prevent six vaccine-preventable diseases: tuberculosis, diphtheria, whooping cough, tetanus, polio and measles with addition of hepatitis B (MOH, 2008a). Data regarding to vaccination coverage in Aceh Province and Aceh Besar District presented in **Table 4** (Aceh PHO, 2008):

Table 4. Percentage of immunization coverage in 2007

No	Type of vaccines	Coverage (%)	
		Aceh Besar	Aceh Province
1	BCG	97.97	88.91
2	DPT3 + Hep B 3 (Combo)	86.76	84.77
3	Polio 3	89.52	83.45
4	Measles	84.39	78.64

Data presented above was collected from public health facilities report and only recorded children who are registered in Posyandu or health facilities. The figures presented might have underestimated the real number of children in the area who are not registered at Posyandu or public health facilities for the vaccination program. Another data from *Riskesdas* shows that the coverage of immunization among children aged 12-59 months in Aceh Besar District was 73.5% of children having completed immunization as provided in national EPI program, 22.4% was having incomplete vaccination, and 4.1% of children didn't receive any type of vaccinations (MOH, 2008c).

Low Posyandu utilization
Posyandu activities are mainly dedicated for pregnant mothers and children under five years. In 2007, there are 385 Posyandu available in Aceh Besar District (Aceh PHO, 2008). According to IDHS 37.6% of the households are utilizing Posyandu services meanwhile 62.3% are not utilizing the services with the reason that they don't have any children under five, they are not sick and the services provided are incomplete (BPS, 2008). For nutrition surveillance, Posyandu is the source for most of children's nutritional status in the reporting system so therefore high percentage of households that are not using this service will lead to under reporting of cases and children who are malnourished will be missed and remain undetected.

Unsafe drinking water sources
Safe drinking water is very important since to prevent the transmission of water-borne diseases due to contaminated water may cause diseases especially diarrhea to children. Most of households (70.5%) in Aceh Province are using water from protected well, unprotected well and piped

water system as the sources of drinking water. For the treatment, 49.3% of households in Aceh Province are using closed container to keep water and 90.4% of households boiled the water before being consumed by the family members (MOH, 2008c).

The same situation also applies in Aceh Besar District where protected well, unprotected well and piped water system are the most common sources of drinking water used by 86.9% of total households. Beside this finding, data from *Riskesdas* also shows that 23.5% of households in Aceh Besar District are prone to have problem to get safe water during the dry season (MOH, 2008c). This lack of safe water period may become critical phase for the transmission of water-borne diseases due to people will use any type of water which is available regardless the quality of the water that might be poor and contaminated with bacteria.

Low latrine utilization
Analysis from IDHS shows that children from households who are using private toilet facility with septic tank are less likely to have diarrhea compared to households with other types of toilet facilities (BPS, 2008). According to *Riskesdas*, more than a half (53%) of sample households in Aceh Besar are using private toilet facilities, 9.4% are using joint toilet facilities with several households, 3.8% are using public toilets and the rest 33.8% are not using toilet facilities (MOH, 2008c). Those who are not using toilet facilities usually defecate in bush, creek or river. The excreta then become source of water or food contamination facilitated by flies that can lead to diarrhea. This poor behavior mainly found in rural compared to in urban areas, since people in rural areas usually still have low awareness on hygiene issues and also they couldn't afford to build private latrines in their houses.

Indoor air pollution
Indoor air pollution mainly caused by the results of incomplete combustion from firewood or coal used for indoor cooking. This pollutant will remain in the air for certain periods and might be inhaled by people in the surrounding. In children, prolonged exposure to the air pollution will lead to the increased risk of getting ARI or other respiratory diseases which has been known to be the common cause of child morbidity and mortality (Bruce *et al*., 2000). No particular information about the situation of indoor air pollution in Aceh Province or Aceh Besar District during the searching. A study done in national level found that indoor air pollution was mainly due to indoor cooking activities and more common in rural areas which increased the risk of child morbidity and mortality (Federman and Levine, 2005). According to author's observation, people in Aceh Besar District especially in rural villages are cooking inside the house with mainly using fire woods and some are using petroleum or gas.

3.3. BASIC CAUSES

The basic determinant of malnutrition is putting the bigger context such as availability of potential resources, economic structure and also political structure which might give significant indirect contribution to malnutrition (UNICEF, 1992).

3.3.1. Potential resources

Prolonged conflict added with massive tsunami had somehow affected the potential resources in Aceh especially in several districts that were severely damaged such as Aceh Barat, Aceh Jaya, Aceh Besar and Banda Aceh. Many lives were dead or missing, land erosion by salt water causing ecological damage, and also lost of important and strategic infrastructures such as schools, health facilities etc (BRR Aceh-Nias, 2006). Prolonged conflict had make people afraid to go to their rice fields or plantations and let their crops or plants unmanaged which is actually very fertile. After the signing of MOU between the two conflicted parties, the situation seems much improving and people are now starting to manage their rice fields or plantations. This situation seems to give enough space for all potential resources (human, agro-ecological, technology) in Aceh to improve.

3.3.2. Economic structure

Aceh's economy is relying mainly on mining sector especially oil and natural gas production will contribute to 24% of the total GDP in 2006. Agriculture is also important sector which contributes 21.2% followed by manufacturing 10.7%, trade 15%, services 12.9% and transportation and communication with 5.2%. Those are the top 5 contributors for Aceh's GDP. As a result of special autonomy, Aceh's provincial government received bigger share from central government compared to other provinces in Indonesia (World Bank, 2008).

The proportion of health expenditure in Aceh is one of the lowest in Indonesia with only less than 6 percent from total expenditure, but since the total budget is big it can compensate the amount of money. This makes health expenditure per capita in Aceh relatively high compared with the rest of Indonesia. As result of decentralization, provincial and district government have to responsible to the biggest share (86%) of public health spending. Most of this expenditures are mostly spent for salaries and building new facilities and only spare little amount for operational and improvement of services. This has been a major constraint that caused the local government has failed to achieve significant improvements in health outcomes (World Bank, 2008).

3.3.3. Political structure

Aceh province has been granted with special autonomy through Act No.18 year 2001 and then added with another law which is Act No. 11 year 2006 as the result of peace agreement between the Indonesian Government with Aceh's Liberation Movement as signed as Memorandum of Understanding in August 15th 2005 in Helsinki (MOH, 2001; MFA, 2009). By this special arrangement, provincial government and legislatives have enough control over the resources and implementation of all activities including health sector in the region. Another major change that may also influence health sector is the decentralization process started in 2001. The decentralization delivered up to district level which make District Health Office (DHO) have broader role and responsibility in designing and running health programs in the area. The objective of this decentralization is to improve the accountability and also to improve the quality of health services to community (MOH, 2001). The fact that the local government couldn't manage the resources properly to improve services has raised many concerns (World Bank, 2008).

CHAPTER IV POSITIVE DEVIANCE IN NUTRITION (POS GIZI) BACKGROUND IMPLEMENTATION AND RESULTS

4.1. BACKGROUND IMPLEMENTATION

Positive Deviance (PD) in nutrition is defined as "*adaptive responses for satisfactory child growth under harsh economic circumstances*" (Zeitlin *et al.*, 1990). PD is the key concept of the nutrition education and rehabilitation program (PD-NERP) activity which aimed to rehabilitate malnourished children and to sustain the improvement after rehabilitation (Wollinka *et al*., 1997). PD-NERP is designed to tackle immediate and underlying determinants of child's malnutrition. PD-NERP mainly works with behavior change of the child care takers through several process including community mobilization and specific information gathering to find out local good behaviors (Marsh *et al.*, 2004). The behaviors adopted in PD activities gathered from poor families with good nourished children within the communities. The behaviors comprises of three main components which are child's feeding practices, child's caring practices and health care seeking behaviors (CORE, 2002). These behaviors are usually low cost and affordable do not conflicts with the local customs make it realistic to be adopted by caretakers (Marsh and Schroeder, 2002).

PD-NERP has been implemented in several countries such as Haiti, Vietnam, Bangladesh, Egypt, and also in Indonesia with various range of success (Wollinka *et al*., 1997; Marsh *et al*., 2004; McNulty and Pambudi, 2008). One of success story from PD implementation was coming from Vietnam where PD could achieve 74% reduction in severe malnutrition among children under 3 years old who participated (Sternin *et al*., 1997). A subsequent follow up was done 3 years after the termination of the program and found sustained results of better nutritional status of these children and their younger siblings compared to the matched control group. From the interviews among mothers who followed PD-NERP activities also revealed that mothers maintained the practices they learned during the PD session (Mackintosh *et al*, 2002). This is shown that PD could provide a sustained solution to improve child's nutritional status.

PD-NERP or known as *Pos Gizi* in Indonesia has been introduced since ten years ago but the implementation started in 2002 initiated by PATH in collaboration with DOH of Cianjur District in West Java. This initiation followed by larger scale piloting in 2003 carried out by 5 international NGOs (CARE, Catholic Relief Services (CRS), Mercy Corps (MC), Save the Children US (SC), and World Vision International (WVI)) and the activities were done in several provinces in collaboration with District Health Offices (McNulty and Pambudi, 2008). PD program in Aceh Province initiated by

Save the Children in 1 village in Banda Aceh Municipality in 2003 but limited information is available (Nurmalaila, 2003).

4.2. POS GIZI IMPLEMENTATION

For the implementation of Pos Gizi, our project developed an operational model adopted from PD/Hearth framework developed by Sternin *et al* (1998) (*see annex 3*) and some modifications were made based on project consideration (see **figure 5**).

Figure 5. The Model of *Pos Gizi* implementation in Aceh Besar District
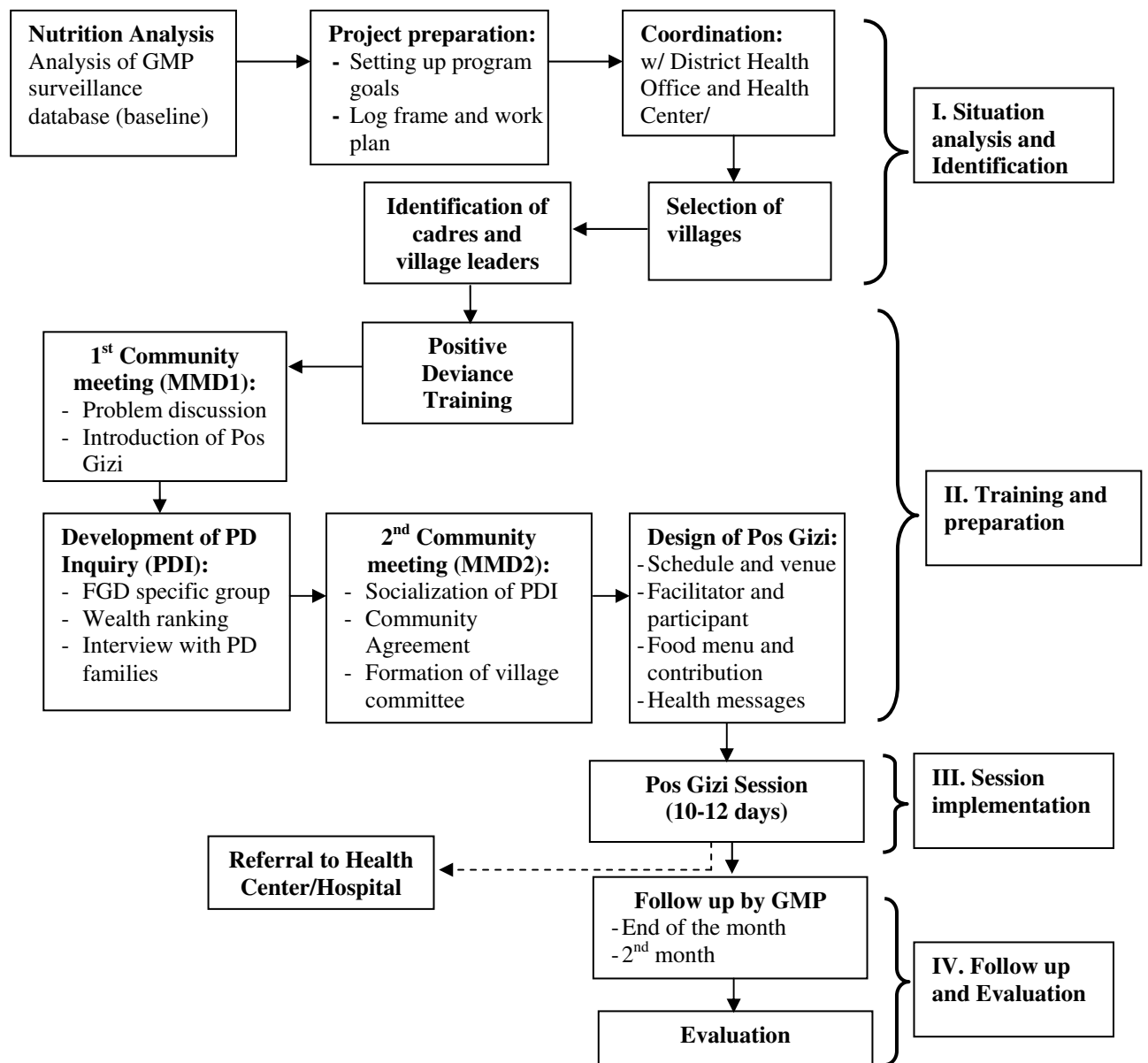
Project started Pos Gizi with the situational analysis rather than conducting identification of local resources as recommended in Hearth

framework (Sternin *et al.*, 1998). The reasoning was project decided to conduct Pos Gizi in the same villages where project has the other running activities such as GMP, so project do not need to identify new health volunteers or health resources available in the villages. In regards of situational analysis of malnutrition in children, project was using data from monthly surveillance database available in the project rather than conducting a specific baseline nutrition survey. The reason at that time was practical issue and also budget and time allocation. Due to this reason, analysis of the baseline results will be restricted in the interpretation and not to be generalized. Based on the findings, project set up program goals which are to rehabilitate malnourished children (mild, moderate, severe) in the targeted villages and to sustain the nutrition improvement after the project terminated.

Training was done 2 batches which accommodate followed by 48 participants which aimed to be training of trainers (TOT). The participants were community health volunteers (cadres), community leaders, health staffs and also project staffs. This training was done in 12 days and facilitated by national facilitators from PD network and Ministry of Health using module developed by CORE (2002). After finishing the training, participants expected to train other volunteer mothers to assist in Pos Gizi implementation.

The development of Positive Deviance Inquiry (PDI) was done according to the Hearth model by Sternin (1998) and also the PD guideline provided by CORE (2002). PDI developed through focus group discussions (FGDs) with several groups to derive general practices and interviews with positive deviant mothers to derive specific practices. PDI covers practices in child care, feeding and health care seeking behaviors (*see list of PDI in annex 4*). Based on the PDI findings, final design of *Pos Gizi* was developed consisted of the date, venue, participants, food menu and contribution from participating mothers. To ensure that community actively involved in the activities, community meetings were done and village nutrition committee was established. The role of this committee is to assist the implementation of Pos Gizi by conducting supervision and community mobilization.

Pos Gizi session was done in 12 consecutive days facilitated by 2 trained cadres and supervised by 1 village committee. Pos Gizi in Aceh Besar included children with mild, moderate and severe underweight. The implementation of Pos Gizi was integrated with GMP activities, counseling caretakers, vital events monitoring done by health staffs to find out whether there is any medical intervention or referral needed as recommended (Sternin *et al.*, 1998). Follow up only done during GMP activities at the end of the month and at second month to see whether children could maintain their weight gain or not (*see Annex 5 for details of implementation*).

4.3. POS GIZI RESULTS

4.3.1. Baseline results
For *Pos Gizi* purpose, a baseline taken from GMP session is in December 2006 which contained records on weight, height, WAZ, HAZ and WHZ. Data collected from 894 children in 36 integrated health post (Posyandu) of the total 56 Posyandu in Aceh Besar District. The interpretation of these findings is limited only for the area of work and not to be generalized for all population in Aceh Besar District.

a. Characteristic of the children
From 894 children participated in GMP session, 473 of them are male (52.9%) and 421 are female (47.1%). The youngest child was 6 months and the oldest was 59 months with the mean of 32.6 months (SD ±15.32 months). The distribution of children based on age group was almost similar in both sexes with slight variations. Based on the age distribution, the youngest group is children aged 6-11 months which constituted to 10.2% of all children and no children under 6 months recorded. According to author's observation this might indicates that the local culture not to expose young babies to outside their house is still practiced. GMP data also not covered all the children in the area, for comparison according to provincial health statistic report, in 2007 total children under five in Aceh Besar District was 28.776 children and only 18.005 children (62.5%) who were attending GMP session (Aceh PHO, 2008). This is why data from GMP might not sufficiently represent the whole children's nutritional status in the community.

b. Characteristic of the households
In the GMP group, most of the mothers (55.3%) aged between 20-29 years. For the mother's age at child birth, it is shown that majority of mothers (80.8%) gave birth at the age ranged from 20-34 years old. Only few (19.2%) mothers who gave birth below 20 years or over 35 which is considered as high risk group. More than two-thirds of the mothers (70.5%) completed either junior or senior high school followed by elementary school (23.7%) and academy/university degree with 5.8% and none were illiterate. Most of the mothers (95.6%) are not working as defined as housewife. But this result may also bias since according to author observation that many of these housewives they are not really jobless, they also assist their husband in the rice farm or garden especially during planting and harvesting time.

Most of the fathers (73.7%) have completed either junior or senior high school and none of them were illiterate. Most of the fathers are working in private sectors (64.1%) but in the database no further details are provided followed by farming/fisheries (22%) and others (13.9%). This farmer status is again also not a precise indicator for socioeconomic

status since there is no clear distinction between the lands owners with those who are only paid workers in the farm.

Most of the households (41.9%) are having only 1 child followed by two children (29.5%) and more than 2 children (28.6%). The other relevant finding for child caring is that 79.3% of households were only having 1 child under five in the family. The most common household's size were 3 (40.5%) and 4 (29%) although the calculation of family size is not only for core family members (father, mother, child) but also included other extended families living in the same house such as grandparents, siblings etc (*for complete characteristics see Table A in annex 6)*.

Prevalence of Undernutrition
Prevalence of child's undernutrition in the baseline presented as prevalence of underweight, stunting and wasting (*see Table B in annex 7 for details*).

Underweight
From the analysis shown that the prevalence of underweight (Z score <-2) in the area of work was 27.3% where 22.5% was moderate and 4.8% was severe. This prevalence is higher compared to the prevalence in Aceh Besar District from Basic Health Survey (*Riskesdas*) 2007 with 20.1% where 12.5% is moderate and 7.6% is severe (MOH, 2008c). If added with the mild underweight children (Z score -2 thru -1.01), the prevalence of underweight in the baseline will become 67.5%. The difference of project baseline results in underweight might be caused that *Riskesdas* was done more recent (2007) and also designed properly as a survey with sufficient sample size to represent the situation in whole district both rural and urban. The other possible reason is that project baseline data collected from rural areas especially those affected by Tsunami disaster where some of them even still living in temporary barracks with poor housing condition, environment and also livelihood that might also influence the outcomes. From the baseline also shown that the prevalence of overweight is very low (0.2%) and might indicate that overweight is not a problem in the project area of work.

From the multivariate regression analysis of underweight by child's and household's characteristics shows that child's age is significant risk factor for underweight. By the increasing of age, the risk of child being underweight is also significantly increase after age of 12 months with the age range of 36-47 months as the most important risk factor (see **Table 5**). This finding has confirmed the results of previous studies done in Vietnam and Kenya that stated that it might be related with the weaning process and introduction off complementary feeding and also poor child caring (Bloss *et al*., 2004; Hien *et al*., 2009).

Socioeconomic status is known has influence to underweight (Kikafunda *et al.*, 1998; Hien *et al.*, 2009). In this study father's occupation is used as proxy variable for socioeconomic status, but no clear cut defined to interpret the wealth ranks. Father's occupation as private employee found to be a protective of getting underweight (OR= 0.628; 95%CI=0.425-0.927; P<0.05). The term 'swasta' that used in the database to reflect status as private employee is a broad term that commonly used by local people to indicate all type of works in non public sector. It is very difficult to distinct between those who are working in the private companies (such as banks, hospitals, etc) which are usually having better socioeconomic status compared to those who are working in other private sectors (such as storekeeper, mechanics, etc). Thus the interpretation of private employees has better socioeconomic status compared to the farmer as reference value as a protective factor is rather biased.

Table 5. Significant characteristics for underweight by multivariate regression analysis

Characteristics	n	% Under weight	Adjusted aOR	95% CI
(1) Child's age (months)				
6-11^			1	
12-23	91	15.4	1.707	.838; 3.478
24-35	201	22.9	2.824**	1.410; 5.654
36-47	208	29.8	3.184**	1.602; 6.329
48-59	212	34.0	2.265*	1.110; 4.622
Total	182	27.5		
	894			
(2) Father's occupation:				
Public servant	44	20.5	.479	.209; 1.093
Private employee	456	25.5	.628*	.425; .927
Others	70	27.1	.721	.382; 1.362
Farmer/fisherman^	180	36.7	1	
Total	**820**			
Missing	74			

Note: ^) reference; *) significance level P<0.05; **) significance level P<0.01

Child's sex is found to be not a significant risk for underweight which is perhaps showing that there is no different treatment between male and female children. Mother's age and mother's age at birth also found to have no influence to underweight which similar to the finding from other studies in Uganda, Vietnam and Bangladesh (Kikafunda *et al.*, 1998; Rayhan and Khan, 2006; Hien *et al.*, 2009). Mother's education, mother's occupation, father's education, family size, number of children and more than one child under five in the households are found to be not significant. These results are not confirming the results from other studies which found that these variables are significant (Kikafunda *et al.*, 1998; Hien *et al.*, 2009). No particular information available to support this finding but

perhaps since the data collected only from children who attended GMP session might give bias that can influence the outcomes (*see Table C & D in Annex 8 & 9 for complete results*).

Stunting
The prevalence of stunting (Z score <-2) in the baseline is 45.1% where 27.9% is moderate stunting and 17.2% is severe stunting. This finding is again higher compared to *Riskesdas* with 39.4% where 14.4% is moderate and 25% is severe (MOH, 2008c). If added with the mild stunting children (Z score -2 thru -1.01), the prevalence of stunting in the baseline will become 79%.Perhaps the same reasoning for underweight mentioned above is also applicable for this finding.

From multivariate regression analysis it is found that child's age and has significant association with stunting. It shows that the risk of being stunted is increased by age and then decrease again as children grow older with children aged 36-47 months as the most important risk (see **Table 6**). This finding is confirmed the results from studies done in Uganda, Kenya and Ethiopia (Kikafunda *et al.*, 1998; Bloss *et al*., 2004; Silva, 2005). The same reasoning as in underweight group is also applies for this finding. Another characteristic which is found significant is mother's age 30-39 years old which is found to be protective and this finding is contradicting with the study from Uganda which found that mother's age has no significant effect on stunting (Kikafunda *et al*., 1998). No clear reasoning for this finding but it might be also related to variables such as birth spacing, birth order or others that are not captured by this study.

Table 6. Significant characteristics for stunting by multivariate regression analysis

Characteristic	n	% stunting	Adjusted aOR	95% CI
(1) Child's age (months)				
6-11^	89	30.3	1	
12-23	184	52.2	2.212**	1.227; 3.987
24-35	191	46.1	2.191**	1.215; 3.952
36-47	196	48.5	2.400**	1.335; 4.316
48-59	171	40.4	1.557	.851; 2.850
Total	**831**			
Missing	63			
(2) Mother's age (years):				
15-19	14	35.7	.805	.240; 2.701
20-29^	417	51.3	1	
30-39	273	36.3	.570**	.405; .804
40+	51	49.0	.813	.429; 1.540
Total	**755**			
Missing	139			

*Note: ^) reference; *) significance level P<0.05; **) significance level P<0.01*

Other characteristics such as child's sex, mother's age at birth, mother's occupation, father's education, father's occupation, household's size, number of children and availability of more than one child under five in the households are found to be not significant. In other studies, these variables are giving significant risk for stunting (Kikafunda *et al.*, 1998; Silva, 2005; Rahman and Chowdhury, 2007) No particular reason which available to explain this finding, but might be bias in the baseline selection is one of the potential causes (*see Table E & F in Annex 10 & 11 for complete results*).

Wasting
The prevalence of wasting (Z score <-2) in the baseline is 7.4% where 6.1% is moderate and 1.3% is severe wasting. The prevalence of wasting found to be lower compared to the *Riskesdas* 2007 with 23.2% where 9.6% is moderate and 13.6% is severe wasting (MOH, 2008c). If added with the mild wasting (Z score -2 thru -1.01), the prevalence of wasting in the baseline will become 32.2%.Since wasting is reflecting acute malnutrition, perhaps children in the area of work who came for the GMP are coming from families that are having better awareness on child caring which may contribute to the child nutritional status. Based on the analysis done to the same characteristics used in underweight and stunting, none of them are found to have significant influence to child's wasting status. This is again inconsistent with the findings from previous studies (Bloss *et al.*, 2004; Hien *et al.*, 2009) (*see Table G in Annex 12 for details*).

4.3.2. Pos Gizi Results after session and follow up

a. Characteristic of children
From 89 *Pos Gizi* participants registered, 70 children (78.6%) were participated to at least 10 days of *Pos Gizi* sessions as we considered as 'completed' and 19 children (21.4%) were participated to less than 10 days as we considered as 'drop out'. For the further analysis only these 70 children who were completed *Pos Gizi* session will be included in the calculation. Since Pos Gizi also included children with mild underweight status, thus these children will also be included in the further analysis of Pos Gizi results.

From 70 children who were completed *Pos Gizi* session, 31 (44.3%) are male and 39 (55.7%) are female. The biggest group was children aged 48-59 months with 32.9% followed by children aged 12-23 months, 24-35 months and 26-47 months with 25.7%, 22.9% and 18.6% respectively. The nutritional status at *Pos Gizi* entry according to new WHO 2007 growth reference shows that most of the children (41.1%) are moderate underweight followed by mild underweight (37.1%) and severe underweight (21.4%). **Figure 6** showing that female children are having higher proportion of moderate and severe underweight compared to the male group although there is no statistical difference found (P=0.363).

Figure 6. Percentage of underweight status as *Pos Gizi* entry by child's sex
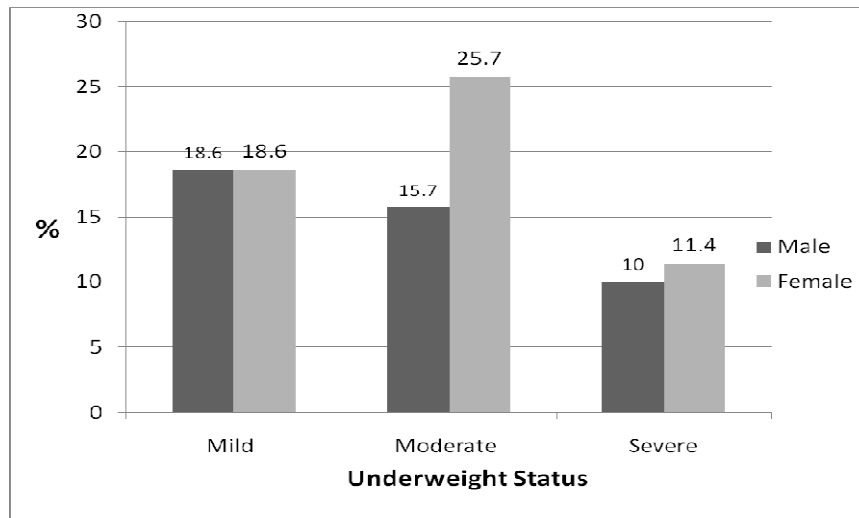
b. Characteristic of the households

Mother's age in Pos Gizi group is mainly 20-29 years old (61.5%) followed by 30-39 years old (29.2%). Most of mothers were giving birth at normal age range 20-34 years old (81.5%) meanwhile some mothers (18.4%) were giving birth either below 20 years or over 35 years. For mother's education, it is found that most of the mothers are completed junior high school (47.7%), followed by elementary school (29.2%) and the rest are completed senior high school and higher (23.1%). For mother's occupation, all of mothers in Pos Gizi are housewife. For father's education, it is found that most of the fathers are completed junior high school (40.0%) followed by senior high school (36.9%). Most of the fathers (66.2%) are working as private employee followed by farmer (22.1%). For the family size, the most common household's size is 3 (40%) followed by 4 (30%), 5 (18.6%) and 6 (11.4%). Most of the households only have 1 child (37.1%), 2 children (32.9%), and the rest (30%) have 3 or more children. More than a half of households only have 1 child under five (58.5%) and the rest (41.4%) have more than 1 children under five. These characteristics are not meant to be compared with the characteristics in baseline group since Pos Gizi group only included children with underweight status which might give bias (*Details see Table H in Annex 13*).

Pos Gizi outcome measurement

To measure the success of Pos Gizi, project referred to guideline established for PD/Hearth for monitoring which suggest that 200 grams weight gain during 10-12 days of *Pos Gizi* session and additional 200 grams during 2 weeks after the session with 400 grams is considered as sufficient for catch-up growth (Sternin *et al*., 1998; CORE, 2003). The 400 grams weight gain at the first month was used by project to measure the success of *Pos Gizi*. This is used as a proxy that indicates that

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mothers could adopt the positive behaviors practiced during *Pos Gizi* session. Children who could achieve 200-399 grams considered to have normal weight gain. This cut off values also used by other projects in Indonesia (Dirja and Apon, 2007; McNulty and Pambudi, 2008). For follow up, project decided to do it through GMP in the second month and using the same 400 grams weight gain from the previous month to be considered as maintained catch-up growth. This interval of follow up is different with the national evaluation which followed up the children in the third months although with the consequence that many of the children were lost during the follow up (McNulty and Pambudi, 2008)

Outcome at the end of session
After 10-12 days of *Pos Gizi* session, children were expected to gain ≥ 200 grams to be considered as sufficient. From the measurement, 44.3% of children could gain sufficient weight which is less compared to national evaluation result with 59.6% (McNulty and Pambudi, 2008). (see **Table 7**). The difference might be caused by some technical differences in the implementation, community where the activity took place and also the number of children participated. The national report evaluate 9,997 children from 564 *Pos Gizi* activities done in urban or suburban setting meanwhile *Pos Gizi* in Aceh Besar district done only for 70 children in 6 rural villages.

Table 7. Weight gain at the end of 10-12 days *Pos Gizi* session by nutritional status at entry

Nutritional status at *Pos Gizi* entry (underweight)	Weight gain at the end of 10-12 days *Pos Gizi* session			Total
	< 200g	200-399g	≥ 400g	
Mild (z = -2 thru -1.01 SD)	12 (46.8%)	8 (30.8%)	6 (23.1%)	26
Moderate (z = -3 thru -2.01 SD)	18 (62.1%)	5 (17.2%)	6 (20.7%)	29
Severe (z = < -3 SD)	9 (60.0%)	5 (33.3%)	1 (6.7%)	15
Total	39 (55.7%)	18 (25.7%)	13 (18.6%)	70

In terms of distribution, more children with mild underweight status at entry (53.9%) could gain sufficient weight compared to children with severe (40%) and moderate underweight (37.9%) at entry. This might be due to children with mild status are having better appetite and having better health status. The percentage of children who failed to gain sufficient weight (55.7%) is higher compared to the finding from national evaluation with 41.4% (McNulty and Pambudi, 2008). The possible reason might be that children were not consuming enough extra nutrients which were served during the session. The other reason is that, the foods prepared during Pos Gizi session are not having enough calories or protein since there was no specific measurement done. The presence of diseases might also contribute since during the session 22 children were recorded to have illnesses where among them 20 children (91%) are belong to the

group of children who failed gaining sufficient weight and the rest (9%) are belong to group of children who gained 200-399 grams. 6 children recorded having problem with appetite, 5 with fever, 4 with diarrhea, 3 with cough, 1 with TB and 1 with common cold. **Figure 7** shows that after completed the session, the nutritional status of the children are slightly shifted from the initial status which is found to be not significant (P=0.530).

Figure 7. Nutritional status at *Pos Gizi* entry and at the end of 10-12 days session (exit)
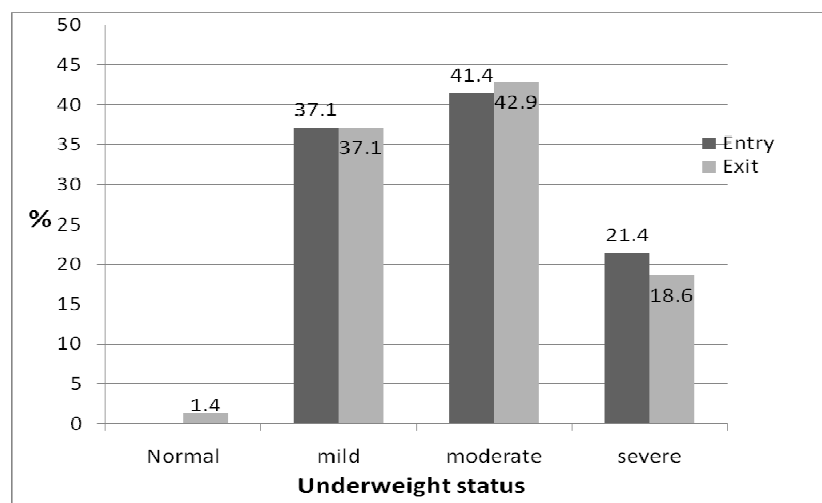
Outcome at the first month
After finished the 10-12 days of *Pos Gizi* session, children and their mothers then asked to practice the positive behaviors at their home. From 70 children who completed *Pos Gizi* session only 63 children who came and weighed meanwhile 7 children (10%) were missing. This missing data is lower compared to national evaluation result which shows 48.5% of children who completed the Pos Gizi session didn't come for weighing at the end of the month (McNulty and Pambudi, 2008). No particular information is available regarding to the cause of missing since no proper home visits were done to track the missing children.

At the first month children who gained weight ≥400 grams are considered as catch-up growth, 200-399 grams as normal weight gain and <200 grams as failed. From the weighing result is found that only 38.1% of children could achieve catch-up growth (see **Table 8**). This percentage is lower compared to the national evaluation result with 45% with slight variation among different implementers (McNulty and Pambudi, 2008). No particular information available but this might be due some problems in adopting the new behaviors at home or children got sick. Another reason might be due to some differences in technical issues, location and the local customs and practices.

Table 8. Weight gain at the first month by nutritional status at entry

Nutritional status at *Pos Gizi* entry (underweight)	Weight gain at the 1st month			Total
	< 200g	**200-399g**	**≥ 400g**	
Mild (z= -2 thru -1.01 SD)	10 (43.5%)	7 (30.4%)	6 (26.1%)	23
Moderate (z= -3 thru -2.01 SD)	6 (23.1%)	7 (26.9%)	13 (50.0%)	26
Severe (z= < -3 SD)	5 (35.7%)	4 (28.6%)	5 (35.7%)	14
Total	21 (33.3%)	18 (28.6%)	24 (38.1%)	63

If added with the percentage of children who could gain normal weight, there will be total 66.7% or meaning 2 out of 3 children could gain ≥200 grams as the minimum of normal weight gain. In terms of distribution, percentage of children who could achieve catch up growth is higher in the moderate (50%) group followed by severe group (35.7%) and mild group (26.1%). These results are closer to the finding from Vietnam and Indonesia that found children with poorer nutritional status at entry will tend to gain more weight compared to children with milder status (McNulty and Pambudi, 2008). Univariate analysis done to some child's and household's characteristics available in the project database against catch-up growth (weight gain ≥ 400g) at the end of the month shows that none of those characteristics are found to have significant effect to the achievement of catch up growth (*see Annex Table I in annex 14*).

Figure 8. Nutritional status at *Pos Gizi* entry and at the first month
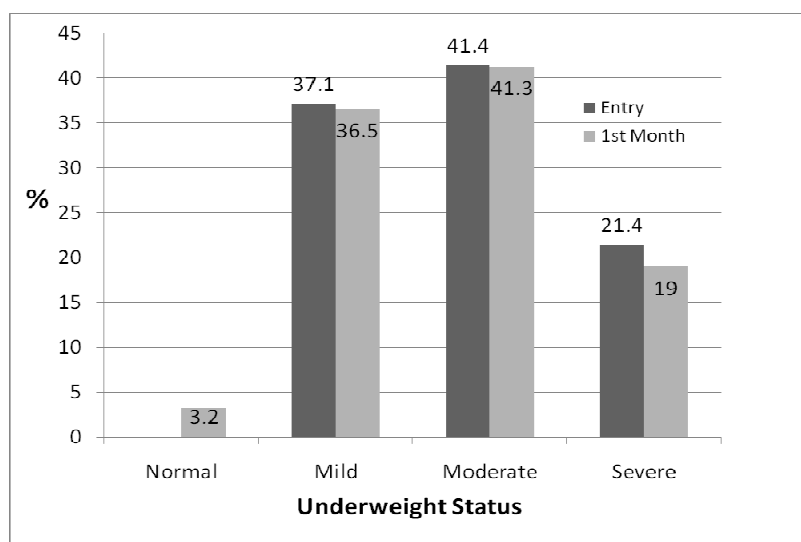
Although in terms of weight gain, at the first month *Pos Gizi* could show good results but the changes of underweight status seems to be minor. It is shown that there are only few children (3.2%) who could reach normal and very slight reduction on the percentage of children with mild, moderate and severe underweight with 0.6%, 0.1% and 2.4%

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respectively (see **Figure 8**). These slight changes may indicate that although 38.1% children are gaining catch up growth but the amount is still not enough to make children shift from their initial nutritional status to better status. Indeed they basically improved but still within their current underweight status range thus didn't give any significant changes. These slight changes before and after *Pos Gizi* is found to be no significant difference (P=0.204).

Outcome at the second month
Follow up in the second month after the end of *Pos Gizi* was done to see whether children could achieve or maintained their catch-up growth achievement. ≥400 grams weight gain from the first month is used as the indicator of achieve or maintained catch-up growth. Measurement was done during GMP thus only children who attended were measured. No home visit was done to collect the missing children. 55 children attended the second GMP (78.6%) meanwhile 15 children (21.4%) were missing. The number of missing children is quite significant and might influence interpretation of the results.

Table 9. Weight gain at the second month by nutritional status at *Pos Gizi* entry

Nutritional status at *Pos Gizi* entry (underweight)	Weight gain at the 2nd month			Total
	< 200g	200-399g	≥ 400g	
Mild (z = -2 thru -1.01 SD)	10 (50%)	3 (15%)	7 (35%)	20
Moderate (z = -3 thru -2.01 SD)	18 (78.3%)	3 (13%)	2 (8.7%)	23
Severe (z = < -3 SD)	7 (58.3%)	2 (16.7%)	3 (25%)	12
Total	35 (63.6%)	8 (14.5%)	12 (21.8%)	55

From the **Table 9** above we can see that only 21.8% children who could achieve catch-up growth in the second month much less compared to the first month. The catch-up growth group children are mainly dominated by children with mild underweight at *Pos Gizi* entry. Overall, there are only 36.3% children who could gain minimum of normal weight gain or more which is almost half decrease from the previous finding at the first month with 66.7%. Although significant number of missing children might influence this outcome but this finding still become a serious concern.

Among the group of children who could gain catch-up growth at the first month, only 8.3% could maintain their catch-up growth at the second month and 12.5% could achieve normal weight gain. Meanwhile 63.6% of children couldn't even gain minimum of normal weight gain (see **Table 10**). This result is somehow surprising and not meeting project expectation where the positive behaviors practiced during *Pos Gizi* suppose to result sustainable child's growth. The unavailability of

information concerning to the reasoning behind this low achievement in the project database is somehow disappointing.

Table 10. Weight gain at the second month by weight gain at the first month

Weight gain at the 1st month	Weight gain at the 2nd month			Total
	< 200g	200-399g	≥ 400g	
< 200 grams	6 (37.5%)	4 (25%)	6 (37.5%)	16
200 – 399 grams	10 (66.7%)	5 (33.3%)	0	15
≥ 400 grams	19 (79.2%)	3 (12.5%)	2 (8.3)	24
Total	35 (63.6%)	8 (14.5%)	12 (21.8%)	55

The trend of failing also found in the group of children who could gain normal weight (200-399 grams) at the first month where only 33.3% could gain the same weight and none of them could gain catch-up growth at the second month. Surprisingly, opposite to the situation found in other groups, there are significant proportion (37.5%) of children who failed in the first month could gain catch up growth at the second month which contributed to half of total catch up growth at the second month. Again unavailability of information makes it difficult to interpret, but might be these children were sick at the first month and then recovered in the second month. Another possibility is that mothers and children might need some time to adopt the new behaviors.

Challenges
The high drop out from session is one of problem during the implementation of *Pos Gizi* by project. Although no proper investigation was done, but from information from fields staffs who facilitated the session said that several mothers were complaining about the duration of one session (12 days) and also they have to bring contribution on daily basis. They considered it as too long and they also not able to come on daily basis because of other appointments. Among those who drop out, 16 children (84.2%) were having moderate underweight status and 3 children (16.7%) were having mild underweight status at *Pos Gizi* entry. Interestingly, there were no children with severe underweight status at entry who drop out from Pos Gizi. This might be due to mothers with severely malnourished children felt that their children's poor nutritional status is a serious problem thus they interested to join the program.

The problem with mother's adherence also found during the follow up at the end of month and at the second month. There are 10% and 21.4% of children were not attending first GMP and second GMP respectively. Overall, only 61.8% who could finish all the sequences until the second follow up. No investigation was done to find out why many children are not coming for follow up. The problem with adherence also found in the national evaluation report which mentioned from total children registered

at the beginning, only 74.9% who could complete 10-12 days *Pos Gizi* session. Among those who completed 10-12 days of *Pos Gizi* only 48.5% who attended the first GMP and 28.6% attended GMP in the third month of follow up (McNulty and Pambudi, 2008). This high proportion of children who lost during follow up might to some extend influence the outcomes of Pos Gizi on child's nutrition and also could be the source of bias.

CHAPTER V   DISCUSSION, CONCLUSION AND RECOMMENDATION

5.1. DISCUSSION

Child's malnutrition
Child's malnutrition in Aceh Besar District is an important public health problem considering to the high prevalence of underweight, stunting and wasting is inherent with the finding in national level (MOH, 2008c). The high prevalence is similar to the findings in other developing countries such as Vietnam, Bangladesh and Kenya (Bloss *et al*., 2004; Rayhan and Khan, 2006; Hien *et al*., 2009). The result from project baseline even revealed higher prevalence especially for underweight and stunting in the area of work compared to the prevalence in Aceh Besar District. This might be due to project was working in communities affected by tsunami and some of the families also still living in barracks. Although bias in the selection might also influence the outcomes but somehow this findings still valid to be used as indication of the malnutrition situation in the area of work.

Child's malnutrition determinants
Many important determinants have been identified using UNICEF's malnutrition framework as presented in Chapter III. Inadequate dietary intake of nutrients was reflected by proxy that 40% of the households are having lower energy and protein intake compared to the national average (MOH, 2008c). ARI, diarrhea, pneumonia and malaria are the most common diseases found. The presence of these two immediate causes having immediate influence to child's malnutrition (UNICEF, 1992). Food insecurity is due to the limited food crops production and inability to pay since the food prices are raising. Poor child care as indicated by exclusive breastfeeding practices and IYCF that are still poorly practiced by some households (BPS, 2008).

Poor health care seeking practices and self treatment are still common in the community. There are still 19.5% of mother who are not completed elementary school or even having no education at all which may also contribute to the child care process (BPS, 2008). Problem in accessing health care services mostly due to financial problem since most of the households are using out of pocket payment for services compounded by the fact that many households are still living under the poverty line (MOH, 2008c; World Bank, 2008). Unhealthy environment due to lack of safe drinking water sources may force people consume poor quality of water that might be contaminated with dangerous microbes. Few people have toilet facilities and more than 1/3 of households that are not using toilet facilities and defecate in the bush or river might become source of contamination (MOH, 2008c).

For the basic determinants, prolonged conflict and tsunami had caused destruction of potential resources such as natural resources, human resources, and also infrastructures. This caused rice fields and plantations are no longer fertile and couldn't produce any food crops which might cause poverty and food shortage. Poor arrangement of financial allocation for health sectors is considered to give significant contribution to the failure of improving health outcomes include the nutrition outcomes. Political changes due to decentralization and the latest arrangement of special autonomy as the result of MOU of peace is still fragile due to the lack of capacity in the district level to manage the programs (World Bank, 2008).

From the analysis of child's and household's characteristics are showing that child's age is important risk factor for both underweight and stunting. This is confirming the result from previous studies (Bloss *et al*., 2004; Hien *et al*., 2009). Other important characteristics are father's occupation that shows father's occupation as indication of socioeconomic status found to be protective against risk of child's underweight and mother's age which found to be protective against child stunting.

Pos Gizi implementation
Positive Deviance in nutrition (*Pos Gizi)* intervention is designed to address several determinants of child's malnutrition within the target communities. PDI that is used as the reference comprises of three main components, which are child caring, child's feeding and health care seeking behaviour practices. This will address the immediate and underlying causes of malnutrition as discussed above. Pos Gizi also works on behavior change which accommodates local customs and cultures to ensure the appropriateness and also sustainability (Sternin, 1998; CORE, 2002).

The duration of Pos Gizi done for 12 days is the same with the international practices (Wollinka *et al*, 1997; Sternin *et al*., 1998). The feedback given by some mothers that felt 12 days is too long might be also considered as valuable input to find out appropriate duration which is acceptable for mothers but also still realistic. Pos Gizi session in Aceh Besar was facilitated by trained community volunteers (cadres) who are also in charge for GMP session, which is slightly different with the practice in Haiti where they recruited mothers and trained them only to facilitate PD-NERP session (Wollinka *et al*., 1997; Bolles *et al*., 2002). The reasoning why project selected cadres was since they were already trained about the basic of nutrition and health issues before and also since they will involve in the monitoring through GMP.

The integration of Pos Gizi with other components such as health education and GMP makes Pos Gizi aligned with the existing community nutrition program. The other benefit is that Pos Gizi and GMP program can

share the same resources such as the 'cadres', venue, equipments and also documentation. The other Pos Gizi activity in West Java carried out by Islamic Relief International (IRI) also integrates Pos Gizi with the nutritional clinic staffed by pediatrician to provide careful assessment and therapy to children with severe malnutrition who were referred by Pos Gizi (Dirja and Apon, 2007). Meanwhile Pos Gizi in Aceh Besar and other implementers commonly used the existing health facilities structure as health centers or hospital that are available in the area as referral (Wollinka *et al*, 1997; McNulty and Pambudi, 2008). Project installed vital event monitoring and also spare one day during the session to allow health staffs from Puskesmas (health center) to come and do physical examination to see whether children need referral.

As discussed in the previous chapter, high dropout is a big problem during Pos Gizi implementation either in project or in national evaluation result (McNulty and Pambudi, 2008). The fact that no proper home visits were done by project was incoherent with international recommendation where regular follow up by community health volunteers (cadres) should be done to supervise and assist mother in practicing the behaviors (Wollinka *et al*, 1997; Bolles *et al*., 2002). Since no information was gathered, no specific reasoning is available to explain this situation. It could be related to complain from mothers about the duration of Pos Gizi but also might be due to other reasons that need to be explored.

Pos Gizi Outcomes
Pos Gizi in Aceh Besar goal was to rehabilitate children 1-4 years old with mild, moderate and severe underweight status, the same as other projects in Indonesia and in Haiti. Meanwhile PD in Vietnam was targeting children under 3 years with severe only and in Bangladesh for children under 2 years with mild, moderate and severe (Wolinka *et al*, 1997; Bolles *et al.*, 2002; McNulty and Pambudi, 2008). The reasoning why project also include the children with mild status was to prevent them from falling to the worse status. The lesson learned from Aceh Besar Pos Gizi shows that only few children with mild status at entry (26.1%) who could gain catch up growth at first month (≥ 400g). The opposite situation found from children with moderate and severe status at entry where they could achieve high percentage of catch up growth with 50% and 35.7% at the first month respectively. This is once again to some extend confirmed the result from other projects in Vietnam and Indonesia that children with more severe status will achieve more weight gain compared to children with milder status (Wollinka *et al*., 1997; McNulty and Pambudi, 2008). It might be better not to include children with mild status in Pos Gizi and let them taken care by regular GMP. But the fact that the positive behaviors derived from PDI are important, perhaps these behaviors can be socialized to the mothers in GMP during education and promotion session.

For the overall outcomes, 38.1% of all children completed the 10-12 days session could achieve catch up growth at the first month. This result is lower compared to the results from national evaluation (45%) and also from Bangladesh (85%) (Bolles *et al.*, 2002; McNulty and Pambudi, 2008). Besides the high dropout and loss of follow up might influence the outcomes, the possibility that the positive behaviors selected as the reference were not sufficient or difficult to be adopted by mothers might also contribute to the low achievement. But the fact that 28.6% of children could achieve normal weight gain at the first month is also a good achievement. To look for the sustainability, follow up at the second month shows only 21.8% of children who could maintain their catch up growth which is lower compared with finding from Haiti (40%) and Bangladesh (90%) (Wollinka *et al.*, 1997; Bolles *et al.*, 2002). Other result from national evaluation shows only 15% of children could maintain their catch up growth at the third month (McNulty and Pambudi, 2008). This roughly indicates that the outcomes of Pos Gizi in Indonesia are rather low compared to the achievement in other countries. The high proportion of children who were drop out and lost during follow up might be one of the causes for this low achievement besides other factors that might be also related.

5.2. CONCLUSION

- Child's malnutrition is a real problem in Aceh Besar District as described in the previous chapters. The results from the national survey and project baseline confirmed that the prevalence of underweight, stunting and wasting are higher compared to the average in national level. This high prevalence is also similar to the finding in other developing countries.

- All of the determinants in UNICEF (1992) malnutrition framework are found Aceh Besar District which might contribute to the outcome of high malnutrition prevalence. These determinants are inadequate dietary intake, diseases, household food insecurity, inadequate maternal and child care, insufficient health services and unhealthy environment, potential resources, economic and political structures. The analysis of some characteristics in the baseline also to some extend confirms the influence of particular child's and household's variables to the child's undernutrition status, however others do not.

- Positive Deviance in Aceh Besar (Pos Gizi) has shows that this approach is a potential strategy to improve child's nutritional status. 38.1% children could gain catch up growth and 28.6% children could gain normal growth at the first month indicates a promising result although still lower than the results from national and international. Problems with adherence might also influence the Pos Gizi outcome especially for the second month of follow up to see whether children could sustain their growth. Analysis to the child's

and household's characteristics against catch up growth at first month shows no significant influence. Insufficient qualitative information available in the project documents also become a problem in analyzing to what extend mothers could adopt the new behaviors.

5.3. RECOMMENDATION

The recommendation addressed to improve the implementation of Positive Deviance approach in nutrition (Pos Gizi) intervention to address child's malnutrition based on the project findings.

5.3.1. Pos Gizi implementer

- Conduct baseline survey with proper methodology prior to the implementation of Pos Gizi to see the real prevalence of undernutrition in the area of work. Important child's and household's characteristics based on literatures must be collected for further analysis.
- Selection of children for Pos Gizi activity must focused more on children with moderate and severe underweight group.
- Home visits must be done to children who drop out during Pos Gizi session to find out the causes and also to locate and measure children who didn't come for follow up in the first or second month to avoid high lost of follow up. Home visit also needs to be done after the completion of 10-12 days of session with specific interval to see whether mothers have problems in adopting the new behaviors. This visit can be done by community health volunteers (cadres).
- Proper documentation both for quantitative and qualitative data during the implementation.
- Integrate Pos Gizi with existing community nutrition programs to create alignment with the government activities as much as possible in order to not creating a parallel system and also to share resources such as the cadres, equipments, venue and also reporting.
- Integrate Pos Gizi with other activities to empower communities such as livelihood programs or environmental health programs.
- Conduct evaluation and share the results of with the local stakeholders including to the community members to show the achievements and challenges.
- Increase the role of local stakeholders by involving them since the planning activities to improve ownerships and sustainability of the program.

5.3.2. Policy Maker

- Support the current implementation of Pos Gizi which is commonly done by NGOs through linking with the local authorities, providing assistance needed especially on data and also coordinate the NGOs to avoid overlapping.
- Conduct careful cost and effectiveness analysis to see whether Pos Gizi is a good value for money to be scaled up as a national program.
- Look for partnerships with donors and implementing NGOs to carry out bigger piloting program for Pos Gizi with careful implementation which can represent the real setting and diversity in the community.

5.3.3. Research

- Nutrition survey needs to be carried out to look for to what extend the determinants could influence child's malnutrition in Aceh Besar District to find the most significant characteristics to be used as the base of district nutrition program planning. This will avoid the unnecessary programs and waste of resources in the already overstretch local health system.
- Qualitative study need to be carried out to see how mothers could or couldn't adopt the new behaviors which are practiced during Pos Gizi at home to see the supportive factors and the challenges.
- Study needs to be carried out to see the sustainability of the adopted behaviors and the outcomes in the households after few years of Pos Gizi completion.

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ANNEXES
Annex 1. Map of Indonesia

Annex 2. Map of Aceh Province and Aceh Besar District
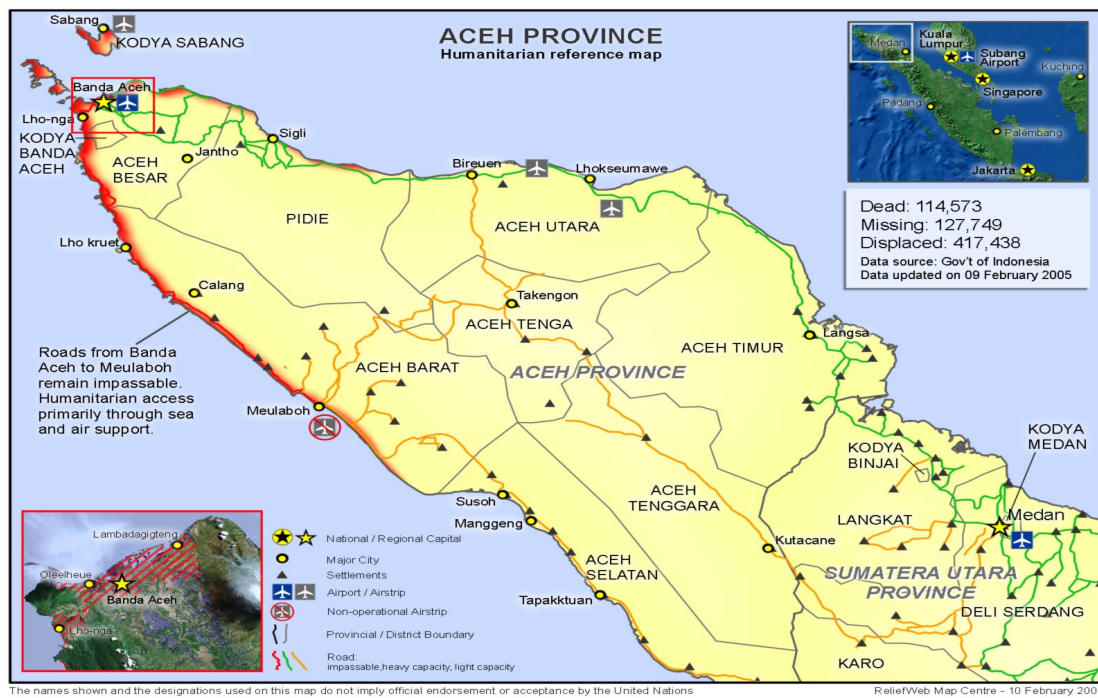
Annex 3. Conceptual framework for designing a Hearth program

Identification of Local Resources

• Village Health Committee
• Health Volunteers
• Formal and Non-formal Health Resources

Situational Analysis Of Malnutrition in Children

• Baseline Nutrition Survey
• Focus Group Discussions
• Setting-up Program Goals

Positive Deviance Inquiry

• Identification of Successful Feeding,
• Caring and Health Seeking Practices

Design Of A NERS Based On PDI Findings

• NERS Menu and Messages
• Positive Deviance Food Contribution
• NERS Protocols
• Integration with Other Existing Programs

Hearth Components

• Counseling Caretakers
• GMP Program
• NERS (Phase 1 only)
• Vital Events Monitoring
• Community Management of NERS

(Sternin et al, 1998)

Annex 4. Sample of Positive Deviance Inquiry (PDI) in Aceh Besar

Feeding practice	
General practice	**Specific practice**

1. Colostrums was given to baby
2. Complementary feeding
3. Feed the children 3 times/day
4. Eat snack sold in stores
5. Father eat first
6. Children drink formula milk
7. Not giving exclusive breastfeeding
8. Weaning period:
   - male children : 19 months
   - female children : 21 months
9. Type of food: rice, vegetables and fish.
10. Children still breastfed
	1. Breastfeeding up to 2 years
	2. Breastfeeding initiated at 30 minutes after delivery
	3. Exclusive breastfeeding
	4. If children sick and lost appetite, mothers gave cooked rice water
	5. Feed the children 3 times/day
	6. Mothers assist children in eating
	7. Cassava leaves soup + coconut milk 4 times/week
	8. Fish 3 times/day
	9. Snack: bread filled with green bean
	10. Coconut water + milk 4 times/week.
	11. Homemade green bean porridge.
	12. Always add fried ground nut for breakfast

Caring Practices	
General practices	**Specific practice**
1 Mothers assist children in eating 2. No special food when child is sick 3. Persuade children to eat 4. Mothers watch children play 5. Giving advice to children if they do something wrong 6. Younger children play with their older siblings 7. Fathers play with children 2x/week 8. Mothers bath the children and apply talc powder 9. Mothers put children cloth on, apply kayu putih oil	1. Fathers and grandmothers assist mother to take care children every day 2. If the child is sick, mothers prepared boiled eggs and not rice.

Hygiene Practice	
General practices	*Specific practice*
1. Children wear sandals if the go out from house 2. Take a bath 3 times/day using soap 3. Cutting nails 1x/week 4. Defecation in public toiled 5. Cattles cage detach from house 6. Clean the house every day 7. Wash the vegetables before being cooked	1. Fathers cut the child's nails 1-2x/week 2. Washing child's hand using soap after defecation. 3. Water for cooking kept in closed jerry cans 4. Pray before eating 5. Washing hands before and after eating with bare hand
Health seeking practice	
General practices	*Specific practice*
1. Bring sick child to health center 2. Bring children to Posyandu every month for weighing 3. Bring children for vaccination 4. Growth monitoring chart kept by mothers 5. Distance to health facilities ± 2 km	1. Children having completed vaccination

Annex 5. Details of Pos Gizi implementation model in Aceh Besar District

1. Situation analysis and identification

Nutrition situation analysis
Situation analysis was done to identify the nutrition problem in the area of work. For this *Pos Gizi* activity no specific baseline survey was done but the baseline information derived from routine GMP data recorded in growth monitoring surveillance database in INTHAN project. Surveillance database were collected only from children who are attending GMP session in Posyandu in the project area of work. This becomes the limitation of data due to bias or data insufficiently represent the whole children in the area of work since some sick children or malnourished might not attend the GMP session for measurement and remain undetected. Data then entered into the database and interpreted as normal, mild, moderate or severe status based on WHO 2007 growth reference. The results of this baseline might give indication of the nutrition situation in the project area of work and will be presented in results and discussion sub chapter.

Project preparation
This high prevalence of underweight was the main concern of project. Based on this finding, project started to look for possible intervention which is community based, local specific and also sustainable. The option goes to *Pos Gizi* as project also noticed that in other provinces CARE also has experienced in doing the same activities to reduce malnutrition among children under five. Based on this decision, project developed a log frame and work plan including budget and procurement plan for *Pos Gizi* to be integrated with other activities in the project.

Coordination
Coordination with nutrition section in District Health Office (DHO) Aceh Besar was done in order to inform and getting approval for the activity as well as technical supports. Coordination with the Head of Health Centers (Puskesmas) and also nutrition staffs was done to get approval to do the activity and also support for the implementation. During the period of implementation, coordination was done with 5 Puskesmas where the *Pos Gizi* took place.

Village selection
Village selection was done by project in coordination with Puskesmas using eligibility criteria listed below:
  1. Within project area of work
  2. Availability of active integrated health post/Posyandu
  3. Availability of active village midwife
  4. Availability of active community health volunteers (cadres)

5. Having minimum 10 children aged 12-59 months with mild, moderate or severe underweight

These criteria set by project in order to ensure that the activity will run smoothly and also to improve the sense of ownership from community and local health providers. To select the villages, criteria 1 to 4 are defined by project staffs from available records and also from confirmation from project field officer who are responsible for the sites. Since the sites are routinely supported by project most of the sites are having active Posyandu, active cadres and village midwives. Criteria number 5 derived from the number of malnourished children counted from the last GMP session in the village in project database. The reason why project also included children with mild underweight is to prevent them from not to fall into moderate or severe condition. Project also identified local village cadres, community leaders and also other important figures in the village to facilitate and support the implementation.

2. Training and preparation

Positive Deviance training
Positive Deviance training was done twice during the implementation. The first PD training done in Banda Aceh on 6-17 February 2007 followed by 23 participants and the second training was done on 8-19 May 2007 followed by 25 participants. The participants were village health volunteers (cadres), community leaders, health staffs and also project staffs. The training was done in 12 days and facilitated by national facilitators for PD network and Ministry of Health. The curriculum of training was using the standardized national curriculum for PD training. During the training, participant was taught on how to do simple nutritional assessment, how to do facilitation, technical issues on how to implement *Pos Gizi* and also given some information on health issues for messages. Detail for the training report is available in *annex*.

Project decided to train the existed village cadres who are also responsible for GMP activities since the *Pos Gizi* activity will be related to GMP activity for the follow up. They also already have the basic understanding of nutrition since they have been trained several times by project in term of growth monitoring and other health issues. Community leaders especially women leaders were chosen in order to assist cadres to persuade mothers to bring their malnourished children to the *Pos Gizi* during the sessions and also to observe the implementation. Health staffs especially village midwives and nutrition staffs in the Puskesmas were chosen to assist the *Pos Gizi* implementation especially in defining and facilitating referral cases.

Village community meeting #1 (MMD1)
Village community meeting (*Musyawarah Masyarakat Desa/MMD*) is done in the selected villages and participated by head of village, community leaders, religious leaders, local village midwife, representatives from Puskesmas and also mothers who have children under five years. This activity was facilitated by the trained village cadres assisted by the trained community leaders. They presented the nutrition situation in village which emphasize on the number of children under five who are underweight and the magnitude of the problem. They also introduced *Pos Gizi* concept and tried to convince community on the benefit of *Pos Gizi* in order to deal with nutrition problem in the village.

Development of Positive Deviance Inquiry (PDI)
After completion of MMD1, positive deviance inquiry (PDI) is done to assess the successful practices on child's feeding, caring and health seeking in poor families with well nourished children. In order to get the PDI, project has done several steps. The first step is conducting focus group discussion (FGD) with 5 different groups which are: group of mothers, sisters, grandmothers, fathers and local food sellers. The FGD facilitated by trained cadres and total participant for each group was 10-12 people for the duration of 2 hours. The purpose of this FGD is to get the general behaviors of child feeding, caring, health seeking behaviors and also hygiene in the community (FGD *see annex 4*).

The second step is doing wealth ranking to define how locally 'poor people' categorized. This wealth ranking was done using the village register and also by community criteria. The result of this wealth ranking than matched with the families who are having well nourished children under five to be chosen as PD Child and PD Family. In average project took 5 to 6 PD Childs/Families in each village for the development of PDI. The third step is information gathering in regard to successful behaviors collected through home visit, interview and also observation done by village cadres assisted by project staffs. Interviews were done by 2 or 3 interviewers per family using structured questioner with open questions to probe answers and done to whole family members. The answers documented and compared with the general behaviors from FGD to see what are the specific behaviors applied in the PD families. The specific behaviors compiled and used as Positive Deviance Inquiry (PDI) for Pos Gizi.

Village community meeting #2 (MMD2)
The second community meeting (MMD2) was done as the follow up of the MMD1. During the MMD2, the village cadres presented the nutritional problem and also the PDI found from PD families. Village cadres tried to convinced community that PDI is applicable and affordable since it was developed from poor families. The outputs of MMD2 are community agreement on *Pos Gizi*, establishment of village committee, and final

design of Pos Gizi. Village committee consisted of community leaders, women representatives, cadres and village midwife. Village committee is responsible to monitor the *Pos Gizi* activity and provide support especially in persuading mothers to join the activity and mobilize community resources. Final design of *Pos Gizi* consisted of the date, venue, participants, food menu and contribution from participating mothers. Participants selected from the children who have mild, moderate and severe underweight in the last GMP sessions. The inclusion of mild underweight children is assumed to prevent them not to fall into moderate or severe underweight. At the end of the activity, community members also committed to donate some of equipments like stove, frying pan and also raw materials such as rice, cooking oil, petroleum oil, etc. These materials then collected and kept by village committee for *Pos Gizi* activity.

3. *Pos Gizi* session implementation

During the period of January 2007 up to May 2008, 6 *Pos Gizi* was established in 6 villages in 5 sub districts. *Pos Gizi* session was done in 12 days in a row and facilitated by 2 village cadres, at least 1 representative from village committee, and 1 project staff. The activity was done in the afternoon (15.00-16.00) after lunch time and before dinner. Children 12-59 months old were selected based on the last GMP session for those who are having mild, moderate and severe underweight. In the first day (day 1), all of the children were registered and weighed before having meal. During the sessions, village cadres facilitated the activity and demonstrate together with the mothers on how to prepare locally nutritious food and also assisted mothers and children to practice successful behaviors in PDI such as hand washing using soap, brushing teeth, cutting nails, etc (Detail of PDI *see annex*). Project didn't used mothers who are used to develop PDI (positive deviance mothers) to facilitate *Pos Gizi* as peer educator with the reason to avoid hesitation among participants and also to avoid if there is any personal conflict between participants with the positive deviance mothers that makes mothers hesitate to come.

Village cadres also delivered health messages regarding to health and hygiene. Duration for *Pos Gizi* activity was 2 hours/day and the time was arranged based on the agreement between cadres and participants. In last day (day 12) children were weighed again before having meal and recorded to see the weight gain. Children who are coming for less than 10 days or more than 3 days absent will be considered as drop out or incomplete session (CORE, 2002). In one day during the sessions, a village midwife/ representative from Puskesmas will come and do health assessment to the children to find out whether referral to health facility is needed. During the *Pos Gizi* sessions none of children was being referred to health facilities.

4. Follow up and Evaluation

Besides the weighing in the first day and in the last day to see the weight gain during *Pos Gizi* session, follow up also done to further monitor the weight gain of children. Follow up done through GMP session in the incoming month (4 weeks) since the start of *Pos Gizi* session. Children who were participated in *Pos Gizi* expected to come to Posyandu for GMP and than weighed to find out the further weight gain. For the evaluation purpose, project defined criteria for 'success' from *Pos Gizi* as children who could reach catch-up growth by having weight gain ≥ 400 grams at the end of the months (Sternin, 1998; CORE, 2002). Further follow up done in the second month (8 weeks) since the start of *Pos Gizi* was done to find out whether the children can maintained their catch-up growth or not. Weight gain ≥ 400 grams from the weight in the previous month considered as maintained catch-up growth. Based on these criteria project author will analyze the implementation of *Pos Gizi* in Aceh Besar District.

Reference:

CORE-Nutrition Working Group-Child Survival Collaborations and Resources Group. *Positive Deviance/ Hearth: A resource guide for sustainably rehabilitating malnourished children.* Washington, D.C: December 2002.

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Annex 6. Table A. Characteristics of children and households in the GMP baseline group

Characteristics	GMP Group	
	n	%
Child's sex:		
Male	473	52.9
Female	421	47.1
Total	**894**	**100**
Child's age (months)		
6-11	91	10.2
12-23	201	22.5
24-35	208	23.3
36-47	212	23.7
48-59	182	20.4
Total	**894**	**100**
Mother's age (years):		
15-19	15	1.8
20-29	450	55.3
30-39	297	36.5
40+	52	6.4
Total	**814**	**100**
Missing	*80*	
Mother's age at birth (years):		
15-19	74	9.1
20-34	658	80.8
35+	82	10.1
Total	**814**	**100**
Missing	*80*	
Mother's education :		
Illiterate	-	-
Elementary school	193	21.6
Junior high school	246	27.5
Senior high school	329	36.8
Academy/university	47	5.3
Total	**815**	**100**
Missing	79	
Mother's occupation:		
Housewife/student	821	95.6
Public/Private employee	22	2.6
Others	16	1.8
Total	**859**	**100**
Missing	35	
Father's education :		
Illiterate	-	**-**
Elementary school	169	20.9
Junior high school	234	29.0
Senior high school	361	44.7
Academy/university	43	5.3
Total	807	**100**
Missing	87	

Father's occupation:		
Public servant	44	5.4
Private employee	526	64.1
Others	70	8.5
Farmer/fisherman	180	22.0
Total	**820**	**100**
Missing	74	
Family size:		
2	18	2.0
3	362	40.5
4	259	29.0
5	126	14.1
6+	129	14.4
Total	**894**	**100**
Number of children in family:		
1	375	41.9
2	264	29.5
3	127	14.2
4+	128	14.3
Total	**894**	100
Availability of other CU-5:		
No	708	79.3
Yes	185	20.7
Total	**894**	**100**

Annex 7. Table B. Prevalence of undernutrition in baseline group

	n	Valid %
Child's underweight status (WAZ):		
Normal	648	72.5
Moderate underweight	201	22.5
Severe underweight	43	4.8
Overweight	2	0.2
Total	**894**	**100**
Child's stunting status (HAZ):		
Normal	456	54.9
Moderate stunting	232	27.9
Severe stunting	143	17.2
Total	**831**	**100**
Missing	*63*	
Child's wasting status (WHZ):		
Normal	754	90.7
Moderate wasting	51	6.1
Severe wasting	11	1.3
Overweight	15	1.8
Total	**831**	**100**
Missing	*63*	

Annex 8. Table C. Univariate logistic regression on characteristics against child's underweight status

Characteristic	n	% underweight	Unadjusted OR	95% CI	Sig. (P)
(1) Child's sex:					
Male	473	27.9	1		
Female	421	26.6	.936	.697; 1.258	.662
Total	**894**				
(2) Mother's age (years):					
15-19	15	26.7	.895	.280; 2.862	.852
20-29	450	28.9	1		.747
30-39	297	25.6	.847	.608; 1.178	.321
40+	52	30.8	1.094	.587; 2.040	.777
Total	**814**				
Missing	*80*				
(3) Mother's age at birth (years):	74	36.5	1.573	.951; 2.604	.078
15-19	658	26.7	1		
20-34	82	28.0	1.068	.640; 1.781	.802
35+	**814**				
Total	*80*				
Missing					
(4) Mother's education :					
Elementary school	193	35.8	1		
Junior high school	246	25.2	.689	.448; 1.059	.089
Senior high school	329	26.7	.733	.485; 1.109	.142
Academy/university	47	21.3	.632	.284; 1.405	.261
Total	**815**				
Missing	79				
(5) Mother's occupation:					
Housewife/student	821	28.3	1		
Public/Private	22	22.7	.747	.272; 2.047	.570
employee	16	37.5	1.532	.547; 4.239	.420
Informal sector	**859**				
Total	35				
Missing					
(6) Father's education :					
Elementary school	169	33.7	1		
Junior high school	234	25.2	.662	.429; 1.023	.063
Senior high school	361	26.9	.722	.486; 1.071	.106
Academy/university	43	23.3	.595	.274; 1.294	.190
Total	**807**				
Missing	87				
(7) Family size:					
2	18	16.7	.578	.164; 2.043	.395
3	362	25.7	1		
4	259	30.1	1.246	.874; 1.778	.224
5	126	27.0	1.069	.676; 1.691	.776
>=6	129	27.9	1.120	.713; 1.758	.623
Total	**894**				

(8) Number of children in family:	375	24.5	1		.068
1	264	31.1	1.386	.976; 1.969	.615
2	127	26.8	1.125	.711; 1.778	.421
3	128	28.1	1.204	.766; 1.890	
>=4	**894**				
Total					
(9) Availability of other CU-5:	709	26.5	1		
No	185	30.3	1.203	.843; 1.716	.308
Yes	**894**				
Total					

Annex 9. Table D. Multivariate logistic regression analysis of underweight by significant characteristics

Characteristics	n	% Under weight	Multivariate Adjusted aOR	Multivariate Adjusted 95% CI	Sig. (P)
(1) Child's age (months)					
6-11			1		
12-23	91	15.4	1.707	.838; 3.478	.141
24-35	201	22.9	2.824**	1.410; 5.654	.003
36-47	208	29.8	3.184**	1.602; 6.329	.001
48-59	212	34.0	2.265*	1.110; 4.622	.025
Total	182	27.5			
	894				
(2) Father's occupation:					
Public servant	44	20.5	.479	.209; 1.093	.080
Private employee	456	25.5	.628*	.425; .927	.019
Others	70	27.1	.721	.382; 1.362	.313
Farmer/fisherman	180	36.7	1		
Total	**820**				
Missing	74				
(3) Mother's education :					
Elementary school	193	35.8	1		
Junior high school	246	25.2	.689	.448; 1.059	.089
Senior high school	329	26.7	.733	.485; 1.109	.142
Academy/university	47	21.3	.632	.284; 1.405	.261
Total	**815**				
Missing	79				

Note: *) significance level $P<0.05$; **) significance level $P<0.01$

Annex 10. Table E. Univariate logistic regression on characteristics against child's stunting status

Characteristic	n	% stunting	Unadjusted OR	Unadjusted 95% CI	Sig. (P)
(1) Child's sex:					
Male	438	46.1	1		
Female	393	44.0	.919	.699; 1.208	.544
Total	**831**				
Missing	63				
(2) Mother's age at birth					
(years):	67	53.7	1.458	.879;2.419	.144
15-19	609	44.3	1		
20-34	79	46.8	1.106	.691; 1.770	.674
35+	**755**				
Total	139				
Missing					
(3) Mother's education :					
Elementary school	183	49.7	1		
Junior high school	231	50.2	1.060	.697; 1.612	.785
Senior high school	298	40.3	.680	.450; 1.029	.068
Academy/university	43	30.2	.589	.267; 1.310	.194
Total	**755**				
Missing	139				
(4) Mother's occupation:					
Housewife/student	763	45.9	1		.164
Public/Private	19	21.1	.578	.143; 2.343	.443
employee	16	50.0	6.770	.777; 58.952	.083
Informal sector	**798**				
Total	96				
Missing					
(5) Father's education :					
Elementary school	155	49.0	1		
Junior high school	223	48.4	.976	.648; 1.471	.908
Senior high school	332	41.6	.739	.504; 1.085	.123
Academy/university	41	34.1	.539	.263; 1.105	.092
Total	**751**				
Missing	143				
(6) Father's occupation:					
Public servant	41	29.3	.694	.307; 1.570	.380
Private employee	485	47.0	1.152	.778; 1.704	.481
Others	65	43.1	.981	.521; 1.848	.954
Farmer/fisherman	174	46.6	1		
Total	**765**				
Missing	129				
(7) Family size:					
2	17	47.1	1.080	.407; 2.868	.878

3	330	45.2	1		
4	239	43.1	.920	.658; 1.287	.626
5	122	46.7	1.065	.702; 1.616	.766
>=6	123	47.2	1.084	.716; 1.642	.704
Total	**831**				
Missing	63				
(8) Number of children in family:	341	46.0	1		
1	246	42.7	.873	.627; 1.214	.419
2	122	45.9	.994	.657; 1.506	.979
3	122	46.7	1.028	.679; 1.556	.897
>=4	**831**				
Total	63				
Missing					
(9) Availability of other CU-5:					
No	656	44.1	1		
Yes	175	49.1	1.227	.879; 1.714	.230
Total	**831**				
Missing	63				

Annex 11. Table F. Multivariate logistic regression analysis of stunting adjusted by significant characteristics.

Characteristic	n	% stunting	Multivariate		Sig. (P)
			Adjusted		
			aOR	95% CI	
(1) Child's age (months)					
6-11	89	30.3	1		.023
12-23	184	52.2	2.212**	1.227; 3.987	.008
24-35	191	46.1	2.191**	1.215; 3.952	.009
36-47	196	48.5	2.400**	1.335; 4.316	.003
48-59	171	40.4	1.557	.851; 2.850	.151
Total	**831**				
Missing	63				
(2) Mother's age (years):					
15-19	14	35.7	.805	.240; 2.701	.725
20-29	417	51.3	1		.016
30-39	273	36.3	.570**	.405; .804	.001
40+	51	49.0	.813	.429; 1.540	.525
Total	**755**				
Missing	139				
(3) Mother's education :					
Elementary school	183	49.7	1		.073
Junior high school	231	50.2	1.060	.697; 1.612	.785
Senior high school	298	40.3	.680	.450; 1.029	.068
Academy/university	43	30.2	.589	.267; 1.310	.194
Total	**755**				
Missing	139				
(4) Mother's occupation:					
Housewife/student	763	45.9	1		.164
Public/Private employee	19	21.1	.578	.143; 2.343	.443
Informal sector	16	50.0	6.770	.777; 58.952	.083
Total	**798**				
Missing	96				
(5) Father's occupation:					
Public servant	41	29.3	.694	.307; 1.570	.380
Private employee	485	47.0	1.152	.778; 1.704	.481
Others	65	43.1	.981	.521; 1.848	.954
Farmer/fisherman	174	46.6	1		
Total	**765**				
Missing	129				

Note: *) significance level P<0.05; **) significance level P<0.01

Annex 12. Table G. Univariate logistic regression on characteristics against child's wasting status

Characteristic	n	% wasted	Unadjusted OR	Unadjusted 95% CI	Sig. (P)
(1) Child's sex:					
Male	438	8.2	1		
Female	393	6.6	.791	.468; 1.336	.381
Total	**831**				
Missing	63				
(2) Child's age (months):					
6-11	89	7.9	1		
12-23	184	9.2	1.192	.476; 2.989	.707
24-35	191	5.2	.647	.238; 1.760	.394
36-47	196	8.2	1.041	.413; 2.628	.932
48-59	171	7.0	.884	.335; 2.331	.803
Total	**831**				
Missing	63				
(3) Mother's age (years):					
15-19	14	14.3	2.005	.430; 9.351	.376
20-29	417	7.7	1		.777
30-39	273	9.2	1.213	.702; 2.096	.489
40+	51	0	.000	.000;.	.997
Total	**755**				
Missing	139				
(4) Mother's age at birth (years):	67	13.4	1.855	.865; 3.978	.112
15-19	609	7.7	1		
20-34	79	3.8	.472	.143; 1.554	.217
35+	**755**				
Total	139				
Missing					
(5) Mother's education :					
Elementary school	183	10.4	1		
Junior high school	231	6.5	.599	.296; 1.215	.156
Senior high school	298	8.1	.756	.402; 1.423	.386
Academy/university	43	4.7	.421	.094; 1.881	.257
Total	**755**				
Missing	139				
(6) Mother's occupation:					
Housewife/student	763	7.9	1		
Public/Private	19	0	.000	.000;.	.998
employee	16	6.3	.781	.101; 6.015	.813
Informal sector	**798**				
Total	96				
Missing					
(7) Father's education :					
Elementary school	155	9.7	1		

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Junior high school	223	6.3	.625	.293; 1.336	.225
Senior high school	332	6.9	.695	.352; 1.372	.294
Academy/university	41	12.2	1.296	.442; 3.803	.637
Total	**751**				
Missing	143				
(8) Father's occupation:					
Public servant	41	4.9	.444	.099; 1.997	.290
Private employee	485	6.8	.633	.346; 1.156	.136
Others	65	6.2	.568	.185; 1.747	.324
Farmer/fisherman	174	10.3	1		
Total	**765**				
Missing	129				
(9) Family size:					
2	17	0	.000	.000;.	.998
3	330	8.5	1		
4	239	8.4	.985	.541; 1.794	.961
5	122	5.7	.657	.279; 1.545	.335
>=6	123	5.7	.651	.277; 1.531	.325
Total	**831**				
Missing	63				
(10) Number of children in family:	341	7.3	1		
1	246	9.3	1.304	.721; 2.356	.380
2	122	4.9	.654	.262; 1.634	.363
3	122	6.6	.887	.389; 2.023	.776
>=4	**831**				
Total	63				
Missing					
(11) Availability of other CU-5:	656	6.7	1		
No	175	10.3	1.595	.897; 2.836	.112
Yes	**831**				
Total	63				
Missing					

Annex 13. Table H. Characteristics of children and households in the Pos Gizi group

Characteristics	Pos Gizi Group	
	n	**%**
Child's sex:		
Male	31	44.3
Female	39	55.7
Total	**70**	**100**
Child's age (months)		
6-11	18	25.7
12-23	16	22.9
24-35	13	18.6
36-47	23	32.9
48-59	**70**	**100**
Total		
Mother's age (years):		
15-19	1	1.5
20-29	40	61.5
30-39	19	29.2
40+	5	7.7
Total	**65**	**100**
Missing	5	
Mother's age at birth (years):		
15-19	6	9.2
20-34	53	81.5
35+	6	9.2
Total	**65**	**100**
Missing	5	
Mother's education :		
Illiterate	-	-
Elementary school	19	29.2
Junior high school	31	47.7
Senior high school	12	18.5
Academy/university	3	4.6
Total	**65**	**100**
Missing	5	
Mother's occupation:		
Housewife/student	65	**100**
Public/Private employee	**-**	
Others	**-**	
Total	**65**	
Missing	5	
Father's education :		
Illiterate	-	-
Elementary school	12	18.5
Junior high school	26	40.0
Senior high school	24	36.9

Academy/university	3	4.6
Total	**65**	**100**
Missing	5	
Father's occupation:		
Public servant	2	2.9
Private employee	45	66.2
Others	6	8.8
Farmer/fisherman	15	22.1
Total	**68**	**100**
Missing	2	
Family size:		
2	-	-
3	28	40.0
4	21	30.0
5	13	18.6
6+	8	11.4
Total	**70**	**100**
Number of children in family:		
1	26	37.1
2	23	32.9
3	13	18.6
4+	8	11.4
Total	**70**	**100**
Availability of other CU-5:		
No	41	58.6
Yes	29	41.4
Total	**70**	**100**

Annex 14. Table I. Univariate logistic regression on household's characteristics against catch-up growth

Note: 'catch-up growth' defined as children who 'completed' the Pos Gizi sessions (attending 10-12 days) and having weight gain ≥ 400 grams at the first month (during follow up at GMP1)

Characteristic	n	% catch up growth	Unadjusted OR	95% CI	Sig. (P)
(1) Child's sex:					
Male	28	42.9	1		
Female	35	34.3	.696	.250; 1.936	.487
Total	**63**				
Missing	7				
(2) Child's age (months):					
12-23	16	18.8	1		
24-35	15	46.7	3.792	.755; 19.045	.106
36-47	13	38.5	2.708	.504; 14.541	.245
48-59	19	47.7	3.900	.832; 18.283	.084
Total	63				
Missing	7				
(3) Child's underweight status at entry:					
Mild	11	45.5	1		
Moderate	42	35.7	.667	.174; 2.557	.554
Severe	10	40.0	.880	.141; 4.534	.801
Total	63				
Missing	7				
(4) Mother's age (years):					
15-19	1	100	*2.858*	*.000*	1.000
20-29	36	36.1	1		
30-39	17	35.3	.965	.289; 3.220	.954
40+	4	50.0	1.769	.222; 14.086	.590
Total	**58**				
Missing	12				
(5) Mother's age at birth (yrs):					
15-19	6	50.0	1.765	.320; 9.731	.514
20-34	47	36.2	1		
35+	5	40.0	1.176	.179; 7.753	.866
Total	**58**				
Missing	12				
(6) Mother's education :					
Elementary school	18	33.3	1		
Junior high school	26	46.2	1.714	.493; 5.965	.397
Senior high school	11	36.4	1.143	.237; 5.501	.868
Academy/university	3	0	.000	.	.999
Total	**58**				

Missing	12				
(7) Father's education :					
Elementary school	12	41.7	1		
Junior high school	22	31.8	.653	.152; 2.804	.567
Senior high school	21	47.6	1.273	.304; 5.329	.741
Academy/university	3	33.3	.700	.049; 10.014	.793
Total	58				
Missing	12				
(8) Father's occupation:					
Public servant	2	0	.000	.000	.999
Private employee	38	36.8	.667	.199; 2.235	.511
Others	6	33.3	.571	.079; 4.128	.579
Farmer/fisherman	15	46.7	1		
Total	61				
Missing	9				
(9) Family size:					
3	23	43.5	1		
4	20	25.0	2.308	.626; 8.513	.209
5	12	50.0	3.000	.657; 13.692	.156
>=6	8	37.5	1.800	.312; 10.390	.511
Total	**63**				
Missing	7				
(10) Number of children in family:	21	42.9	1		
1	22	27.3	.500	.140; 1.791	.287
2	12	50.0	1.333	.321; 5.538	.692
3	8	37.5	.800	.150; 4.258	.794
>=4	**63**				
Total	7				
Missing					
(11) Availability of other CU-5:					
No	35	40.0	1		
Yes	28	35.7	.833	.298; 2.327	.728
Total	**63**				
Missing	7				