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PREFACE

Assalamu'alaikum wr. wb.

Praise to God the Almighty, for the overflow of taufiq, guidance and blessing, so that we can continue to work including completing a book entitled "Stunting in Indonesia, Problems and Solutions".

The writing of this book was preceded by a task assigned by the Directorate of Community Nutrition, Directorate General of Nutrition, Maternal and Child Health of the Ministry of Health in order to create a book review on stunting. Even if it was only 2 months allocated to create this book, we were trying to complete it out and then we submit it and well received by the Directorate of Community Nutrition.

As time goes by, there are some advanced Riskesdas analysis and findings from the doctoral research that were deemed very useful to complement these reviews. Therefore we have asked for permission to the Directorate of Community Nutrition Directorate General of Nutrition,Mother and Child Health, of the Ministry of Health to complete the writing, package it using the rules of scientific papers, and publish it into a book.

The team of writers attempted to encapsulate all the data and information related to stunting, especially those from the research in the country, so as to illustrate the real problem, both in terms of quantity or quality problem.

Our expectations are for the reader to get a full picture of the stunting problem in Indonesia, complete with a variety of factors that influence stunting and for them to eventually be able to design a variety of efforts to overcome them.

"There is nothing perfect in this world yet if we chase perfection, we can chase excellence. For it we apologize for any imperfection in this book. We desire of receiving any criticism, input and suggestions, for the sake of the improvement of our next edition.

Enjoy the reading and hopefully you find this book as useful.

Billahit taufiq walhidayah, wassalamu'alaikum wr. wb.

Lead Author,

Trihono

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Specially thanks are dedicated to:

1. Directorate of Community Nutrition, Directorate General of Nutrition,Maternal and Child Health, of the Ministry of Health, which has given trust to writer to sum up plenty of information on stunting, and allows writer to publish this book by following the rules of scientific writing, after obtaining some of the latest data.
2. National Institute of Health Research and Development Ministry of Health that has allowed the authors use RISKESDAS data to do additional analysis in order to complete the required information.
3. Indonesia Health Care Forum (indo HCF) who had contributed to partly finance the cost of printing the book.

ABSTRACT

Background: The growth failure of children in Indonesia has an impact on increasing non-communicable diseases in adulthood. This study is aimed to obtain a complete picture of the trends and problems of stunting in Indonesia and to identify appropriate strategy to overcome it, so the incidence of non-communicable diseases in adulthood can be prevented.

Method: This study uses the method of literature review and analysis of correlation from secondary data sets. The data sources are National of Household Health Survey/HHS (2001, 2004), National Basic Health Research/Riskesdas (2007/08, 2010 and 2013), Socio Economic National Survey/Susenas (2007, 2012), Growth Cohort Study (2010 to present), Total Diet Study/TDS in 2014; Public Health Development Index/PHDI (IPKM 2013); the Indonesian doctoral dissertations until 2015, and other literatures.

Results: There were no improvements of the high prevalence of stunting at national level for under five children up to school-aged children. The latest prevalence of stunting (2013) was at 37.2% for children under five, and at 31.7% for school-aged children. Babies born with a short body length in 2013 recorded at 20.2% have an impact on the amount of stunted under five children and school-aged children as much as 8.9 million and 20.8 million respectively. The determinant factors related to stuntingwere low birth weight at<2500 grams and short birth length <48 cm. Women with height <150 cm tend to deliver a short baby (47.2%) compared to women with height >150 cm (36.0%). Mothers who were married at the age of<19 years are more likely to give high proportion of stunted children (37%) compared to married mothers in the age

group of 20-34 years (31.9%). Correlation analysis of aggregate data resulting from IPKM 2013 indicated that stunting among children (under five and school-age children), are influenced by environmental health, health services, health behavior, reproductive health, economic status and educational status.

Conclusion: Improving the quality and improvement of services related to the specific program of health sector becomes very important, such as supplementary feeding high in calories, protein and micronutrients for pregnant women, the quality of maternal and child health services, health promotion related to smoking, and hand washing, exclusive breastfeeding and complementary feeding, improvement of School Health Program, reproductive health and family planning. From non-health sectors required a 12-year compulsory education (instead of 9), revision of marriage law, environmental improvement and poverty alleviation.

Keywords: stunting, child health, stunting interventions.

EXECUTIVE SUMMARY

Stunting can be identified by comparing the height of a child with the standards of height in normal population within the same age andgender. Children are categorized as stunting if the height is below - 2 SD from WHO standards.

This review aims to acquire short description of the stunting problem in Indonesia and the strategies to overcome it.

Methods used in this study is to review all literaturesfrom research results in Indonesia, then aggregating them into a single set of information the condition of stunting in Indonesia. Based on the information derived from this country, the recommendations can then be designed.

The data used in this book are National of Household Health survey/HHS(2001, 2004), National Basic Health Research/Riskesdas (2007/08, 2010 and 2013), Socio Economic National Survey/ Susenas (2007, 2012), Growth Cohort Study (2010 to present), Total Diet Study/TDS in 2014; Public Health Development Index/PHDI (IPKM 2013); the Indonesian doctoral dissertations up to 2015, and other complementing literatures. Most of the information data in this book are ready to use information obtained from published reports, dissertations etc. Some of the information were gathered from further analysis of national data done by the team of writers.

Riskesdas 2013 showed that the prevalence of low birth weight (< 2500 g) was at 10.2 % and prevalence of the short birth length (< 48 cm) was at 20.2 %. The national prevalence of stunting among under-five childrens went declining declininge from 29,5 % in 2001 to 28,5 % in 2004, however it rose up to 36.,8 % in 2007 , and

declined to 35.,6 % in 2010 but rose again in 2013 be 37.,2 %.

For school-aged children, there were fluctuations in the prevalence of stunting, from 32 % in 2001, to 30% in 2004, increased to 33.4% in 2007, declined again in 2010 to 28.3 %, but increased again in 2013 to 31.7%.

The magnitude of the burden of stunting on 23.8 million children under five in 2013;,specificallyas much as 4.8 million children were born short, and 8.9 million under-five children were stunted, and kept on continuing the age of school children (5-18 years), where as much as 20.8 million children were stunted.

Cohort studies of child development showed that when compared with the WHO standard,the average of child body height from the Cohort study is below the WHO standards.

Groups of children with birth weight <2500 g, tend to grow into stunted children than the group of children who were born with normal weight.

Riskesdas 2010 showed that stunted children aremost likely to beborn from mothers having average height shorter (<150.7 cm) than the average height of the group of normal mothers (152.4 cm). In contrary, the group of short mothers (height<150 centimeters) tend to give birth to a short baby (47.2%)compared to the mothers with normal height (36.0%).

From Riskesdas 2013, it is known clearly that within group of mothers who got married at the age of less than 19 years, the proportion of short children reached 37%, compared to the group of mothers who go marreid at the age of 20-34 years (31.9%).

During the baby's development, the group of infants with low

birth weight have higher proportion of suspected developmental disorders (35.4 %) than a normal infant (25.0%). While short babies (the body length < 50 cm) suffer from suspected of developmental disorders a 20.8 % or three times greater than a normal infant who is only at 8.3 %. Associated with infectious diseases, there is no significant difference between the stunted and normal children.

The determinant factors of stunting in infants including maternal height < 150 cm, maternal BMI < 18.5 kg/m2, the weight gain during pregnancy is below standard and nutrient intake is below the nutritional adequacy. In addition, factors of education and economic status clearly affect the stunting. The higher the education and the more prosperous the family, the prevalence of stunting decreases.

Correlation analysis of the aggregated data in each district from Riskesdas 2013 resultwhich were reformulated into 2013 PHDI indicators showed that stunting of the under-five children and on school-aged children are, influenced by environmental health, health services, population behavior, reproductive health, economic status and educational status.

Significant gaps also occurred on the stuntingof all age groups: prevalence of stunting in rural area is higher than urban, the prevalence of stunting at the poorest household (quintile 1) was higher thanthe richest, the same pattern also occurred on the education levels.

The gap also occureds between provinces, for example for under five children in East Nusa Tenggara, the prevalence is almost twice higher than the best province namely Riau Islands. If we compared between 2007 and 2013, the gap remained wide for all age groups. By using a life-cycle approach, from pregnant

women, under five children, school-aged children, working age and elderly, a series of proposed intervention programsfor each age group were presented, either specifically by health personnel, as well as sensitive programs by sectors other than the health sector.

Proposals for specific programs such as :

1. The provision of additional food HCPM (High Calories, Protein and Micronutrients) for pregnant women
2. Improving the quality of maternal and child health services.
3. School Health Programs become a mandatory program in all community health centers.
4. Reproductive health education for teenagers.
5. Intensive counseling about family planning program.
6. Delivery assistance by health personnel at the health facilities.
7. Exclusive breastfeeding and adequate complementary feeding
8. Monitoring child growth.
9. Provision of supplementary food and micronutrients for childrenunder five.

Sensitive program by cross-sector such as:

1. The nutrition education in schools.
2. Improved environmental health in schools and homes.
3. Poverty alleviation.
4. Compulsory education for 12 years.
5. Revision Act Number 1 of 1974 on Marriage, the minimum age of marriage should change to 20 years.

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ACRONYMS ABBREVIATIONS

AKDR	:	Alat Kontrasepsi Dalam Rahim
AKG	:	Angka Kecukupan Gizi
ASI	:	Air Susu Ibu
BAB	:	Defecated/defecation
Balita	:	Childen Under Five Years
BB	:	Body Weight
BB/U	:	Weight for Age
BB/TB	:	Weight for Height
BBLR	:	Low Birth Weight Baby
BPJS	:	Social Security Agency
CI	:	Confidence Interval
DIY	:	Yogyakarta Special Region
DKI	:	Special Capital Region
Faskes	:	Health Facilities
HIV/AIDS	:	Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome
IMD	:	Early Initiation for Breastfeeding
BMI	:	Body Mass Index
BMI/A	:	Body Mass Index for Age
IPKM	:	Public Health Development Index
ISPA	:	Acute Respiratory Tract Infections
IUD	:	Intra Uterine Device
Jabar	:	West Java
Jateng	:	Central Java
Jatim	:	East Java
Kalbar	:	West Kalimantan
Kalsel	:	South Kalimantan

Kalteng	:	Central Kalimantan
Kaltim	:	East Kalimantan
KB	:	Family Planning
KEK	:	Chronic Energy Inadequency
Kepri	:	Riau Islands
Kel	:	Familly
Kes	:	Heatlh
MUAC	:	Mid Upper Arm Cirumference
Litbangkes	:	National institute of Heath Reseach and Development
Malut	:	North Maluku
MKJP	:	Long Term Contraception Method
MTBS	:	Intregrated management sick todler
Nakes	:	Health Personnel
NTB	:	West Nusa Tenggara
NTT	:	East Nusa Tenggara
OR	:	Odds Ratio
Pabar	:	West Papua
PB	:	Body Length
PDAM	:	Local drink water company
PKTP	:	Primary Health Services
PMT	:	Food supplementation
Posyandu	:	Integrated Heath Services
Puskesmas	:	Community Health Centers
Pustu	:	Supporting Primary Healthcare Centre
RDA	:	Recommended Daily Allowances
Riskesdas	:	Basic Health Reseach
RPJPN	:	Rencana Pembangunan Jangka Panjang Nasional
RS	:	Hospital

SBH	:	Saka Bhakti Husada
SD	:	Elementary School
SDM	:	Human Resources
SDT	:	Total Diet Study
SEANUTS	:	South East Asian Nutrition Survey
SKMI	:	Individual Food Consumption Survey
SKRT	:	Household Health Survey
SLTA	:	Senior High School
SLTP	:	Junior High School
SMP	:	Junior High School
SMTA	:	Senior High School
Sulut	:	North Sulawesi
Sulteng	:	Central Sulawesi
Sultra	:	Southeast Sulawesi
Sulbar	:	West Sulawesi
Sulsel	:	South Sulawesi
Sumbar	:	West Sumatera
Sumsel	:	South Sumatera
Sumut	:	North Sumatera
SUN	:	Scaling Up Nutrition
Surkesnas	:	National Health Survey
TKPM	:	High in Calories, Protein and Micronutrient
TSH	:	Thyroid Stimulating Hormon
UKS	:	School Health Effort
UU	:	Law
WHO	:	World Health Organization
WORA	:	Women of Reproductive Age
Σ	:	Sigma/Amount

CHAPTER 1
INTRODUCTION

1.1. BACKGROUND

Stunting is identified by comparing the height of a child with a height standard of normal children in the population within the same age and the same gender. Children is stunted if the height is below -2 SD from the WHO standards (Dewey & Begum, 2010 and WHO, 2005). Illustration of different heights within the same age can be seen in the following figure.

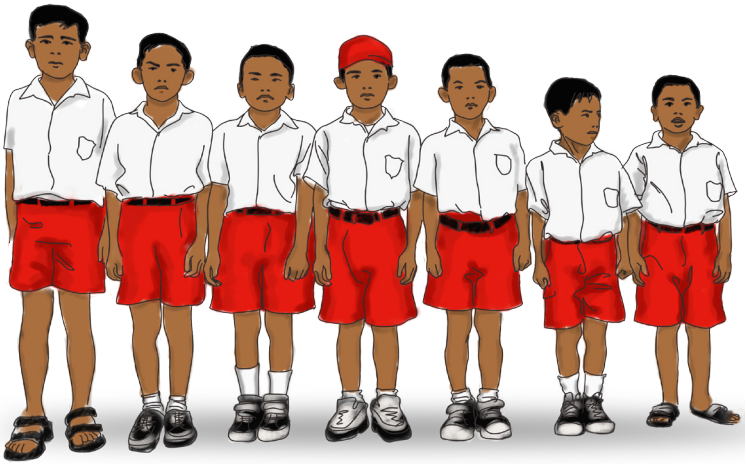


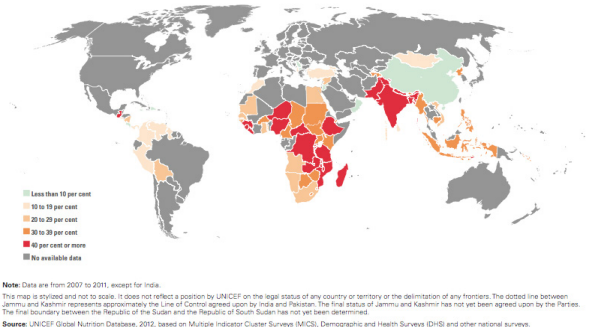
Figure 1. Children's 4th grade elementary school with different heights

Current studies indicate that stunted children are areis intimately connected to poor scholastic achievement, decreased length of education and low income as an adult.Stunted children face a greater problem when growing up, into adults that have less education, poor, less healthy and more prone to non-communicable diseases. Since, stunting widely accepted as the

predictor of poor quality human resources, it will eventually lower the productive capability of a nation in the future.

Stunting is a hidden tragedy. Stunting occurs due to the effects of chronic malnutrition during the first 1,000 days of a child's life. The damage that has resulted is a irreversible development of the child (can not be changed), the child will therefore never learn or get as much as he/she could.

The threat of nutritional problems in the world is, there are 165 million children under 5 years old in conditions of stunted and more of the 90% are in Africa and Asia. The global target is to reduce stunting by 40% by 2025 (WHA, 2012) which requires a decrease of 3.9% per year. The global target is to reduce stunting that reached 39.7% as of 1990 to 26.7% in 2010. In the 20-year period, stunting can be reduced by 1.6% per year. A very small/ in significant decrease occured mainly in Africa (from 40% to only 38%) while a substantial decline/decrease (agar konsisten) occurred in Asia (from 49% to 28%) to, approximately 2.9% per year. The most significant decline was in China, in 1990 by 30 percent to 10 percent in 2011. The prevalence of stunting represented by countries can be seen in the images below:



Source: www.globalnutritionseries.org

Figure 2. Map of the stunted children, 2007-2011

How about Indonesia? It is illustrated that the state of Indonesia when compared to countries included in the group that have a relatively high prevalence of 30% -39 %, Indonesia ranks fifth in the world with the highest number of stunted children. The position of Indonesia is only better better from India, China, Nigeria, and Pakistan. Butactually there is a different situation between Indonesia and those countries, since in the Central African States, Nigeria and Pakistan are in a situation of armed conflict / war, which led to the children being orphaned, abducted, tortured and even sold as slaves. Whereas Indonesia with a wealth of abundant natural resources should be/ perform much better than the countries experiencing the crisis.

Compared to countries in Southeast Asia, the prevalence of stunted children under five in Indonesia is located right above Vietnam (refer to Figure 3).

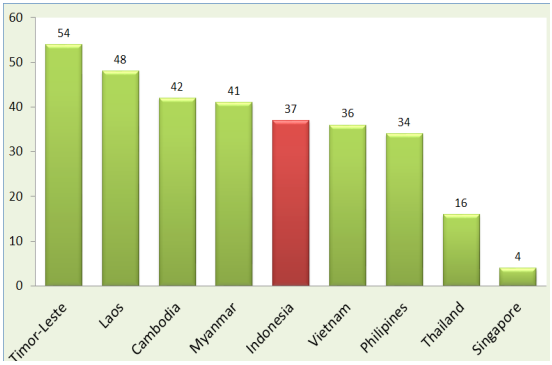


Figure 3. Comparison of stunted prevalence among some ASEAN countries

Results of another study such as South East Asian Nutrition Survey (SEANUTS) in 2010-2011 put Indonesia as the country with the largest number of stunted children under five, far above than Malaysia, Thailand and Vietnam.

In 2010, the standard of height for children under five was 110 centimeter, but the average height of Indonesian children reaching the age of five years was lacking 6.7 centimeter for boys and lacking 7.3 centimeter for girls. When entering the age of 19 years old, the heights are approximately lacking 13.6 centimeters for boys and 10.4 centimeters less for girls than it should (Atmarita, 2012). Failure to grow occuringed in children under-fives will go to their subsequent ages. It is likely that when they hit the age of 19 years old, then the optimal height is not reached. They will be short adult human with limitations for optimal productivity. The data shows the high percentage of women aged 15-19 years who no longer continue schools and get in on subsequent reproductive age do eventually gave birth to children who are undernourished.

Another problem is the disparity that varies widely and spread throughout the region, from the lowest at 26.3% in the Riau Islands until the highest at 51.7% in the East Nusa Tenggara. The current situation does not improve, the tendency indicates the prevalence of stunting to be increasing.

Over the past decade, efforts to improve people's nutrition are experiencing relatively slow movement.Global nutritional targets endorsed by the World Health Assembly in resolution of WHA 65.6 has been widely adopted by global initiatives, including the movement of Scaling Up Nutrition (SUN).Indonesia has become part of the SUN Movement through the participation of the Minister of Health by letter to the UN Secretary General in December 2011, and thereafter the UN Secretary General appointed the Deputy Human Resources and Culture, of which Bappenas became a member of the SUN Lead Group movement. This movement in Indonesia has been strengthened with the

issuance of Government Regulation No. 42 of 2013 concerning the National Movement Acceleration Nutrition Improvement on May 24, 2013.

Through the SUN movement,50 countries have committed to improve the political commitment, aligning the various parties, to promote policies and legislation as well as the rapidly expanding nutrition effective action. In June 2013, government leaders from 19 countries and development partners, private sector, community and groups of civil scientific society took the steps in at least 20 million children of not experiencing stunted growth by 2020, which are in line with comprehensive global targets implementation plan to 2025 (WHO, 2014).

National commitment to overcome the problem of nutrition in indonesia has been good enough since it has been a part of the national mission"Embodying people who are competitive"as written on a document of the National Long-Term Development Plan (RPJMN) 2005-2025 (Law 17/2007 about RPJMN2005-2025) (Atmarita, 2012). But to achieve this, the necessary supporting informations are needed . Success in overcoming stunting is also very dependent on intervention strategy at the right time. Based on these reasons, this book was written to address the needs of information on the subject of stunting at the- national level, current issues, and solutions based on the analysis of descriptive and analytic.

1.2. PROBLEMS

Indonesia has abundant natural resources, but the nutritional status in Indonesia particularly stunting prevalence increases/ is increasing. Stunting status is also spread throughout the provinces in Indonesia, with very wide disparities among

provinces. The impact it is inflicting inflictinged is the loss of desired the state in the future because stunted children will potentially be short adults with less education, poor, less healthy and more susceptible to non-communicable diseases (obesity, potentially tocardiovascular diseases, etc). For that information on the magnitude of the problem of the stunting for all age groups (underfive children, school-age children, adult and elderly), determinant factor of stunting in indonesia as well as appropriate strategy based on evidence are required.

1.3. OBJECTIVE

1.3.1. General Objective

To provide an overview on the problem of stunting in Indonesia and to identify strategies to overcome it.

1.3.2. Specific Objectives

1. To provide information on the trend of stunting in Indonesia.
2. To provide information on the magnitude of the stunting problem in Indonesia, including the disparity among provinces and districts/cities.
3. To provide information of the burden in the future as a result of a stunting in Indonesia, both near-term and long-term burdens.
4. To provide information on stunting determinant factors in Indonesia.
5. To give recommendations of strategies on stunting- prevention and intervention, either through specific programs done by the Ministry of Health as well as sensitive programsdone by non - health sectors

1.4. BENEFITS

Results from statistical analysis as well as informations from the relevant literatures can become scientific evidences of the

stunting prevention and controlling program. Stunting is a multifactorial and multisectoral problems, so the informations provided in this review could be used as a portrait of health and non-health status of a developing country.

CHAPTER 2
METHOD

This study undertook a literature review and statistical analysis of all Indonesian studies. Results from these literatures were then summarized to depict situation of stunting in Indonesia. This information will served as the basis to develop evidence-based recommendations afterwards.

2.1. DATA SOURCES

This study involved secondary datasets from Indonesian studies to describe the situation in this country specifically. Information related to theoretical and conceptual framework has been taken from other literatures. A number of Indonesian data sources used on this book includes:

1. National Health Survey (Surkesnas) 2001 and 2004
2. Basic Health Survey (Riskesdas) 2007/2008, 2010, and 2013
3. National Socio-Economic Survey (SUSENAS) 2007
4. Child Growth and Development Cohort Study 2011-2013
5. Total Diet Study (SDT) 2014
6. Public Health Development Index (IPKM) Study 2013
7. Indonesian Doctoral Dissertation, up to 2015
8. Other complementary literatures

2.1.1. Surkesnas (National Health Survey)

Surkesnas is a national household health survey conducted by the National Institute of Health Research and Development (NIHRD)/Balitbangkes in 2001 and 2004. Several studies were integrated into the Surkesnas to collect a wide range of indicators, involving morbidity study in 2001 and Household Health Survey

(HHS) in 2004. Multi-stage cluster sampling method was used to select subjects of these studies. The samples obtained for both studies represent national and regional level of Indonesia, namely Java–Bali, Sumatra, and the Eastern region. This study used anthropometric data collected from morbidity study, enabling users to compare the proportion of nutritional status at a national level.

2.1.2. Riskesdas (Basic Health Survey)

Riskesdas has been conducted three times by NIHRD in 2007/2008, 2010, and 2013. This national survey provides more extensive data and information with regards to variables and indicators as compared to Surkesnas. Riskesdas also demonstrates a large-scale data representing national, province, and district population as conducted in 2007/2008 and 2013. Multi-stage cluster sampling method was used to select subjects of this survey. Table 1 presents the comparison of Riskesdas by its respective years.

Tabel 1. Comparison of Riskesdas 2007/2008, 2010 and 2013

	2007/08	2010	2013
Household samples	280,000	69,000	295,000
Individual samples	986,532	251,388	1,027,763
Representativeness	National, province, district	National, province	National, province, district
Number of census block (CB) samples	18,000	2,800	12,000
Number of biomedical CB	971 (urban)	823 (urban and rural)	1000 (urban and rural)
Selection of CB samples	Similar to Susenas CB	Separated from Susenas CB	Separated from Susenas CB

	2007/08	2010	2013
Household number per CB	16	25	25
Collected data on indicators	HL Blum indicators, include nutritional status, except mother-child health and genetic factor	Related to MDGs, include nutritional status	HL Blum indicators, include nutritional status, except mother-child health and genetic factor
Biomarker data	Complete	Limited	Complete

The following surveys are nationally representative databases, which are morbidity survey of Surkesnas 2001 and SKRT 2004; Riskesdas 2007/2008; Riskesdas 2010; and Riskesdas 2013. Furthermore, the data gathered in all Riskesdas surveys represent province level whilst the comparison in district level can only be generated by Riskesdas data from 2007/2008 and 2013.

2.1.2.1. Riskesdas 2007/08

This survey was the first research managed by NIHRD. This baseline data was collected from approximately one million subjects and it represents national, province, and district level. Due to budget cuts, this survey was conducted within two years, 28 provinces were conducted at the end of 2007 and 5 provinces (East Nusa Tenggara, Maluku, North Maluku, Papua, and West Papua) were in the early of 2008.

2.1.2.2. Riskesdas 2010

The second Riskesdas was conducted particularly to evaluate MDGs (Millennium Development Goals) related to health, including nutritional status. To complete the indicators that were

not collected in Riskesdas 2007, reproductive health indicators were assessed in this survey. Since this survey covered a limited sample, the available data only represents national and province level.

2.1.2.3. Riskesdas 2013

The latest Riskesdas in 2013 had similar sample size with Riskesdas 2007/2008 of which, so that the information is available at district level. The data sources enable users to examine health indicators improvement of each district from 2007/2008 to 2013. However, there were several variables addedd and substracted from Riskesdas 2007/08. Anthropometry data for indicators related to nutritional status remained collected. Dietary intake was finally excluded from this survey and eventually, then it has been accommodated in Total Diet Study in 2014.

2.1.3. Susenas (National Socio-economic Survey)

Susenas is a series of large-scale socio-economic surveys that was conducted by Central Bureau of Statistics (BPS). Similar to Riskesdas, the Susenas data is aggregated at national, provincial and district levels. Riskesdas survey data was collected within Susenas sample frame in 2007. Hence, socio-economic status in Susenas (categorized as quintile 1 to 5) can be linked to Riskesdas data. However, both surveys used different sampling frame as well as socio-economic status indicator in 2013. Household ownership of assets was used to construct socio-economic status.

2.1.4. Child Growth and Development Cohort Study

This cohort study has been conducted by NIHRD since 2010 in Bogor District. Pregnant mothers were followed-up during pregnancy until delivery and their children were followed-up until the age of 18 years. This study has currently followed-up the children until 2 years of age. Moreover, this study performed

statistical analysis to 220 pregnant mothers whereas children growth and development were followed until the 18 months of age. Detailed information on pregnancies as well as children growth and development in this book were obtained from cohort study. However, it cannot be generalized to the population due to study area coverage.

2.1.5. Total Diet Study

This study comprised the individual food consumption survey (SKMI) and food chemical contamination analysis (ACKM). SKMI was conducted in 2014 and followed by ACKM in 2015. SKMI aimed to provide detailed information about dietary patterns prevailing in Indonesia and nutrients adequacy status. This survey used 24-hour individual dietary recall method. Moreover, this survey also gathered information on cooking method, process, utensils; and food list that will be used for the purpose of ACKM study. As one of large-scale surveys, SKMI also represents national and provincial level.

2.1.6. Public Health Development Index/PHDI

PHDI was constructed by multiple indicators comprising a composite index of main health indicators that were selected from community-based surveys. This index was initially formulated by 24 main health indicators from Riskesdas 2007/2008, Susenas 2007, and Podes 2008 whereas PHDI 2013 was developed on the basis of 30 main health indicators from Riskesdas 2013. PHDI 2013 provides more indicators as compared to PHDI 2007. It depicts current public health status in all Indonesian districts.

2.1.7. Indonesian Doctoral Dissertations

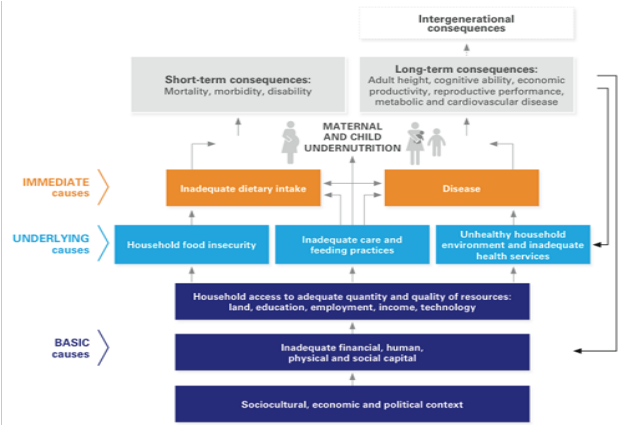
Many Indonesian doctoral dissertations used data from Indonesian survey to provide information on problem magnitude

and determinant factors of nutritional status. These results are very useful to complement the nutritional status evidences in this book.

Finally, all information obtained from these research/studies/ dissertations were then analyzed and compiled in this book. The authors performed additional analysis to accommodate the important information, which has not been provided by these study results, under the permission of NIHRD.

2.2. CONCEPTUAL FRAMEWORK

Information on stunting are referred to several factors in the "logical framework of the nutritional problems" or the "conceptual framework of the determinants of the child under nutrition" as described in Figure 4.



Sumber : Improving Child Nutrition, The achievable imperative for global progress, Unicef, 2013 Adapted from Unicef 1990.

Figure 4. Logical framework of nutritional problems.

Then, we developed logical framework of stunting problems in Indonesia based on this theoretical framework, as explained in Figure 5.

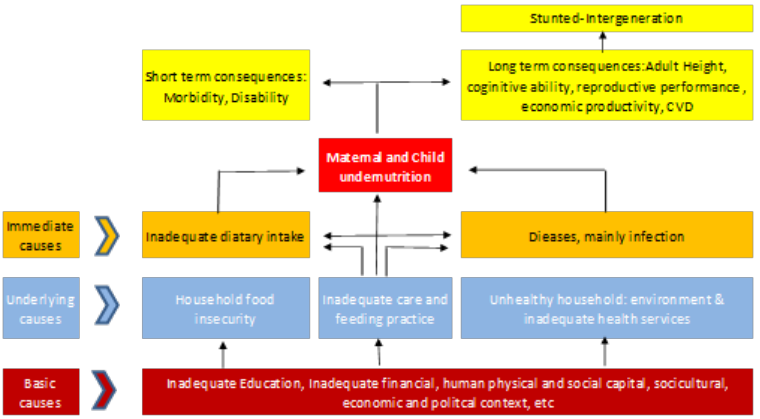


Figure 5. Logical framework of stunting in Indonesia, modified from "Logical framework of the nutritional problems" Unicef, 2013

Referring to the logical framework in Figure 5, the flow of discussion will be presented as follows:

- Trends of stunting in Indonesia based on survey conducted from 2001 to 2013.
- Magnitude of stunting, particularly the proportion of stunting and regional disparities.
- Burden of stunting in the future, including short and long term impacts of stunting.
- Determinant factors that influence stunting status, involving immediate, underlying, and basic causes.

The results from determinant factor analysis will be developed as recommendation of stunting prevention strategy. This output will be submitted to the Ministry of Health for specific programs and other related stakeholders for sensitive programs.

2.3. DATA ANALYSIS

Data and information provided in this book were mostly cited from available ready-to-use data of Indonesian research/study/

dissertations. The authors conducted additional analysis by using existing database to acquire any missing information.

Furthermore, results of the descriptive analysis were derived from Surkesnas, HHS, Riskesdas, Susenas, and TDS, while the results from cohort and the dissertation are use bivariate as well as multivariate analyses.

2.4. OPERATIONAL DEFINITION

2.4.1. Nutritional assessment for children under-five

Nutritional status of children under-five were assessed by using variable of age, body weight and body height/length. Variable of body weight and body height/length were presented as anthropometry indexes, which are weight for age (WAZ), height for age (HAZ), and weight for height (WHZ).

To assess nutritional status of under-five children, body weight and body height were converted into WHO anthropometry standards Z-scores for under-five children (2005). The value of Z-score from each indicator was interpreted as follows:

a. Nutritional status based on weight for age (WAZ) indicator:

Severe underweight	:	Zscore < -3,0
Moderate Underweight	:	Zscore ≥ -3,0 to Zscore < -2,0
Normal	:	Zscore ≥ -2,0

b. Nutritional status based on height for age (HAZ) indicator:

Severe stunting	:	Zscore <-3,0
Moderate Stunting	:	Zscore ≥- 3,0 to Zscore < -2,0
Normal	:	Zscore ≤-2,0

c. Nutritional status based on weight for height (WHZ) indicator:

Severe wasting	:	Zscore < -3,0
Moderate Wasting	:	Zscore ≥ -3,0 to Zscore < -2,0

Normal : Zscore ≥ -2,0 to Zscore ≤ 2,0
Overweight : Zscore > 2,0

d. The classification based on combination of HAZ and WHZ indicators (severe and moderate stunting are identified as stunting; severe and moderate wasting are identified as wasting):

Stunting and wasting : Z-score HAZ < -2.0 and Z-score WHZ < -2.0
Stunting and normal : Z-score HAZ < -2.0 and Z-score WHZ -2.0 to 2.0
Stunting and overweight : Z-score HAZ < -2.0 and Z-score WHZ > 2.0
Normal and Wasting : Z-score HAZ ≥ -2.0 and Z-score WHZ < -2.0
Normal and Normal : Z-score HAZ ≥ -2.0 and Z-score WHZ -2.0 to 2.0
Normal and Overweight : Z-score HAZ ≥ -2.0 and Z-score WHZ > 2.0

Prevalence was calculated as follows:

Based on WAZ indicator:

Severe underweight : (∑ Balita gizi buruk/∑ Balita) x 100%
Moderate Underweight : (∑ Balita gizi kurang/∑ Balita) x 100%
Normal : (∑ Balita gizi baik/∑ Balita) x 100%

Based on HAZ indicator:

Severe stunting : (∑ severe stunted children<5 years/∑ children<5 years) x 100%
Moderate Stunting : (∑ moderate stunted children<5 years/∑ children<5 years) x 100%
Normal : (∑ normal children<5 years/∑ children<5 years) x 100%

Based on WHZ indicator:

Severe wasting : (∑ severe wasted children<5 years/∑ children<5 years) x 100%
Moderate Wasting : (∑ moderate wasted children<5 years/∑ children<5 years) x 100%

Normal : (∑ normal children<5 years/∑ children<5 years) x 100%

Overweight : (∑ overweight children<5 years/∑ children<5 years) x 100%

Based on HAZ and WHZ indicators:

Stunting – wasting : (∑ stunted and wasted children<5 years/∑ children<5 years) x 100%

Stunting – normal : (∑ stunted but not wasted children<5 years/∑ children<5 years) x 100%

Stunting – overweight : (∑ stunted and overweight children<5 years/∑ children<5 years) x 100%

Normal - Wasting : (∑ wasted and not stunted children<5 years/∑ children<5 years) x 100%

Normal – normal : (∑ normal children<5 years/∑ children<5 years) x 100%

Normal - Overweight : (∑ overweight but non stunted children<5 years/∑ children<5 years) x 100%

There are certain nutrition terminologies used in this book, namely:

Underweight : *Identified as severe and moderate underweight*

Stunting : *Identified as severe and moderate stunting*

Wasting : *Identified as severa and moderate wasting*

The weight for age indicator reflects nutritional problem in general. This indicator does not indicate short or long-term health and nutritional experience of the individual or population since body weight is positively correlated with age and body weight. Low WAZ in childrenunder-five can be caused by stunting (chronic malnutrition) or suffering from diarrhea or other infectious diseases (acute malnutrition).

Indicator of height for age express long-term health and nutritional conditions. Low height for age are associated with poor socio-economic conditions, frequent exposure of illness and inappropriate feeding practices.

The weight for height nutritional status indicates recent health and nutritional experience, which is often associated with acute starvation and/or severe diseases that cause wasting. This indicator can be used to identify wasting and overweight.

Another nutritional problem is described as acute-chronic malnutrition, which can be shown in stunted wasted children.

2.4.2. Nutritional assessment for children aged 5-18 years

Nutritional status indicators for older children aged 5-18 years are based on anthropometry measurements of body weight and body height. According to WHO 2007, these indices are expressed as body height for age Z-score (HAZ) and Body Mass Index for age Z-score (BAZ). Interpretations of Z-score are classified as following:

HAZ indicator:	
Severe stunting	: Z-score < -3.0
Moderate Stunting	: Z-score ≥ -3.0 to Z-score < -2.0
Normal	: Z-score ≥ -2.0
BAZ indicator:	
Severe wasting	: Z-score < -3.0
Moderate Wasting	: Z-score ≥ -3.0 to Z-score < -2.0
Normal	: Z-score ≥ -2.0 to Z-score ≤ 1.0
Overweight	: Z-score > 1.0 to Z-score ≤ 2.0
Obese	: Z-score > 2.0

2.4.3. Nutritional assessment for adult aged >18 years

Nutritional status of adult is evaluated by using Body Mass Index (BMI), with the formula as following:

$$BMI = \text{Body weight (kg)} \div \text{Body height (m)}^2$$

This indicator is categorized as follow:

Thin	BMI < 18.5
Normal	BMI ≥ 18.5 to < 24.9
Overweight	BMI ≥ 25.0 to < 27.0
Obese	BMI ≥ 27.0

Based on body height, adult nutritional status is classified as stunted if body height <150.1 cm for female and body height <161.9 cm for male.

This book will focus on stunting problems with regards to its problem magnitude, determinant factors, and recommended intervention to Ministry of Health and other related sectors.

2.5. STUDY LIMITATION

1. This study used secondary data from large-scale surveys in 2001-2013. Although these studies have been conducted on a national scale, they used different sampling frame as well as sample size. HHS 2001 and 2004 are nationally representative database. The Riskesdas 2010 represents national and province level whereas Riskesdas 2007 and 2013 represent national, province, and district level. Precision of each study is different so that data interpretation should be read carefully, particularly regarding the information on trends 2001-2013.
2. Indonesian studies have not fulfilled the logical framework yet and some information are still missing, which are:

- No research on relationships between stunting and mortality
- Limited study on stunting and non-communicable diseases in adulthood
- The study on stunting and children development status is still conducted in the early stage

CHAPTER 3
TREND OF STUNTING

3.1. TREND OF STUNTING AMONG CHILDREN UNDERFIVE

The National Institute of Health Research and Development of the Ministry of Health has done 5 national large surveys measuring the nutritional status of children, namely HHS 2001 and 2004, as well as Riskesdas in 2007, 2010 and 2013. The number of samples used for each survey do not equally represent the territory, so it should be take into caution in interpreting the results. Survey in 2001 and 2004 could represent the national and regional (Java-Bali, Sumatra and East indonesia) level, Riskesdas 2010 represents national and provincial level, while Riskesdas 2007 and 2013 are using the largest sample so they represent the national, provincial and district level. For the national level there is a decrement of the prevalence of stunting among underfive, in 2001 is at 29.5% (CI 27.9 to 30.1) to 28.5% (CI27.2 to 28.8) in 2004. The prevalence of stunting in underfive showed an increment from 2004 to 2007 (36.8%:CI 35.8 to 36.2), and then there was a slight decrease in 2010 (35.6%; CI 34.7 to 35.3) and increased again in 2013 to 37.2% (CI 36.7 to 37.3). In general, boys tend to have higher prevalence than girls (see figure 6 below)

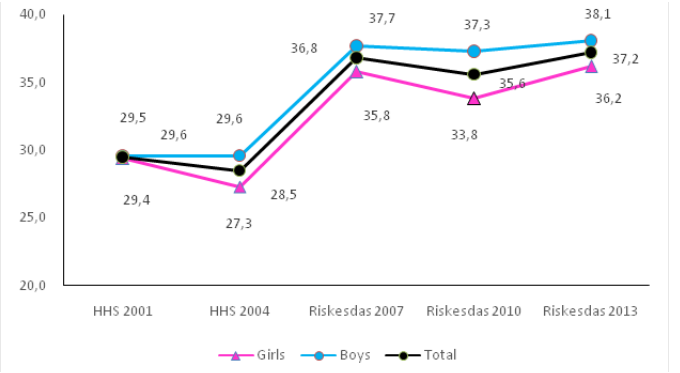


Figure 6. Trend ofstunted prevalence among children under five, 2001 – 2013

Trends of stunting prevalence among children under five in the last 6 years can be seen from the results of Riskesdas 2007, 2010 and 2013 (Figure 7). For the prevalence of severe stunting, tends to have decreased from 18.8% (Riskesdas 2007) to 18.0% (Riskesdas 2013), but for stunting occured a slight increment from 18.0% (Riskesdas 2007) slightly fell to 17.1% (Riskesdas 2010) but then to 19.2% (Riskesdas 2013).

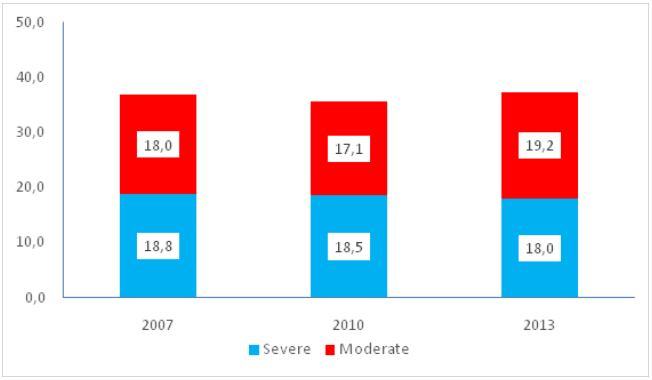


Figure 7. The trend of severe and moderate stuntedprevalence of children under five: 2007-2013

Dynamics of changes in the prevalence of stunting between provinces can be seen in Figure 8 that combines the prevalence of stunting from Riskesdas (2007, 2010 and 2013) below.

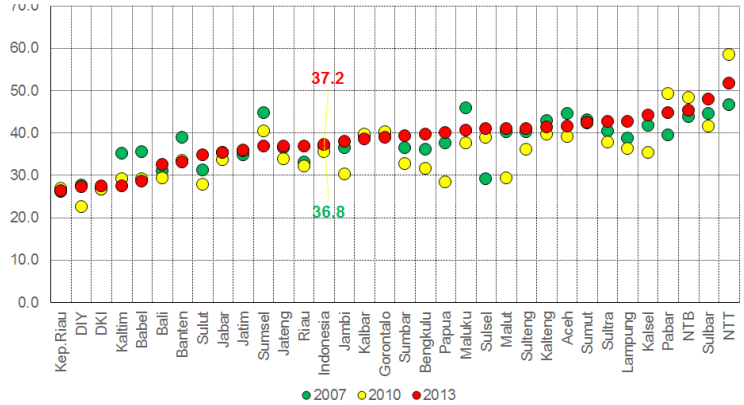


Figure 8. The trend of stunted prevalence among children under five by province, 2007-2013

Compared to 2007, the prevalence of stunting was relatively stagnant, some provinces showed progress with a decrease in the prevalence of stunting among underfive (Kaltim, Babel, Banten, South Sumatra, Maluku). Some provinces showed deterioration due to increased prevalence of stunting (Sulawesi, West Papua and Aceh, NTT). According to Riskesdas in 2013, the provinces with the highest prevalence of stunting are East Nusa Tenggara, West Sulawesi and West Nusa Tenggara.

Public health problems of stunting are considered as severe when its stunting prevalence is of 30-39 percent and the prevalence of severe stunting ≥ 40 percent (WHO 2010). A total of 14 provinces are considered as having severe category, and as many as 15 provinces are categorised as very severe . The 15 provinces are: (1) Papua, (2) Maluku, (3) South Sulawesi, (4) North Maluku, (5) Central

Sulawesi, (6) Central Kalimantan, (7) Aceh, (8) North Sumatra , (9) Southeast Sulawesi, (10) Lampung, (11). South Kalimantan, (12). West Papua, (13). Nusa Tenggara Barat, (14). West Sulawesi and (15) East Nusa Tenggara.

The results of further review of the height/length of children under five in Indonesia based on gender as compared to WHO reference 2005 can be seen in Figure 9 below. It appears that with increasing of the age, there was a widening gap compared to the standard/reference, both for boys and girls. In 2010 the average height of childrenunderfive when reaching the age of 5 years, for boys there is a difference of 6.7 cm and 7.3 cm forgirls compared to WHO standards.

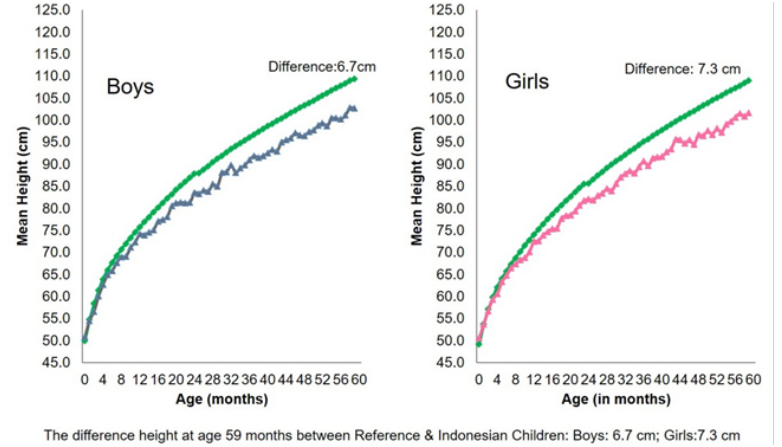


Figure 9. The difference of mean height of Indonesian Children under five (Riskesdas 2010) compared to WHO's Reference

While based on the results of Riskesdas 2013 at the same age, for boys there is a difference of 6.4 cm and 6.7 cm in girls compared to the standard. Height improvement occurred within the last 3 years. Compared to the standard, the gap decreased by 0.3 cm in boys and 0.6 cm in girls.

Trends of stunting using a national research data from 2001 through 2013 can be concluded based on the year of birth. Assumed that the child was born in 2001 (0 years old), in 2004 he will be 3 years old, and for a child that were born in 2004, in 2007 will be 3 years old, and so the children that born in 2010, in 2013 will be 3 years old. The situation looks like in figure 10, which seems to be that the children of Indonesia were deteriorated. The proportion of children that were born short in 2001 at 23 percent, had dropped to 18.6 percent in 2004, but rose again in 2007 to 27.9 per cent, and in 2010 to 29.3 per cent. From that, the child who was born in 2001, will be 3 years old in 2004, with the proportion of stunting of 29.4 percent, and so on, who was born in 2004 will be 3 years old in 2007, with the proportion of stunting to 44.8 percent. And so on, who was born in 2010, will be 3 years old in 2013 with the proportion of stunting dropped to 39.6 percent.

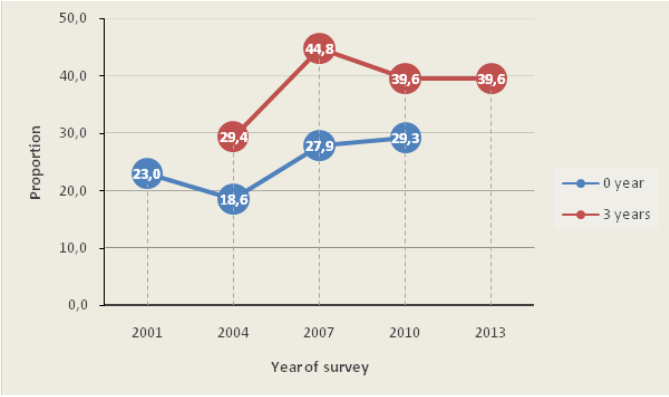


Figure 10. Trends of stunted prevalence at the aged 0 and 3 years according to the child's year of birth

By comparing the prevalence between children aged 0 to 3 years, it appears that the prevalence of stunting at the age of 3 years is always higher than at birth. It shows during the growing age of (0-

3) years, there is an increase in the prevalence of stunting, which means there is a worsening of the nutritional status, particularly on stunting.

Figure 11 presents the trend for the prevalence of the combined nutritional status indicators of height for age and weight for height nationwide. The underfive children that have normal height and normal weight nutritional status were less than 50 percent. Additionally there is a trend of increment in the prevalence of normal-overweight at 3.9 percent (2007) to 5.1 percent (2013). This situation shows that the double burden of malnutrition problem has been existing since the age of five.

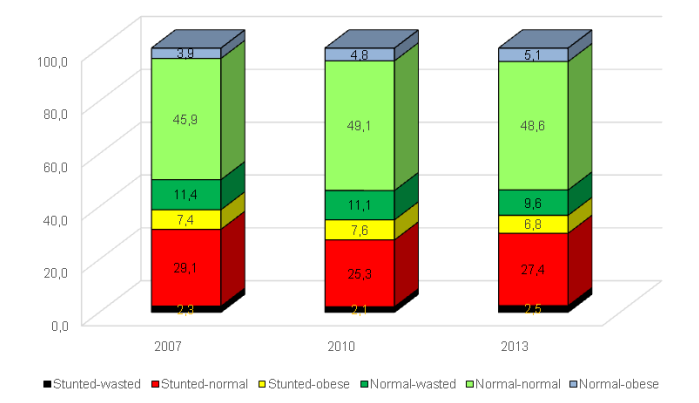
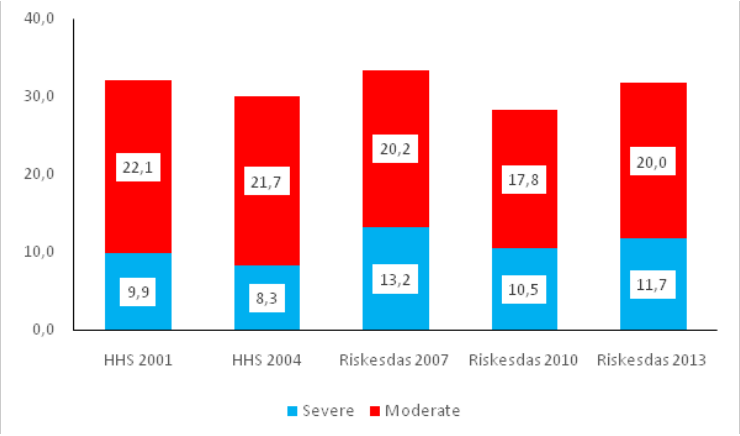


Figure 11. Trends in the proportion of combined nutritional status(Height for Age and Weight for height) of children under fivebased on Riskesdas 2007, 2010, and 2013

3.2. TRENDS OF STUNTING AMONG SCHOOL-AGED CHILDREN

The trends of the prevalence of stunting among school-aged children from 2001 to 2013 can be seen in Figure 12. It appears that there are fluctuations in the prevalence of stunting among school-aged children. The highest prevalence occurred in 2007

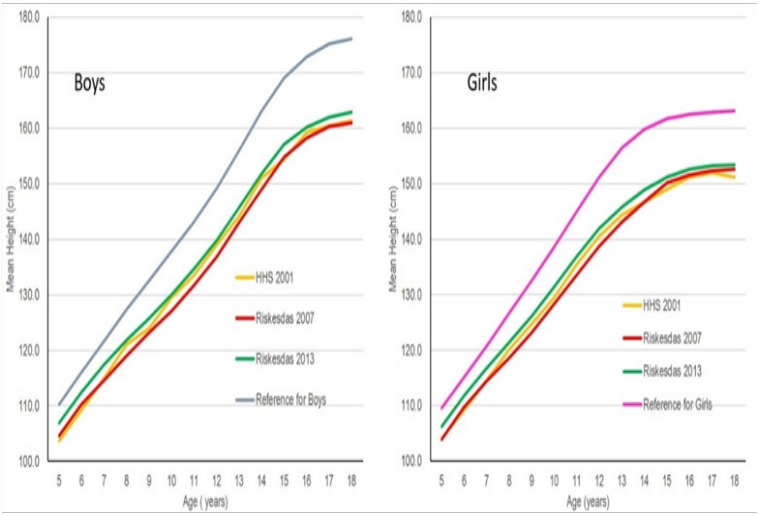
which was at 33.4% (CI 33.3 to 33.5). Prevalence in 2001 was at 32% (CI 31.4 to 32.6) which declined in 2004 to 30% (CI 29.4 to 30.6). This prevalence decreased again in 2010 to 28.3% (CI 28.1 to 28.5), but increased again in 2013 (31.7% CI 31.6 to 31.8), although not as high as in 2007.



Source: HHS 2001, 2004 and Riskesdas 2007, 2010, 2013

Figure 12. The trend of severe and moderate stunted prevalence of school aged children, 2001 – 2013

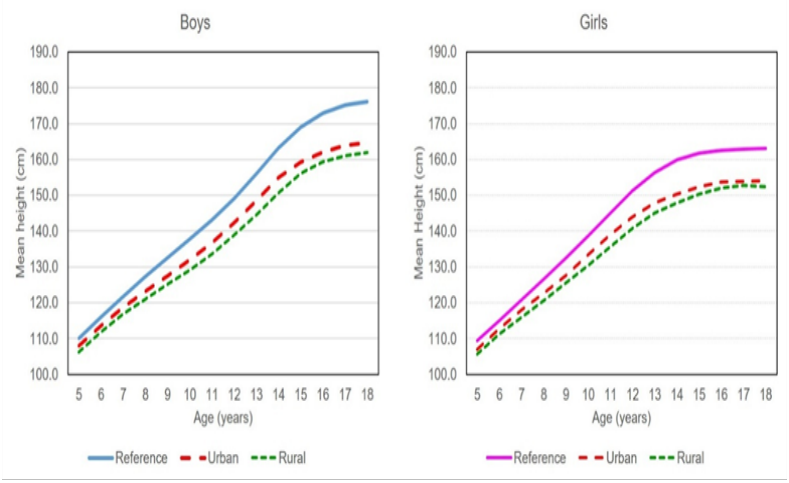
Analysis of growth in school-aged children from 2001 to 2013 by sex can be seen in the following figure. It appeared to have improvements in growth rate of school-aged children for boys and girls gradually, although not particularly meaningful. The growth of school-age children based on Riskesdas 2013 looks better than the results of previous similar surveys, but when compared to WHO standards, the gaps are still significant. The gap for boys is at 12.5 cm and at about 9.8 cm for girls.



Source: HHS 2001, 2004 and Riskesdas 2007, 2010, 2013

Figure 13. Comparison of the mean height of Indonesian children with the WHO's reference: boys and girls of school aged children: 2001-2013

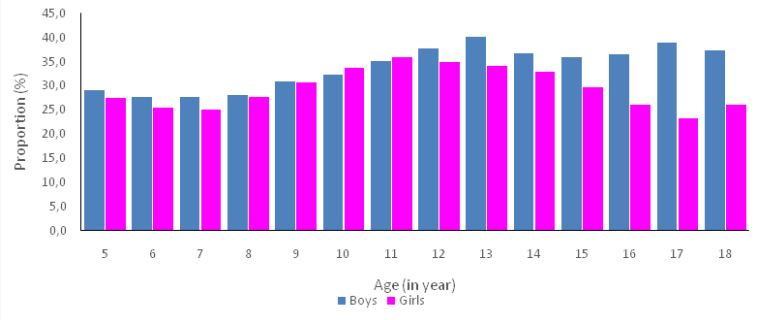
When associated with location of residence, the gap of growth of school-aged children in Indonesia with WHO standards by sex can be seen in Figure 14. In urban areas the growth of school-aged children is better than in rural areas, for boys the differences was at 2.7 cm, while for girlswas at 1.7 cm. However, for both (boys and girls) in urban and rural areas there is still a wide gap compared to the WHO's standard.



Source: Riskesdas 2013

Figure 14. Mean Heightof school-aged children by residence and sex, 2013

Overall, the prevalence of stunting among children aged 5-18 years according to sex is presented in Figure 15. Among boys, the highest stunting prevalence was at the age of 13 years (40.2%), while in girls at the age of 11 years (35.8%).



Source: Riskesdas 2013

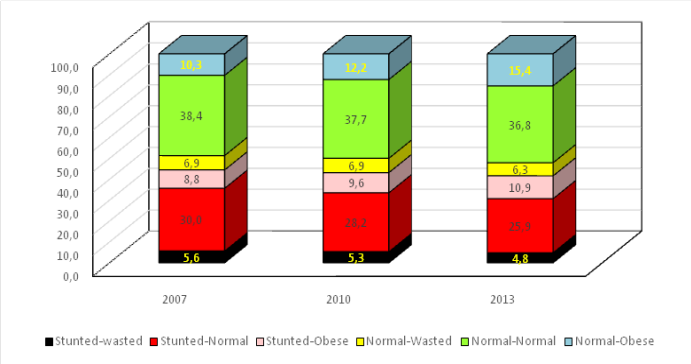
Figure 15. Prevalence of stunted at the age of 5-18 years by sex, 2013

There is a tendency of increasing prevalence in the age of 11-17 years for boys, and at the age of 11-15 years for girls. This can be attributed as a result of the economic crisis in 1998 - 2000, where the majority of children in these age group were born.

The condition that one third of girlswere suffering from stunting are very alarming, because it will affect to the condition of the fetus later on. When pregnant woman is short, she will more likely to give birth to short length babies, which later on become a short teenager as well. This condition can be dangerous because it can cause a cross-generational stunting when there is no intervention that has leverage.

3.3. TRENDS OF STUNTING AMONG ADULTS AGED >18 YEARS OLD

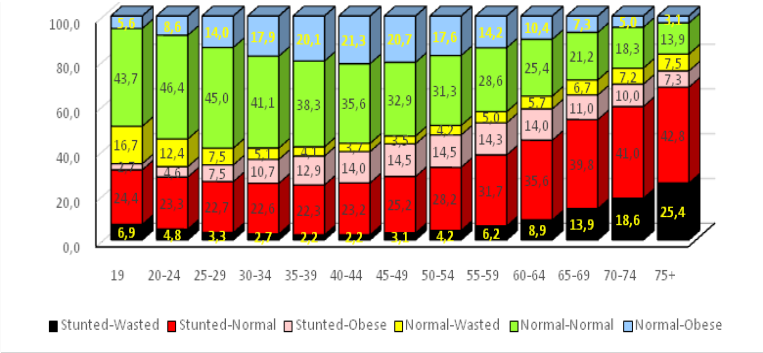
The tendency of the nutritional status of adults aged> 18 years during 2007-2013 can be seen in Figure 16, which is a combination of height and weight: 1) stunted-wasted, 2) stunted-normal weight, 3) stunted-overweight, 4) normal-wasted, 5) normal height-normal weight, 6) normal height-overweight has not changed much in the last 6 years. There is a tendency of stunted-overweight among adults to increase, which means the risk of suffering from non-communicable diseases also increases, because the stunted-overweight group is more risky than stunted-normal weight and stunted-wasted.



Sources: Riskesdas 2007, 2010, 2013

Figure 16. Trends in the proportion of combined nutritional status (Height for Age and Weight for Height) among adult aged>18 years based on Riskesdas 2007, 2010, and 2013

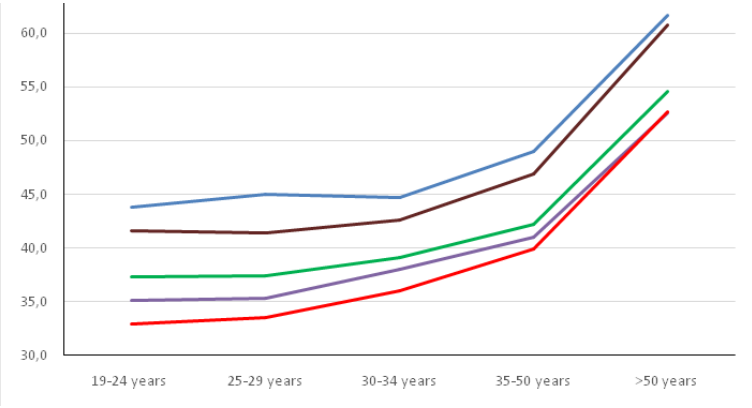
The same analysis was performed on Riskesdas 2013 data, by separating based on age group from 19 years up to 75 years and older. Normal nutritional status haveless proportion as the age increases, otherwise the proportion of stunting (wasted-stunted, normal weight-stunted and overweight-stunted) increases with increasing age (Figure 17).



Source: Riskesdas 2013

Figure 17. Proportion of combined nutritional status (Height for Age and Weight for Height) among adults aged 19-75+ years based on Riskesdas 2013

Stunting overview on adults on 2001 - 2013 can be seen in Figure 18 below. It appears that there is improvement of nutrition in adulthood indicated by decrement of the prevalence. It can be seen from the age group 19-24 years, the prevalence from survey in 2001 was nearly from 45% reduced to 34% in 2013. Similarly for the other age groups, albeit the direction is towards the top of the graph which shows that the prevalence of stunting increases with the increasing of age.



Source: HHS 2001, 2004, and Riskesdas 2007-2013

Figure 18. Prevalence of stuntedby age groups, 2001-2013

CHAPTER 4
THE MAGNITUDE OF STUNTING PREVALENCE

Based on the 2010 Population Census, with 1.49 growth rate, the number of population in Indonesia reached 237.56 millions which resided in 33 provinces. Proportion of children aged 0-4 and 5-14 years was at 8.8and at 20.2 percent, respectively. These children are the future generation expected to develop and change Indonesia after the year of 2025. It is estimated that the proportion of young population will decline, and the population will reach an older age. In that year, the estimated proportion of children aged 0-4 and 5-14 years will be at 7.3 and at 15.0 percent, respectively. Meanwhile, people aging at 65 years and above will be at 9.2 percent. To note, the proportion of people within this age group in 2010 was at 5.5 percent. (Atmarita, 2012)

The basic question is whether the 20.2 percent children are able to bring Indonesia to a better condition in 2025? Therefore, vision, mission, policies, and strategies elaborated in the Long Term National Development Plan 2005-2025 need to be translated into applied programs that can be implemented in a large scale in order to build the future generation which is highly competitive at a global level.

4.1. STUNTING AMONG INFANTS

Birth weight and birth length

Besides birth weight, one of the nutritional status indicators for a newborn baby is the birth length. Birth length is considered as normal if it is between 48 and 52 cm. Thus, babies born with less than 48 cm in birth length are categorized as short babies.

Nevertheless, if we want to relate the birth length with risk of non-communicable disease in later life, the WHO recommends using<50 cm as the cut off point.

Birth weight and birth length were recorded or copied based on the document/record possessed by the subjects, such as KIA book, growth chart, or other child's health record books. Data from the 2013 Riskesdas showed that 52.6 percent of children under five years old have birth weight record, and 45 percent of the same group had birth length record.

Condition of newborns in Indonesia is presented in Figure 19. As many as 10.2 percentage of the newly born babies had birth weight of <2500 gram, while 4.8 percentageof the newly born had birth weight of >4000 gram. In term of length, 20.2 percentage of them had <48 cm birth length, and 3.3 percentage were born with >52 cm inbirth length.

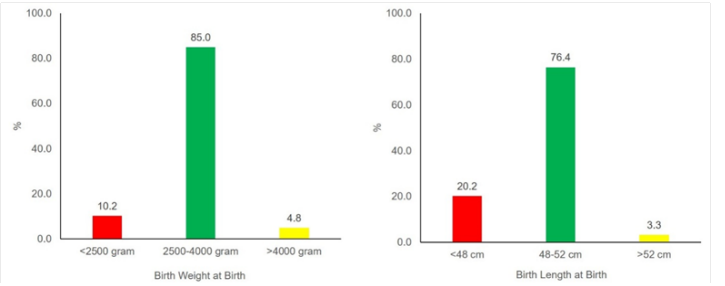


Figure 19. Proportion of baby born by Weight and Length at birth, Riskesdas 2013

The next analysis was focused on babies with short birth length. Figure 20 demonstrates proportion of babies born with short length by provinces. Variations of the proportions were quite high, in which Bali had the lowest proportion (9.6%), and East

Nusa Tenggara had the highest (28.7%), i.e. almost three times higher than Bali's.

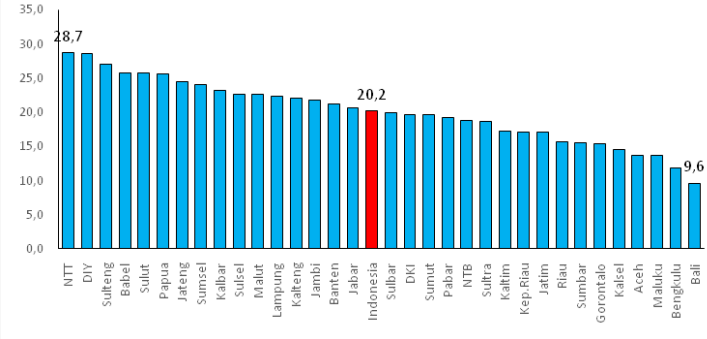
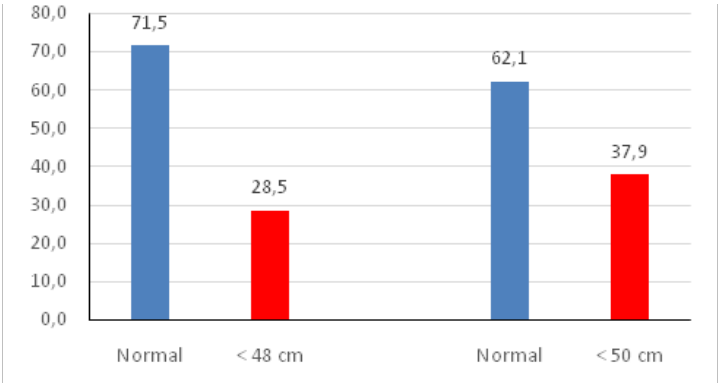


Figure 20. Proportion of baby born with short length (<48 cm) by province, 2013

The cohort study on Child's Growth and Development conducted in Bogor City by the National Institute of Health Research and Development (NIHRD)-Ministry of Health suggested? Atau confirmed? a higher percentage, i.e. 28.5 % baby with <48 cmbirth length, and 37.9 % baby with<50 cm birth length (the WHO standard). Reliability of the Cohort Study's data is considered better than that of Riskesdas. It was indicated that short birth length occurred in 30-40 percentage of newborns, and the percentage of this problem in Indonesia is estimated to be higher than the figure shown below (Figure21).



Source: The Cohort Study on Child Growth and Development, NIHRD, 2013

Figure 21. Proportion of normal infant compare to short infant in cohort studies in Bogor, 2013

The following figure (Figure 22) outlinesthe percentage of baby born with <2500 gram birth weight (low birth weight) and <48 cm birth length (short birth length) by provinces. Nationally, percentage of underfive year-old children having history of short birth length and low birth weight was at 4.3 %. The highest percentage was in Papua (7.6%) and the lowest was in Maluku (0.8%).

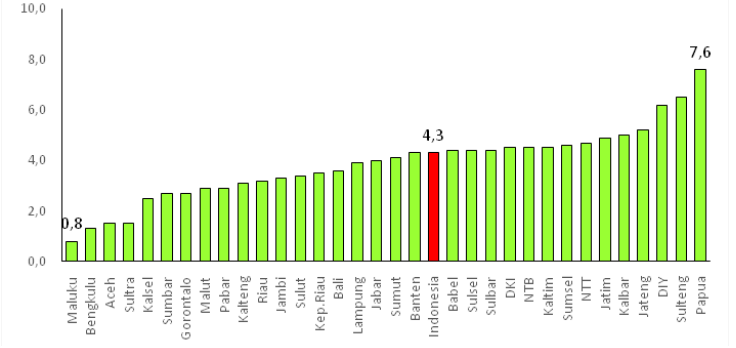


Figure 22.Proportion of infants with birth weight <2500 g and length <48 cm at birth by Province, Indonesia 2013

Percentage of children under five years old with history of low birth weight and short birth length by their characteristics is described in Figure 23. The highest percentage of children with history of low birth weight and short birth length was observed among the age group of 0-5 months, which was at 5.8 % comparedto the age group of 48-59 months (at 3.3%).This information indicates the percentage of infants with a history of short birth length and low birth weight increased. Moreover, the percentage was higher among females (4.99%) compared to males (3.8%).

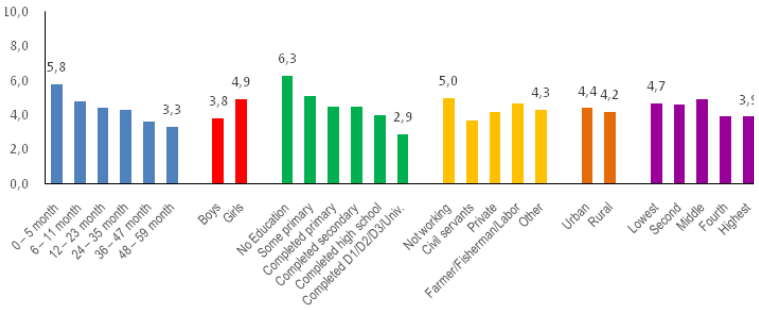


Figure 23. Proportion of children with birth weight <2500 g and length <48 cm at birth by characteristics, Indonesia 2013

The percentage of children with history of low birth weight and short birth length tends to decrease as itsparent'seducational level increases. By head of household's occupation, the percentage was higher among children originating to households of which the head has no occupation and farmer/fisherman/labor, than children from household of which the head worked as civil servant/ employee. By residence, the problem was slightly higher among children living in urban than rural (4.4 vs 4.2%) area respectively. On the other hand, there was no clear pattern observed by wealth index quintile.

The following Table 2 presents number and percentage of the children's birth length by provinces. The birth length was categorized into three, i.e. <48 cm, 48-52 cm, and >52 cm. Percentage of baby with short birth length (birth length of <48 cm) was the highest in East Nusa Tenggara (28.7%) and the lowest in Bali (9.6%). At national level, number of babyieswith short birth length was at 4.8 million.

Table 2. Number and percentage of children under five years old according to birth length categories by provinces, Indonesia 2013

Provinces	Birth Lenght					
	<48 cm		48 - 52 cm		>52 cm	
	N	%	N	%	N	%
Aceh	62.107	13,7	372.641	82,1	18.587	4,2
North Sumatera	309.270	19,6	1.172.386	74,3	96.252	6,1
West Sumatera	81.079	15,5	428.264	82,4	10.914	2,1
Riau	112.035	15,7	577.301	80,8	24.976	3,5
Jambi	75.072	21,7	257.734	74,4	13.146	3,9
South Sumatera	193.709	24,1	583.537	72,6	26.524	3,3
Bengkulu	21.534	11,8	149.085	81,0	13.436	7,2
Lampung	171.037	22,4	577.251	75,5	15.271	2,1
Bangka Belitung	36.083	25,8	98.078	70,3	5.155	3,8
Kepulauan Riau	39.946	17,1	189.859	80,8	4.934	2,1
DKI Jakarta	172.117	19,7	669.343	77,0	28.686	3,3
West Java	897.353	20,6	3.310.622	76,0	148.107	3,4
Central Java	668.666	24,5	1.997.810	73,2	60.043	2,2
DI Yogyakarta	75.934	28,6	185.586	70,0	3.983	1,4
East Jawa	516.230	17,1	2.404.073	80,1	81.036	2,7

Provinces	<48 cm		48 - 52 cm		>52 cm	
	N	%	N	%	N	%
Banten	241.804	21,2	872.546	76,5	26.233	2,3
Bali	34.457	9,6	302.653	85,3	18.117	5,1
West Nusa Tenggara	91.844	18,8	379.099	77,6	17.587	3,6
East Nusa Tenggara	180.907	28,7	415.580	65,7	36.055	5,6
West Kalimantan	107.317	23,2	336.752	72,7	18.503	4,0
Central Kalimantan	54.597	22,1	184.789	74,9	7.658	3,0
South Kalimantan	55.196	14,5	300.934	79,6	21.927	5,9
East Kalimantan	75.301	17,2	334.232	75,9	30.385	6,9
North Sulawesi	53.323	25,7	145.915	70,9	7.440	3,5
Central Sulawesi	81.757	27,1	209.540	69,1	11.507	3,8
South Sulawesi	183.896	22,6	603.766	74,2	26.038	3,2
South East Sulawesi	71.349	18,6	278.491	72,5	33.756	8,9
Gorontalo	17.485	15,4	90.228	80,5	4.371	4,0
West Sulawesi	29.643	19,9	113.979	77,2	4.595	2,9
Maluku	28.013	13,6	162.393	79,7	12.382	6,8
North Maluku	30.627	22,6	100.945	72,6	5.768	4,8
West Papua	20.022	19,2	76.974	74,0	6.743	6,8
Papua	95.461	25,6	266.167	71,1	13.102	3,3
Indonesia	**4.825.391**	**20,2**	**18.250.490**	**76,4**	**788.307**	**3,3**

The percentage of birth length of children under five years old by characteristics is explained in Table 3. By age group, no specific pattern was observed. The percentage was, however, higher among females (21.4%) than males (19.2%). By education and wealth index quintile, there was a tendency that the higher the education as well as the wealth index quintile, the lower the percentage of babies with short birth length. By type of occupation the percentage of short birth length was the highest among children from household whose head of the family had no occupation (22.3%) and was the lowest among children from household whose head of the family worked as employee/civil servants(18.1%). The percentage of short birth length baby was higher among rural than urban baby (21.9 vs 19.1%) respectively.

Table 3. Percentage of children under five years based on birth length categories by characteristics, Indonesia 2013

Characteristics	<48 cm	48 - 52 cm	>52 cm
Age group (month)			
0 – 5	22,7	74,1	3,2
6 – 11	21,4	75,6	3,1
12 – 23	20,7	75,9	3,4
24 – 35	20,9	76,0	3,2
36 – 47	18,3	78,3	3,4
48 – 59	17,7	78,5	3,8
Gender			
Males	19,1	77,3	3,6
Females	21,4	75,6	3,1
Education			
No education	24,9	73,1	2,0
Some primary	22,5	75,1	2,4
Completed primary	22,1	74,9	3,0
Completed secondary	21,1	76,0	2,8
Completed high school	18,5	77,6	3,9

Characteristics	<48 cm	48 - 52 cm	>52 cm
Diplome/University, graduated	16,7	79,0	4,3
Occupation			
No working	22,3	74,7	3,0
Employee/civil serrvants	18,1	77,9	4,0
Private	18,8	77,7	3,5
Farmer/fisherman/labor	22,3	74,9	2,8
Others	21,1	75,5	3,4
Residence			
Urban	19,1	77,5	3,4
Rural	21,9	74,9	3,2
Wealth index quintile			
Lowest	24,1	73,5	2,4
Second	22,5	74,6	2,9
Middle	21,6	75,9	2,5
Fourth	19,0	77,3	3,7
Highest	17,8	78,0	4,2

4.2. STUNTING AMONG CHILDREN UNDER FIVE YEARS OLD

Figure 8, presented in the previous chapterindicated the trend of stunting prevalence among chidren under five years at national level as well as by provinces. In 2013, 37.2%of children under five years were stunted, indicating an increased prevalence compared to that in 2010 (35.6%) and 2007 (36.8%). The stunted prevalence of 37.2 percentwas consisted of 18.0% severe and 19.2%moderate. The total number of children under five years who were severely stunted, moderatelystunted, and not stunted by provinces in 2013 is listed in table 4.

Table 4. Number of children under five years old based on their nutritional status (length or height/age) by provinces, Indonesia 2013

Provinces	Nutritional status based on length or height/age		
	Severe stunted	Moderate Stunted	Normal
Aceh	91.120	97.013	265.200
North Sumatera	358.185	312.426	907.297
West Sumatera	95.632	108.106	316.001
Riau	142.720	119.884	450.994
Jambi	65.731	65.385	214.836
South Sumatera	159.950	135.033	508.786
Bengkulu	41.412	31.657	110.985
Lampung	210.743	114.534	438.283
Bangka Belitung	17.554	22.430	99.332
Kepulauan Riau	23.497	38.301	173.176
DKI Jakarta	105.183	133.869	630.226
West Jawa	736.178	801.519	2.818.385
Central Java	458.514	543.121	1.724.885
DI Yogyakarta	21.771	50.711	193.285
East Java	504.225	570.255	1.926.860
Banten	187.056	189.337	764.191
Bali	46.535	69.269	239.778
West Nusa Tenggara	100.149	120.667	267.226
East Nusa Tenggara	165.726	161.298	305.518
West Kalimantan	104.079	74.474	284.019
Central Kalimantan	45.456	56.573	145.015
South Kalimantan	77.124	89.978	210.956
East Kalimantan	51.962	69.577	319.260
North Sulawesi	35.135	36.789	134.755
Central Sulawesi	53.596	70.553	178.351
South Sulawesi	133.447	199.357	480.897
South East Sulawesi	81.322	82.090	220.184
Gorontalo	16.476	27.125	68.484

Provinces	Nutritional status based on length or height/age		
	Severe stunted	Moderate Stunted	Normal
West Sulawesi	33.052	38.092	77.073
Maluku	41.410	41.004	120.577
North Maluku	25.133	31.314	81.031
West Papua	22.719	23.652	57.471
Papua	93.589	56.528	224.239
Indonesia	**4.299.854**	**4.586.511**	**15.001.712**

The number and proportion of children under two years old by their nutritional status (length for age) in Indonesia is presented in Table 5. The table informs us that more than two millions of Indonesian children in this age group were stunted (stunted and severely stunted). The highest proportion was in East Nusa Tenggara (43.5%) where as the lowest was in DI Yogyakarta (24.5%).

Table 5. Number and proportion of children under two years (0-23 months) based on their nutritional status (length for age) by provinces, Indonesia 2013

Provinces	Nutritional status based on length for age					
	Severe Stunted		Moderate Stunted		Normal	
	N	%	N	%	N	%
Aceh	32.658	19,6	26.038	15,6	107.740	64,7
North Sumatera	87.178	20,5	70.514	16,6	268.015	63,0
West Sumatera	30.480	18,5	27.015	16,4	107.591	65,2
Riau	45.919	20,2	31.153	13,7	150.223	66,1
Jambi	19.101	18,0	18.417	17,3	68.795	64,7
South Sumatera	46.192	19,3	35.215	14,7	157.810	66,0
Bengkulu	11.062	20,6	7.968	14,9	34.554	64,5
Lampung	44.913	23,5	27.957	14,6	118.141	61,9
Bangka Belitung	7.247	14,8	7.207	14,7	34.495	70,5
Kepulauan Riau	12.135	11,6	17.827	17,0	74.739	71,4
DKI Jakarta	45.489	14,6	40.586	13,0	225.785	72,4
West Java	226.729	15,8	201.413	14,1	1.002.436	70,1
Central Jawa	162.461	18,1	140.521	15,7	594.011	66,2
DI Yogyakarta	5.884	6,4	16.594	18,1	69.404	75,5
East Java	186.835	16,7	158.017	14,1	773.670	69,2

Provinces	Nutritional status based on length for age					
	Severe Stunted		Moderate Stunted		Normal	
	N	%	N	%	N	%
Banten	63.000	15,8	58.656	14,7	277.967	69,6
Bali	19.807	15,5	19.160	15,0	88.549	69,4
West Nusa Tenggara	31.117	19,8	26.118	16,6	99.832	63,6
East Nusa Tenggara	46.899	25,5	33.150	18,0	103.638	56,4
West Kalimantan	21.797	17,6	14.931	12,1	86.963	70,3
Central Kalimantan	15.701	19,2	16.304	20,0	49.584	60,8
South Kalimantan	29.178	20,9	26.609	19,1	83.747	60,0
East Kalimantan	15.480	11,4	18.946	14,0	101.220	74,6
North Sulawesi	11.454	17,5	8.725	13,4	45.095	69,1
Central Sulawesi	24.962	21,2	22.666	19,3	69.877	59,5
South Sulawesi	44.296	16,0	49.409	17,8	183.500	66,2
South East Sulawesi	17.684	19,7	16.429	18,3	55.703	62,0
Gorontalo	5.713	15,5	6.404	17,4	24.634	67,0
West Sulawesi	8.791	18,9	9.754	20,9	28.088	60,2
Maluku	12.939	19,5	11.071	16,7	42.345	63,8
north Maluku	9.048	19,6	9.028	19,5	28.109	60,9
West Papua	5.960	19,1	6.367	20,4	18.830	60,4
Papua	25.252	25,4	13.419	13,5	60.742	61,1
Indonesia	**1.373.361**	**17,6**	**1.193.588**	**15,3**	**5.235.832**	**67,1**

The proportion of samples of the Riskesdas 2013 for children under two years by combination of nutritional status is shown in Table 6.It showed that 8.5 %children under two years old in Indonesia were short and overweight. The highest proportion of short and overweight children under two years old was in Lampung (13.5%). In contrary, the lowest proportion was in Maluku (4.1%).

Table 6. Number of children under two years old (0-23 monthd) by combination of nutritional status across provinces, Indonesia 2013

Provinces	Combination of Nutritional Status											
	Short Thin		Short Normal		Short Overweight		Normal length-Thin		Normal length-Normal weight		Normal length Qverweight	
	n	%	n	%	n	%	n	%	n	%	n	%
Aceh	34	3,9	280	23,2	82	7,5	161	14,6	576	46,1	56	4,8
North Sumatera	52	2,6	430	23,5	173	9,8	260	13,9	747	44,7	95	5,6
West Sumatera	17	2,1	226	25,4	63	7,2	127	12,9	469	48,7	32	3,7
Riau	21	2,6	168	20,7	79	10,0	103	12,2	372	47,4	51	7,1
Jambi	12	2,7	109	21,9	47	8,8	64	10,6	245	49,8	31	6,3
South Sumatera	8	,7	155	19,3	97	11,7	106	11,4	390	49,0	63	7,7
Bengkulu	5	1,4	94	21,6	41	11,2	44	12,6	171	45,2	28	8,0
Lampung	10	1,5	105	21,1	76	13,5	75	12,4	251	42,0	50	9,5
Bangka Belitung	6	1,6	73	18,8	29	9,3	34	10,2	203	53,7	23	6,4
Kepulauan Riau	4	1,0	87	20,1	27	7,2	43	13,2	236	54,9	17	3,6
DKI Jakarta	4	1,0	57	18,2	19	5,0	32	10,7	187	60,5	16	4,6

Provinces	Combination of Nutritional Status											
	Short Thin		Short Normal		Short Overweight		Normal length-Thin		Normal length-Normal weight		Normal length Qverweight	
	n	%	n	%	n	%	n	%	n	%	n	%
West Java	23	1,5	379	19,5	154	8,2	217	11,7	1003	52,9	123	6,3
Central Java	28	1,3	337	21,1	159	9,6	210	11,6	900	50,1	104	6,4
DI Yogyakarta	3	1,6	45	18,7	5	2,8	24	14,1	145	56,9	15	6,0
East Jawa	25	1,2	464	19,7	206	8,7	246	11,0	1233	53,3	134	6,3
Banten	9	1,3	111	17,2	60	10,0	74	13,8	337	52,0	39	5,6
Bali	6	1,7	91	18,2	46	9,7	42	9,2	265	52,6	44	8,7
West Nusa Tenggara	8	1,0	174	27,2	51	7,3	82	11,9	312	48,1	30	4,4
East Nusa Tenggara	49	3,7	417	31,1	113	8,7	155	13,1	538	40,1	41	3,3
West Kalimantan	14	1,7	123	19,8	37	7,3	91	16,7	280	49,0	30	5,5
Central Kalimantan	13	2,7	167	25,7	57	10,2	64	10,0	288	47,9	30	3,4
South Kalimantan	26	3,3	208	28,9	54	7,6	68	8,9	356	46,1	35	5,2
East Kalimantan	15	1,3	125	16,1	61	6,5	96	13,0	382	58,2	30	4,9
North Sulawesi	11	1,4	112	20,1	47	8,3	41	7,2	256	57,1	29	5,8

Provinces	Combination of Nutritional Status											
	Short Thin		Short Normal		Short Overweight		Normal length-Thin		Normal length-Normal weight		Normal length Qverweight	
	n	%	n	%	n	%	n	%	n	%	n	%
Central Sulawesi	19	2,5	195	28,4	60	8,0	61	8,6	349	48,6	24	3,9
South Sulawesi	38	2,9	323	25,1	75	5,2	129	9,7	648	52,4	63	4,7
South East Sulawesi	11	2,0	168	27,2	51	7,9	68	9,4	367	49,4	32	4,2
Gorontalo	10	3,0	76	24,5	16	5,7	36	10,2	154	53,5	10	3,2
West Sulawesi	10	2,6	72	30,3	15	5,0	29	10,0	123	46,5	21	5,5
Maluku	36	6,4	158	23,7	25	4,1	95	13,9	348	49,3	24	2,5
North Maluku	18	2,5	155	27,3	36	8,5	49	9,4	259	48,2	19	4,2
West Papua	17	3,2	131	28,7	35	6,7	64	12,3	228	47,0	14	2,2
Papua	24	2,9	172	22,8	88	12,3	105	13,6	341	44,1	44	4,3
Indonesia	**586**	**1,8**	**5.987**	**21,3**	**2.184**	**8,5**	**3095**	**11,8**	**12959**	**50,8**	**1397**	**5,8**

4.3. STUNTING AMONG SCHOOL-AGED CHILDREN

In general, in term of number, prevalence of stunting (height/age among 5-18 years old children by sex previously presented in Figure 15 is elaborated in detail in Table 7.

Table 7. Number of stunted and not stunted children aged 5-18 years by sex, Indonesia 2013

Age (years)	Stunted (male)	Stunted (female)	Number of stunted children	Not stunted
5	721.864	648.311	1.370.174	3.476.504
6	673.080	570.932	1244.012	3.424.829
7	698.809	580.522	1.279.331	3.565.422
8	699.093	651.306	1.350.399	3.480.305
9	778.173	749.668	1.527.841	3.440.611
10	855.464	824.341	1.679.805	3.414.807
11	923.265	897.816	1.821.081	3.317.170
12	1.051.520	942.640	1.994.160	3.495.993
13	938.010	759.699	1.697.708	2.863.505
14	806.937	696.313	1.503.250	2.818.395
15	811.543	626.484	1.438.027	2.931.911
16	815.411	549.326	1.364.738	2.982.059
17	868.441	476.086	1.344.527	2.931.256
18	721.243	495.064	1.216.307	2.601.707
Total	11.362.853	9.468.508	20.831.361	44.744.473

Followings are the results of analysis based on three age groups, i.e. 5-12 years, 13-15 years and 16-18 years.

4.3.1. Age 5–12 years

Figure 24 suggests that prevalence of stunting among children aged 5-12 years at national level was at 30.7 percent (12.3% severe and 18.4% moderate).

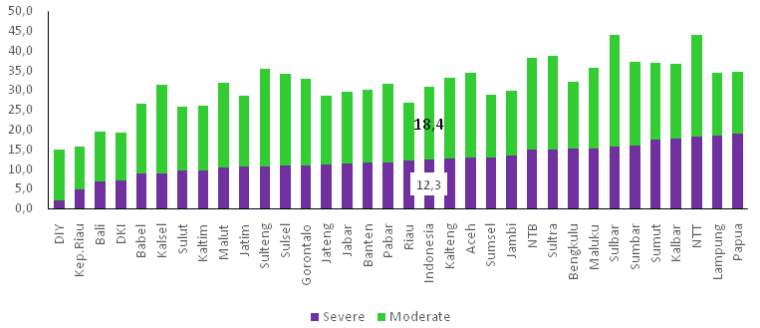


Figure 24. Prevalence of stunted at the age of 5-12 years by province, Indonesia 2013

By provinces, the lowest prevalence of severe stunting was at D.I.Yogyakarta (14.9%), while the highest prevalence was at Papua (34.5%). As many as 15 provinces had the prevalence of severe stunting above the national level; i.e.Central Kalimantan, Aceh, South Sumatera, Jambi, West Nusa Tenggara, Gorontalo, Bengkulu, Maluku, West Sulawesi, North Sumatera, West Kalimantan, East Nusa Tenggara, Lampung, and Papua.

Table 8 describes the magnitude of the stunting problem among children in this group in terms of number of samples and prevalence by provinces.

Table 8. Proportion of children aged 5-12 years based on their nutritional status (height for age) by provinces, Indonesia 2013

Provinces	Nutritional status based on height/age					
	Severe stunted		Moderate stunted		Normal	
	N	(%)	N	(%)	N	(%)
Aceh	886	12,9	1.454	21,4	4.885	65,7
North Sumatera	2.567	17,3	2.893	19,6	8.648	63,1
West Sumatera	963	16,0	1.355	21,1	4.202	62,8
Riau	600	12,1	782	14,7	3.818	73,2
Jambi	496	13,3	589	16,5	2.569	70,3
South Sumatera	873	13,0	1.001	15,7	4.406	71,3
Bengkulu	470	15,1	500	17,0	1.984	67,8
Lampung	925	18,5	779	15,8	3.176	65,7
Bangka Belitung	165	8,9	355	17,7	1.516	73,4
Kepulauan Riau	103	4,8	308	10,8	1.719	84,5
DKI Jakarta	163	7,1	240	12,1	1.473	80,9
West Java	1.354	11,4	2.229	18,2	8.987	70,4
Central Java	1.193	11,0	2.018	17,6	8.486	71,4

Provinces	Nutritional status based on height/age					
	Severe stunted		Moderate stunted		Normal	
	N	(%)	N	(%)	N	(%)
DI Yogyakarta	30	2,1	168	12,8	1.060	85,1
East Jawa	1.299	10,7	2.210	17,8	9.295	71,5
Banten	426	11,7	725	18,4	2.757	69,9
Bali	172	6,9	352	12,5	2.321	80,6
West Nusa Tenggara	538	14,9	886	23,2	2.450	61,9
East Nusa Tenggara	1.614	18,1	2.397	25,8	5.159	56,1
West Kalimantan	897	17,8	979	18,8	3.255	63,4
Central Kalimantan	507	12,6	807	20,5	2.765	66,9
South Kalimantan	357	8,9	912	22,5	2.758	68,7
East Kalimantan	449	9,6	757	16,4	3.280	74,0
North Sulawesi	405	9,5	685	16,3	2.788	74,2
Central Sulawesi	439	10,7	988	24,6	2.685	64,6
South Sulawesi	921	10,8	1.950	23,2	5.604	66,0

Provinces	Nutritional status based on height/age					
	Severe stunted		Moderate stunted		Normal	
	N	(%)	N	(%)	N	(%)
South East Sulawesi	666	14,9	1.024	23,8	2.771	61,4
Gorontalo	228	10,8	455	22,0	1.370	67,2
West Sulawesi	348	15,6	573	28,3	1.197	56,0
Maluku	645	15,1	959	20,5	2.696	64,4
North Maluku	340	10,4	708	21,4	2.321	68,2
West Papua Barat	291	11,7	589	19,8	1.954	68,5
Papua	1.122	18,9	1.005	15,6	3.752	65,5
Indonesia	**22.452**	**12,3**	**33.632**	**18,4**	**118.107**	**69,3**

Magnitude of the problem in term of prevalence of stunting by demographic characteristics is presented in Table 9.

Table 9. Proportion of children aged 5-12 years based on their nutritional status (height/age) by demographic characteristics, Indonesia 2013

Characteristics	Nutritional status based on height/age		
	Severe stunted	Moderate Stunted	Normal
	(%)	(%)	(%)
Gender			
Males	12,4	18,7	68,9
Females	12,2	18,1	69,8
Education			
No education	16,3	20,2	63,5
Some primary	14,9	22,5	62,7
Completed primary	14,2	21,2	64,7
Completed secondary	12,3	18,4	69,3
Completed high school	9,4	14,9	75,7
Diplome/University, graduated	7,3	11,1	81,6
Occupation			
No occupation	12,2	18,7	69,1
Employee	8,0	12,8	79,1
Enterpreneur	10,6	16,9	72,4
Farmer/fisherman/labor	14,9	21,2	63,9
Others	10,5	18,9	70,6
Residence			
Urban	9,1	15,9	75,1
Rural	15,1	20,7	64,2
Wealth index quintile			
Lowest	18,6	24,3	57,1
Second	14,0	22,1	63,9
Middle	12,0	19,0	69,1
Fourth	9,9	15,6	74,5
Highest	8,5	12,8	78,7

4.3.2. Age 13 -15 years

Similar with that applied for children aged 5-12 years, nutritional status assessment for 13-15 years old children is based on height for age and BMI/age. Figure 25 illustrates the prevalence of stunting among adolescents aged 13-15 years. Nationally, the prevalence of stunting among adolescents was at 35.1 percent (13.8% severe and 21.3% moderate). The lowest prevalence of severe stunting was at D.I.Yogyakarta (4.0%), while the highest was at Papua (27.4%). There were 16 provinces that had prevalence of severe stunting higher than the national prevalence. Those provinces were West Nusa Tenggara, Riau, Banten, Maluku, West Sumatera, South Sumatera, Gorontalo, Aceh, Bengkulu, North Sumatera, Jambi, West Sulawesi, West Kalimantan, Lampung, East Nusa Tenggara and Papua.

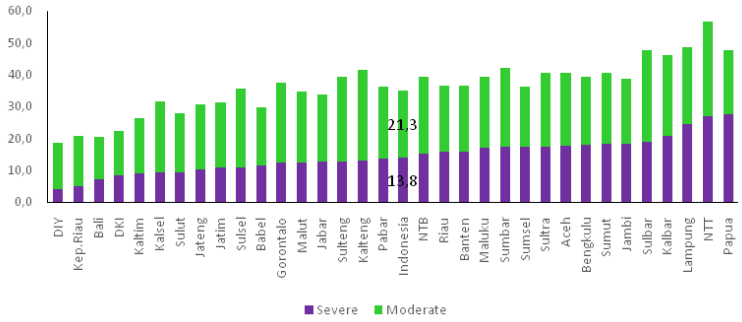


Figure 25. Prevalence of stunted at the age of 13-15 years by province, Indonesia 2013

Detailed information on proportion of adolescents aged 13-15 years based on their nutritional status (height for age) by province is listed in Table 10 and by characteristic in Table 11.

Table 10. Proportion of adolescent aged 13-15 years based on their nutritional status (height for age) by province, Indonesia 2013

Provinces	Nutritional status based on height for age					
	Severe Stunted		Moderate Stunted		Normal	
	N	%	N	%	N	%
Aceh	386	17,5	545	22,9	1.537	59,6
North Sumatera	1.082	18,2	1.221	22,2	2.782	59,6
West Sumatera	403	17,3	603	24,7	1.482	57,9
Riau	239	15,7	352	20,8	1.076	63,5
Jambi	247	18,3	280	20,5	746	61,2
South Sumatera	402	17,3	430	18,8	1.445	63,9
Bengkulu	212	17,9	257	21,5	686	60,7
Lampung	450	24,4	455	24,1	1.069	51,5
Bangka Belitung	60	11,5	116	18,3	431	70,3
Kepulauan Riau	32	4,8	102	15,8	497	79,4
DKI Jakarta	65	8,4	107	14,0	520	77,6
West Java	563	12,6	966	21,2	3.089	66,2

Provinces	Nutritional status based on height for age					
	Severe Stunted		Moderate Stunted		Normal	
	N	%	N	%	N	%
Central Java	468	10,2	941	20,4	3.385	69,5
DI Yogyakarta	17	4,0	73	14,5	373	81,4
East Java	486	10,8	907	20,3	3.315	68,9
Banten	232	15,8	316	20,7	970	63,5
Bali	72	7,2	136	13,3	839	79,5
West Nusa Tenggara	199	15,2	345	24,1	913	60,7
East Nusa Tenggara	764	26,9	880	29,6	1.427	43,5
West Kalimantan	376	20,7	451	25,3	1.031	53,9
Central Kalimantan	164	13,0	354	28,5	848	58,5
South Kalimantan	128	9,4	309	22,0	953	68,6
Central Kalimantan	167	9,0	286	17,3	999	73,7
North Sulawesi	137	9,4	259	18,5	953	72,1
Central Sulawesi	167	12,7	353	26,5	807	60,7

Provinces	Nutritional status based on height for age					
	Severe Stunted		Moderate Stunted		Normal	
	N	%	N	%	N	%
South Sulawesi	361	10,9	786	24,8	2.013	64,3
South East Sulawesi	264	17,3	371	23,1	966	59,6
Gorontalo	92	12,3	186	25,2	470	62,5
West Sulawesi	141	18,8	201	28,9	387	52,3
Maluku	268	17,0	341	22,4	810	60,6
North Maluku	132	12,5	219	22,2	703	65,3
West Papua	108	13,7	183	22,4	456	63,9
Papua	477	27,4	391	20,3	943	52,3
Indonesia	**9.361**	**13,8**	**13.722**	**21,3**	**38.921**	**64,9**

Table 11. Proportion of adolescent aged 13-15 years based on their nutritional status (height for age) by population characteristics, Indonesia 2013

Characteristics	Nutritional status based on height for age		
	Severe stunting (%)	Moderate Stunting (%)	Normal (%)
Gender			
Males	16,2	21,5	62,2
Females	11,3	21,0	67,7
Education			
No education	18,3	26,0	55,7
Some primary	15,9	25,4	58,7
Completed primary	15,7	23,5	60,7
Completed secondary	13,3	21,3	65,4
Completed high school	10,2	16,7	73,1
Diplome/University, graduated	9,1	13,1	77,8
Occupation			
No occupation	12,5	20,3	67,2
Employee	9,0	15,4	75,7
Enterpreneur	11,5	19,4	69,1
Farmer/fisherman/labor	16,8	24,1	59,1
Others	12,6	23,7	63,6
Residence			
Urban	10,0	18,2	71,8
Rural	17,3	24,2	58,5
Wealth index quintile			
Lowest	22,0	27,5	50,5
Second	15,8	25,1	59,1
Middle	13,1	22,2	64,7
Fourth	10,7	18,2	71,0
Highest	9,6	15,3	75,1

4.3.3. Age 16–18 years

Figure 26 presents nutritional status of adolescents aged 16–18 years. At the national level, prevalence of stunting among this age group was at 31.4 percent (7.5% severe and 23.9% moderate). As many as 17provinces had higher prevalence of severe stunting than the national level. They were Central Kalimantan, South Sumatera, Riau, West Sumatera, Bengkulu, Aceh, Banten, Bangka Belitung, Southeast Sulawesi, West Kalimantan, Central Sulawesi, Lampung, North Sumatera, West Sulawesi, Gorontalo, East Nusa Tenggara, and Papua.

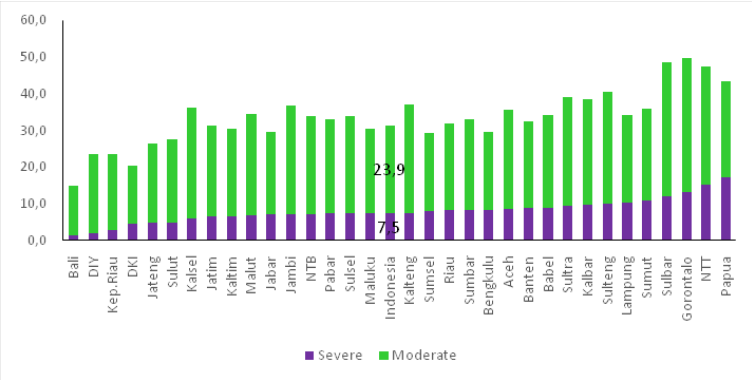


Figure 26. Prevalence of stunted at the age of 16-18 years by province, Indonesia 2013

Proportion of adolescents aged 16-18 years who were severely stunted and moderatelystunted by province are described in Table 12 as follow:

Table 12. Nutritional status ofadolescents aged 16–18 years based on height/age by province, Indonesia 2013

Provinces	Nutritional status based on height for age					
	Severe stunting		Moderate Stunting		Normal	
	n	(%)	n	(%)	n	(%)
Aceh	196	8,6	579	27,1	1379	64,4
North Sumatera	561	10,8	1245	25,1	2650	64,1
West Sumatera	188	8,4	565	24,7	1444	66,9
Riau	123	8,3	364	23,5	1035	68,3
Jambi	98	7,2	337	29,6	767	63,2
South Sumatera	165	7,9	456	21,5	1489	70,6
Bengkulu	92	8,4	257	21,3	755	70,3
Lampung	159	10,2	412	24,1	1143	65,7
Bangka Belitung	39	9,0	137	25,2	335	65,8
Kepulauan Riau	19	2,9	124	20,6	418	76,5
DKI Jakarta	19	4,5	95	15,9	472	79,6
West Java	275	7,1	932	22,6	2926	70,3
Central Jawa	198	4,9	846	21,4	3156	73,7
DI Yogyakarta	8	1,9	101	21,5	391	76,5
East Jawa	237	6,5	1022	24,7	3118	68,8
Banten	102	8,8	346	23,7	935	67,5

Provinces	Nutritional status based on height for age					
	Severe stunting		Moderate Stunting		Normal	
	n	(%)	n	(%)	n	(%)
Bali	13	1,5	117	13,3	786	85,2
East Nusa Tenggara	84	7,3	298	26,6	788	66,1
East Nusa Tenggara	303	15,1	672	32,2	1199	52,7
West Kalimantan	150	9,9	403	28,6	1000	61,4
Central Kalimantan	77	7,6	276	29,5	684	62,9
South Kalimantan	67	6,1	354	30,0	749	64,0
East Kalimantan	76	6,5	272	23,9	750	69,6
North Sulawesi	73	4,9	307	22,7	818	72,4
Central Sulawesi	96	10,0	326	30,4	599	59,5
South Sulawesi	195	7,5	654	26,3	1602	66,2
South East Sulawesi	111	9,4	381	29,6	742	61,0
Gorontalo	77	13,3	208	36,4	305	50,4
West Sulawesi	66	12,1	202	36,3	283	51,6
Maluku	92	7,5	234	23,0	684	69,5
North Maluku	50	6,9	212	27,6	548	65,5
West Papua	45	7,4	137	25,5	355	67,1
Papua	230	17,1	384	26,3	745	56,6
Indonesia	**4284**	**7,5**	**13255**	**23,9**	**35050**	**68,6**

Based on demographic characteristics, the stunting prevalence among adolescents aged 16-18 years is detailed in Table 13.

Table 13. Nutritional status (height for age) among adolescents aged 16-18 years by characteristics, Indonesia 2013

Characteristics	Nutritional status based on height for age			
	Severe stunting (%)	Moderate Stunting (%)	Normal (%)	Total (%)
Gender				
Males	10,4	27,2	62,4	100
Females	4,4	20,7	74,9	100
Education				
No education	10,4	28,2	61,4	100
Some primary	8,3	28,8	62,9	100
Completed primary	8,8	26,2	65,1	100
Completed secondary	7,1	23,2	69,8	100
Completed high school	5,4	18,8	75,7	100
Diplome/University, graduated	3,7	16,9	79,3	100
Occupation				
No occupation	6,7	23,6	69,6	100
Employee	4,6	17,3	78,1	100
Enterpreneur	5,9	21,2	72,8	100
Farmer/fisherman/labor	9,4	27,6	63,0	100
Lainnya	6,5	23,4	70,1	100
Residence				
Urban	5,4	20,5	74,2	100
Rural	9,6	27,6	62,8	100
Wealth index quintile				
Lowest	13,0	32,5	54,6	100
Second	8,9	28,6	62,5	100
Middle	7,7	24,0	68,3	100
Fourth	5,2	19,8	75,0	100
Highest	4,9	18,8	76,3	100

4.4. NUTRITIONAL STATUS AMONG ADULTS

4.4.1. Stunting among adults (age 18-65 years)

In all over Indonesia,over 59 million (39.5%) Indonesian adults were categorized as stunted. Eighteen (18) provinces had proportion of stunted adult higher than or equal tothe national level. The highest stunted adult proportion was in West Sulawesi (54.3%) while the lowest stunted adult proportion was in Bali (25.7%).

Table 14. The number and proportion of stunted adult by province, Indonesia 2013

Provinces	Nutritional status based on height for age			
	Stunting		Normal	
	N	%	N	%
Aceh	1.017.134	37,6	1.691.068	62,4
North Sumatera	2.711.625	36,8	4.655.013	63,2
West Sumatera	1.140.644	41,1	1.636.033	58,9
Riau	1.182.774	33,9	2.310.233	66,1
Jambi	736.836	37,5	1.227.530	62,5
South Sumatera	1.641.122	35,9	2.933.215	64,1
Bengkulu	371.098	35,5	675.517	64,5
Lampung	1.538.402	33,7	3.025.788	66,3
Bangka Belitung	360.739	44,8	444.481	55,2
Kepulauan Riau	374.971	30,7	846.928	69,3
DKI Jakarta	1.876.830	28,5	4.704.652	71,5
West Java	10.728.415	40,3	15.898.158	59,7
Central Java	7.742.359	39,6	11.792.185	60,4
DI Yogyakarta	879.353	39,5	1.344.861	60,5
East Java	10.326.139	43,6	13.359.289	56,4
Banten	2.349.272	34,8	4.406.465	65,2

Provinces	Nutritional status based on height for age			
	Stunting		Normal	
	N	%	N	%
Bali	657.356	25,7	1.899.077	74,3
West Nusa Tenggara	1.194.721	45,6	1.427.801	54,4
East Nusa Tenggara	1.064.790	42,8	1.424.314	57,2
West Kalimantan	1.116.626	43,6	1.445.514	56,4
Central Kalimantan	668.622	49,0	695.086	51,0
South Kalimantan	1.187.351	51,9	1.098.499	48,1
East Kalimantan	922.648	38,5	1.472.024	61,5
North Sulawesi	539.805	38,4	866.042	61,6
Central Sulawesi	770.340	49,8	777.776	50,2
South Sulawesi	1.944.908	42,1	2.675.953	57,9
South East Sulawesi	501.729	40,0	754.040	60,0
Gorontalo	334.442	53,4	291.422	46,6
West Sulawesi	351.684	54,6	292.785	45,4
Maluku	317.465	37,0	540.515	63,0
North Maluku	231.810	38,5	369.911	61,5
West Papua	196.499	41,0	282.554	59,0
Papua	766.481	41,4	1.086.947	58,6
Indonesia	**57.744.990**	**39,5**	**88.351.676**	**60,5**

Nationally, over 36 million people in Indonesia sustained central obesity (26.4%). Sixteen (16) provinces had an adult central obesity rate higher than the national proportion. The highest central obesityproportion was found in North Sulawesi (37.0%), while the lowest proportion was found in East Nusa Tenggara (15.1%).

Table 15. The proportion of central obesity among adults by province, Indonesia 2013

Provinces	Central Obesity (Waist Circumference: male> 90, female>80)	
	N	%
Aceh	650.107	25,2
North Sumatera	2.101.462	29,8
West Sumatera	769.853	28,8
Riau	906.212	27,2
Jambi	388.872	20,9
South Sumatera	918.113	21,0
Bengkulu	231.763	22,9
Lampung	774.920	17,9
Bangka Belitung	243.248	31,2
Kepulauan Riau	323.650	27,5
DKI Jakarta	2.243.348	37,8
West Java	6.775.203	26,5
Central Java	4.637.960	24,5
DI Yogyakarta	609.882	27,9
East Java	6.145.916	26,7
Banten	1.642.204	25,5
Bali	657.882	26,2
West Nusa Tenggara	569.066	22,2
East Nusa Tenggara	351.177	15,1
West Kalimantan	455.464	18,6
Central Kalimantan	271.834	21,0

Provinces	Central Obesity (Waist Circumference: male> 90, female>80)	
	N	%
South Kalimantan	569.149	25,7
East Kalimantan	690.181	30,3
North Sulawesi	508.027	37,0
Central Sulawesi	415.208	27,5
South Sulawesi	1.381.522	30,8
South East Sulawesi	310.130	25,7
Gorontalo	205.965	34,0
West Sulawesi	141.091	22,6
Maluku	237.165	28,8
North Maluku	165.775	28,4
West Papua	138.338	29,9
Papua	569.260	32,6
Indonesia	**36.999.947**	**26,4**

4.4.2. Pregnant women with high risk

The Riskesdas 2013 defined the pregnant women at high risk are those with <150 cm height (WHO 2007). The following figure (Figure 27) presents high risk pregnant women as high as 31.3 percent. The lowest prevalence of high risk pregnant women was found in Bali (12.1%) while the highest one was found in West Sumatera (39.8%). The nineteen provinces with prevalence above the national prevalence included Southeast Sulawesi, North Sumatera, Jambi, Bengkulu, Aceh, Central Sulawesi, Gorontalo, South Sulawesi, West Papua, Central Kalimantan, East Nusa Tenggara, West Java, East Java, Yogyakarta, West Kalimantan, South Kalimantan, West Sulawesi, Bangka Belitung and West Sumatera.

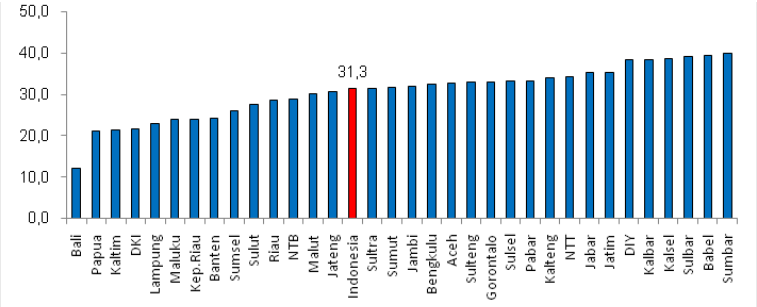


Figure 27. Prevalence of high-risk pregnant women (height <150 cm) by province, Indonesia 2013

Table 16. Prevalence of high risk pregnant women by characeteristic, Indonesia 2013

Characteristics	High risk (height<150cm)
Education	
No education	35,4
Some primary	40,0
Completed primary	39,6
Completed secondary	33,0
Completed high school	24,3
Diplome/University, graduated	22,7
Occupation	
No occupation	32,4
Employee	20,4
Enterpreneur	30,1
Farmer/fisherman/labor	35,4
Others	31,2
Residence	
Urban	28,0
Rural	35,1
Wealth index quintile	
Lowest	40,1
Second	35,5

Characteristics	High risk (height<150cm)
Middle	35,7
Fourth	29,3
Highest	22,0

4.4.3. Women in reproductive age with chronic energy deficiency (CED)

Figures 28 and 29 present the information regarding chronic energy deficiency (CED) in pregnant women and reproductive-aged women aging at 15-49 years old, based on mid-upper arm circumference (MUAC). To illustrate the presence of the risk in relation to the reproductive health in pregnant women and reproductive-aged women, <23.5 cm average cut-off was used.

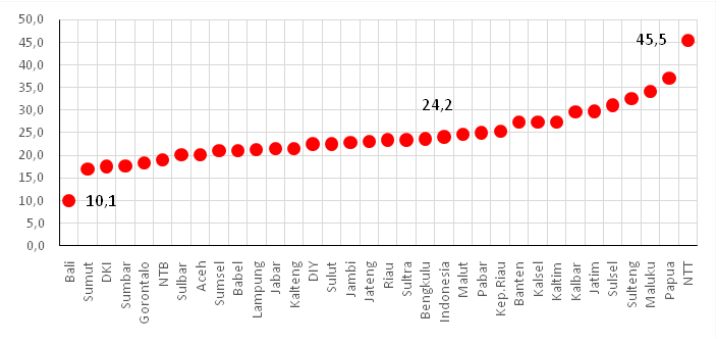


Figure 28. Prevalence of chronic energy deficiency (CED)' riskin 15-49 years pregnant women by province, Indonesia 2013

Figure 28 presents the prevalence of CED risk in 15–49 year-old pregnant women nationally, which was at 24.2 percent. The lowest and the highest prevalence of CED risk were found in Bali (10.1%) and East Nusa Tenggara (45.5%) respectively. As many as 13 provinces were found to have the prevalence of CED risk above

the national prevalence. They were North Maluku, West Papua, Riau islands, Banten, South Kalimantan, East Kalimantan, West Kalimantan, East Java, South Sulawesi, Central Sulawesi, Maluku, Papua and East Nusa Tenggara.

Figure 29 shows the prevalence of CED risk in reproductive-aged women (not pregnant). Nationally, the prevalence of the CED risk in reproductive-aged women was as high as 20.8 percent. The lowest prevalence was found in Bali (14%) while the highest one was in East Nusa Tenggara (46,5%). The 16provinces with the prevalence of CED risks above the national prevalence include:Central Kalimantan, East Java, Banten, South Kalimantan, D.I. Aceh, D.I. Yogyakarta, West Nusa Tenggara, South Sulawesi, Central Sulawesi, North Maluku, Southeast Sulawesi, West Sulawesi, West Papua, Maluku, Papua and East Nusa Tenggara.

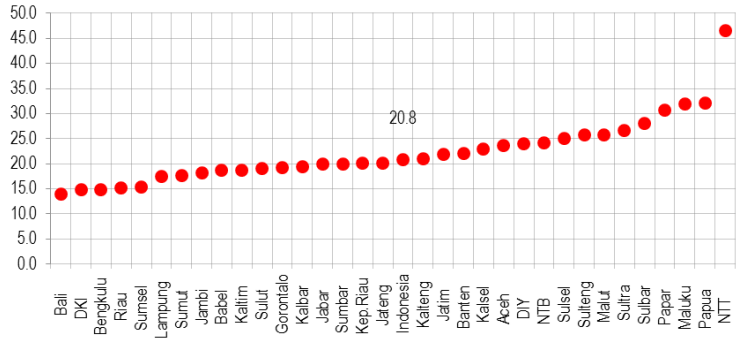


Figure 29. Prevalence of chronic energy deficiency (CED)' riskin women at reproductive age of 15-49 years by province, Indonesia 2013

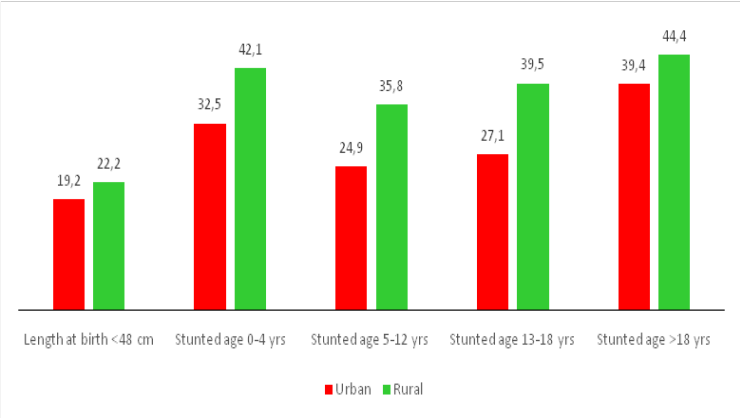
4.5. THE GAP OF STUNTING PREVALENCE

There were significant gaps of stunting prevalence by residence (urban and rural), household's wealth level, educational level, gender, inter-provincical, inter-districts within the province, as

well as the tendency of the gap in 2007 compared to in 2013. Magnitudes of the gaps on the stunting prevalence and disparity across age groups by characteristics are discussed in more details as following.

4.5.1. Gaps by residence

Magnitude of gap on stunting prevalence between urban and rural from all age groups is shown in Figure 30.



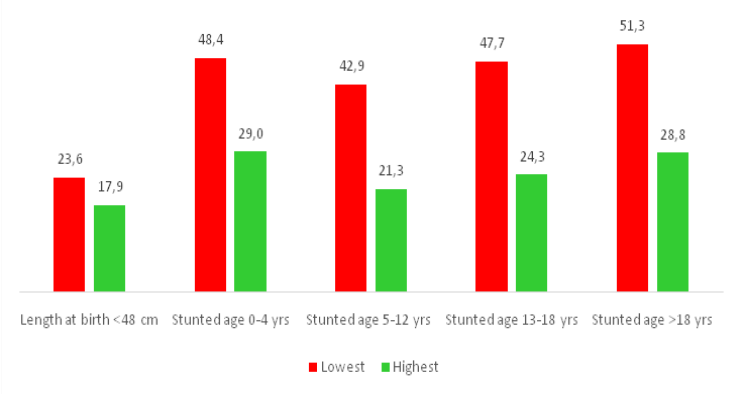
Source: Riskesdas 2013

Figure 30. The gap of stunted prevalence for all age groups between urban and rural areas, 2013

It is consistently and significantly shown by the above figure that stunting prevalence was higher in rural than urban for all age groups, i.e. newborns, children under five years old, adolescents and adults. Considering that the number of population in rural is a liitle bit higher than that in urban, priority of intervention has to be reaching all rural areas in order to accelerate the reduction of stunting prevalence.

4.5.2. Gaps by household's wealth level

Wealth of household was categorized into 5 quintiles, in which quintile 1 was the poorest group and quintile 5 was the richest group. To measure the role of household's wealth index on the prevalence of stunting, the prevalence of children from quintile 1 (the poorest households) was contrasted with that of children from quintile 5 (the richest households), as outlined in the following figure:



Source: Riskesdas, 2013

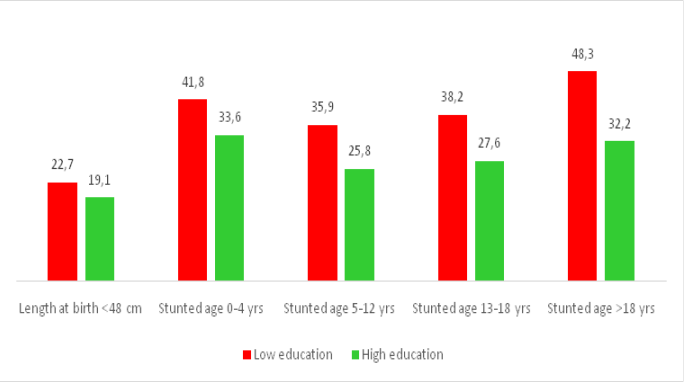
Figure 31. The gap of stunted prevalence for all groups in lowest and highest economic status, 2013

The figure 31 clearly showed that stunting prevalence among children from quintile 1 was consistently and significantly higher than the prevalence among the quintile-5 children. The difference of the prevalence among school-aged children (5-12 years) and (13-18 years) between these two wealth quintiles was almost doubled. The role of household's wealth on stunting is indeed uncontested. Therefore, programs addressing poverty reduction have to always be put as priority. In addition, nutrition education at school is one of the key interventions to reduce stunting among school-aged children. It is for the benefits of not only the adolescent themselves but also their offspring.

4.5.3. Gaps by educational level

For the purpose of assessing the association of educational level with prevalence of stunting, the educational level was categorized into two, i.e. low education (elementary school level or lower), and medium-high education (junior high school level or higher). The following figure (Figure 32) demonstrates the gaps of stunting prevalence for each age group, related with educational level of head of the households. A significant and consistent pattern was observed in each age group, in which the prevalence was always higher among children from family with low educated head of households. It indicates that the household head's level of education do influence nutritional status of the household members.

It was obviously seen that there was a significant and consistent findings showing that in all age groups, low educated head of households had higher prevalence of stunting of their household members compared to that of the medium-high educated head of households.

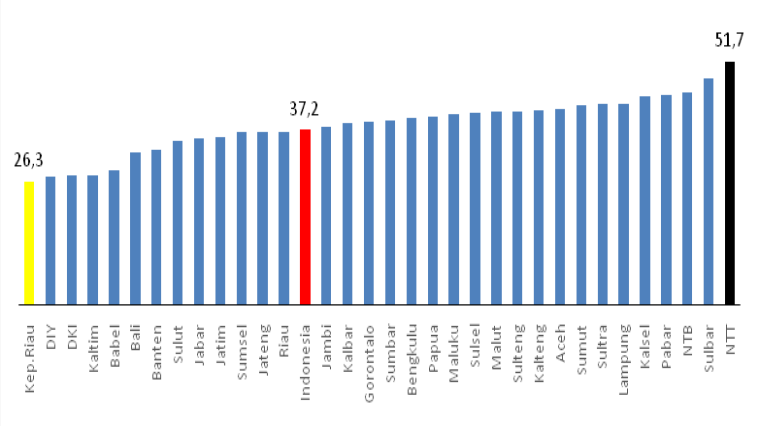


Source: Riskesdas 2013

Figure 32. The gap of stunted prevalence for all groups based on Education level of Household's head, 2013

4.5.4. Gaps across provinces

Gaps on stunting prevalence also occurred across provinces. As an example, the following figure (Figure 33) shows prevalence of stunting among children under five years old across provinces in 2013.



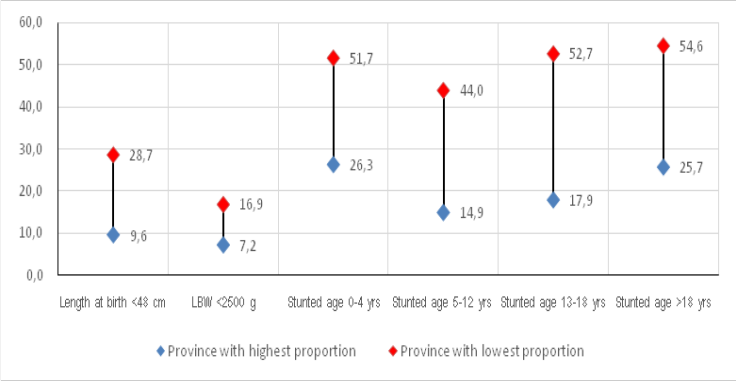
Source: Riskesdas 2013

Figure 33. The gap of stunted prevalence of children under five by province, 2013

Kepulauan Riau, DI Yogyakarta and DKI Jakarta were three provinces with the lowest prevalence of stunting among children under five years old. In contrary, East Nusa Tenggara and West Sulawesi had the highest prevalences. The stunting prevalence among the children in East Nusa Tenggara was almost 2 times higher than that in Kepulauan Riau.

4.5.5. Gaps across provinces for all age group

The gaps on stunting prevalence for all age groups across provinces can be seen in the following figure.



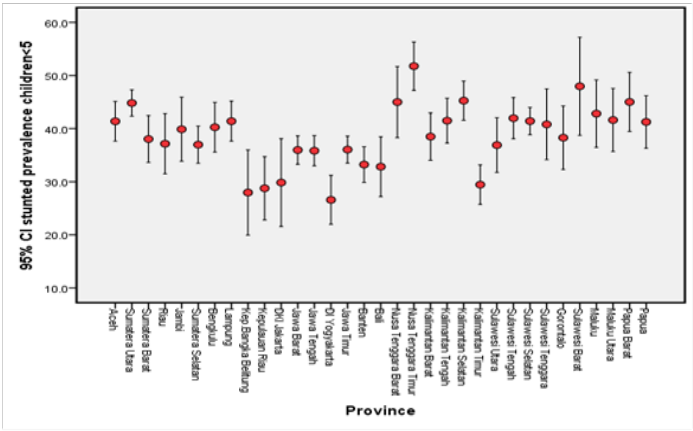
Source: Riskesdas 2013.

Figure 34. The gap of stunted prevalence for all groups based on lowest and highest province, 2013

The above figure tells us that for newborns, the gaps on stunting prevalence (based on their birth length) were higher than the gaps on low birth weight. The gaps were calculated by comparing provinces with the highest and the lowest prevalence. The largest gap was observed among adolescents aged 13-18 years, or among those who were at junior or senior high school. It indicates the importance and strategy of school-based approach as the basis for nutrition education intervention.

4.5.6. The gaps across districts within province

Gaps on stunting prevalence also occur across districts/ municipalities within province, as illustrated in Figure 35.



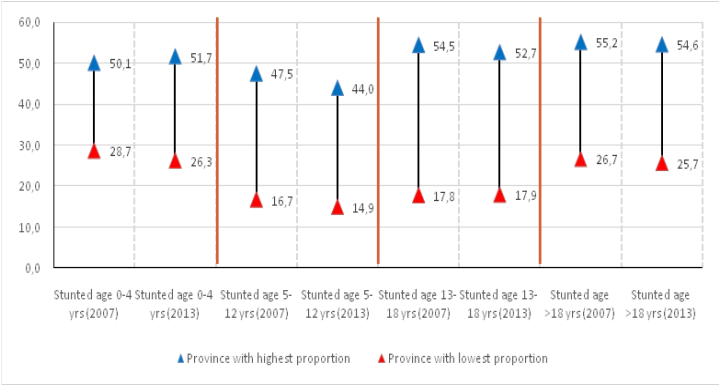
Source: Riskesdas 2013

Figure 35. The gap of stunted prevalence for children under 5 across districts by province, 2013

The lowest gap was the one in D.I.Yogyakarta and Banten, while the highest one was in Papua and Southeast Sulawesi. These data can be used to make priority in selecting district/municipality for intervention, when resources are limited.

4.5.7. Pattern of the gaps across provinces in 2007 – 2013

It is interesting to observe pattern of the gaps on stunting prevalence in 2007, compared to the ones in 2013. Figure 36 demonstrates the patterns across provinces for all age groups in 2007 and 2013.



Source: Riskesdas 2007, 2013

Figure 36. The trend and gap of stunted prevalence for all groups based on lowest and highest province, 2007 – 2013

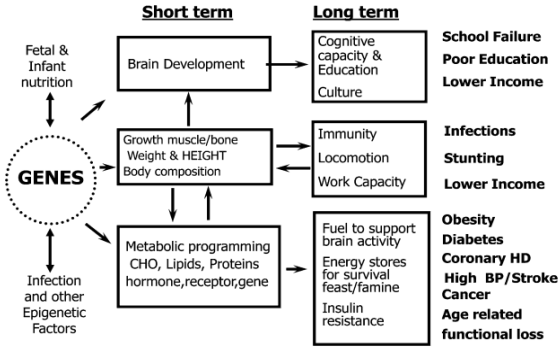
It is shown that there was no significant change of the gaps between 2007 and 2013. Moreover among children under five years of age, the gaps in 2013 were larger than the ones in 2007. It indicates that for around 5-6 years there was no significant change on the efforts to reduce the prevalence of stunting for all age groups.

CHAPTER 5
THE BURDEN IN THE FUTURE AS A RESULT OF STUNTING TODAY

Barker's hypothesis

The fetal origins of adult disease (Foad??) hypothesis ...." intrauterine environmental factors exposures risk/affect the fetus' development during sensitive periods, and increases the risk of specific diseases in adult life ....

The sentences above illustrate the magnitude of the burden as a result of stunting in the future if it is not tackled. The following is a theoretical framework related to the burden of stunting.

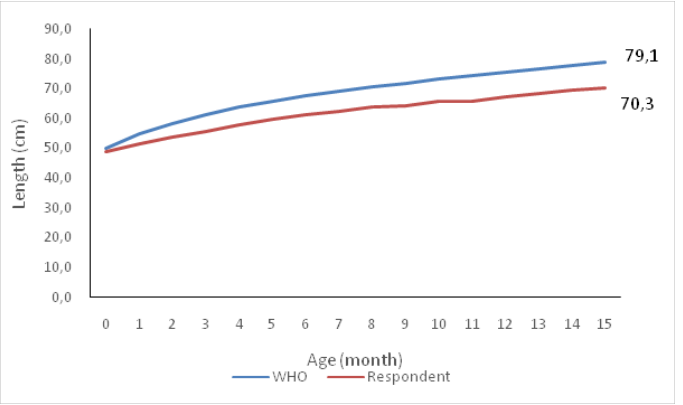


Source: Ricardo Uauy, et.al, 2011

Figure 37. A scheme representing short and long term consequences of nutrition-gene-environment in early life on relevant health and disease outcomes that have potential social and economic effects

In order to find out a baby's growth, especially its body length, a Cohort Study of Child Growth and Development in Bogor have successfully followed 220 mothers, and monitored the growth of their babies from birth to age of 15 months. The figureof the

average length of the child's growth can be seen in the chart below. Compared to the WHO standard, the results of the cohort studies showed that the average growth of body length is under the WHO standards. This means that there is an interruption of growth, probably due to the lack of nutrition, frequent suffering from infectious diseases, or due to other determinant factors.



Source: The Cohort Study of Child Growth and Development, NIHRD, 2013

Figure 38. The growth of body length (cm) of a child cohort study in Bogor city, 2013

In the following figure, we can see that the children who had birth weight <2,500 g tend to have a higher prevalence of stunting compared to children born with normal weight and birth weight> 4000 grams. This means that the incidence of double burden has begun to appear since birth. Keeping the baby to born with a normal birth weight becomes very important, to improve the nutritional status(Ministry of Health, 2013).

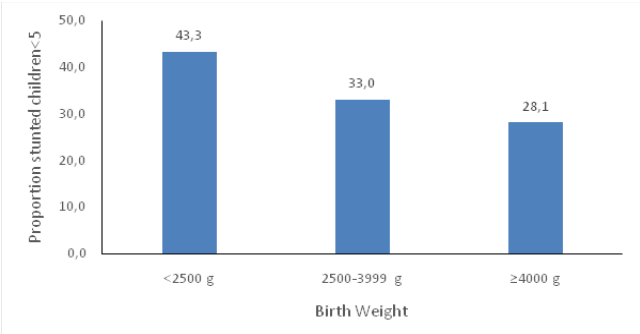
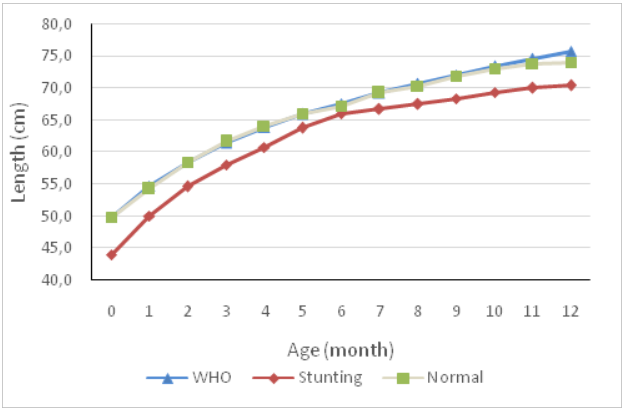


Figure 39. Proportion of stunted among children under five by birth weight

Further data on the growth of stunted and normal infants were obtained from a study of stunting in 10 health centers in the district of Bogor. The study results showed that the length growth of stunted infants is slower compared to the normal infants. In addition, the curve of length growth of stunted infants was away (does not intercept) from the baby's standard growth of length according to the WHO (see figure below).



Source: Study of stunting in Bogor district, 2012

Figure 40. The accretion of stunted infants lengths compare to normal infants, 2012

The study result showed the importance of having a baby with normal birth length, because when a baby is born with length less than normal, the growth and development will be hampered, and eventually will be at risk of suffering from non-communicable diseases in adulthood. As a result, a baby with this condition will grow as a stunted child and when becoming a mother, she will continue give birth to ageneration that is short (in height)/ stunted, and this cycle happens repeatedly. Therefore, stunting occurs across generations asshown in figure 41. This illustration had actually been introduced since 1992 (ACC / SCN 1992). The study of stunting shows that the problem of inter-generation is visible in Indonesia.

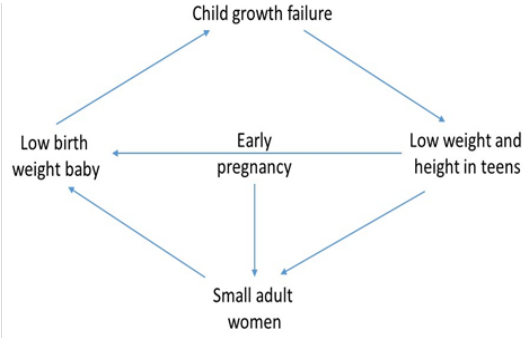


Figure 41. Intergenerational cycle of growth failure

The following two pictures were analyzed from Basic Health Survey (Riskesdas) 2010, which indicated that short children are generally born to mothers who are also short. Figure 42 shows the difference in average height of 1.7 cm between stunted and normal children. In Figure 43 can be seen clearly about 60 percent incidence of short children are often found in short women. There were also differences on the magnitude of the problem, the prevalence of stunted children on mothers with an average height of<150 cm was at 47.2 percent compared to mothers with an average height at ≥150 cm was at 36.0%. (Atmarita, 2012).

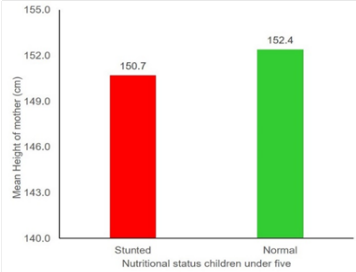


Figure 42. The average height of the mother according to nutritional status of children <5

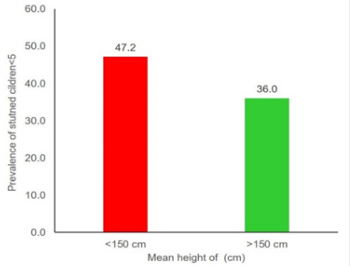
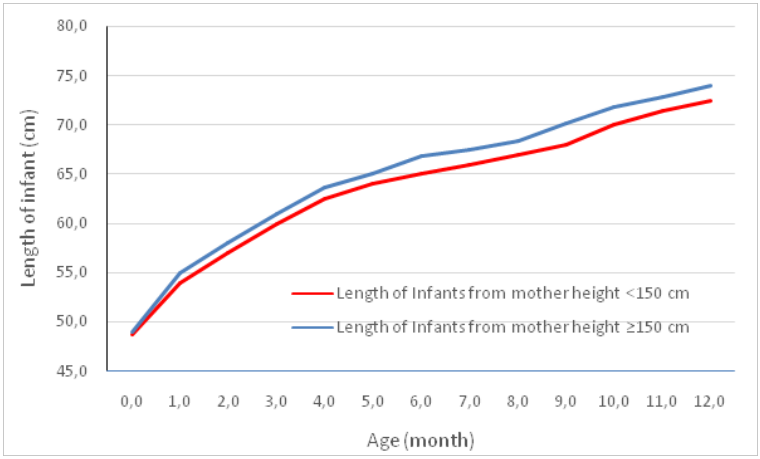


Figure 43. The prevalence of stunted children <5 according to the mother of risk

This assessment is reinforced by a study of stunting inBogor district, 2012 which more clearly shows that maternal factors turned out to have a very decisive role on the growth of children. The growth rate of infants born to mothers with height <150 cm is always slower than the growth rate of infants of mothers with height ≥150 cm (Figure 44).



Source: Study of stunting Bogor district, 2012

Figure 44. The accretion of infants' length growth associated with the mother's height, 2012.

Another factor that plays an important role in exacerbating the problem of the stunting is the age of marriage. Riskesdas 2013 proved clearly that the group of mothers who are married at the age less than 19 years tend to have stunted children more likely than the group of mothers who are married at the age of 20-34 yearsand the risk of having stunted children will increase as the age of married is above 35 years. Figure 45 showed the prevalence among three groups of mothers age <19 years, 20-34 years, and above 35 years: 37.0%, 31.9%, and 34.8%. This proves that early marriage and getting married at over 35 years of age are at higher risk of giving birthto stunted children.

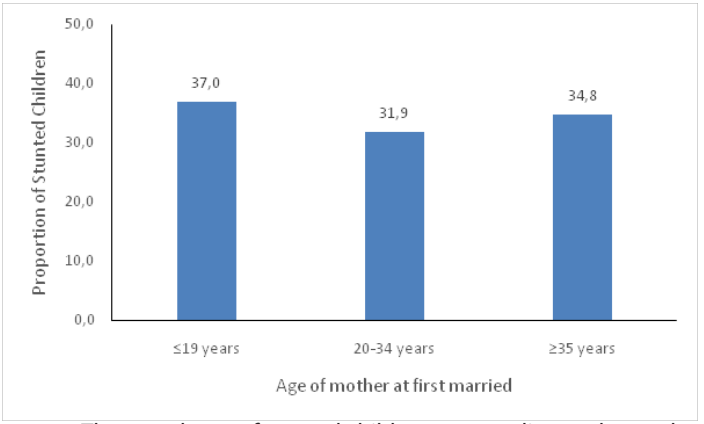


Figure 45. The prevalence of stunted children<5 according to the mother's age of first married

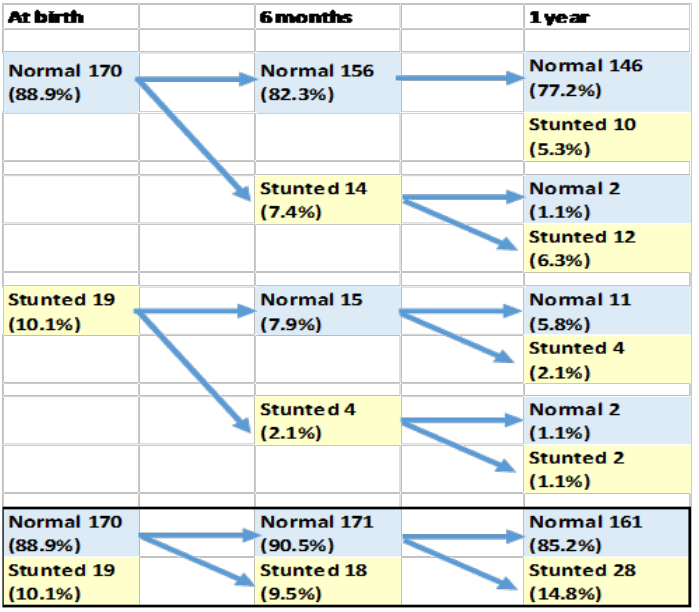
Another factor closely associated with stunting is the incidence of chronic energy deficiency (CED) in women of childbearing aged 15-49 years, either pregnant or not pregnant. According to Riskesdas 2013, the risk of CED in pregnant women is at 24.2 percent, whereas in non-pregnant women was at 20.8 percent. Table 17 shows the distribution of CED' s risk by province.

Table 17. Prevalence of CED riskof women of childbearing aged 15-49 years by province, Indonesia 2013

Provinces	RISK OF CHRONIC ENERGY DEFICIENCY*	
	Pregnant women	Non Pregnant women
Aceh	20,3	23,6
North Sumatera	17,1	17,6
West Sumatera	17,8	20,0
Riau	23,5	15,2
Jambi	23,0	18,2
Sumatera Selatan	21,1	15,3
Bengkulu	23,7	14,9
Lampung	21,3	17,5
Bangka Belitung	21,2	18,7
Kepulauan Riau	25,4	20,2
DKI Jakarta	17,6	14,8
West Java	21,6	19,9
Central Jawa	23,2	20,2
DI Yogyakarta	22,6	24,0
East Java	29,8	21,8
Banten	27,4	22,0
Bali	10,1	14,0
West Nusa Tenggara	19,1	24,2
East Nusa Tenggara	45,5	46,5
West Kalimantan	29,7	19,5
Central Kalimantan	21,6	21,0
South Kalimantan	27,4	22,9
East Kalimantan	27,5	18,7
North Sulawesi	22,6	19,0
Central Sulawesi	32,6	25,8
South Sulawesi	31,2	25,1
South East Sulawesi	23,5	26,6
Gorontalo	18,5	19,3
West Sulawesi	20,2	28,0
Maluku	34,3	32,0
North Maluku	24,7	25,8

Provinces	RISK OF CHRONIC ENERGY DEFICIENCY*	
	Pregnant women	Non Pregnant women
West Papua	25,1	30,7
Papua	37,2	32,1
Indonesia	**24,2**	**20,8**

Figure 46 shows an increasing trend in the prevalence among the age groupsbut actually in fact the dynamics change in nutritionalstatus was short for each individual. Stunting cohort study conducted by Balitbangkes shows the dynamics of changes in the nutritional status of stunting as follows.



Source: Study of stunting in the district. Bogor, 2012

Figure 46. The dynamics of changes in the nutritional status of stunted childern from age 0 till 12 months

Of the 189 children who were born and observed, their development indicated that the prevalence of stunting increased from 10.1% at birth to 14.8% at the age of 1 year. When followed individually, the dynamic of changevaries between individuals at the moment of birth, at the age of 6 months, and 1 year. A child could be still in normal height, or shifted from normal to stunting and then go back to normal height, or remain normal until the age of 1 year. It can be concluded that stuntedchild could be normal when intervened appropriately. In contrast, a child with normal height could turn out to be stunted if not given proper care.

This finding is further assessed by looking at the dynamics of change between birth to six months of age and the age of one year. The figure can be seen in the following table.

Table 18. The dynamics of change of stunting at aged 0-6 months to 1 year old

Nutritional status at birth and 6 months	Nutritional status at 12 months	
	Normal	Stunting
	n (%)	n (%)
Normal → normal	146 (93,6)	10 (6,4)
Normal → stunting	2 (14,3)	12 (85,7)
stunting → normal	11 (73,3)	4 (26,7)
stunting → stunting	2 (50.0)	2 (50,0)
Total	**161 (85,2)**	**28 (14,8)**

Source: Study of stunting in Bogor district, 2012

The study revealed that if a child can survive with normal height until the age ofsix months, 70% chance is the child will have have normal height at the age of one year. In reverse, if a child with normal length at birth becomes stunted within 6 months, then> 80% chance for the child to remain short at the age of 1 year. This shows the importance of mantaining children growing up with normal length, failure to be stunted must be prevented.

The study revealed that if children born stunted can catch up to normal length at the age of 6 months, more than 70% will remain normal at the age of 1 year. Although the number of infants observed/monitored is still limited to189 infants, of which the precise percentage might be unstable, this study managed to explainthe general picture of the risk of stunting.

Aryastami (2015) had analyzed data derived from a longitudinal study IFLS 1993-1997-2000. The study aims to determine changes in nutritional status of stunting from children aged 0-2 years to 4-6 years as a prediction of stunting at the age of 7-9 years. The result is as follows.

Table 19. The nutritional status of children aged 7-9 years based on changes in nutritional status at age 0-2 to 4-6 years

(The changes of nutritional status at aged 0-2 to 4-6 years old	Nutritional status at age 7-9 years old		Total
	Normal (%)	Stunting (%)	
Normal → normal	89,9	10,1	138
Normal → stunting	40,5	59,5	42
Pendek → normal	84,3	15,7	51
stunting→ stunting	22,9	77,1	70
Jumlah	**66,4**	**33,6**	**301**

Source: Aryastami, 2015

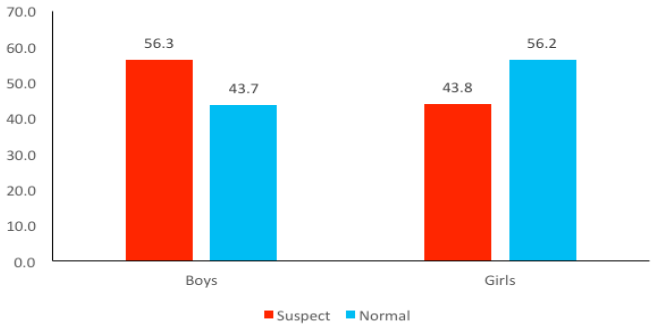
The above table shows that children who were stunted at the age of 0-2 years to 4-6 years of age. The majority (77.1%) of children will remain stunted at the age of 7-9 years. Yet, if a child grew from stunting to normal status, then 84.3% chance is the child nutritional status will remain at normalheight. It means that if we can overcome stunted children at an early age, then most children will be normal in the future age.

Conversely if the growth of age (0-2) years was normal but become stunted at age 4-6 years, only about half of children will be able to return to normal. It gives guidance for us to maintain children at a normal nutritional status, prevented for being stunted, because once a child is stunted, thenit will be more difficult to bring the child back at normal height.

5.1. CHILD DEVELOPMENT

Stunting is very closely related to child's development. There have been many theories that claim that the nutritional status including stunting, have a major influence on the development of a child, both short term and long term. Indonesia does not has a lot of data on child development. A Cohort Study of Child Growth and Development in Bogor has successfully followed the growth process of 220 infants, with some information on the child's development as follow.

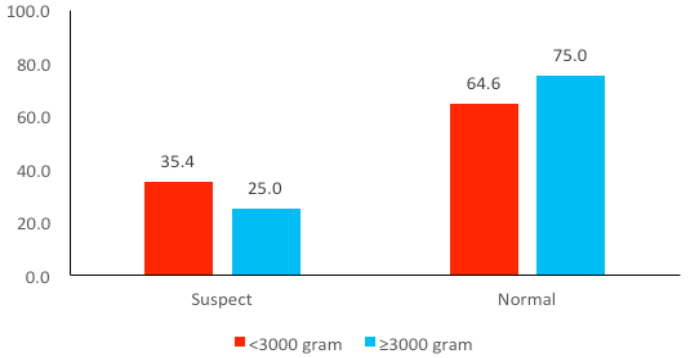
The infant development is measured by using Denver II, the result showed that boys (56.3) were suspected having developmental disorders, more than female (43.8) as shown in the following figure.



Source: Child Growth and Development Cohort Study, Balitbangkes, 2013

Figure 47. The proportion of infants suspected with developmental disorders, 2013

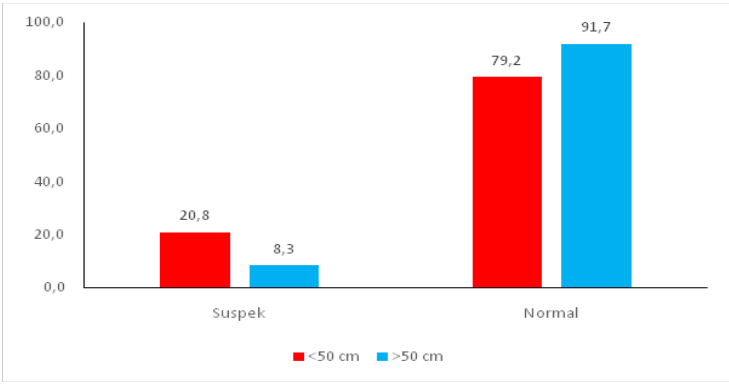
Further analysis (Figure 48) on developmental disorder associated with birth weightis shown below. The result demonstrated that infants with low birth weight were more likely to have developmental disorder than those born normally. The suspected babies with developmental disorder is 10 percent higher in babies born with BW <3000 grams.



Source: Child Growth and Development Cohort Study, Balitbangkes, 2013

Figure 48. The proportion of infants suspected with developmental disorders according to birth weight

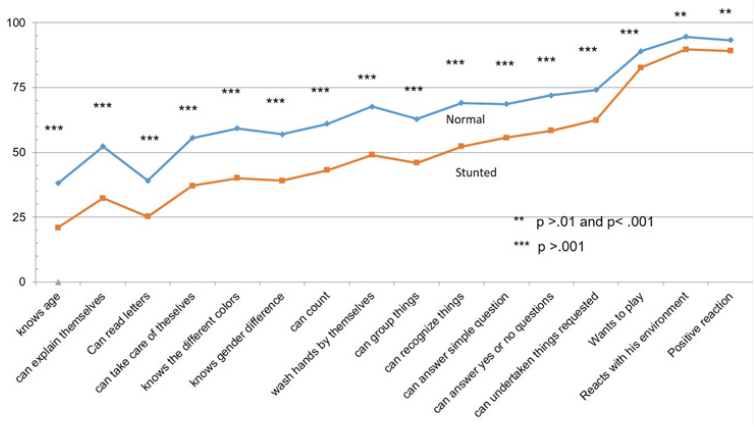
The following figure shows the relationship between the suspected developmental disorder with birth length of babies. It showed that babies who are born short, with body length <50 cm will have a developmental disorder. It differs significantly by 20.8 percent in infants who are born with a body length <50 cm versus 8.3 % in infants who are born with a body length of> 50 cm.



Source: Child Growth and Development Cohort Study, Balitbangkes, 2013

Figure 49. The proportion of infants suspected with developmental disorders according to lenght weight

A Study on Early Childhood Education in three provinces (West Sumatra, South Sulawesi and East Java) in 2009 showed clearly the linkage between stunting and the delay of child development. It can be concluded that almost in all domains of development, the level of development of stunted children were far below than normal children (Figure 50 and Table 20).



Source: Study on Early Childhood Education in 3 Province (Sumatra, Sulawesi, East Java), 2009

Figure 50. The difference in the level of development of stunted children compare to normal children

Table 20. The comparison of child development in the stunted and normal children in various domains of child development

Domains		Stunted n=404 (Yes)	Normal n=988 (Yes)
Communication skills and general knowledge			
1	Can answer simple questions	55.7	67.1
2	Can answer yes or no questions	58.4	70.7
3	Can explain his actions	32.2	51.2
4	Knows age	21.0	37.3
Emotional Maturity			
1	Likes to break things	16.1	19.0
2	Looks sad	9.4	8.9
3	Always changing moods	18.3	19.8
Self-sufficiency Maturity			
1	Positive attitude	89.1	93.3
2	Knows gender differences	39.1	55.9
3	Can go to bathroom by themselves	53.2	68.5
4	Can follow instructions	62.4	73.2
5	Can wash hands by themselves	49.0	66.3
6	Can do things for themselves	37.1	54.1
7	Likes to learn	53.2	62.1
Language and cognitive development			
1	Can count	43.1	60.4
2	Can group things	46.0	61.8
3	Can differentiate colors	40.1	58.0
4	Can recognize various letters	25.2	38.4
Social Competence			
1	Interacts with immediate environment	89.6	94.6
2	Wants to play	82.7	88.9
3	Plays with friends	73.7	76.8
4	Likes to be by themselves	72.0	79.0
5	Only likes to be by themselves	18.6	18.2
6	Enjoys playing	13.6	14.8
7	Likes to act	52.5	64.1

Source: Study on Early Childhood Educationin 3 Province (Sumatra, Sulawesi, East Java), 2009

Notes: Domains have developed by Atmarita, 2009

5.2. MORBIDITY

The analysis of the pevalence of disease in children aged 5-18 years is shown in the figure below. Generally speaking, there is no significant difference in the occurrence of diarrhea last month against child length/height. The prevalence of diarrhea in childrenaged 5-8 years is clearly seen higher in stunted children compared to normal children. The impact of stunting is more visible on the prevalence of ARI (Acute Respiratory Infection) although there was no significant difference. Almost in every age, the prevalence of acute respiratory infection occurs more frequently in children who are stuntedthan children who are at normal height.

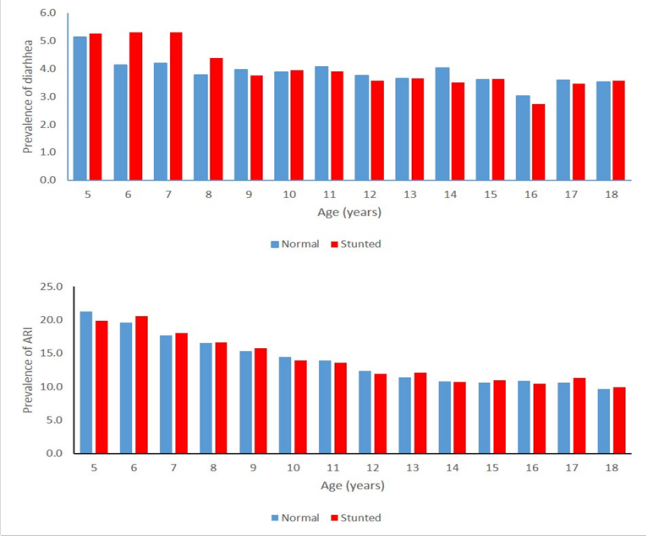


Figure 51. The difference between stunted and normal children on prevalence of Diarrhea and ARI, 2013

5.3. NON COMMUNICABLE DISEASES

Short or stunting in childhood is closely linked to non-communicable diseases in later adult life. Many studies in several

coutries proved the existence of this relationship, unfortunately it is limited for Indonesia. An analysis about the relationship between stunting and diabetes mellitus have been conducted using Riskesdas 2007/08data. Although the Riskesdasdata are cross-sectional, but the analysis reveals the following findings (Donny KM, 2013):

1. Stunting is a risk factor of diabetes mellitus in the adults who were thin and normal (BMI <23), and had 1.5 times the risk for diabetes mellitus.
2. Those who were short and non-obesed (BMI <23) had 1.5 times riskof developing diabetes mellitus, while those who were short and fat had 3.4 times risk of developing diabetes mellitus compared with those who were not short and fat.

A similar study using Riskesdas 2007 data also measured the relationship between stunting and high blood pressure/ hypertension, the result did not show any significant relationship between height at adulthood with risk of hypertension. Domination of obesity as the risk factors of hypertension had covered the role of stunting. (Agus T., 2013).

An analysis of relationship between nutritional status and hypertension was conducted using Riskesdas 2013 data. It revealed that those who areclassified as obesed and stunted were more likely to suffer from high blood pressurecompared to the wasted and stunted.

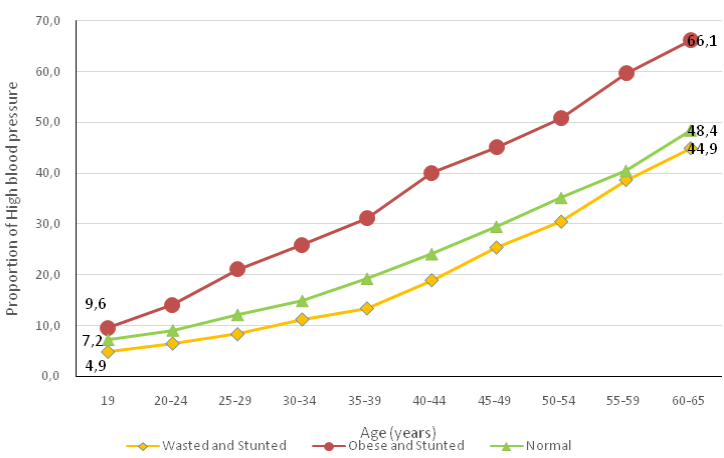


Figure 52. The risk of high blood pressure age 19 and above in various nutritional status

The economic burden of non-communicable diseases is enormous. As an illustration for 6 months (January to June 2014), the catastrophic costs is dominated by four major non-communicable diseases in a row: heart disease, stroke, kidney disease and diabetes mellitus, with the amount of costs > 3.5 trillion rupiah.

CHAPTER 6
SOCIAL FACTORS OF STUNTING DETERMINANT

6.1. THE FRAMEWORK FOR HANDLING STUNTING PROBLEM

To find a proper solution for the stunting problem, determinant factors that are affecting stuntingshould be known. Many of the theoritical frameworks tcan be used to interpret determinant factor, one of them is in the discussion framework of stunting (see chapter 2). Some determinants based on the available data and information that we have, will be described below.

6.2. THE CAUSE OF STUNTING ON INFANT

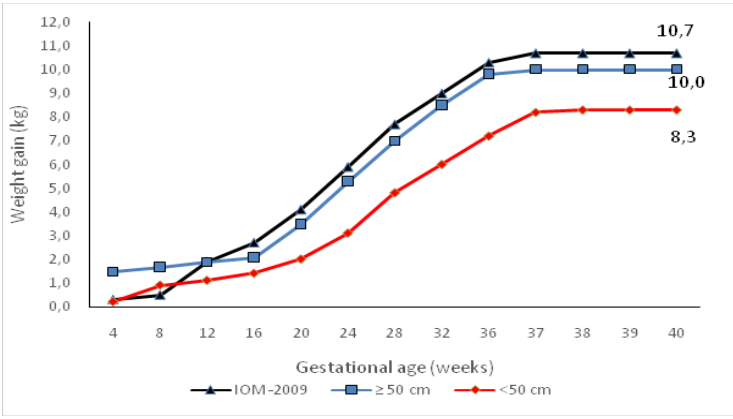
The Cohort study of Child and Developmentin Bogor city which was conducted by NIHRD hadsuccesfully observed/monitored and analyzed 220 pregnant women until delivery. We analyzed the factors using multivariate method that is affecting birth length, and obtained the result as follows:

Table 21. Factors affecting birth length, 2013

Factors	Birth Length	
	RR	95 CI
Mothers height<150 cm	3,7[a]	2,2- 4,5
BMI of mother before pregnancy	3,1[a]	1,5- 3,7
Mother age <20 yr and >35 yr	1,1[a]	1,0- 1,36
Parity (≤ 2 times)	1,2[a]	1,0 -1,6
WeightGain in pregnancy<9.1 kg	2,3[a]	1,4- 3,7
Protein consumption (<100 RDA)	2,2[a]	1,1- 2,7
Constant	**39.357**	

Source: Cohort Study of Child and Development, NIHRD 2013

The same study also proved that maternal factors during pregnancy and before pregnancy, also determined the birth length. Weight gained during pregnancy affected the baby's birth length. If we traced back, infants with shorter birth length had a history of substandard weight gain during pregnancy compared to those who were born with normal birth length (see figure below).



Source: Cohort Study of Child and Development, NIHRD 2013

Figure 53. History of Weight Gain during pregnancy based on birth length

So it was obvious that the condition of the mother during pregnancy absolutely influenced the growth ofthe fetus, which would affect the birth length of infant after birth. Further analysis had been done to figure out the factors that influence weight gain during pregnancy, the results were as follows.

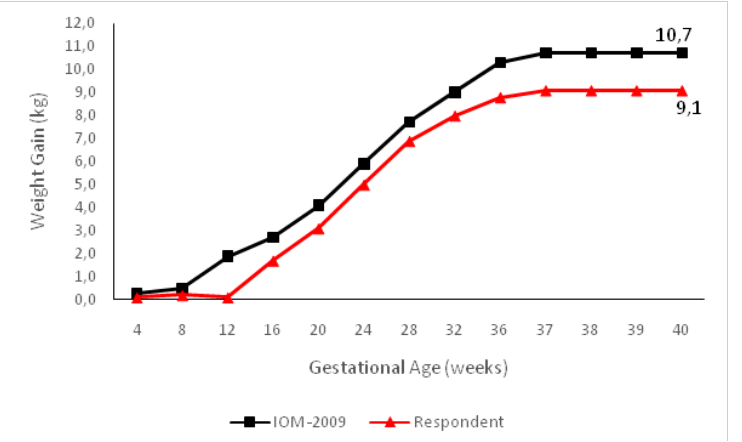
Table 22. Factors affecting weight gain during pregnancy

Factors	RR	95CI
Mother age <20 yr and >35 yr	1,3	1,2 – 2,3
Parity ≤ 2	2,4	1,7 – 3,0
Weight before pregnancy < 45 kg	2,1	1,5 – 3,2
Height< 150 cm	2.1	1,2 – 2,8

BMI Before Pregnancy< 18.5	2,8	1,1 – 3,2
Energy consumption < 100 RDA	1,5	1,3 – 2,2
Protein consumtion < 100 RDA	1,9	1,1 – 2,2
Diarrhea ≥ 1 time	2,3	1,5 – 2,6
Constant	**7,3467**	

Source: Cohort Study of Child and Development, NIHRD 2013

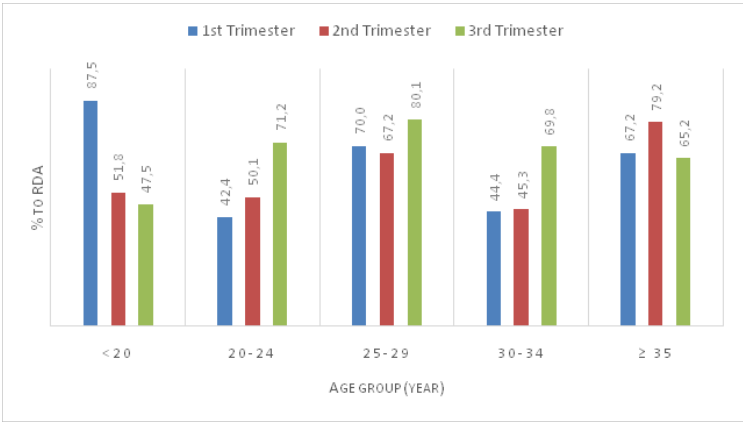
One of the important factors durings pregnancy is food intake, either calories, proteinas well as micronutrients. Based on cohort sudy of Child and Development of weight gain during pregnancy of respondents of this study (see red line) since week 12 of pregnancy is under the 2009 IOM recomendations for pregnant women with a BMI:18.5 to 24.9 kg/m2 (see black line). Although weight gain during pregnancy under there commendation, but the position of each is in parallel, meaning that there is weight gain with age of pregnancy. The proportion of women with aweight gainless than 9.1kg were at 22.7%,meaning thata quarter of respondents during pregnancy had poor nutritional status.



Source: Cohort Study of Child and Development, NIHRD 2013

Figure 54. Weight gain during pregnancy compared to a standard (IOM)

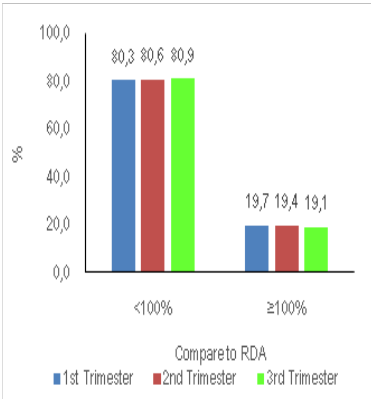
The calory intake during pregnancy in many pregnant women is <100% RDA (Recommended Daily Allowance). Figure55 showed sufficient nutritional intakes decreased from the first trimester(87.5) to the second trimester (51.8) and third trimester (47.5) in pregnant women aged <20 years old. These young women should be a concern, they are not ready for pregnancy, hence the fetal growth may also be disrupted.

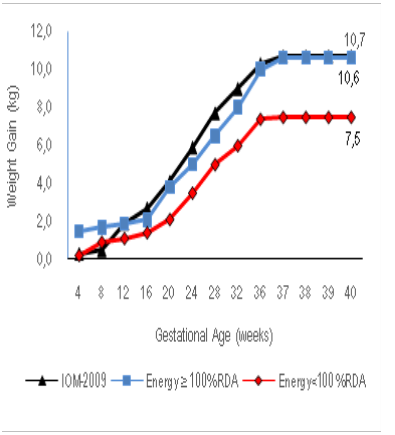


Source: Cohort Study of Child and Development, NIHRD 2013

Figure 55. Energy intake per trimester based on age of pregnant women

The proportion of pregnant women with sufficient and insufficient calories intake then followed by weight gained during pregnancy, can be seen in Figure56 and 57. The graph of weight gained during pregnancy for women with calories intake <100% RDA were lower than a women with sufficient energy intake and deviates from a standard with a difference up to 3.2 kg at the end of pregnancy.





Source: Cohort Study of Child and Development, NIHRD 2013

Figure 56. Proportion of pregnant women according to % RDA energy intake by trimester of pregnancy

Figure 57. Weight Gain during pregnancy by energy intake less/ more of 100% RDA

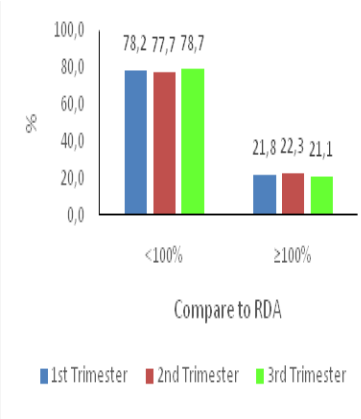
Tabel 23. The proportion of pregnant women based on classification of the adequate energy level and characteristics, Indonesia 2014.

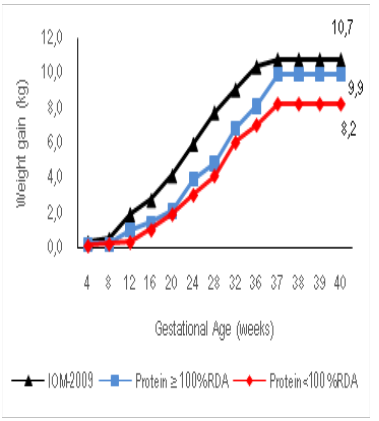
Characteristics	Classification of the Adequate Energy Level		
	< 70% ERA	70 - <100% ERA	≥100% ERA
Residence			
Urban	51,5	34,5	14,0
Rural	52,9	33,1	14,0
Wealth index quintile			
Lowest	67,9	22,6	9,5
Second	60,4	28,8	10,8
Middle	42,1	43,4	14,5
Fourth	50,0	36,0	14,0
Highest	48,9	31,9	19,1

Source: Total Diet Study NIHRD, 2014

Total Diet Study Data in 2014 showed that 80% of pregnant women were having energy intake lessthan 100% RDA. The proportion of pregnant women with energy adequency level <70% ERA (Energy Recommended Allowance) is slightly higher in rural areas compared to urban areas (52.9% compared to 51.5%). But the proportion of pregnant women with energy adequency level ≥100% ERA showed similar results, with 14% in both urban and rural areas. According to Socio-economic level, result of the analysis showed that the highest proportion of pregnant women with energy adequency level of <70% ERA were found in the very poor families (67,9%) and the lowest proportion of those were found in the middle quintile families (42,1%).

The proportion of pregnant women with adequate protein intake which were grouped by age and trimester of pregnancy can be seen in figure 58. This figure showed that less than 25% of pregnant women have adequate protein intake. Figure 59 showed the graph of weight gain during pregnancy which were grouped by protein intake. This figure showed that the weight gain graph of pregnant women who had protein intake less than 100% of RDA were lower compared to those who had adequate protein intake and the IOM standard.





Source: Cohort Study of Child and Development, NIHRD 2013

Figure 58 Proportion of pregnant women according to % RDA protein intake by trimester of pregnancy

Figure 59 Weight Gain during pregnancy by protein intake less/ more of 100% RDA

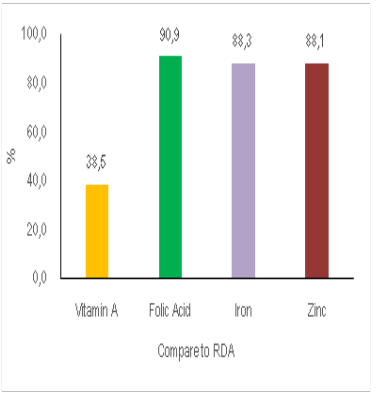
The Total Diet Study (TDS) data 2014 showed that around 70 percent of pregnant women had protein intake <100% of Protein recommended allowance (PRA) with protein adequancy level <80% PRA were a little higher in rural area than in urban area; 55.7% and 49.6% respectively, but proportion of pregnant women with protein adequacy level ≥100% of PRA were higher in urban area than in rural area; 31.5% and 26.9% respectively. According to Socio-economic level, the result of analysis showed that the highest proportion of pregnant women with protein adequency level of <80% PRA were found in the very poor families (67.1%) whereas the lowest proportion of those were found in the rich families (44%).

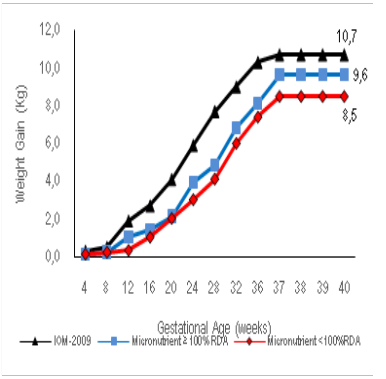
Table 24. Proportion of Pregnant Women based on protein adequency level and characteristics, Indonesia 2014

Characteristic	Classification of the protein adequacy level		
	<80% PRA	80-<100% PRA	≥100 % PRA
Residence			
Urban	49,6	19,0	31,5
Rural	55,7	17,5	26,9
Wealth index quintile			
Lowest	67,1	16,5	16,5
Second	60,0	10,9	29,1
Middle	46,5	23,6	29,9
Fourth	52,8	20,2	27,0
Highest	44,0	17,0	39,0

Source: TDS NIHRD 2014.

Similar pattern was seen in the micronutrient intake (Vitamin A, folic acid, iron and zinc). Vitamin A and iron intake were relatively adequate, meanwhile for folic acid and zinc intake were far form adequate (Figure 60).



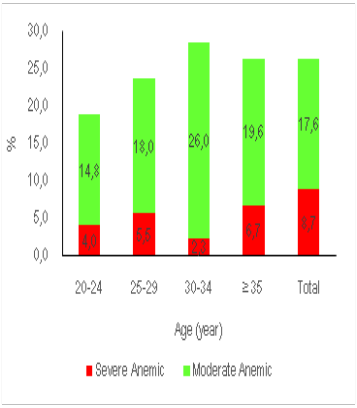


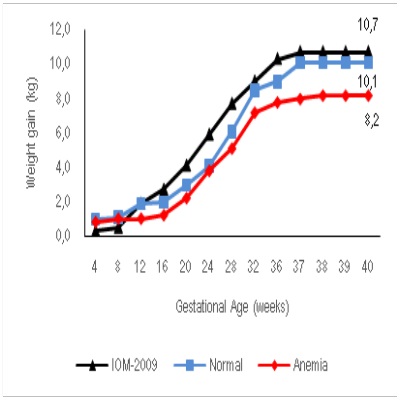
Source: Cohort Study of Child and Development, NIHRD 2013

Figure 60 Proportion of pregnant women according to % RDA MIcronutrient intake

Figure 61 Weight Gain during pregnancy by micronutrient intake less/more of 100% RDA

The graph of weight gain during pregnancy according to micronutrient intake could be seen in Figure 61 above. It showed that pregnant women with micronutrient intake lower than RDA has lesser weight gain during pregnancy than the ones with adequate micronutrient intake and also lesser than standard. The same thing happened with the women with anemia (Figure 62 and 63).





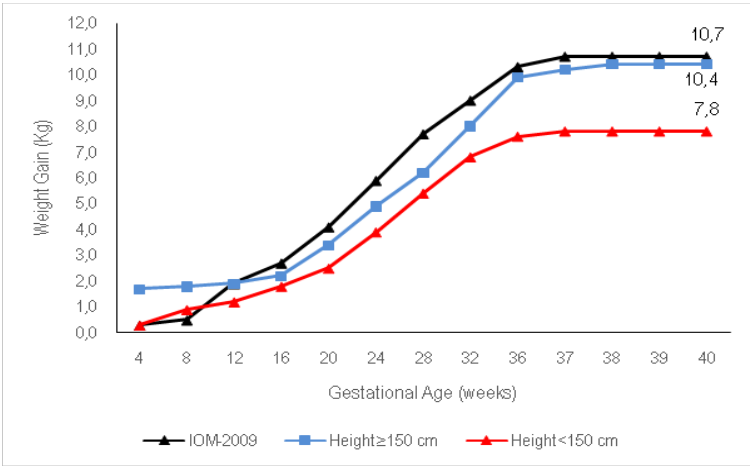
Source: Cohort Study of Child and Development, NIHRD 2013

Figure 62. Proportion of pregnant women with anemia

Figure 63. Comparison of Weight Gain for Normal, Anemic pregnant women with IOM

Analysis showed that nutrient intake during pregnancy had significant effect on pregnant women weight gain, which then would affect the development of brain and physical quality of its fetus. Therefore, there should be a special program of supplementary feeding containing high calory, protein as well as micronutrients for pregnant women.

Other than nutrient intake during pregnancy, the condition of pregnant women before pregnancy also can have an effect to the weight gained during pregnancy. As shown in Figure 64, the height of pregnant women wasa significant factor which affected weight gained during pregnancy. Pregnant women with height <150 cm got much lower weight gain than standard. Aggravated more if it were pregnant women with age <19 years old with height <150 cm which itheir growth period haven't stopped yet. In contraryto that, graph of pregnant women with heigh ≥150 cm were closer to standard.

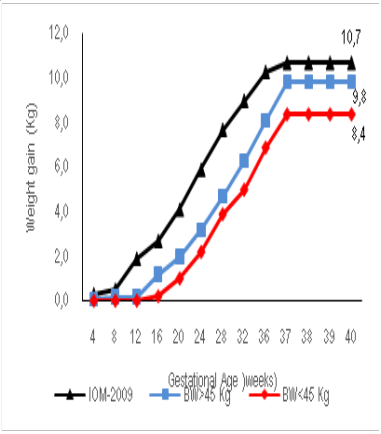


Source: Cohort Study of Child and Development, NIHRD 2013

Figure 64. Weight gained during pregnancy according to the height of women before pregnancy

Based on Basic National Health Survey (Riskesdas) 2013, 31.3% of pregnant women had height <150 cm (Figure 27).

This cohort study followed the weight gain during pregnancy start from before conception. The result of the study showed that pregnant women with weight of pre-pregnancy <45 kg compared with pregnant women with weight of pre-pregnancy ≥45 kg could be seen in following figure. Pregnant women with weight of pre-pregnancy <45 kg had far lower weight gain compared to standar. Meanwhile, pregnant women with weight of pre-pregnancy ≥45 kg had closer weight gain compared to standard. Pregnant women with weight of pre-pregnancy <45 kg usually is a teenage pregnancy, when their growth is still ongoing. If they want to postpone their pregnancy until their growth has stopped, this condition could be avoided.

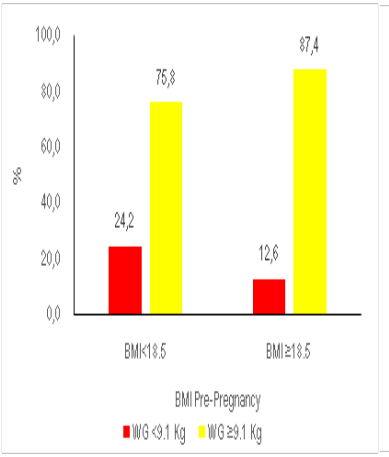


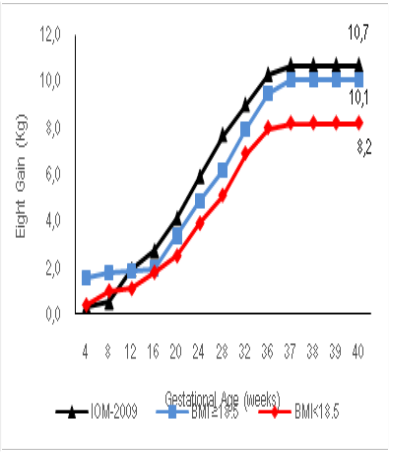
Source: Cohort Study of Child and Development, NIHRD 2013

Figure 65 Proportion of pregnant women with Body weight pre-pregnancy ≤45 Kg

Figure 66 Comparison of Weight Gain for BW>45 Kg, BW<45 Kg with IOM

Similar result was seen if we combine height and weight in form of body mass index (BMI). Pregnant women with normal BMI of pre-pregnancy had weight gain during pregnancy close to the standard. In contrary to that, pregnant women with BMI <18.5 showed weight gain far from standard, with the difference up to 2.3 kg at the end of pregnancy (see figure below).



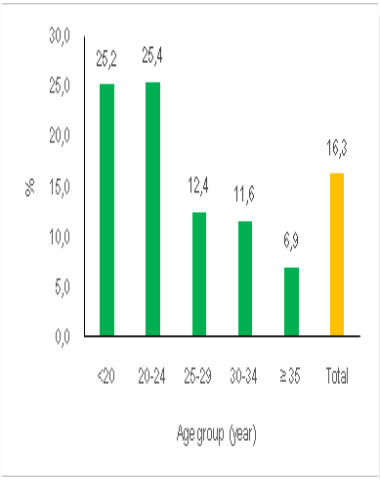


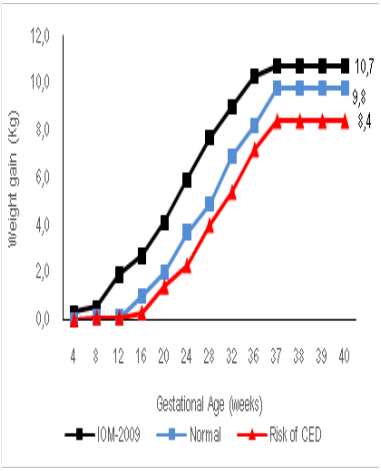
Source: Cohort Study of Child and Development, NIHRD 2013

Figure 67 Proportion of pregnant women with BMI pre-pregnancy ≤45 Kg

Figure 68 Comparison of Weight Gain for BMI≥18.5, BMI<18.5 with IOM

There were information about occurance of chronic energy deficiency(CED) problem among women at reproductive age (WORA) aged 15-49 years and on pregnant women according to its mid upper arm circumference (MUAC). To showthe occurance of CED risk in relevance to WORA, we use the average of MUAC value at<23.5 cm. Similar pattern of weight gain was shown between normal pregnant women and pregnant women with CED, which is shown below. It could be seen that pregnant women with CED had weight gain during pregnancy far from standard. On the contrary, the weight gainof a normal motherduring pregnancy could meet the standard.





Source: Cohort Study of Child and Development, NIHRD 2013

Figure 69 Proportion of pregnant women with risk of CED

Figure 70 Comparison of Weight Gain during pregnancybeween Normal, having Risk of CED with IOM

The figure below presents the prevalence of women at reproductive age with risk of CED according to age in 2007 and 2013. Overall, the prevalence of the risk of CED increase in all age groups for all condition of women (pregnant and non-pregnant). This means that the condition of pregnant women in 2013 is worse than in 2007.

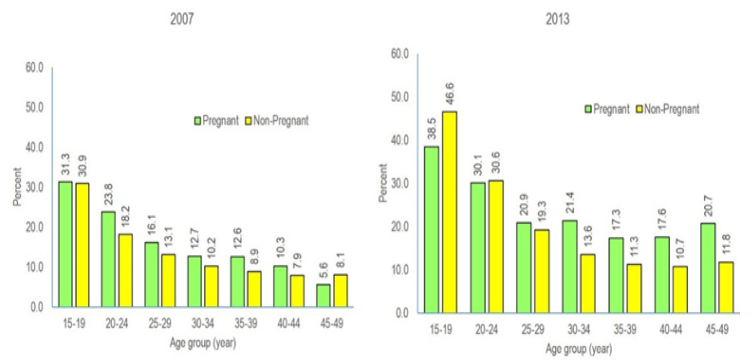


Figure 71. The proportion of WORA with risk of CED by age group, Indonesia 2007 and 2013

Study of factors that influence the weight gain before pregnancy will determine the condition of the mother and the baby, which is referring to the reproductive health of adolescents . Teenagers who will be a mother in the future should behealthy, therefore will not deliver a stunted baby. Some health indicators are:

- Height ≥150 cm
- Body weight ≥ 45 kg
- BMI ≥18,5
- MUAC ≥ 23.5 cm
- Do not suffer from anemia
- Physically, psychologically and socially healthy

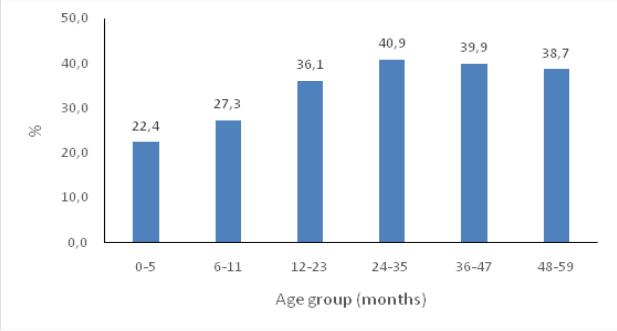
Therefore, there should be a system that makes the teenagers only to get married after a period of growth stops, in particular by :

1. Increase the 9 -year compulsory education to 12 years, so they have to passhigh school
2. Revision on The UU No. 1 of 1974 about Marriage, that the age of marriage for women revised from 16 years to 20 years
3. Teenager reproductive health education, either through intra - curricular and extra- curricular activities

4. Nutrition improvement programme in schools. The school day is changed to 5 days (Monday to Friday) a week, study hours increased from 7 to 16. Lunch and snacks are used for nutrition improvement program in schools. During the day and before going home, there should beobligatory prayers in congregation, as well as moral and cultural development of the nation. Therefore the intensity of children and parents interaction could be longer, 2 days (Saturday-Sunday) in a week.
5. UKS (School Health Program) becaming a Health center should be mandatory, with coverage throughout the primary, secondary, and high school.

6.3. THE CAUSE OF STUNTING IN CHILDREN UNDER FIVE

If we look more carefully at the prevalence of stunting in children under five,it is shown that the prevalence increase from age 6 month (22.4) - 1 year (27.3) – 2 year (36.1) to 3 year (40.9 the highest), and then showed a little decrease to 38.7 at age 5 year, as seen at the following figure. It is clear that the prevalence of stunting increased, along the 5 years duration there is problem causing theincrease in prevalence.



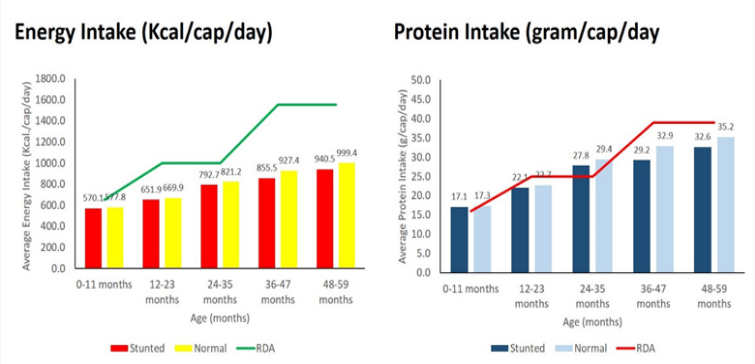
Source: Riskesdas 2013

Figure 72. Proportion of Stunting according to the age group, 2013

Associated with the growth rate of WHO standard, as shown in Figure 9 in the previous chapter, it appears that thegap of growth of children both for male and female is widening, and also shows the slowdown in the growth start from age 12-23 months. Many factors are causing this, but because they are very dependent on the mother/family, therefore the family and environmental conditions that affect the family will have an impact on nutritional status.

Reduction of the nutritional status occurs due to poor nutritional intake and frequent infections. Therefore environmental factors, and health behavior of the families who facilitate/triggering the infection, affects the nutritional status of children. Adequacy of energy and protein per day per capita of Indonesian child seems very lacking when compared to Recommended Dietary Allowance (RDA), both for normal children or stunted children (Figure 73).

It is very interesting that the energy and protein intake did not differ significantly between children who are classified as stunted nor normal. Generally assumed, that consumption obtained for all children (stunted or normal) is in the same condition, which is less than the RDA. If it lasts for years then a chronic problem occurs.



Source : Riskesdas 2010.

Figure 73. Average intake of energy and protein per day per capita by age in under five children.

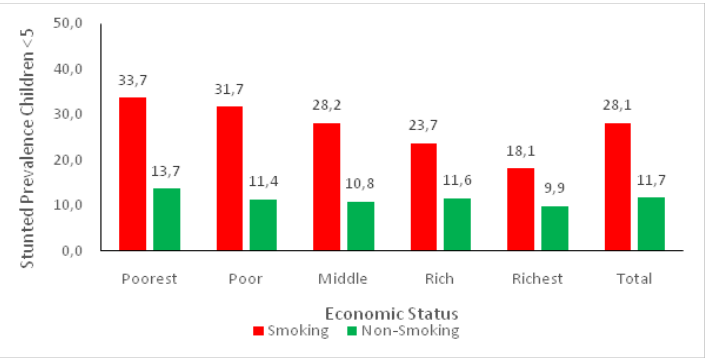
The incidence of infection in the past month can be seen from the Susenas data in the following table. It appears that in average,children under five get sick (in average) 3-4 days in a month. This could bea factor that makes their nutritional status deteriorated, influencing their growth performance, and thus the prevalence of stunting increased.

Table 25. Proportion of children <5 sick last month and average days of affected by age groups and gender, Susenas 2012

Age (month)	Health complaints last month			Average days of sick
	Boys	Girls	Boys+ Girls	
0-11	38.5	35.7	37.1	4.2
12-23	49.0	49.6	49.3	4.1
24-35	43.9	44.0	44.0	4.0
36-47	39.3	38.8	39.0	3.8
48-59	37.1	36.4	36.8	3.8

Source : Atmarita, 2014

Significant factors that worsened the problem of nutrition is clearly shown in Figure 74. The influence of parents who smoke both at the level of the lowest economic status (quintile 1) to the top (quintile 5), underlines the magnitude of stunting problem more than doubled. In the poorest group, the prevalence of stunted children of smoking parents was at 33.7 percent compared to 13.7 percent whose parents do not smoke. The prevalence of stunfed children for the richest group also differ significantly in smoking parents or non-smoking parents (18.1% versus 9.9%). It is clearly shown that poverty factors greatly affected the prevalence of stunting and the number is worsened with smoker's parents. Overall, a smoker parent causes about 16% increase (OR: 1.156, 95CI: 1,154 - 1,159) in the incidence of stunting compared withnon-smokers parents. (Atmarita, 2012)

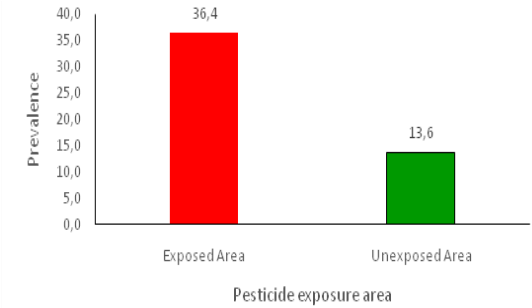


Source: Riskesdas 2010

Picture 74. The proportion of stunted children in families of smokers and non-smokers based on economic status

One study of environmental pollution which have an impact on public health is the contamination of pesticides that is widely used in agriculture. At one areas with a high pesticide usage, a significant difference is found in the proportion of patients with hypothyroidism (based on the level of TSHs/Thyroid Stimulating hormons) between pesticides exposed and non exposed areas,

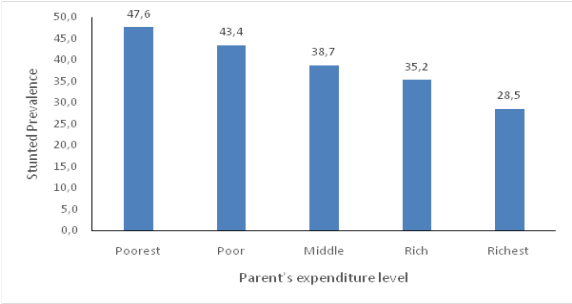
as shown in the following figure. If the exposure to the pesticides happen continuously, the growth of the children will be impaired and lead to the more incidence of stunting. Although the coverage area of this study is not very wide, but the impact of environmental contamination must continually be put into concern.



Source: Study of pesticides environmental pollution, Balitbangkes 2012

Figure 75. The proportion of patients with hypothyroidism based on TSHs levels by pesticide exposure areas 2012

The dominance of stunted children incidence in the population is likely as a result of the famine that occurred in a long time. One of the fundamental causes is poverty. Clear differences are shown in Figure 76, where the prevalence of stunted in population groups with the lowest spending level (quintile 1) is almost at 20 percent of population with the highest expenditure level (quintile 5).



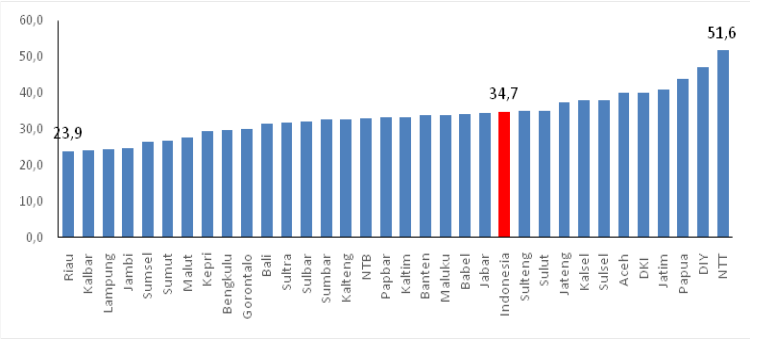
Source : Riskesdas 2010.

Figure 76. The stunted prevalence among children 0-59 months by Parent's Expenditure level

A significant difference in prevalence between population quintile groups 1 to 4 with quintile 5 is clearly shown by the difference of average expenditure per capita which are<Rp700,000 versus>Rp 1,500,000. The figure of this economic status is actually an interaction of malnutrition that causes poverty, and vice versa poverty causes chronic malnutrition. In adulthood, the people with malnutrition will potentially not have optimal productivity, and generally, this condition is followed by imperfect intelligence (Atmarita , 2012).

6.4. THE CAUSE OF STUNTING IN SCHOOL AGE CHIDLREN

One of the factors causing the deteriorationin nutritional status is the presence of the illness, including for school-aged children. Riskesdas 2013 showed that the proportion of school aged 5-18 years who became sick a month ago is ranged from 23.9 to 51.6%, as follows.



Source : Riskesdas 2013

Figure 77. The proportion of children 5-18 years getting sick last month

The same data is used to determine the proportion of children aged 5-18 years who fell sick a month ago by gender and characteristics as shown in Table 26.

Table 26. The proportion of children aged 5-18 years who are sick a month ago by characteristics, 2013

Age (Year)	Residence		Economic Status					Sex	
	Urban	Rural	Lowest	Second	Middle	Fourth	Richest	Boys	Girls
5	44,1	43,7	46,8	42,7	45,5	44,1	41,0	43,1	44,8
6	41,8	40,5	41,8	41,8	42,6	42,2	37,3	42,3	39,8
7	39,2	39,4	41,9	40,3	40,1	40,1	34,6	39,9	38,6
8	38,3	36,8	40,6	36,6	38,5	38,1	34,0	38,0	37,0
9	35,0	36,4	37,7	38,0	38,0	34,0	31,6	35,7	35,8
10	35,2	33,5	38,6	33,8	36,1	33,4	30,7	33,7	35,0
11	34,3	34,2	39,4	34,7	35,3	33,7	29,2	34,3	34,1
12	32,4	31,8	36,1	32,2	33,1	31,1	28,8	30,9	33,3
13	30,9	31,6	37,3	31,2	31,3	30,0	27,3	31,1	31,4
14	31,9	29,8	33,5	30,6	32,9	31,1	26,3	31,8	29,7
15	30,9	30,2	32,7	32,2	30,4	28,8	29,5	30,6	30,5
16	31,2	29,4	34,1	30,1	29,0	31,4	28,3	29,8	30,9
17	31,9	30,4	32,8	30,6	33,1	30,9	28,8	30,7	31,6
18	30,8	28,5	30,4	30,2	31,6	30,6	25,9	29,2	30,3

Source: Atmarita, 2014

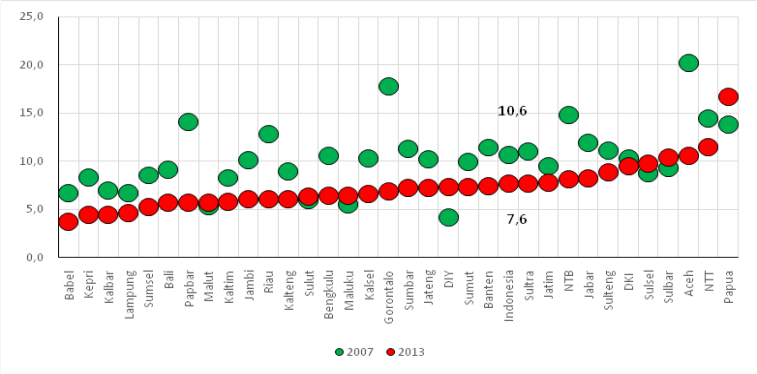
Advanced analysis about the duration of days being sick for school age group (5-18 years) can be seen in the following table. It appears that about 15-30 percent of school-aged children, has an average about 4 days of being sick per month. The proportion of sick incidence decline with increasing age. (Table 27).

Table 27. The proportion of school-aged children who was sick last month and the average days of sick

Age (years)	Health complaints last month			Average days of sick
	Boys	Girls	Boys+ Girls	
5	33,5	33,2	33,4	3,8
6	30,8	30,6	30,7	3,6
7	27,7	28,2	28,0	3,6
8	25,2	24,9	25,0	3,6
9	23,9	24,2	24,1	3,7
10	23,3	22,4	22,9	3,8
11	20,8	20,9	20,9	3,6
12	18,9	19,0	19,0	3,8
13	18,3	18,7	18,5	4,0
14	17,2	18,0	17,6	3,8
15	16,2	17,7	17,0	4,2
16	16,9	17,9	17,4	4,0
17	15,1	18,0	16,5	4,1
18	15,1	19,1	17,1	4,5

Source: Atmarita, 2014

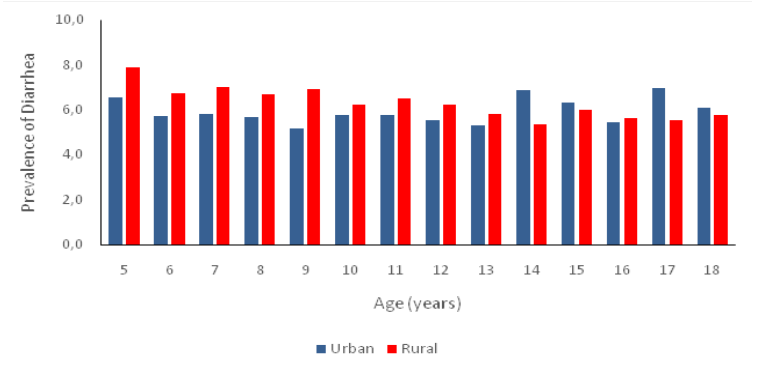
As an illustration, the proportion of children aged 5-18 years who suffer from diarrhea last month by province can be seen in the following figure. The proportion of school–aged children with diarrhea last month in 2013 is at 7.6 per cent, this proportion is smaller than in 2007 which was at 10.6 percent.



Source: Riskesdas 2007, 2013

Figure 78. The prevalence of children aged 5-18 years with diarrhea last month by province, 2007 and 2013

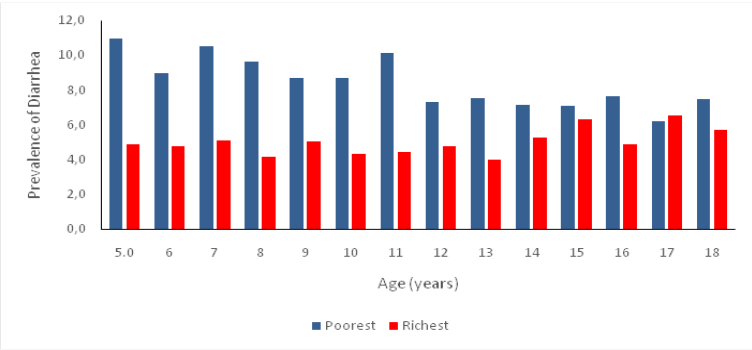
The proportion of diarrhea one month ago for children aged 5-18 years is slightly higher in rural areas than in urban areas.



Source: Riskesdas 2013

Figure 79. The prevalence of children aged 5-18 years with diarrhea by residence

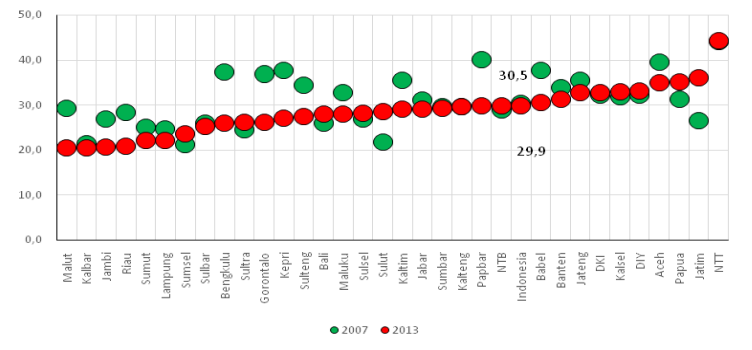
Economic status appear to be more influential to the incident of diarrhea, this is proven that the proportion of school-age children who experience diarrhea last month in among poorest was much higher than the richest.



Source: Riskesdas 2013

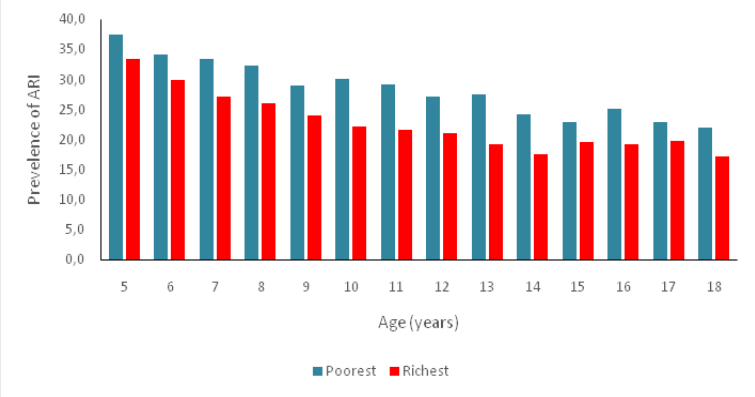
Figure 80. The prevalence of children aged 5-18 years with diarrhea by Economic Status

Another disease that often affects school-aged children is ARI (Acute Respiratory Infection). Riskesdas 2013 reported that the prevalence of acute respiratory disease has not changed much from 2007, which is at 29.9 per cent as presented below. The same condition with diarrhea, if we observed that the poorest relatively have higher prevalence of ARI compared to the richest (Figure 82). However, there is a little proportional differrence between urban and rural areas, even though the proportion of ARI in school-age childrenis more common in rural areas (figure 83).



Source: Riskesdas 2013

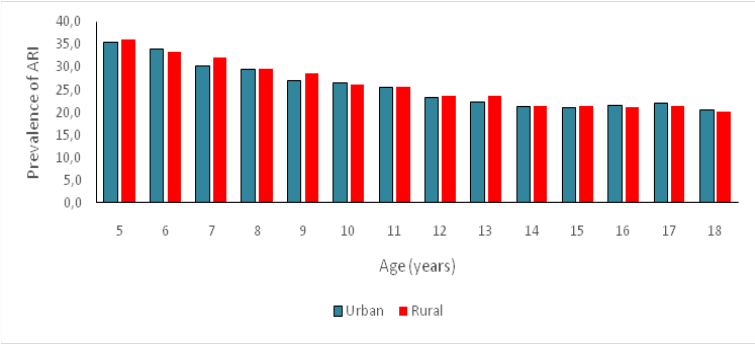
Figure 81. The prevalence of children aged 5-18 years with ARI by province



Source : Riskesdas 2013

Picture 82. The prevalence of ARI in people aged 5-18 years in the last month by economic status, 2013

Comparing with RDA values, the nutrition intake (energy, carbohydrate/CHO, protein, fat, and fiber)for school age children can be seen in the following table. It appears that approaching teens aged, thepercentage of nutrient intake (energy, CHO, fat) compare to RDA is declining. For girls who will become mothers who should have an adequate nutritional and health status (Table 28).



Source : Riskesdas 2013

Figure 83. The prevalence of children aged 5-18 years with ARI by Residence

Table 28. The average of Nutrient intake for school-age children compare to RDA by age and sex, 2010

Age (Year)	Boys					Girls				
	Energy	CHO	Protein	Fat	Fiber	Energy	CHO	Protein	Fat	Fiber
5	85,1	88,7	136,0	69,1	20,7	80,7	83,4	127,7	67,0	20,8
6	80,5	84,2	129,4	64,4	21,9	78,9	82,7	125,6	64,3	21,9
7	69,3	74,0	90,6	53,8	19,6	68,1	71,1	90,0	54,9	19,4
8	71,8	76,3	92,3	56,5	20,5	68,5	71,7	90,8	54,7	19,9
9	69,9	74,7	93,4	55,6	20,3	69,3	73,3	90,5	55,4	21,0
10	62,8	67,5	79,4	56,2	19,3	63,2	67,4	73,1	57,4	19,4
11	64,3	69,3	83,0	57,4	19,8	64,4	68,4	75,2	58,6	20,1
12	64,5	68,8	83,5	59,4	20,2	65,4	69,3	74,9	59,5	20,6
13	55,9	60,8	65,3	48,1	17,0	60,6	64,4	65,4	55,8	19,1
14	56,2	61,7	64,5	47,8	17,5	60,1	64,4	61,9	53,0	19,7
15	59,0	64,7	68,7	51,0	18,8	60,2	64,2	62,4	54,9	19,4
16	54,6	59,7	74,6	46,9	17,7	61,3	65,0	77,9	56,6	20,0
17	57,1	63,6	77,3	47,1	18,4	60,3	63,9	76,1	54,2	19,8
18	55,9	62,3	74,0	46,7	17,4	61,3	64,9	76,8	55,8	20,3

Source: Atmarita, 2014

If we convert the percentage above into the amount of nutrient intake, we can see how low the energy intake per day is for school-aged chidren. The table below shows the average of nutrient intake for 5-18 years group of afe. It appears that in general, the nutritional intakes for girls are less than boys. It is also seen that the nutrient intake becomes less when the age is getting older.

Table 29. The average of nutrient intake for school-age children by age and sex, 2010

Age (year)	Boys					Girls				
	Energy Kkal	CHO (gram)	Protein (gram)	Fat (gram)	Fiber (gram)	Energy Kkal	CHO (gram)	Protein (gram)	Fat (gram)	Fiber (gram)
5	1362,0	195,2	47,6	42,8	4,6	1291,5	183,5	44,7	41,6	4,6
6	1287,8	185,3	45,3	39,9	4,8	1263,2	182,0	44,0	39,8	4,8
7	1281,3	188,0	44,4	38,7	5,1	1260,5	180,6	44,1	39,5	5,0
8	1328,9	193,7	45,2	40,7	5,3	1268,0	182,2	44,5	39,4	5,2
9	1292,5	189,6	45,8	40,0	5,3	1282,6	186,2	44,4	39,9	5,5
10	1319,5	195,0	44,5	39,4	5,6	1264,8	185,4	43,9	38,5	5,4
11	1349,9	200,3	46,5	40,2	5,7	1288,7	188,2	45,1	39,3	5,6
12	1355,4	198,9	46,8	41,6	5,9	1308,2	190,6	44,9	39,9	5,8
13	1384,1	206,7	47,0	40,0	5,9	1287,3	188,2	45,1	39,6	5,7
14	1390,5	209,7	46,4	39,7	6,1	1276,9	187,9	44,6	37,6	5,9
15	1459,7	219,9	49,5	42,3	6,6	1280,1	187,4	44,9	39,0	5,8
16	1459,5	219,8	49,3	41,7	6,5	1303,5	189,8	45,9	40,2	6,0
17	1526,6	234,1	51,0	41,9	6,8	1280,9	186,6	44,9	38,5	5,9
18	1494,6	229,2	48,9	41,5	6,4	1303,3	189,6	45,3	39,6	6,1

Source : Atmarita, 2014

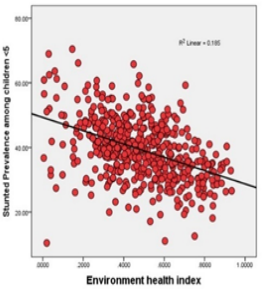
6.5. OTHER DETERMINANT FACTORS

Riskesdas 2013 has produced information on health status and its determinant factors such as environmental health, health behavior and health services that can be described up to district/ city level. The numbers of district/city in Indonesia were 497 that scattered in 33 provinces. A variety of these health indicators are then summarized in the form of PHDI/ Public Health Development Index, which is a composite of 30 key health indicatorsof which the district/city is ranked from 1 to 497. Various factors are thought to be related to the stunting among children under five and school-aged children (5-18 years). The analysis used scatter plot to see how strong the relationship is between stunted prevalence and each sub-index of PHDI, such as environment health, health care, health behavior, and reproductive health.The same analysis was also observed with complete PHDI, as well as economic status and education. The results are as follow.

6.5.1. Environmental Factors

At PHDI 2013, the index of environmental health for ranking the district/city are determined based on population access to sanitation and clean water. Access to sanitation is measured based on the ownership of facilities for defecation and the type of toilet used, and classified as good if the facility is owned by the population and the type of toilet is the"swan neck" type. While access to clean water is measured by the use of clean water per capita in the household of at least 20 liters / person / day and is coming from tap water / tap water taps or retail / purchase or boreholes / pumps , or protected wells or protected spring. Districts/cities are ranked based on health environment index from 0 to 1 ; 0 is judged to be not good and 1 is good.

Plot 1: Children <5 years & environment health



Plot2: Children age 5-18 years & environment health

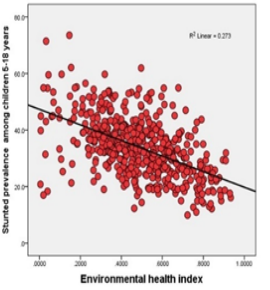


Figure 84. Association between stunted prevalence and enviromental health index, 2013

This environmental health conditions have significant association with nutritional status, especially with stunting prevalence among children under five as well as children aged 5-18 years. Figure 84 (plots 1 and plot 2) showed the scattered plot between stunted prevalence and environment index for all 497 districts/cities.

Improvement of access to sanitation and clean water supply will lower the stunting problems forchildren under five by 20.58 percent, or 27.55 percent for stunted children aged 5-18 years, if the environmental health indices can be equal to 1. Conversely, if the index is equal to 0, then the stunting prevalence in children under five will remain at 49.3 percent, or in stunted children aged 5-18 years, will remain at 47.3 percent . The linear regression equations are as follow:

a) Stunting among children <5: the value of R2 = 0.185, Y = 49.3 to 20.58 * (environmental health)
b) Stunted Children 5-18 years; the value of R2 = 0.273, Y = 47.3 to 27.55 * (environmental health)

These two linear relationships above are significant with confidence level of 95 percent.

6.5.2. Healthcare Factors

The same analysis was done for health care index, which is a composite of several indicators, that are i) delivery by health workers in health facilities (hospitals, maternity homes, clinics, health workers practices, health centers, supporting health centers, including polindes / poskesdes); ii) The adequacy of the number of doctors in each district, with criteria of 1 doctor per 2500 population; iii) the adequacy of Posyandu (minimum 4 Posyandu / village); iv) the adequacy of the number of midwives (1 midwife per 1000 population); and v) ownership of health insurance of the population. Of the five indicators of health services, they arecompiledinto a health care sub-index, then used to rank up the district / city from the worst to the best, with the index value ranging from 0 to 1.

The same analysis was done using a scatter plot for all 497 districts between the prevalence of stunted for children under five and children aged 5-18 years and their health care index. The results are shown below which can be concluded that the improvement of health care index by taking into account those five indicators in each district / city can reduce stunting problemsfor children under five as well as stunted children age 5-18 years by 27.39 to 36.29 per cent if the district can achieve health care index value by 1. The regression value of both plots are as following:

a) Stunted among children <5, the value of R2= 0.169, Y = 50.0-27.39* (Health care)
b) Stunted Children 5-18 years; the value of R2= 0.245, Y = 48.1-36.29* (Health care)

These two linear relationships were significant with a confidence level of 95 percent.

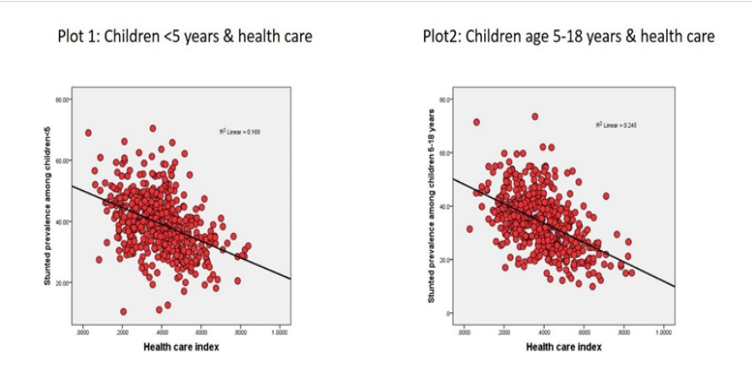


Figure 85. Association between stunted prevalence and health care index, 2013

6.5.3. Behavioral factors

At Riskesdas 2013, the Healthy Behavior information obtained from the population for 10 years and over, and in PHDI 2013, the behavior index is made based on a composite of five indicators, that are:

- Smoking behavior defined as the one who smokes every day or occasionally;
- Hand washing defined that anyone washing hand with soap at the time before eating, before preparing food and after touching animals;
- Defecation behaviour defined as anyone who defecates in the toilet;
- Physical activity defined as anyone who fairly doesa hard or moderate physical activity in a week, according to WHO criteria;
- Brushing teeth properly everyday behavior defined as anyone who brushes their teeth after breakfast and before going to bed at night

The behavior of the population is something that is very difficult to change, especially when the program to change behavior itself

is not carried out continuously. Unhealthy behaviors which are done in a long time may have a negative impact not only for the individual person, but also is a disadvantage to other people. The following figure is a linear relationship of the aggregate districts/ cities between the prevalence of stunting among children under five and children aged 5-18 years with behavior index.

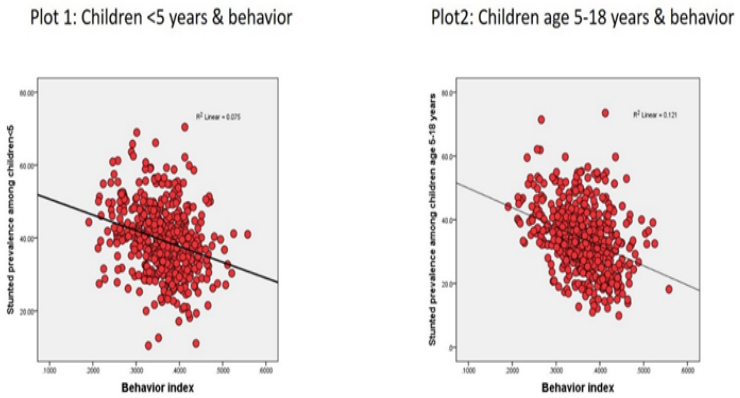


Figure 86. Association between stunted prevalence and behavior index, 2013

The correlation value is not too large, but if the people behaviour is successfully changed, it will contribute to the reduction of stunting problems both in under-five children and school-aged children by 38-50 per cent if the district can reach the index equal to 1. This relationship was significant with a confidence level of 95 percent with the linear regression as following:

a) Stunted among children <5, the value of R2= 0.075, Y = 54.99 - 43.29 * (behavior)
b) Stunted Children 5-18 years; the value of R2= 0.121, Y = 55.96 to 50.79 * (behavior)

6.5.4. Reproductive Health Factors

Reproductive health indices for PHDI 2013 was developed based on three indicators, that are:

1. The use of long-term contraceptive methods defined as couples of reproductive age 15-49 years using contraception with a long-term methods including implants, IUDs, Female sterilization, and vasectomy;
2. Antenatal care (pregnancy examination) by health professionals in health facility is receivedby pregnant woman at aminimum of 1 time in the first trimester, 1 time in the 2nd trimester , and twice in the third trimester (K4 : 1-1-2);
3. The prevalence of CED among women at the reproductive age of 15-49 years (pregnant/not pregnant) that is classified by their mid-upper circumference of less than 23.5 cm.

The afore mentioned three reproductive indicators strongly infuence the occurrence of stunting. The infants who are born from those pregnant women will be at the risk of low birth weight as well as on their length, and will have an effect to their growth performance. Couples who do not use contraception will tend to have many children, and mothers who are pregnant and do not have antenatal care will be at risk of having a baby with a body length that is not optimal.

The following figure shows a strong correlation between the prevalence of stunting with reproductive health indicators at a confidence level of 95 percent. These means if the district/city can increase the coverage of couples in reproductive age to use long-term contraceptive methods, and improving the quality of antenatal care, and also preventing the women at reproductive age from being at risk of CED, improving the nutritional status of women of reproductive age to avoid chronic calory inadequacy,

then the stunting prevalence could be reduced by 38-52 percent. It eventually means, the district can reach an index value equal to 1 for reproductive health index. The value of correlation and regression are as following:

a) Stunted among children <5: the value of R2= 0.181, Y = 56.21 -38.21 * (Reproductive health)
b) Stunted Children 5-18 years; the value of R2= 0.252, Y = 57.21-52.29 * (Reproductive health)

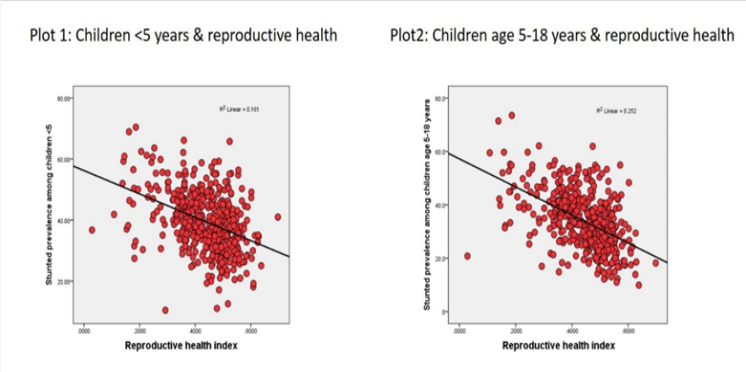


Figure 87. Association between stunted prevalence and reproductive health index, 2013

Beyond the four sub-indexesabove, there are another three sub-indexes that are child health index, infectious disease index and the index of non-communicable diseases. These three indices are not analysed for correlation. Child health index is based on six indicators, of which three of them are nutritional status of under-five children, if they are analysed for correlationan incorrect interpretation (multicollinearity)is likely to occur. Where as the index of non-communicable diseases and communicable diseases also do not provide an acceptable correlation value.

6.5.5. PHDI 2013

The analysis for scatter plot was also done using the value of PHDI 2013, where the result of a composite of 7 sub-index includes 30 indicators with the prevalence of stunting for children under-five as well aschildren aged 5-18 years (See Table 30 for list of 30 indicators). With the same concept of previous analysishow strong the association is can be seen. District/city are ranked from 0 to 1, a value of 0 is considered as not good and a value of 1 is considered as good.

Modeling results of PHDI 2013 have placed the district Tolikara in Papua as the district with the lowest PHDI value (0.2079) and Gianyar (Bali) with the best PHDI value (0.7318). Then PHDI index is plotted to stunting nutritional status and malnutrition in under-five children and children aged 5-18 years. The result is shown in Figure 88.

Table 30. Indicators of PHDI 2013 based on 7 sub-index

	Sub Index in PHDI 2013	List of Indicators
a.	Child health status of children under 5	• Prevalence of underweight for children <5 years • Prevalence of stunted for children <5 years • Prevalence of obesed children <5 years • Coverage of growth monitoring and weighing for children <5 years • Coverage of neonatal visit • Coverage of basic complete immunization
b.	Reproductive health	• Coverage of long-term use of contraception method • Pregnancy examination (K4:1-1-2) • Prevalence of the risk of chronic energy deficiency (CED) on women at the reproductive age (WORA)

c.	Health Care/ Services	• Proportion of delivery by health worker in health facility • Proportion of subdistrict with sufficient doctors • Proportion of village with sufficient integrated health post (Posyandu) • Proportion of village with sufficient of midwife • The coverage of health care insurance ownership
d.	Health behavior	• Proportion of smoking • Proportion of proper handwashing • Proportion of defecation in toilet • Proportion of sufficientphysical activity • Proportion of proper tooth brushing
e.	Non communicable diseases	• Prevalence of Hypertension • Prevalence of injury • Prevalence of Diabetes Mellitus • Prevalence of mental disorders • Proportion of central obesity • Prevalence of teeth and mouth disease
f.	Communicable diseases	• Prevalence of Pneumonia • Prevalence of Diarrhea onchildren under five • Prevalence of ARI on children under five
g.	Environtmental health	• Coverage of access to sanitation • Coverage of access to clean water

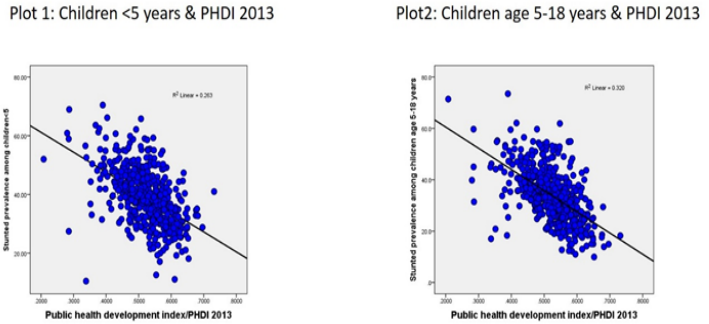


Figure 88. Association between stunted prevalence and public health development index / PHDI 2013

All 497 districts/cities that were ranked from the lowest to highest (according to PHDI 2013) and plotted with the prevalence of stunting of children under five (plot 1) as well as stunting prevalence of children aged 5-18 years (plot 2). It can be seen that the plotting showed a very strong relationship, which means improvement of PHDIin relation to improving 30 indicators listed in table 30, could help reduce the prevalence of stunting in children aged 0-18 years by 68-72 percent if the district can reach the index equal to 1. The value of correlation and regression of both plots are as follow:

a) Stunted among children <5: the value of R2= 0.253, Y = 74.73 - 67.87 * (PHDI 2013)
b) Stunted Children 5-18 years; the value of R2= 0.320, Y = 77.05 - 72.57 * (PHDI 2013)

6.5.6. Economic status

At Riskesdas 2013, the economic status of the population is assessed based on household ownership indicator which is known as wealthy index that has assessed its validity with the economic status performed by Susenas based on the level of household expenditure per capita. Economic status of the population is

classified into five, namely: i) the poorest as quintile1; ii) the second as quintile 2; iii) the middle as quintile 3; iv) the fourth as quintile 4; and v) the richest as quintile 5. (Riskesdas, 2013)..

Correlation and regression analysis is performed forthe poorest (quintile 1) and the richest (quintile 5) population groups byplotting the nutritional status, which is the prevalence of stunting for children underfive. The results are shown in the following figure:

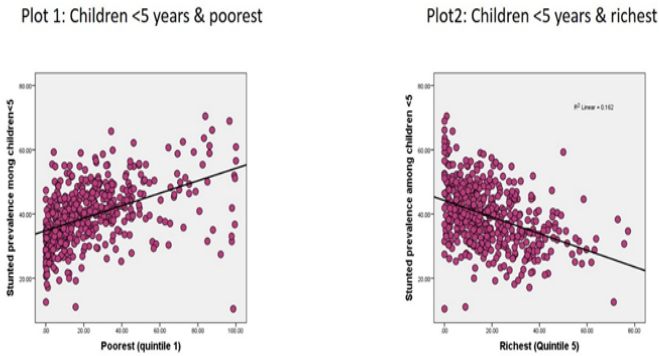


Figure 89. Association between stunted prevalence and economic status, 2013

Plots 1 and 2 are the plotting among the 497 districts/cities with the prevalence of stunting in children under five with the poorest economic status (plot 1) and with the richest economic status (plot2). It appears that the prevalence of stunting in children under five will increase by 0.19 percent with positive relationship, while in the highest economic status groups, the prevalence of stunting in children under five will be lower by 0.26 percent with a negative correlation relationship.

The values of correlation and regression plots 1 - plot 2 (level of confidence is 95) is as follow:

a) Stunted among children <5: the value of R2= 0.214 , Y = 34.82 + 0.19 * (economic status, Q1)
b) Stunted among children <5: the value of R2= 0.162 , Y = 44.19 - 0.26 * (Economic Status, Q5)

6.5.7. Educational status

At Riskesdas 2013, information on the higher education achievedbythe population is collected from aged 5 years and above. The level of education in general will have an effect on employment, where a higher education tend to get better job opportunities. Another thing is the ability to receive information, which is usually the more educated they are, the easier for them to receive any information, especially for issues related to better health and nutrition. Educational status are classified into two groups, first is the group of people who never go to school up to completingprimary school, and second is the group of people who graduated from secondary high school and above. Districts with the least proportion of the population graduated from secondary high or above is Nduga (Papua) at 6.50 pervcent, and the highest is Banda Aceh (76.2%). For analysis, the group 2 proportion is taken from each district /city, and it is correlated with prevalence of stunting of children under five and children aged 5-18 years, as shown in the following figure:

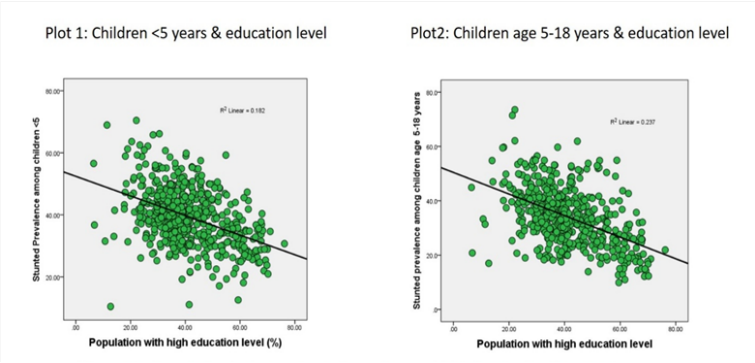


Figure 90. Association between stunted prevalence and high education level, 2013

The higher the proportion of highly educated people in the district/city, the lower prevalence of stunting for children under five as well as at the children aged of 5-18 years. The value of correlation and regression (with a confidence level of 95) are as following :

a. Stunted among children <5: the value of R2 = 0.182 , Y = 52.41 to 0.32 (educational status)
b. Stunted among children 5-18 years: the value of R2= 0.237, Y = 50.42 - 0:40 * (educational status

Overall analysis only applies to children aged 0-18 years, if the same analysis is conducted in 19-90 years of age, it does not provide significant correlation with all PHDI 2013. This shows that improving nutritional status can provide optimal benefits if it wasl done at the age of 0-18 years.

The above analysis which uses aggregate data of districts / cities show the determinants of nutrition problems and burdens faced by Indonesia in the future. Stunting problems among children under five and children aged 5-18 years can be overcome by

conducting environmental health improvement programs, improvement in health care, reproductive health, changing the population behavior, improvement in education, improvement in economic status, and others.

To overcome stunting problem at an earlier age (0-18 years) is really important because in adulthood (19 years and older) this problem will be difficult to overcome and will also trigger a burden, because if people were initiallystunted in the past, they would be sick/ill in adulthood, and will need a greater cost to cure the diseases.

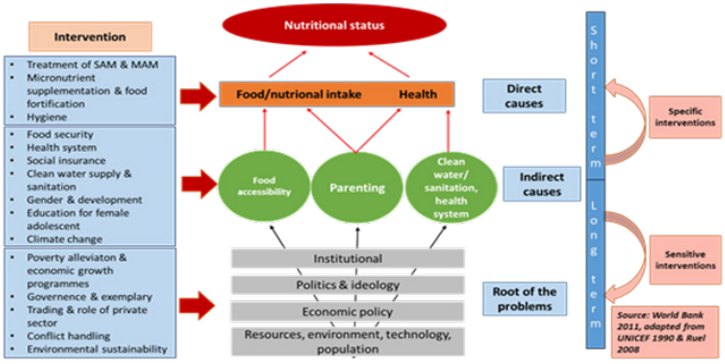
Every district in Indonesiais facing stunting problems that needs to be overcome based on the determinant above. Existing programs in each district must be reassessed if it is already delivered to the community. It would be better if the development planning could be calculated by using total population unit in each region for the sake of improvement of human resources. The district with a population of less than 10 thousand will be different to the district with a population of more than 1 million people. The geographical situation should also be taken into account, such as Papua, Kalimantan that has geographical circumstances that is more difficult than districts in Java.

CHAPTER 7
RECOMMENDED NUTRITION INTERVENTION PROGRAM IN INDONESIA

7.1. FRAMEWORK FOR STUNTING REDUCTION

Stunting reduction needs to follow a theorietical framework of the causes of nutritional problems, which includes both direct and indirect causes. One of the theoretical framework which can be used to identify stunting reduction inteventions are given in the following figure.

LOGICAL FRAMEWORK OF THE CAUSES OF NUTRITIONAL PROBLEMS



Source: World Bank 2011, adapted from UNICEF 1990 & Ruel 2008

Figure 91. Theoretical framework of the causes of nutritional problems

The above mentioned figure clearly shows that the health sector involved more direct causes of nutritional problems, while

addressing indirect causes and root problems should involve other sectors. Thus, the nutrition specific intervention conducted by the health sector was considered as a downstream effort, which may not be able to have a large impact if the upstream sector is not addressed adequately. Expert judgement revealed that nutrition specific intervention for stunting reduction by the health sector only played a role by 30%, while 70% of the effort needs to be addressed by nutrition sensitive intervention by other sector.

A lot of experts mentioned that nutrition intervention was the kind of intervention which will lead to inter-generational benefit. Nutrition intervention was shown to be able to cut the vicious cycle of poverty and increase country's gross domestic product by 2-3 percentage poitnts yearly. A $1 investment in nutrition intervention could lead to $30 gain in health sector and productive economic education.

Health sector specific intervention could be done through the following programs (Lancet, 2013):

Program for pregnant women:

1. Iron tablet supplementation
2. Balanced energy and protein supplementation for under nourished pregnant women
3. Deworming program
4. Calcium supplementation
5. Malaria control program through medication and the use of insecticide-treatedbednet

Lactating mothers:

1. Breastfeeding promotion
2. Imrpovement of infant and young child feeding (IYCF)

Children 6-23 months:

1. Zinc supplementation

2. Diarrhea control program, including zinc supplementation
3. Vitamin A Supplementation
4. Iodized salt usage
5. Prevention of acute malnutrition
6. Deworming program
7. Food fortification
8. Malaria control program through the use of insecticide-treated bednet

For nutrition sensitive intervention conducted by non-health sector, the following program should be considered:

1. Adequate water and sanitation program
2. Food and nutrition security
3. Family planning
4. Universal health coverage
5. Full maternal and child health coverage
6. Food fortification
7. Nutrition education
8. Adolescent health
9. Poverty alleviation programs

Stunting reduction is not an easy task. It needs strong commitment and political will from the government as well as integrated, continous and long term multi-sectoral intervention programs. However, some countries have successfully shown significant stunting reduction among children underfive years of age within the last decade, for example:

- Peru has reduced stunting prevalence from 30% in 2004 to 20% in 2011
- Rwanda has reduced stunting prevalence from 52% to 44% in 5 years period (2005-2010)
- Nepal has reduced stunting prevalence from 57% to 41% in 10 years period (2001-2011)

7.2. RECOMMENDED INTERVENTION PROGRAM IN INDONESIA

Considering the Indonesian data dan situation, recommended intervention programs, both the nutrition specific programs by the health sector or the nutrition sensitive programs by non-health sectors, shall be outlined based on the nutrition in life cycle concept.

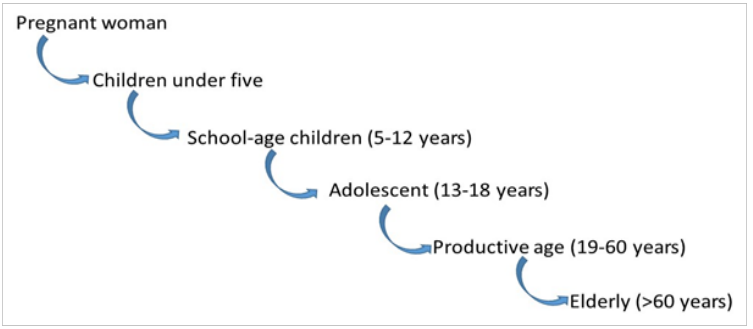


Figure 92. Life cycle framework for discussing specific intervention for stunting reduction

Using the above life cycle framework, discussion on health status and priority programs could be outlined based on the matrix in Table 31.

Table 31. Matrix for discussion on stunting reduction interventions

No	Life cycle period	Specific Intervention	Sensitive Intervention
1	Pregnant women	Inter-program	Inter-sectoral
2	Balita (0 – 4 tahun)	Inter-program	Inter-sectoral
3	Children under five years (0 – 5 years)	Inter-program	Inter-sectoral
4	School-age children (5 – 12 years)	Inter-program	Inter-sectoral
5	Productive age (19 – 60 years)	Inter-program	Inter-sectoral
6	Elderly (>60 years)	Inter-program	Inter-sectoral

The following section shall describe specific and sensitive intervention at different life cycle periods.

7.3. PREGNANT WOMEN

Reviews on current condition of pregnant women in Indonesia lead to the conclusion that a series of intervention need to be implemented to reach the goal of having a healthy pregnancy and optimal fetal development, which in turn will lead to having a normal healthy infant with adeqaute birth length and weight. These interventions include the following:

7.3.1. Interventions during the first 1000 days of life

The period of first 1000 days of life includes 270 days (9 months) pregnancy period and 730 days (2 years) after birth. These golden period is unreplaceable. If during these period the nutrition requirement are adequately fulfilled, children can have an optimal growth and development, including the rapid brain development. On the contrary, if there was nutrition inadequacy during these period, children will have sub-optimal brain development and lack of immunity so that during adulthood, these children are at risk of non-communicable diseases leading to unproductive life.

Non-communicable diseases bear a very high health care cost. Coupled with high unproductive life in the young age, these will become a high burden for the country. These are one of the reason why developed countries had started to invest on the first 1000 days of life interventions.

A study on benefit-cost ratio of stunting reduction interventions in diffrent countries by John Hoddinott et al. showed that benefit cost ratio was different in different countries. The range spanned from the lowest at 3.9 in Congo to the highest at 48 in Indonesia,

with median value of 18, which was the benefit-cost ratio value shown in Bangladesh. This means, in Indonesia for every dollar investment for stunting reduction through nutrition specific intervention with minimal 90% coverage, the return or the gain on the country's gross domestic product was at 48 times (48 USD).

7.3.2. Universal health coverage

Universal health coverage (UHC) program knwon as *Jaminan Kesehatan Nasional (JKN)* was intended to reduce economic gap in health care services. By being the member of JKN, the pregnant women was ensured to receive adequate health care despite their economic status. The UHC was introduced in 2014 and it continued to grow gradually and expected to reach universal coverage in 2019. Before the introduction of *JKN* as means of UHC, all pregnancy and delivery services was covered by the program known as *Jampersal (Jaminan Persalinan* or Delivery care coverage). This *Jampersal* covered all pregnant women in Indonesia. However, after the introduction of *JKN*, only member of JKN will have pregnancy and delivery care coverage. Therefore, it was essential that all pregnant women should register themselves as member of *JKN*, in order for the cost of their delivery health care can be covered by *JKN* and not becoming a hinderance to receiving adequate care.

A study among poor segment of population which was registered in *Askeskin (asuransi kesehatan keluarga miskin* or poor family health insurance) in 2007 showed that poor families who were the member of Askeskin have 2 times higher probability to have health personnel assisted delivery than those who were not members of *Askeskin* (Trihono, 2007). Study on *Jampersal* (Tety Rachmawaty, 2013) also showed that *Jampersal* for pregnant women have shifted place of delivery from home to health facility.

7.3.3. High calorie, protein and micornutrient food Supplementation

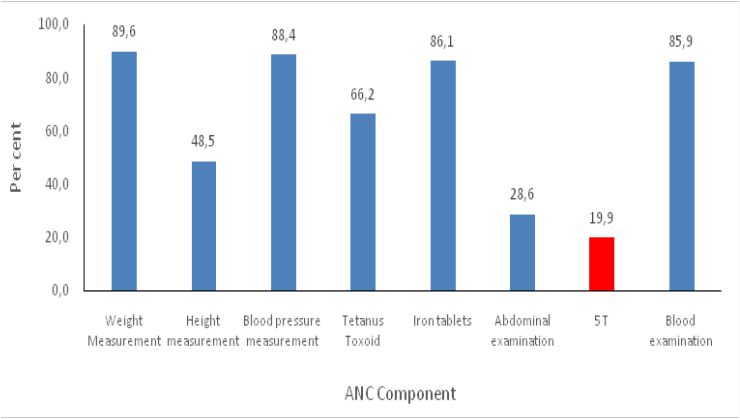
A cohort study on child and development conducted by the NIHRD in Bogor showed that pregnancy weight gain in the area was lower than the international of Medicine (IOM) standard. Moreover, as much as 80% of pregnant women in the area have calories intake <100% of the calorie requirement during pregnancy, 78% have protein intake <100% of the protein requirement and more than 80% of pregnanct women have inadequacy of folate, iron and zinc intake. The situation seems to be evident in other areas as well. The Total Diet Study (TDS) 2014, which have representativesamples at national and provincial level, also showed that more than 80% and 70% of pregnant mothers have their intake <100% from the requirement of calorie and protein intakes, respectively.

The upmost importantmicronutrient for pregnant women are calcium, folic acid, iron (Fe) and vitamin D. Calcium is needed during pregnancy because it is important for fetal growth. Food sources of Calcium included plant origin (i.e. legumes, wheat/ cereal, tofu, tempe, broccoli and green leavy vegetables) and animal origin (i.e. milk, cheese, red meat, salmon, tuna, sarden, egg, shrimp, etc.). Meanwhile iron is important for red blood cell formation, and the food cources of iron includes: liver, chicken, scallops, fish, green leavy vegetables and red meat.

Considering that majority of pregnant women having inadequate energy, protein and micornutrient, the high calorie, protein and micronutrient food supplementation for pregnant women needs to be implemented for all pregnant women.

7.3.4. Quality of Ante Natal Care (ANC) Services

Antenatal Care (ANC) coverage based on the result of Basic Health Research (BHR) 2013, or known in Indonesia as Riset Kesehatan Dasar (Riskesdas), was relatively good. ANC 1 coverage were at 81.3% and ANC 4 coverage (once in 1st trimester, once in 2nd trimester and twice in 3rd trimester) reached 70%. However, the quality of care was still inadequate. Data from the technocratic review for the Ministry of Health (MOH) strategic planning 2015-2019 showed that even though the ANC coverage was high, the type of assessment conducted in each check up was still low in some aspect as shown in Figure 93, indicating a low quality of care.



Source: The technocratic review for MOH strategic planning 2015-2019

Figure 93. Quality of antenatal care 2010

Observation in the field also showed that assessment for proteinuria as indicator of pre-eclampsia was rarely conducted in Puskesmas (Health center), although based on analysis of 4000 maternal death reported in the 2010 population cencus, pregnancy hypertension including pre-eclampsia was the most common cause of maternal death (32.4%), followed by bleeding after delivery at 20.3% (Teti Tejayanti, 2013).

Therefore, improvement in the quality of ANC was imperative. It seems that ANC should not be programmed for only minimally 4 times, but should be conducted once a month and becoming more frequent near delivery/birth time.

7.3.5. Health personnel assisted delivery in health facility

Health personnel assisted delivery had also already showed a good figure. Riskesdas 2013 showed that 86.9% of delivery were assisted by health personnel, but only 76.1% of delivery were in health facility (including polindes/poskesdes or village health post). Analysis of maternal death from population census 2010 showed that around 29.4% took place at home. Should they choose delivery at health care facility, the referral process to get more qualified delivery assistance may become faster and the number of maternal death can be reduced.

Based on period of maternal death, Table 32 showed the analysis of population census in 2010.

Table 32. Period of maternal death (Population census 2010)

No	Time of death	Number	(%)
1.	Pregnant< 20 weeks	543	7,2
2.	Pregnant> 20 weeks	1,3721	18,2
3.	Delivery	973	13,0
4.	Post Partum	4.634	61,6
	Total	**7.524**	**100,0**

Source: Maternal Health Services Study, 2013

The table shows that almost 2/3 of maternal death took place during post partum period, i.e. 2x24 hours after delivery. Thus, the program for health personnel assisted delivery at health

facility need to be strengthened accordingly, so that post partum monitoring of mother can be adequately conducted and if necessary to be referred timely.

7.3.6. Early detection of communicable and non-communicable diseases

A lot of pregnant women suffered from diseases which may jeopardize their pregnancy, both communicable (i.e. Malaria) and non-communicable diseases (i,e. Hypertension, Diabetes mellitus, etc.). As an example, pregnant women who suffered from diseases were shown in Table 33.

Table 33. Proprotion of pregnant mothers who suffered from the diseases.

Diseases	15-19 yrs	20-24 yrs	25-29 yrs	30-34 yrs	35-39 yrs	40-44 yrs	>45 yrs
Malaria	2,4	2,5	2,4	2,4	3,5	4,4	6,2
Hypertension	5,8	7,0	9,8	12,5	18,1	25,0	44,0
DM	0,5	0,5	0,4	0,5	0,7	1,6	0,5

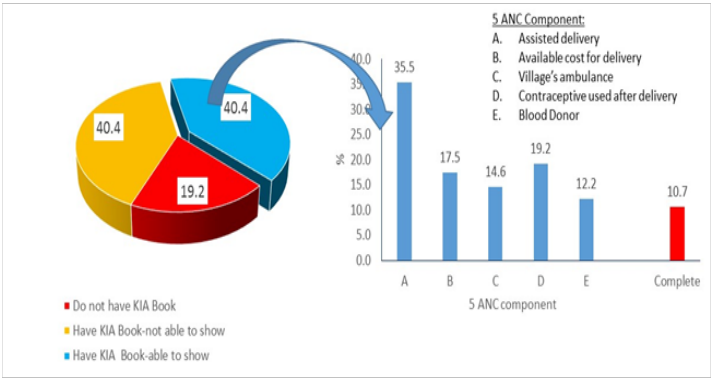
Sumber: Riskesdas 2007

Early detection of diseases among pregnant mothers was very important in order to prepare for the best treatment. Malaria could exaggerate anemia problem which in turn could lead to the risk of bleeding. Uncontrolled hypertension could lead to pre-eclampsy and eclampsy which are very dangerous for the mother and the fetus.

7.3.7. Reproductive health education for pregnant women

Reproductive health education for pregnant women is very important. Thus, a series of activities related to health education among pregnant mothers should be maintained and improved, such as delivery and complication treatment planning program (or (program perencanaan persalinan dan penanganan komplikasi/

P4K), pregnant womenfitness? classes, the use of maternal and child health (MCH) book (or Buku Kesehatan Ibu dan Anak/ KIA), etc. The concept of the education program is already well established but the coverage of implementation need to be scaled up. The limited implementation of the education program can be seen for example from the use of MCH book as means for counselling for pregnant women. The coverage and quality of MCH book usage can be seen from Figure 94.



Source: Riskesdas 2013

Figure 94. Percent ownership of MCH book and completeness of its record, 2013

The figure showes that only 40.4% of pregnant women had and could show the KIA/MCH book. Among those could shows MCH book, only 10.7% had completed records of ANC component. This figure indicated that the MCH book has not been used as counseling media adequately.

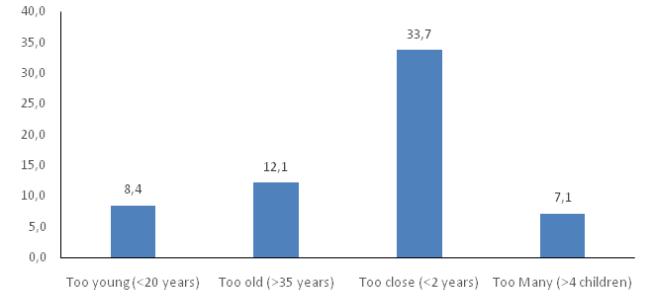
In conclusion, several models and media for counselling and health education among pregnant women have been designed and conducted, but the implementation is yet to be strengthened and scaled up. Increasing the coverage of reproductive health education among pregnant mothers may help to improve pregnancy health and pregnancy outcome.

7.3.8. Early initiation of breastfeeding and exclusive breasfeeding

Early initiation of breastfeeding has started to be strengthened, and this program is a good media to address the importance of exclusive breasfeeding for infant health. Exclusive breastfeeding need to be continuously improved to ensure optimal growth and development of infant. Riskesda 2013 showed that exclusive breastfeeding prevalence was only at 38%, which means that education of the importance of exclusive breastfeeding needs to be continuously improved.

7.3.9. Family Planning

Family planning program was weakened during the Indonesian reformation era, as shown by the stagnancy of Total Fertility Rate/ TFR for the last 10 years at 2.6. Figure 95 shows the proportion of pregnant women who were categorized as 4 "T" risky group, i.e too young, too old, too narrow birth spacing and too many children.



Source: Riskesdas 2013

Figure 95. Proportion pregnant women who was categorized as risky groups, 2013

The figure shows that as much as 8.4% of women experienced pregnancy at a too-young age (<20 years). Pregnancy at too-young age could potentially lead to low birth length, because the

pregnancy took place during the period when the mother was also still growing up. Thus, maternal height has not yet reached its full potential. Studies showed that short stature mothers have higher tendency to have stunted children. Meanwhile, too-old pregnancy (12.1% according to Riskesdas 2013) could increase risk for delivery complication. The optimal age range for delivery is at 20-30 years-old, and age group below 20 and above 30 years is not an ideal age for delivery.

Too narrow birth spacing may be related to the failure of family planning program. Too narrow birth spacing forced mothers to be pregnant again while their reproductive organs have not recovered fully from their last pregnancy. This condition could influence the fetal development. Moreover, having too many children may have an impact to care in the family, especially related to child feeding and child care. In some situation, too many children may lead to inadequate intake of food and inadequate care which may lead to more frequent infectious diseases. This may in turn have further influence on the child's nutritional status. Thus, for stunting reduction, mothers shoudl be encouraged to adopt family planning.

7.3.10. Deworming program

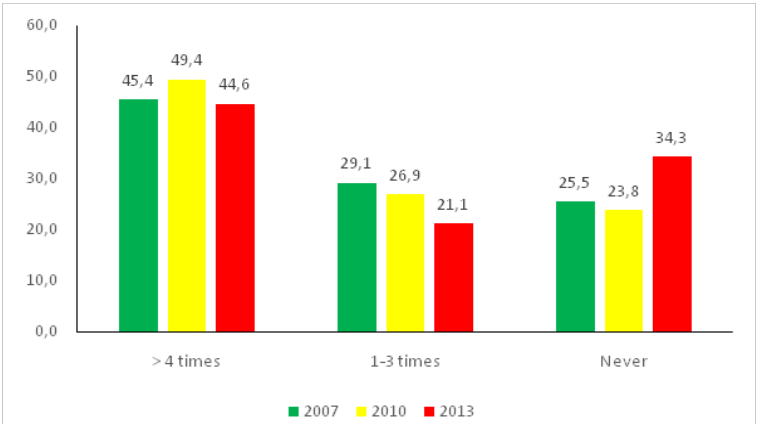
Worm infestation in children disturbs the nutrient absoprtion in the gut, because the nutrient which was important for child growth and development gets stolen by the worm. Thus, it may disturb the child growth and development. One consequence to worm infestation is the increase in anemia problem, due to inadequate iron for the body's utilization. Thus worm infestation may also be associated with suboptimal brain growth and development, leading to suboptimal IQ. Among pregnant women, worm infestation may also lead to anemia, which in turn may increase the incidence of low birth weight in infants

7.4. CHILDREN UNDER FIVE YEARS

The growth of Indonesia children was apprently still under the standard growth chart. This fact indicated that there are many disturbances which influenced child growth, such as inadequate nutrition intake, frequent infection, and other determinant factors. This section will outline typical intervention that can be implemented in this age group to reduce stunting.

7.4.1. Growth monitoring among under five children

Growth monitoring through the integrated health post (pos pelayanan terpadu or Posyandu) needs to be stregthened for early detection of growth failure among children under five years of age. Revitalization of the integrated health post was an important program for this. Result of Riskesdas 2013 shows that the proportion of under-five children who have regular weighing was reduced compared to the previous years (Figure 96).



Source: Riskesdas 2007, 2010, 2013

Figure 96. Trend of growth monitoring among children under five 2007 – 2013

The figure shows that children under-five who were never weighted 6 months prior to the survey increased in 2013 to the

level of 34.3% (from previously 23.8%), which indicated that one-third of all children never visited *Posyandu* in the last 6 months prior to the survey.

The number of integrated health post (or *posyandu*) was relatively adequate, but as much as 32.4% posyandu was considered as *posyandu pratama* (i.e. posyandu which could not run the program every month and have limited active cadres) and 29.2% as *posyandu madya* (i.e. *posyandu* which could run program at least 8 times per year and has at least 5 active cadres, but still have very low coverage of its main program, that is family planning, maternal and child health, nutrition and immunization program). Thus, more than 60% of the posyandu have not been functioning as expected (Table 34). Meanwhile, *Posyandu* which was already functioning as expected was categorized as purnama (i.e *Posyandu* which could run the program more than 8 times per year and already reached more than 50% of the target coverage) and mandiri/independent (i.e *Posyandu* which have routinely conducted the monthly program with full coverage of all program components, and may include additional program such as the management of health fund).

Table 34. Number and strata of the integrated health post (Posyandu) in Indonesia, 2013

Posyandu strata	Number	(%)
Pratama	91.061	32,4%
Madya	81.925	29,2%
Purnama	84.591	30,1%
Mandiri	23.249	8,3%
Total	**280.826**	**100,0**

Source: Health Promotion Center, MOH RI, 2013

The key to success of the posyandu was the capacity of the cadres, therefore cadres training and aknowledgement were important.

One of the acknowledgement that could be given to the cadres was making them registered as member of JKN for free, in which the premi was paid by the district government. This was the least that can be given to honourwhat they have done for improving the public health.

7.4.2. Food supplementation for underfive children

Considering the growth curve of the Indonesian children, which was more and more deviating from the standard growth curve, development of food supplementation for under-five children seemed to be needed. Total Diet Study 2014 showed that more than 50% of under-five children had energy intake <100% RDA and more than 30% had protein intake <100% RDA. However, the food supplementation should be targeted to wasted children, not just underweight children. Some underweight children were actually normally stunted, thus food suplementation to these children may lead to obesity. Studies among adult showed that hypertension was more prevalent among the stunted-obesed individual than the stunted-wasted.

7.4.3. Early stimulation for child development

Program for early childhood stimulation for under-five years of age should be integrated to the activities of the integrated health post. The reason for this was because the coverage of pre-school education was still very low as shown in Table 35.

Table 35. Pre-school education coverage in Indonesia, 2012

Age (months)	Boys			Girls		
	Yes, had been in pre-school	Yes, curr-rently in pre-school	Never	Yes, had been in pre-school	Yes, curr-rently in pre-school	Never
0-11	0.2	0.2	99.7	0.3	0.2	99.5
12-23	0.3	0.7	99.0	0.3	0.5	99.2
24-35	0.7	1.9	97.4	0.7	2.6	96.7
36-47	2.1	9.0	88.8	2.6	10.4	87.0
48-59	5.3	24.8	69.9	5.4	27.6	67.0
60-71	11.0	44.7	44.3	12.2	46.4	41.4
72-83	30.8	25.1	44.1	33.4	24.3	42.3
Total	7.3	15.7	77.0	7.9	16.5	75.6

Source: Atmarita, 2014

Early Childhood Education Program or knwon as PAUD (Pendidikan Anak Usia Dini) program as part of early childhood stimulation effort has developed, but the coverage was still very low. Even after combining with other stimulation model (such as family with under-five's education/Bina Keluarga Baita or BKB, posyandu garden or taman posyandu, play group etc.), the coverage was still very low as shown in Table 36. Lowest coverage was seen for age group 1, 2 and 3 years old; the age in which early stimulation was mostly needed. PAUD was actually an ideal program, but this program needs well educated teachers and operational fund which is not small. Thus, simplification of this aspect was needed because stimulation program was still an optimum program, but the implementation needs to be strengthened and simplified so that all posyandu can impelment the programs.

Table 36. Early childhood development education coverage by age and gender, 2012

Age (months)	Boys					Girls				
	Kin-der-gar-ten	Play gro	TPA	Pos PA-UD	PA-UD	Kin-der-gar-ten	Play gro	TPA	Pos PA-UD	PA-UD
0-11	0.0	0.0	7.3	0.4	0.3	0.0	0.0	14.0	0.3	0.5
12-23	0.0	10.5	8.3	0.9	0.9	0.0	4.9	7.5	0.7	0.8
24-35	0.0	11.6	10.6	4.9	4.6	0.0	18.1	20.9	6.4	3.5
36-47	1.6	34.6	10.0	21.3	19.3	2.0	30.1	9.8	21.6	19.5
48-59	13.7	43.3	15.0	36.4	32.1	14.5	46.9	12.5	35.7	33.8
60-71	41.5	0.0	25.9	20.9	26.0	41.9	0.0	21.6	22.6	23.4
72-83	43.2	0.0	22.8	15.3	16.8	41.6	0.0	13.7	12.7	18.5

Source: Atmarita, 2014

In conclusion, the coverage of early childhood stimulation programs, whatever the form was, should be increased, so that all *posyandu* are able to deliver the program and for all under-five children to receive this program. If this has been addressed, the country will have the benefit of the demographic bonus.

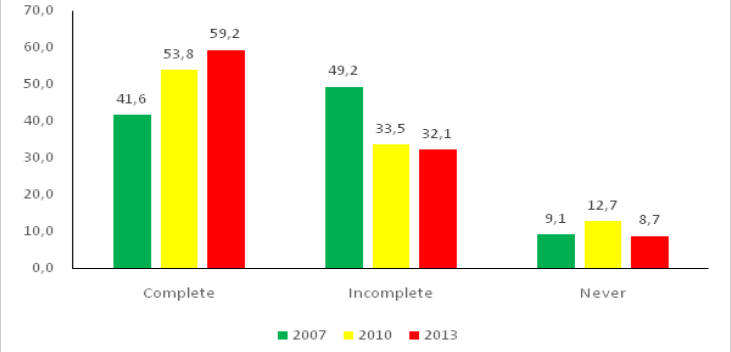
7.4.4. Universal health coverage through JKN

Under-five children were an age-group vulnerable to diseases. Thus, families having under-five children should become the priority to receive universal health coverage through JKN, so that disease treatment will not be limited by cost.Families should be encouraged to register themselves for JKN. If they are already member of JKN, all treatment for diseases will be borne by JKN.

7.4.5. Optimal health care services

Health care services for under-five children should be optimal, because this age group is vulnerable to diseases which could influence their nutritional status. Integrated Managament of childhood illnesses (IMCI) should become standard treatment

for children in *Puskesmas* and other primary care health facilities under *JKN*. Thus, under-five children who visit the facilities with any kind of diseases could receive appropriate treatment and could undergo comprehensive assessment to be healthy, also to detect other diseases besides the main disease symptoms. One of the indicator for coverage of child health services for children is immunization and the coverage can be seen in Figure 97. The figure shows that completeness of immunization displays an increasing trend from 2007 to 2013.



Source: Riskesdas 2007, 2010, 2013

Figure 97. The trend of basic immunization coverage year 2007 - 2013

Vitamin A capsule supplementation, iodized salt fortification, usage of bednet, especially in malaria endemic areas are important?. Preventive and promotive program should be conducted in parallel to allow under-five children grow up normally.

7.5. SCHOOL AGE CHILDREN: 6-12 YEARS

School-aged children especially in elementary school, was one of the main target for immediate improvement of nutritional status, aiming at improvement of their health and preparing for female adolescent to enter pregnancy. Recommended programs for this age group were outined in this section.

7.5.1. Prolonged compulsory education from 9 years to 12 years

Compulsary education for 12 years enabled all children to reach high school and thus allow children to be in school until they are 18 years old. Result from national socioeconomic survey (SUSENAS) showed that only around 63% of female adolescent aged 17 years were still in school and by 18 years, only 37% (Table 37).

Table 37. Population proportion who were still in school by gender and age, 2012

Age (Years)	Boys			Girls		
	Never go to school	Still school-ing	Not at school anymore	Never go to school	Still school-ing	Not at school anymore
7	4,4	95,3	0,3	3,4	96,4	0,1
8	1,1	98,7	0,2	1,0	98,8	0,2
9	1,0	98,7	0,3	0,7	99,0	0,3
10	0,8	98,8	0,4	0,8	98,9	0,3
11	0,6	98,4	1,0	0,6	98,7	0,7
12	0,6	96,8	2,6	0,7	97,2	2,2
13	0,8	94,2	5,1	0,8	95,6	3,6
14	0,8	89,2	10,1	0,7	92,0	7,3
15	0,8	82,2	17,0	0,8	84,5	14,6
16	0,7	78,0	21,3	0,6	80,7	18,7
17	0,9	63,2	35,9	0,9	63,3	35,8
18	0,9	38,6	60,5	0,9	37,0	62,0

Source : Atmarita, 2014

Compulsary education for 12 years is one of the current strategic government program, because it may be able to increase the proportion of population aged 18 years to still be in school/ receive schooling. One of the foreseen impact was the possibility to make adolescent to increase marrital age after high school,

and thus postpone pregnancy to the period when their growth is already stopped. Thus when they were pregnant, their height has already > 150 cm and their weight is> 45 kg, which in turn may decrease stunting and low birth weight infants.

7.5.2. School days become 5 days/week, 7 hours/day

Implementation of 12 years compulsory education will have an impact to increase the proportion of school age children who are still in school / schooling chidren. This will allow the designing of education process at school to cover many aspects of education, not only academic aspects, but also moral and ethics, nationalism and religious education. Considering the tendency of juvenile delinquency, parental control toward adolescent is very important to be strengthened, which could be done among others by increasing time spent together in the family. Considering that many parents work at least 8 hours per day and have 2 days off during weekend, it was suggested that school time should be made 5 days instead of 6 days, with longer duration, i.e. 7 hours / day, and Saturday becomes a family time. This means that there will be 2 effective days for the family to stay together as a family. (Nowadays, average school hours are only untill 1 pm. Thus, when children finish their school time, some of the parents are still at work, and thus children have the opportunity to conduct activities under minimal control both from parents and teachers).

7.5.3. Nutrition improvement progrm at school

Longer schooling hours will also enable the school to implement nutrition improvement programs at school. Adequate menu for lunch and snacks could be provided, either through government school feeding programs or at the school canteen. This programs, if managed well, have the potential to improve nutritional status of the school-aged children, although it be costly. Total Diet Study

2014 showed that among children aged 5-12 years, almost 70% have calorie intake <100% RDA and more than 40% have protein intake <100% RDA.

7.5.4. Moral and religious education

For students who are moslems, performing zhuhur and ashar prayers together should be programmed by the school. For students with other religion, religious education also may be given during break or before going home. In this occasion, not only religious education, moral and ethical education could be given/delivered/provided.

7.5.5. Clean and healthy behaviour education

The period of elementary school age is the perfect period to build positive values in a child's life in many aspects, such as being a religious person, respect for parents, teachers and elders, discipline, obey the rule, love for study, including self-awareness, character building and nationalism so that they would be proud to be Indonesian. In these periods, positive values toward clean and healthy behaviour can also be introduced and developed. The clean and healthy lifestyle to be introduced to children included but not limited to some habits should be;washing hand with soap, sanitary defecation, eat nutritious food, eat fruit and vegetables, frequent sport physical activity, not smoking, not doing drugs, etc.

7.5.6. Provision of safe drinking water and hand washing facilities at school

To ensure clean and healthy behaviour among children, the facilities need to be provided at school. Every school should have safe drinking water and hand washing facilities adequately in quantity and quality. Provision of clean water is the primary

requirement for washing. If clean water is not available, it will be difficult to expect for clean and healthy behaviours.

7.5.7. Provision of adequate sanitary toilet facilities

Unsanitary defecation will be difficult to be reduced if the facility for sanitary defecation are not available in adequate quantity and quality. Adequate sanitary toilet facility mau also have an impact on reducing diarrhea and other fecal-oral transmitted diseases.

7.5.8. Provision of sanitary disposal and sewerage facilities

Garbage disposal accordingly and good sewerage system will not only lead to clean and healthy environment, but also keep the sources of disease transmission away from the children. It can also give additional benefit if garbage can be recycled and managed well.

7.5.9. Health education (intra dan extra curriculair)

School is an educational institution, thus it is very appropriate if health education is included in the educational curriculum at school. Nonetheless, the content of the health education need to be aligned with their age. Which health education component needs to be given at school is needed to be assessed by the health sector. Considering clean and healthy behaviour is a skill that needs to be learned, including having this asan the extra curricular activity may help; For example through scouting activities, a unit of boy's scout that learned about knowledge and skill pertaining to health can be formed.

7.5.10. School as non smoking areas

Currently, the age of smoking onset have shifted to younger age, even in primary school. This condition need upmost attention

because smoking has been known to be related to many degenrative diseases. For school-aged children, rules and role model of behaviour are important. Therefore, it is very important to declare school areas as non-smoking areas, where no one is allowed to smoke in the school areas including teachers, staff and parents who visited the school, both in the classroom and school yard. If teachers and parents do not smoke, children are expected to follow this behaviour. Preventing children from smokingis very important, because drug abuse is also started from smoking.

7.5.11. School free of drug abuse

Not only for smoking, school areas should also be free of drug abuse. This was not easy to be achieved, especially in the current condition. Drug abuse was rampage among teenagers and not easy to be prevented. Narcotics business was one of the high profit business which attracted drug dealers. Many drug dealers secretively targeted their markets to school children, therefore many could be found in the school surroundings. School teachers have to be equipped with the ability for early detection of drug abuse, and took necessary steps if they found students who were drug addicts.

7.5.12. Health services at school

Health services at elementary school could be used as the place for early detection of health problems, such as under nutrition including stunting, eye problem, hearing problem, worm infestation or other development problems like hyperactivity disorders, slow learner, etc. Health assessment need to be conducted not only for screening purposes, but could be followed up by programs to improve children's health. For example deworming program, because it was found that many students suffered from worm infestation. Deworming program could help to improve children's

nutritional status as it prevents the worms to absorb nutrients needed by the children.

7.5.13. Bullying free environment at school

Bullying was one of the social problems that needs to be prevented at school. Bullying is not a simple problem because of its impact on students's mental health, both the victims and the bully. Many bullying behaviour which was spread through videos in social media were actually like an ice-berg phenomenon. What has been revealed only told us the tip of the ice-berg, there are more real problems in the real situation.

7.5.14. Cooperation with the National Social Insurance System for health sector

Starting from 2014, National health insurance (JKN) was introduced, and its scope/coverage was broadened ever since. This JKN program was intended to reduce gap of health care cost. JKN program will also be beneficial for health service program for school children. If school found children with specific diseases, teachers can suggest that the children with their families to register themselves in the JKN program so that all their health care cost can be borne by the insurance program with very cheap premi. In one hand, it can help the social insurance program to increase their coverage, and on the other hand, the most important thing is it can help school children and their families to access adequate health care services.

7.5.15. School health program become compulsory health services of the primary health care center

To manage health intervention through school, school health program or usaha kesehatan sekolah (UKS) should become one of the compulsary health services of the Primary health care center

(Puskesmas) and should be implemented in all elementary school. This is related to child's right to health. Focusing school health program at this age groups also could prepare the children's nutritional status before entering adoslecent period.

The expected impact of the school health program was improvement of general health condition of the school children which may lead to reduction of absenteeism. Moreover, healthy children will be able to absorb knowledge better than unhealthy ones, so that they will be prepared to be excellent human beings in the future and enable the country to benefit from the "demographic bonus", a golden period which is the opportunity for the country to improve the welfare quality.

7.6. ADOLESCENT PERIOD, AGED 13-15 YEARS

Health improvement effort for the junior high school students will have the same pattern as for the elementary school. Only the substance will be shifted to the following:

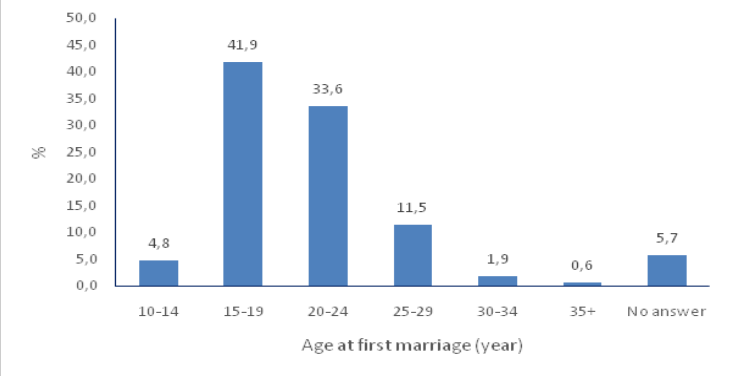
1. Clean and healthy lifestyle/behaviour shall focus more on no smoking, as well as avoidance of drug abuse and alcohol abuse
2. Consumption of balanced diet shall be stressed through nutrition education program at school. The image that "slim" is healthy have to be straightened as too slim is actually unhealthy and wi;; lead to wasting. Eating a lot of fruit and vegetables as will as enough calorie and protein shall also be part of the nutrition education at school
3. Enough physical activity is important to keep the body fit and healthy
4. Reproductive health shall be introduced early on, because puberty signs start to emerge during these age period
5. 5. In these age group, apparently traffic accident started to

icnrease and become one of the cause of death. Therefore, safe traffic awareness should be introduced, so the adolescents will start to have careful driving and obey traffic signs, rules and regulation.

7.7. ADOLESCENT PERIOD, AGED 16-18 YEARS

For high school students, similar pattern as the junior high school can be implemented, with additional focus on the following:

1. Reproductive health shall be focused on healthy reproductive behaviour, because pre-marital sex have started to emerge more and more. It was suggested that marrital age shall be after high school, so the mean of marrital age will be increased. Riskesdas 2010 showed that very early marrital age were still found, even as early as 10-14 year old and 41.9% of first marriage took place at the age of 15-19 years as shown in Figure 98.



Source: Riskesdas 2010

Figure 98. Age of first marriage among pregnant women

2. Nosmoking and free drug abuse should also be more emphasized, because when they were addicted, it was difficult to avoid these anymore. Prevention is better than treatment

3. Balanced nutrition education, eating a lot of fruit and vegetables, maintain ideal body weightare the important messages that needed to be stressed. Total Diet Study 2014 showed that for age group 13-18 years, more than 80% had calorie intake <100% RDA and more than 60% had protein intake <100% RDA. Consumption of iron pills also important to be introduced to prevent anemia
4. Safe traffic behaviour, both for public transport users or as drivers was also an important message to be conveyed, because the highest cause of death in this age group was from traffic accident
5. Moreover, there is a need to revise Law no. 1/1974 about marriage, of which the age limit for legal marriage was stated. Age limit for legal marriage should be increased from 16 years-old to 20 years-old for female and from 19 years to 20 years old for male. This is important to ensure that they are ready for the marriage mentally, physically and economically.

7.8. PRODUCTIVE AGE

For the reproductive age above 18 years old, stunting investment will not have an impact to themselves, but for their offspring, or it may have an impact toward other nutritional problems, such as obesity. Intervention programs which could be implemented to improve nutritional status of their off-pring are as follows:

1. For people who have married, it was strongly suggested that they follow a family planning program, to avoid risky pregnancy known as "the 4 too", i.e. pregnant at age too young, too old, too narrow birth spacing and too many children.
2. Early detection of non communicable diseases (NCD) especially among women, because in pregnant women, NCD could influence not only the mother but also the fetus
3. Maintain healthy lifestyle, including not smoking, because

smoking can have an impact not only for the smokers, but also to the family as passive smokers. Survey results showed that stunted children were found more in household whose head of family was smokers.

4. Never get involved in drug abuse and narcotics, because once addicted, it will be very difficult to quit. For this case, prevention is better than treatment.
5. Alcoholic beverages consumption was strongly suggested to be avoided, because it can compromise the brain which lead to alcohol inflicted injuries and criminal behaviour
6. Risky sexual behaviour should be avoided, in light of the risk of HIV/AIDS and sexually transmitted diseases
7. Balanced food consumption pattern should be maintained. Total Diet Study 2014 showed that for age group 19-55 years, more than 80% have calorie intake <100% RDA and more than 50% have protein intake <100% RDA.

7.9. ELDERLY

For elderly, health intervention will not have an impact on stunting. Health intervention was intended to maintain normal nutritional status and prevent metabolic syndrome so that degenerative diseases can be prevented. Thus, the health intervention may include the followings:

1. Healthy lifetyle program such as smoking prevention/cessation, prevention or treatment of drug abuse and avoidance of alcoholic beverages consumption
2. Routine physical activity with adequate time to maintain fitness and prevent obesity
3. Early detection of non-communicable diseases. Once detected, continous and routine medical treatment and check-up should be maintained in order to control the disease
4. Being registered as JKN member would be helpful to avoid

financial catasthrope due to medical care cost

5. Maintain healthy eating habit. Total Diet Study 2014 showed that for age group more than 55 years old, more than 70% had calorie intake <100% RDA and more than 60% had protein intake <100% RDA.

7.10. OTHER INTERVENTION PROGRAMS

Other interventions which focused more on nutrition sensitive intervention conducted by non-health sector were as follows:

1. Poverty alleviation program, because evidence has showed that poverty is closely related to stunting. Stunting prevalence was higher at the lower socioeconomic status. Various poverty alleviation programs need to be strengthened and scaled up, including JKN and and other social safety net.
2. Food and nutrition security, or stronger food and nutrition sovereignity. This could ensure continous availability and accesibility of food and nutrition for everyone. Nonetheless, even among the highest two quintiles of wealth, a significant number of stunting was still found. Thus, Food and nutrition security has to beensured in parallel with adequate nutrition education.
3. Improvement of clean water supply and sanitation. This has an impact in disease control program, especially infectious diseases. Nutritional status will not be disturbed too much if infectious diseases can be controlled adequately.
4. Environmental sustainability. environmental damage will have large impact on environmental health, which in turn will influence health status of the people, including the nutritional status.
5. Prevention of environmental pollution has to be continously conducted, because some pollutants have impact on child growth and development.

7.11. CHALLENGES FOR STUNTING REDUCTION INTERVENTION

Implementation of both the nutrition specific and nutrition sensitive interventions were not an easy task. Some challenges were apparent as follow:

- Stunting and maternal undernutrition were not easily detected. The majority of people do not realize that stunting was a nutrition problem. Nutrition problem were more easily noticed when people see wasted children rather than stunted children.
- Many people thought that nutritional problems were associated with the lack of food. But in fact, stunting was also found among the highest two wealth quintiles (quintile 4 and 5)
- Awareness on the importance of nutrition waspoor, even among women: 81% of pregnant women received iron tablet, but only 18% actually consumed the iron tablet for 90 days during pregnancy
- Family was lacking of knowledge about nutrition and healthy lifestyle.

Moreover, there were a lot of wrong myths, such as pregnant women should not eat shrimp because it was believed to lead to obstructed labour. Nutrition-wise, shrimp was in fact a good source of protein, mineral and omega-3 fatty acid for pregnant women. Another example was that pregnant women should not eat seafood, because it will make their breastmilk fishy. When in factnutrition-wise,fish is a good source of protein and mineral. Fish is also known to have high omega-e fatty acid content which are essentialfor infant's brain growth and vision.

7.12. SUMMARY OF INTERVENTIONS

All the series of inerventions mentioned could be grouped into nutrition specific or nutrition sensitive intervention as following:

Tablel 38. Type of nutrition specific and nutrition sensitive interventions for stunting reduction

Program/activities	Specific	Sensitive
Pregnant mothes registered as member of JKN	V	V
High energy, protein and mikronutrient food supplementation	V	V
Frequent and good quality of ante enatal care	V	
Iron folic acid pills supplementation for pregnant women	V	
Calcium supplementation for pregnant women	V	
Nutrition counselling through posyandu	V	
Health personnel assisted delivery at health facilities	V	
Early initiation of breastfeeding and exclusive breastfeeding	V	V
Growth monitoring for underfive children	V	V
Food supplementation for underfive children	V	V
Early stimulation of child development	V	V
Optimal health care services	V	
Vitamin A supplementation for children 6-59 years	V	
Iodized salft fortification	V	
Usage of bednet	V	V
Extend compulsory education from 9 years to 12 years		V
Change number of days and hour of studying at school becoming 5 days/week and 7 days		V
Nutrition improvement program at school	V	V
Moral/ethic and religious education		V
Clen and healthy lifestyle education/ counselling	V	V

Provision of safe drinking water and handwashing facilities in all schools		V
Adequate sanitary toilets provision		V
Provision of garbage disposal and sewerage facilities		V
Health education (intra and exstra curriculair)	V	V
Deworming for pregnant women and children 1-5 years	V	
Non-smoking areas school		V
Drug abuse free at school		V
Health care services at school	V	V
Bullying free at school	V	V
Cooperation with the "BPJS" health sector	V	V
School health program should become compulsary activities of Puskesmas/Primary Healthcare Facility	V	
No smoking, free of drug abuse and alcohol abuse	V	V
Eat balanced food diet	V	V
Increase physical activities	V	V
Reproductive health focused on health behaviour as well	V	V
Safe traffic behaviour		V
Revision of Undang-undang no.1/ 1974 about marriage		V
Family Planning	V	V
Early detection of non-communicable diseases	V	V
Poverty alleviation		V
Sustainable environment		V
Prevention of enviornment pollution		V
Availability of good data in the health information system	V	
1000 days of life campaign	V	V
Ensure adequacy and implementation of nutrition planning and budgeting at the district level	V	

FINAL CHAPTER

Alhamdulillah (thanks to God), the writing proccess of this book on stunting can be completed. This book is expected to be used as reference for health development which is closely associated with the quality of human resources. Stunting in Indonesia is a very serious problem and needs to be addressed by involving many institutions, using integrative and comprehensive solutions.

We also thank all of those who had contributed to the publication of this book, hopefully Allah SWT will bless and give the best for you. Amiiin.

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Stunting is a big issue in Indonesia. There is some improvements In the past ten years, but still unsignificant. Proven by the height of most teenagers in Indonesia are still below WHO standard.

The team of writers attempt to encapsulate all data and information relating to stunting, especially those from the research in the country, so as to illustrate the trend and magnitude of the urden in current days and in future, in terms of stunting itself as well as the impacts. Almost all the data are colledted from surveys or researches in Indonesia, so that it can describe how big the problem is in our beloved country, Indonesia.

Related to some frameworks from experts, this book is also suggests some solutions and what should be done to overcome stunting sistematically and significantly both by health and non-helath personnels.

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