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# Pemanfaatan Bahan Pangan Lokal Dalam Lingkup Kesehatan Ibu Dan Anak



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## ORGANISASI



## BIDANG KEAHLIAN

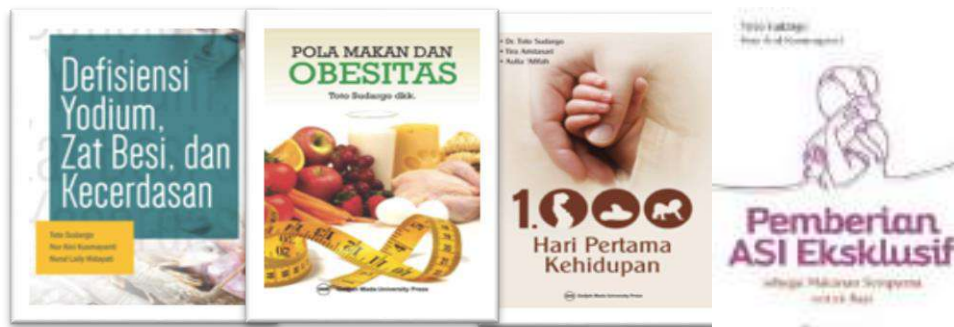
Gizi Masyarakat  
Stunting dan Gizi Buruk  
Gizi Ibu & Anak  
Anemia

# TOTO SUDARGO

DEPARTEMEN GIZI KESEHATAN  
FAKULTAS KEDOKTERAN, KESEHATAN MASYARAKAT, DAN KEPERAWATAN (FK-KMK)  
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## PUBLIKASI BUKU



## PENELITIAN DAN PENGABDIAN

Penelitian Multisektoral Efektivitas PMT untuk Mengatasi Stunting (DIKTI)	2017
Model Percepatan Perbaikan Status Gizi Melalui Gerakan 1000 HPK Berbasis Posyandu (KEMENKES)	2017 2018
Efek Dose-response Suplementasi Furikake Berbasis Algae dan Ikan Tuna terhadap Status Gizi dan Fungsi Kognitif Tikus Wistar Malnutris	2018
Action Research Multicenter Evaluasi dan Penyempurnaan Program Pencegahan dan Pengentasan Masalah Gizi Terkait Stunting di 100 Kab. Indonesia (KEMENKES)	2018
Pengembangan Produk Makanan Tabur Berbasis Labu Siam dan Ikan Tuna (CHAGURO) Sebagai Terapi Diet bagi Individu Prediabetes dengan Dislipidemia (DIKTI)	2019 2020
Ketua Panti Asuhan Al-Muthi'in Yogyakarta	

## PENDIDIKAN

Universitas Diponegoro (S1)	1991
Universitas Gadjah Mada (S2)	1997
Universitas Gadjah Mada (S3)	2012

## PUBLIKASI INTERNASIONAL

The effect of additional egg supplementation on vitamin and mineral fortification program on growth, cognitive development and hemoglo-bin in Indonesian underweight and stunting children (Nutrition & Food Science)	2018
Effects of Supplementation with Furikake Ulvamina Made of Algae (Ulva sp.) and Tuna (Thunnini) on Cognitive Function of Malnourished Mice (Rattus norvegicus) <b>Current Research in Nutrition and Food Science</b>	2020
Understanding Determinants of Stunted Chil-dren in Poor Rural Area of Indonesia ( <b>Indian J. of Pub. Health Res. &amp; Development</b> )	2018
The Effect of Kersen Juice on Lipid Profile of Sparague Dawley Rats: A Randomized Con-trolled Trial ( <b>Asian J. of Clin. Nutr.</b> )	2017
Egg, Iodine, and Iron Supplementation Increase Nutrition: Iodine and Iron Status In Elementary School Children in Rural Indonesia ( <b>Int. J. Community Med Public Health</b> )	2016
Maltodextrin and Vitamin C Combination Drink in Effective to Reduce Malondialdehyde ( <b>Pakistan Journal of Nutrition</b> )	2015
Effects of Maternal Weight Gain and Macronutrients Intakes during the Third Trimester of Pregnancy on Birth Weight: A Prospective Cohort Study in Pregnant Women in Sleman, Indonesia ( <b>Indian J.Pub.Health Research Developmet</b> )	2020

GLOBALLY RESPECTED



# INTEGRATING A SYSTEMS APPROACH TO NUTRITION IN THE COVID-19 SOCIO-ECONOMIC RESPONSE

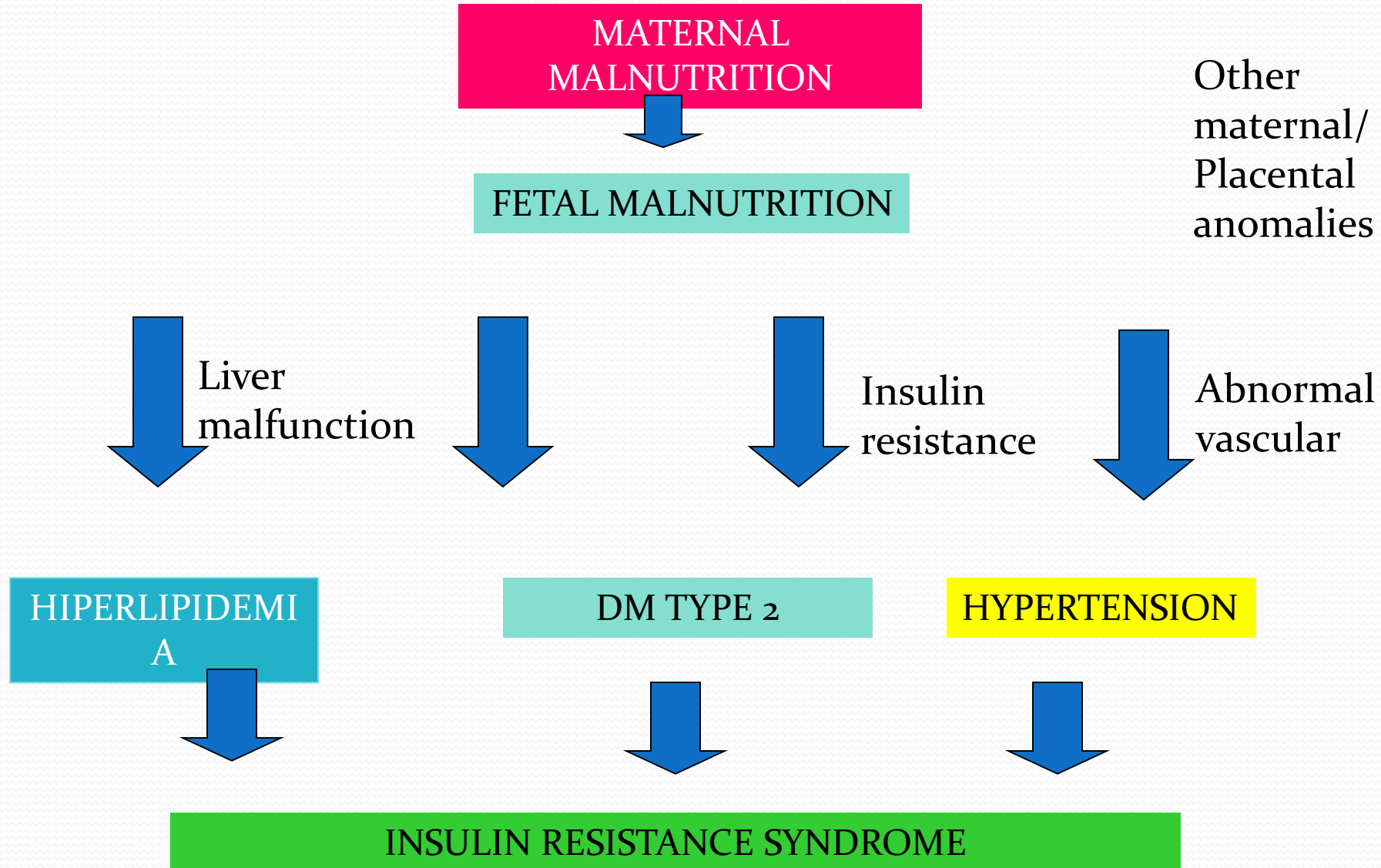


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## A systems approach to nutrition

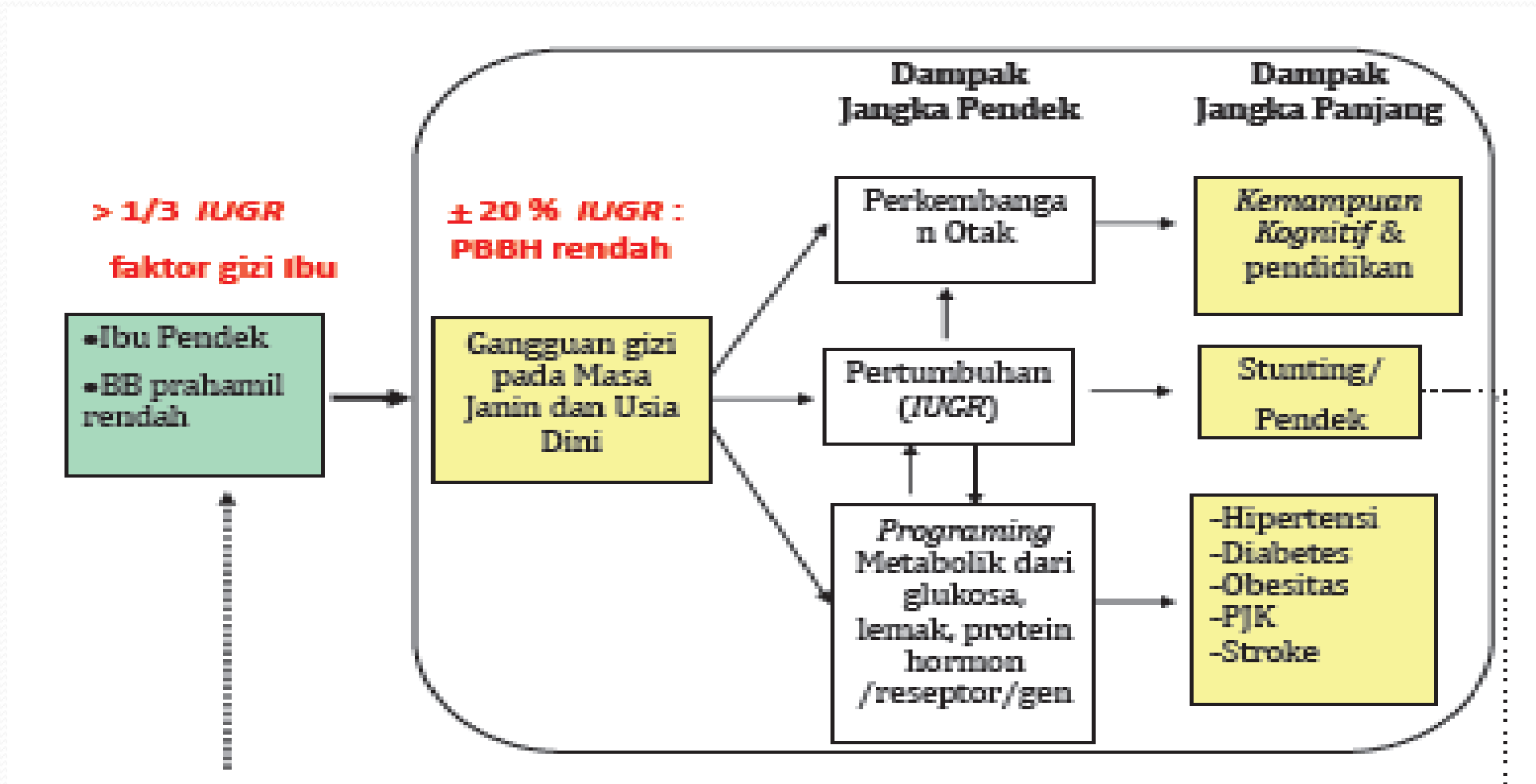


# Do You Know Barker Hypothesis???



# DAMPAK JANGKA PENDEK DAN JANGKA PANJANG AKIBAT GANGGUAN GIZI PADA MASA JANIN DAN ANAK- ANAK

SUMBER: MODIFIKASI DARI "THE UN COMMISSION ON NUTRITION OF THE  
21ST CENTURY, 2000"



9 BULAN  
PERTAMA  
MENENTUKAN  
MASA DEPAN  
KITA



# JADI MENURUT :

Prof.Barker : Sering tidak kita sadari yang menentukan masa depan kita ialah KEHIDUPAN JANIN 9 BULAN DLM KANDUNGAN, yaitu :

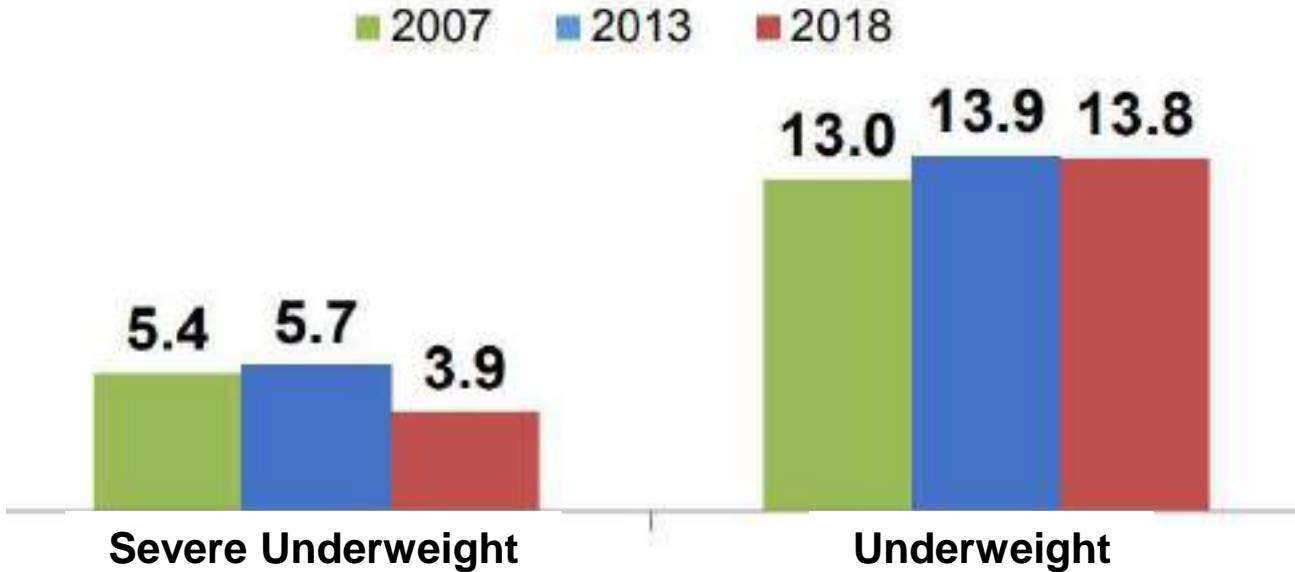
- GIZI waktu Janin
- Asupan gizi pada saat Ibu Hamil
- Kesehatan , Ketenangan Hidup dan Kejiwaan Ibu waktu Hamil

**SEMUANYA ITU MEMBENTUK KITA SEJAK BAYI DAN BERLANJUT SAMPAI SEKARANG**



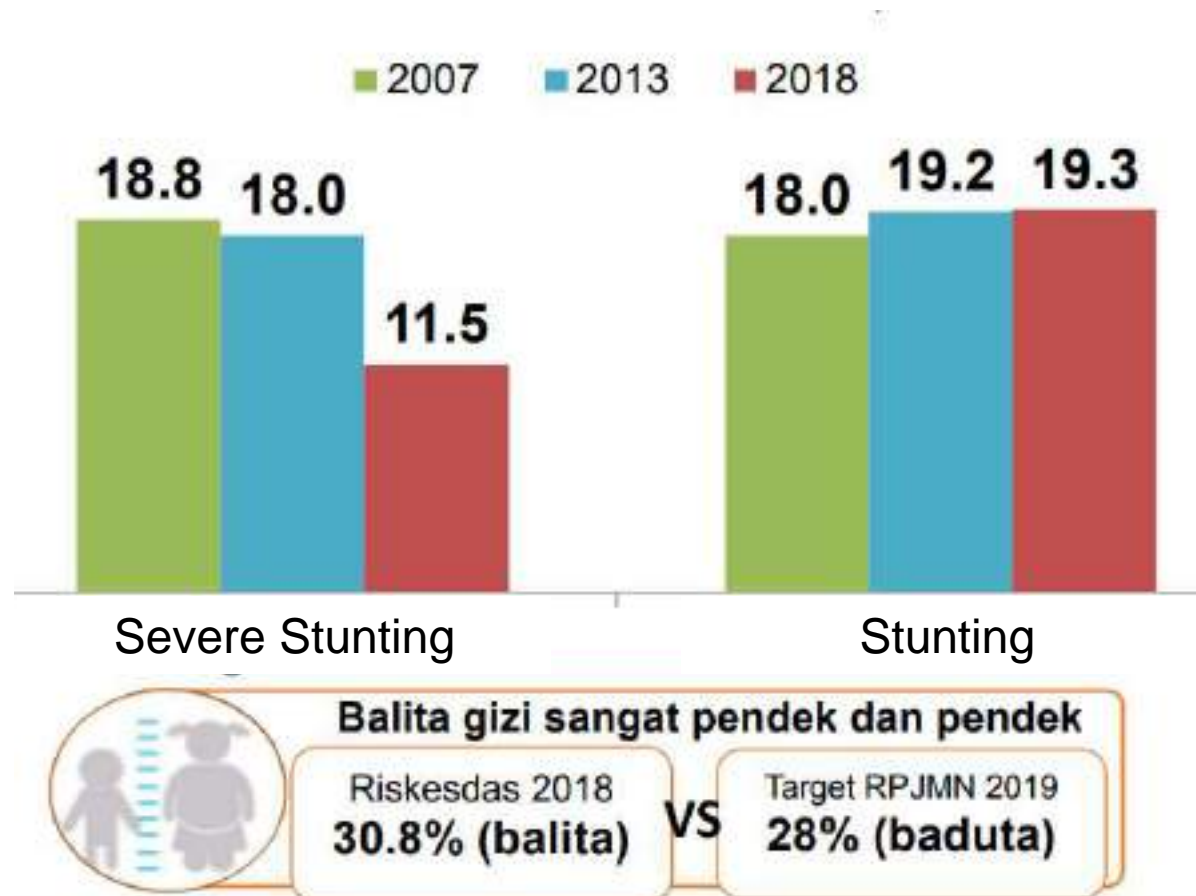
# Undernutrition persists and still does not meet the target

Prevalence of underweight and severe underweight among Indonesian children aged <5 years, 2007-2018 (RISKESDAS)



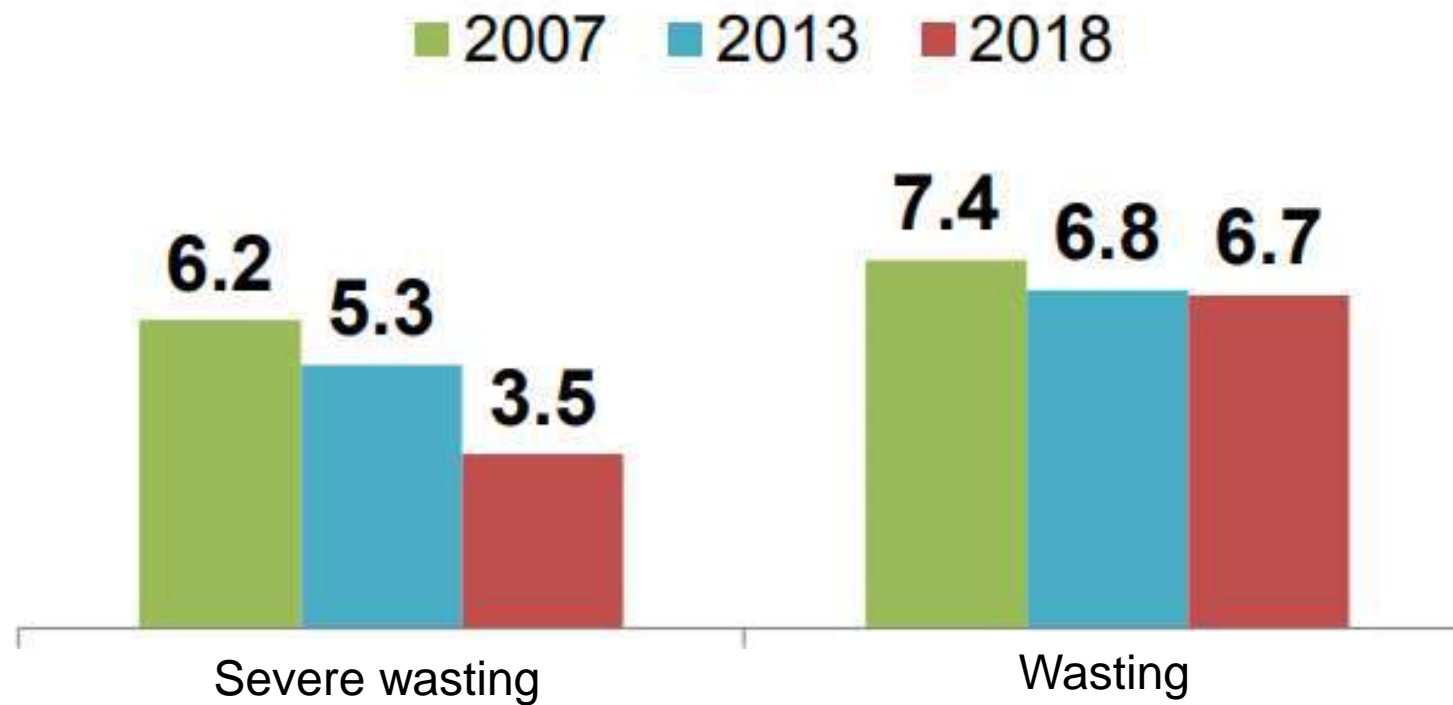
# Undernutrition persists and still does not meet the target

Prevalence of stunting and severe stunting among Indonesian children aged <5 years, 2007-2018 (RISKESDAS)



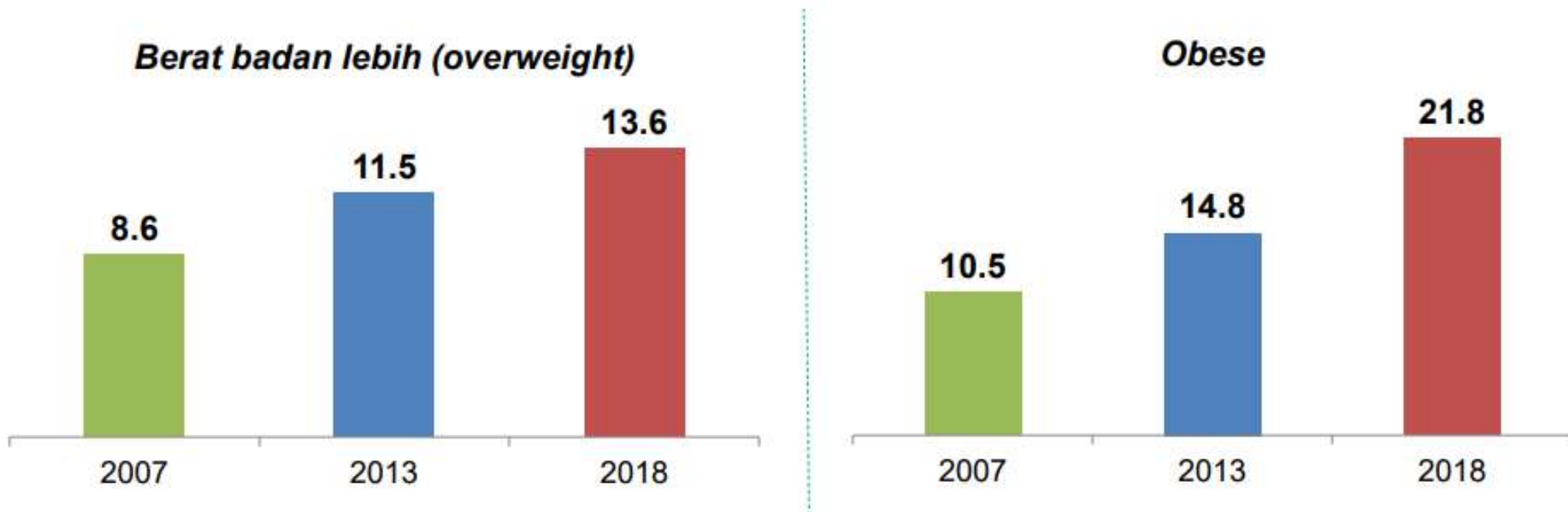
# Undernutrition persists and still does not meet the target

Prevalence of wasting and severe wasting among Indonesian children aged <5 years, 2007-2018 (RISKESDAS)

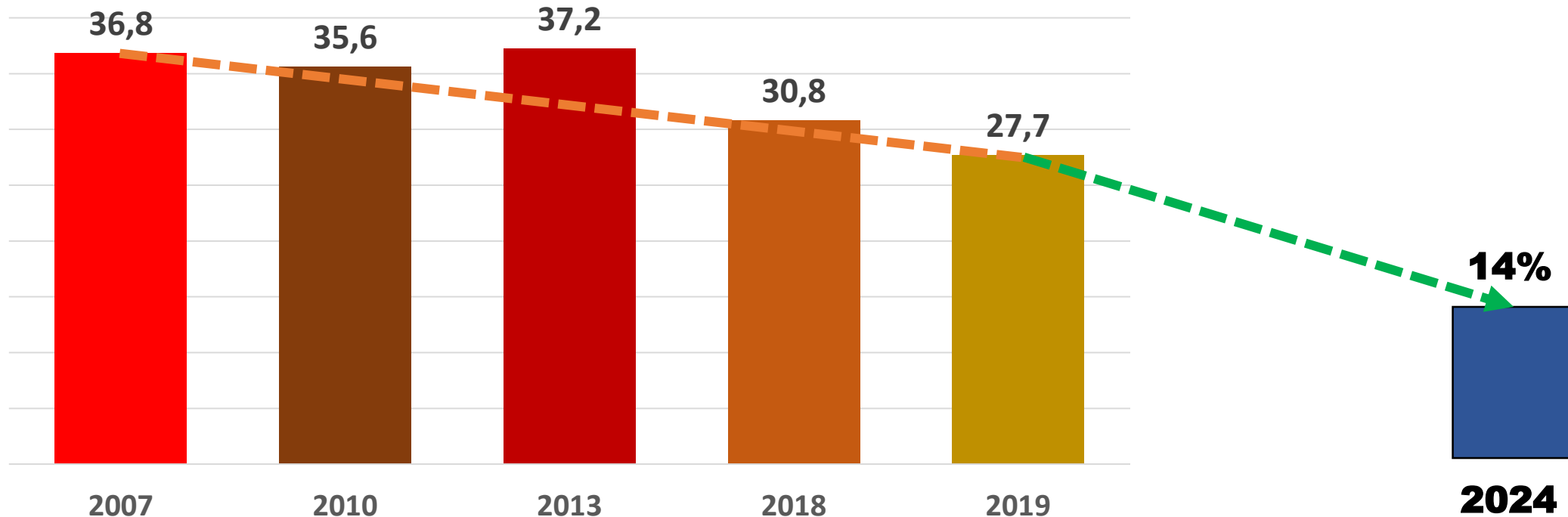


# Meanwhile, adult overweight and obesity are rising

Prevalence of overweight (BMI  $\geq 25$  s/d  $< 27$ ) and obesity (BMI  $\geq 27$ ) among Indonesian adults aged  $\geq 18$  years, 2007-2018 (RISKESDAS)



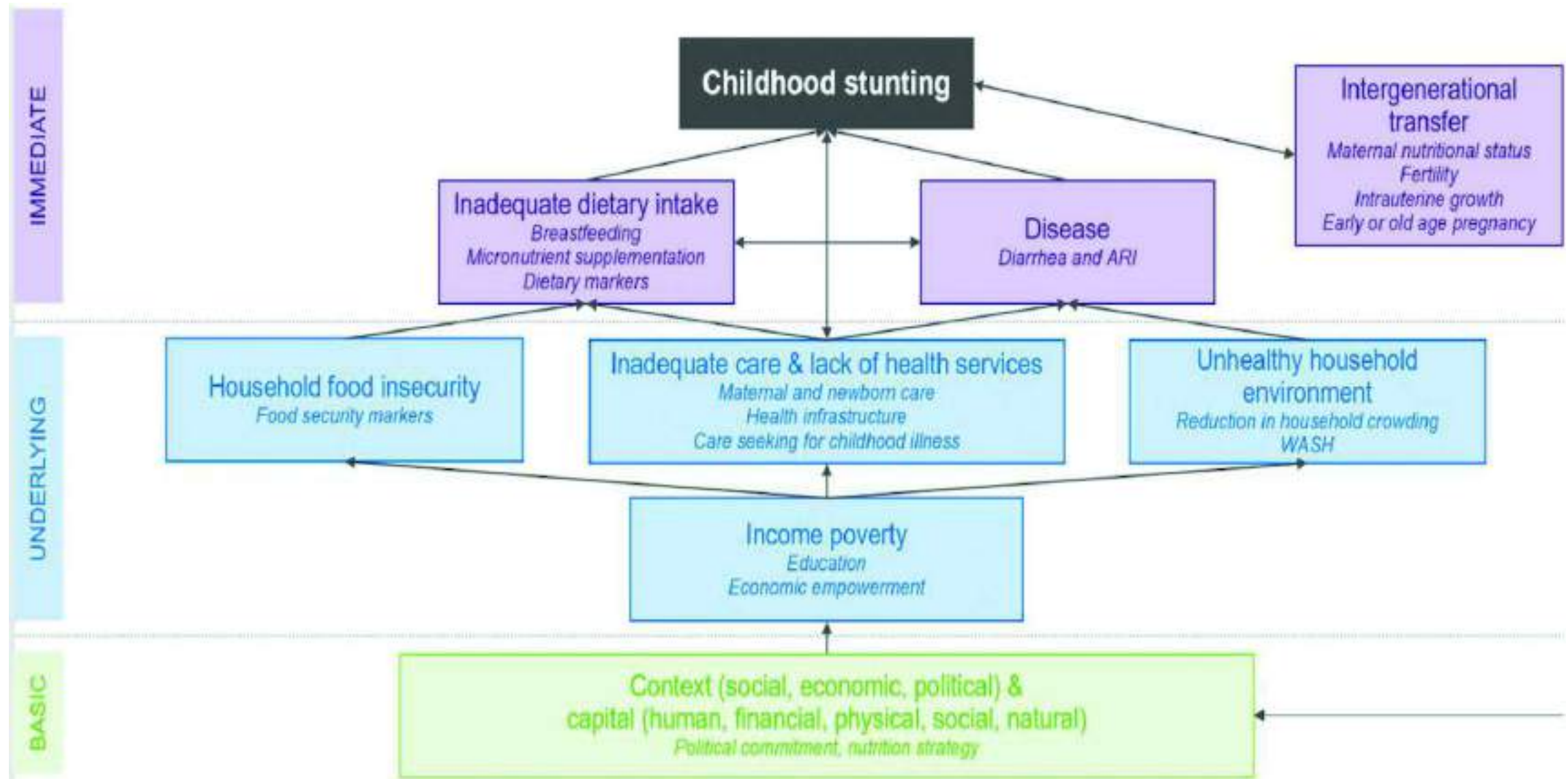
# Target Penurunan Angka Stunting Nasional (%)



Angka Stunting Balita pada tahun 2019 sebesar 27,7% (sumber data: SSGBI), mengalami penurunan sebesar 3,1% dari tahun 2018 (sumber data: RISKESDAS)

Sumber: STRATEGI NASIONAL PERCEPATAN PENCEGAHAN STUNTING 2018 -2024

# Kerangka konsep determinan stunting



# Permasalahan gizi masyarakat





## Abstract

A randomized, double-blind, placebo controlled trial of a **single dose** of 200,000 I.U. of **vitamin A** with daily zinc supplementation was conducted with children in Mojo village, Surabaya City. Children aged 48 to 60 months were randomized to receive a single dose of 200,000 I.U. of vitamin A plus **zinc sulfate** ( $n = 12$ ) or a single dose of 200,000 I.U. of vitamin A ( $n = 12$ ) plus placebo six days a week for six months. Children were evaluated weekly for **nutrient intake** and for IGF-1, **C-reactive protein** levels, **gamma globulin** levels, **serum zinc**, serum retinol, bone age and the index height for age at six months.

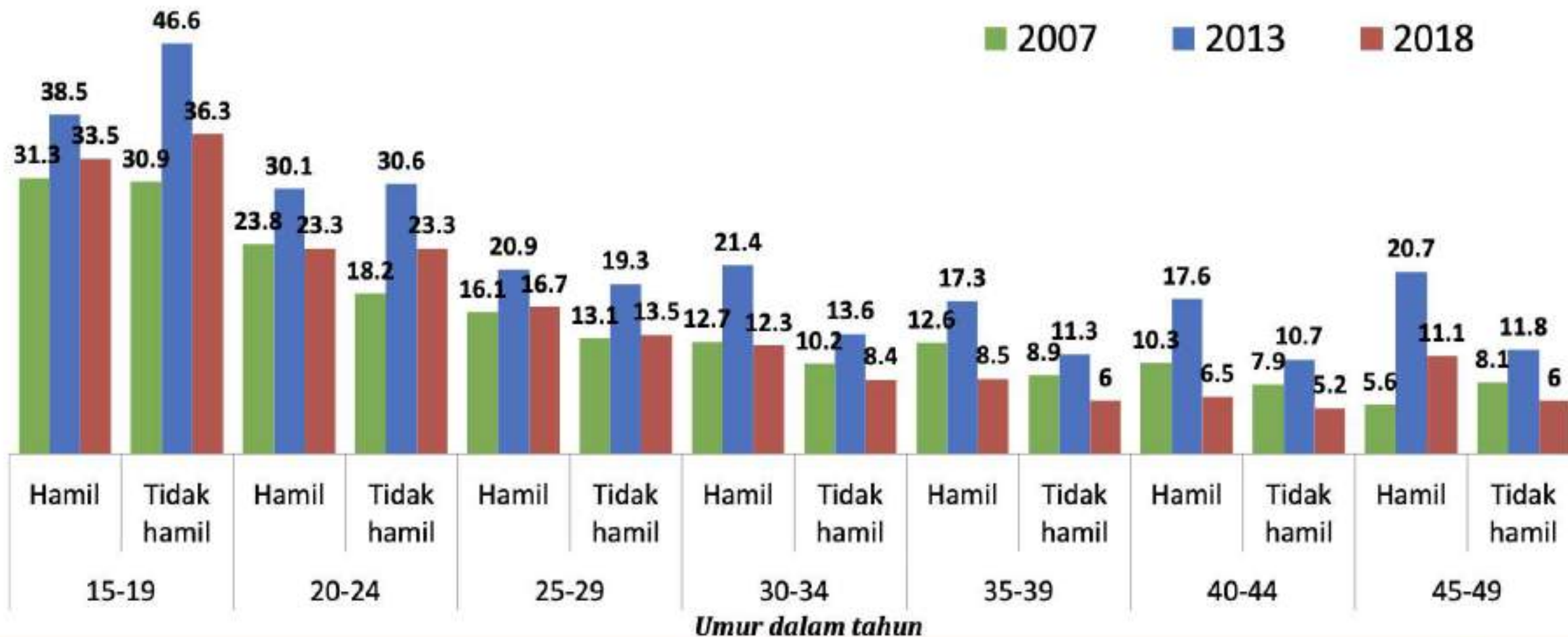
At the end of the study, there was a significant increase in the serum retinol level ( $p < 0.03$ ), serum zinc level ( $p < 0.03$ ), IGF-1 hormone ( $p < 0.04$ ) and Z-score height for age ( $p < 0.001$ ), bone age ( $p < 0.01$ ), and gamma globulin level ( $p < 0.04$ ) and a significant decrease in the amount of infection/inflammation measured by CRP level ( $p < 0.001$ ). There was also a significant correlation between CRP level and height for age ( $p < 0.01$ ), and between gamma level and height for age ( $p < 0.01$ ).

These results suggest that combined vitamin A and zinc supplementation reduces the risk of infection and increases linear growth among children, and thus may play a key role in controlling infection and stunted growth for children under five years old.

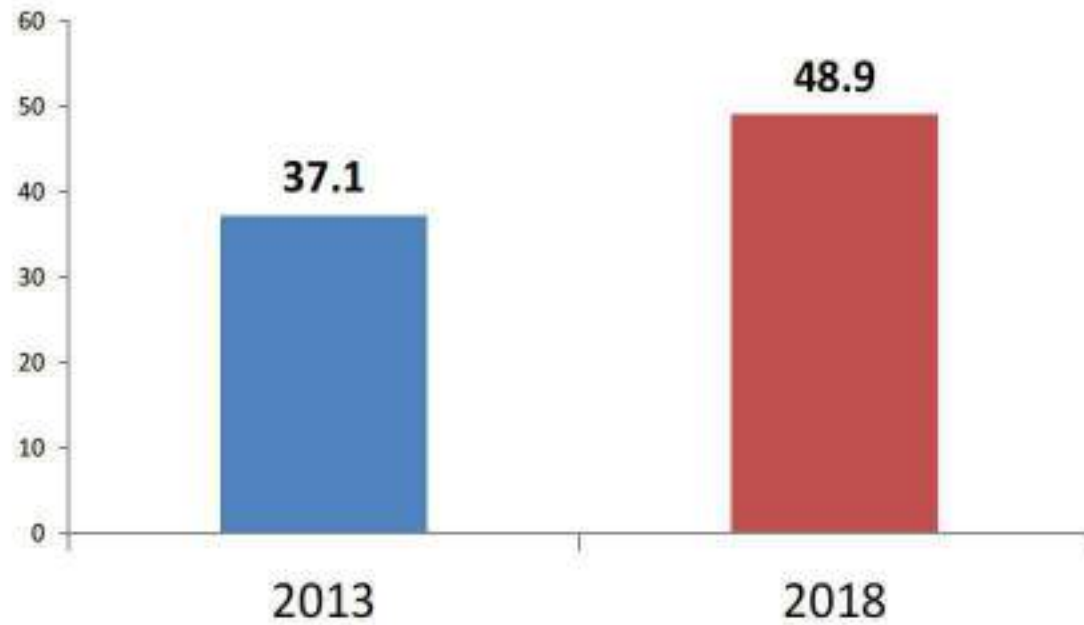
(Adriani & Wirjatmaji, 2016)



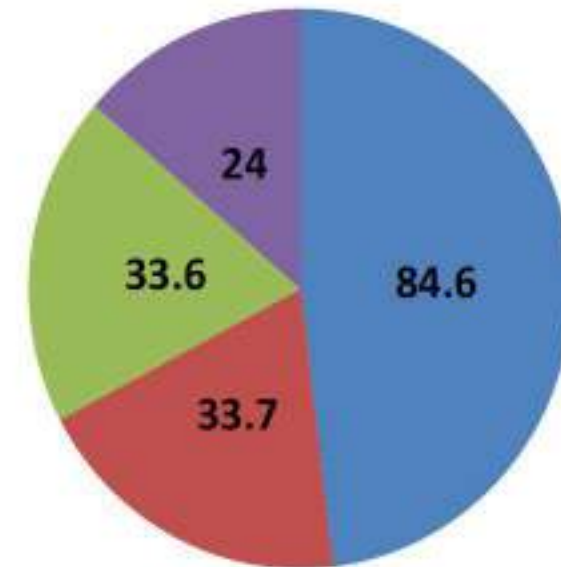
## PROPORSI KURANG ENERGI KRONIS PADA WANITA USIA SUBUR, 2007-2018



## PROPORSI ANEMIA IBU HAMIL, 2018



*Anemia ibu hamil menurut umur*



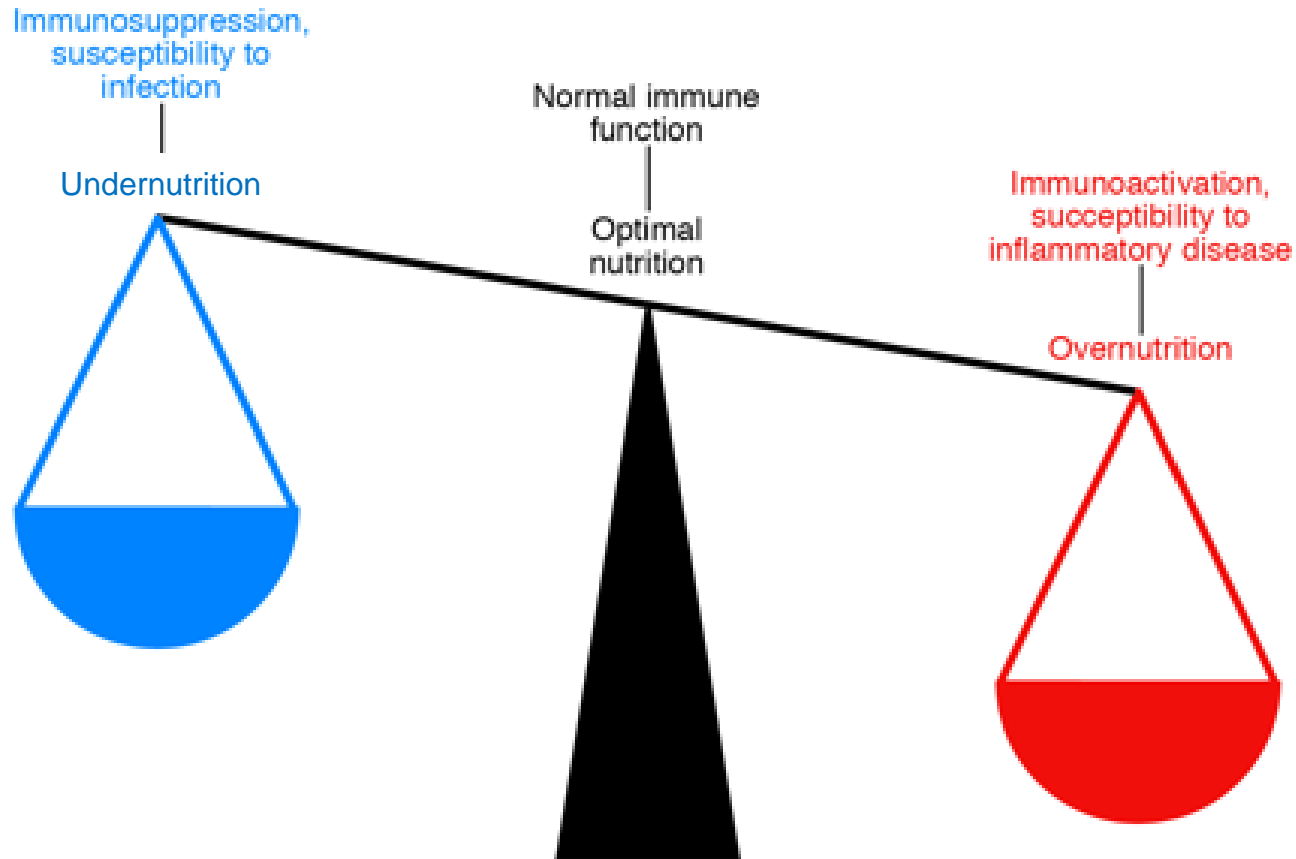
■ 15-24 tahun ■ 25-34 tahun ■ 35-44 tahun ■ 45-54 tahun



- **Indonesia is facing the triple burden of malnutrition**

- While the classic undernutrition problems persist (stunting, underweight, wasting) among children, overnutrition problems are rising (overweight, obesity) among adults
- Both over and undernutrition are inclined with diseases.

# Imbalanced nutrition can cause diseases



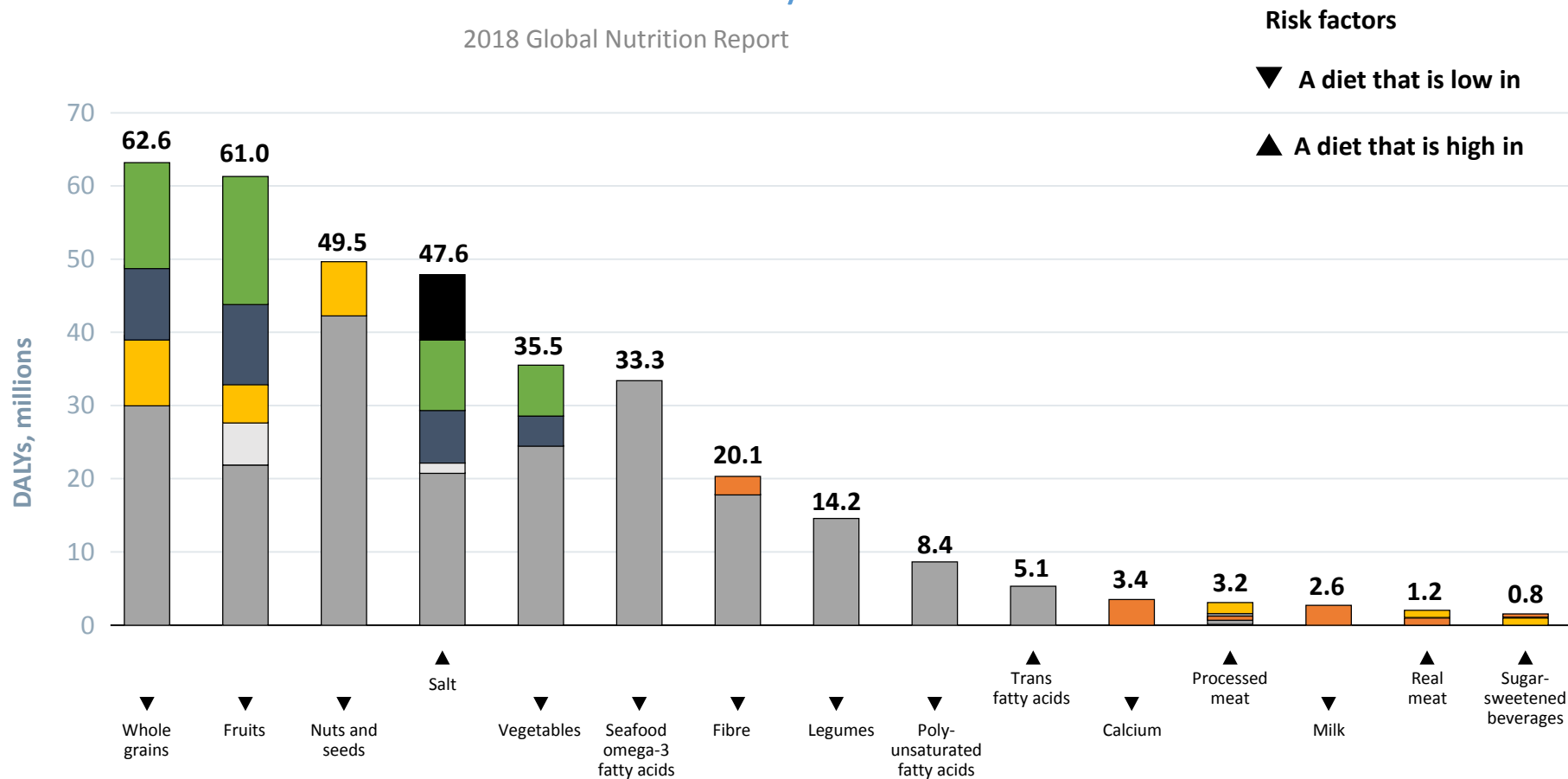
<b>UNDERNUTRITION</b>
Growth and development issues Diarrhea Anemia
<b>OVERNUTRITION</b>
Obesity Cardiovascular diseases Type 2 diabetes Metabolic syndrome

# Diets low in nutritious foods are a leading cause of healthy life years lost

## DALYs related to each dietary risk factor

2018 Global Nutrition Report

- Ischemic heart disease
- Other cancers
- Diabetes mellitus
- Ischemic stroke
- Intracerebral hemorrhage
- Colon and rectum cancer
- Other



- Nutrition plays role in both preventive and curative approach of health.
- Maintaining a balanced diet help sustain wellbeing while modified diet help recover from diseases and regain wellbeing.





Balanced diet:  
what should  
we eat and  
how much?

# What is a balanced diet?

A diet which contains **a variety of foods** in such quantities and portions that **the need** for energy, amino acids, vitamins, minerals, fats, carbohydrates, and other nutrients **is adequately met** for **maintaining health, vitality, and general well-being.**



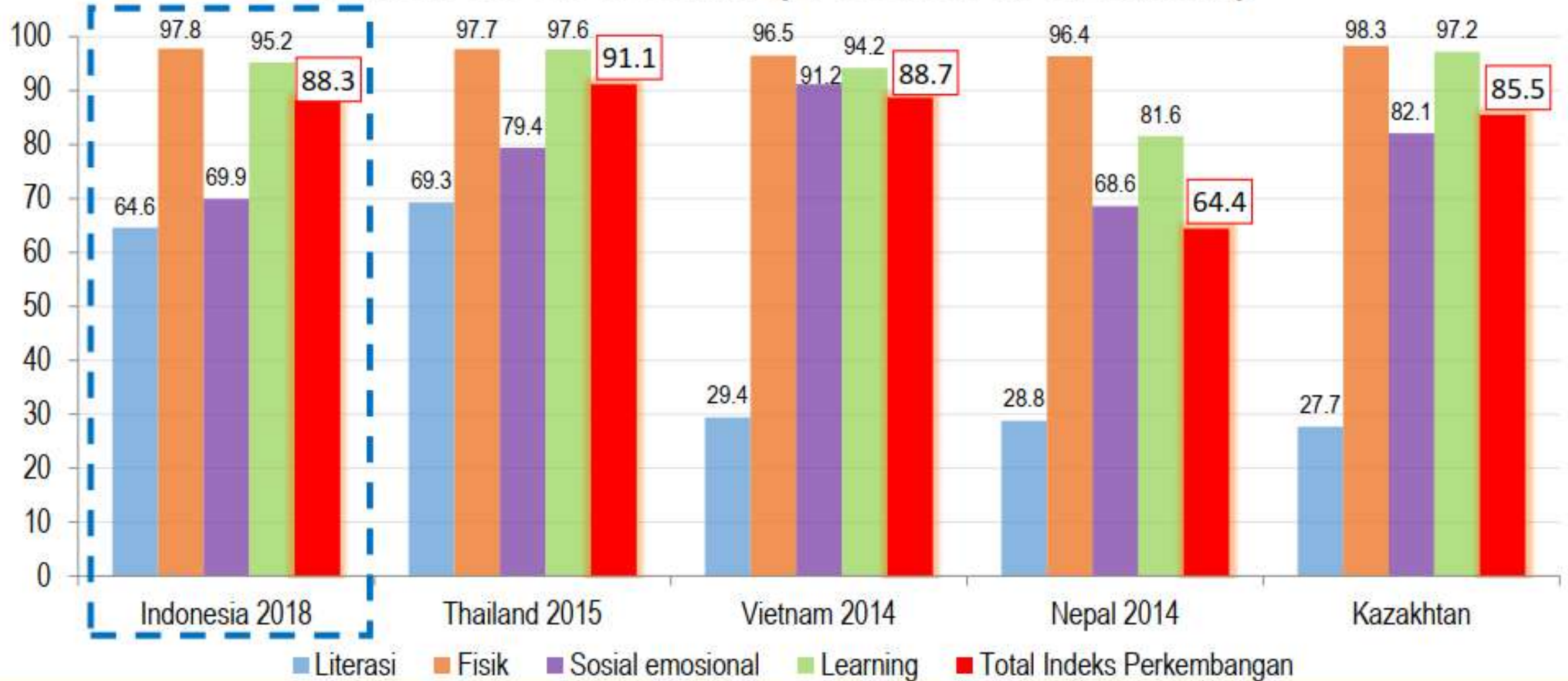
# WHO Dietary Recommendation

- Limit **dietary fats to 15-30%** of daily energy intake
- Limit **saturated fats to 10%** and **trans-fats to 1%** of daily energy intake
- Replace refined carbohydrate with **carbohydrates rich in dietary fibers** (eg. whole grain)
- At least **400 grams of fruits & vegetables** per day
- Limit **salt intake to 5 gram/day**. Salt should be **iodised!**
- Reduce high density food e.g junk food

# Food Pyramid (Indonesia)



# INDEKS PERKEMBANGAN ANAK PADA ANAK UMUR 36-59 BULAN (BEBERAPA NEGARA)





# ZAT GIZI, PEMBENTUKAN SEL OTAK

- **Karbohidrat, Lemak dan Protein :** dibutuhkan sebagai salah satu unsur pembentukan sel otak.





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**Seng** : berkaitan dgn metabolisme dan berbagai fungsi vit A, pembentukan kulit dan berpengaruh pembentukan sel otak

Sumber : daging, hati, kerang, telur, sereal & kacang-kacangan





# Kandungan dalam 1 butir telur

**Only 75 CALORIES**



**7 gr of high-quality PROTEIN**

**5 gr FAT**

**1.6 gr SATURATED FAT**

**VITAMINS, MINERALS,  
CAROTENOIDS**

**30 mg DHA**

Bian *et al.*, 2012

X. ISTERH Conference

## The effect of adding zinc to vitamin A on IGF-1, bone age and linear growth in stunted children

Merryana Adriani , Bambang Wirjatmadi

Variable	Zinc supplement	Placebo	<i>p</i> -Value
Serum retinol level	22 ± 19	3 ± 2	0.033
Serum zinc level	43 ± 23	26 ± 13	0.039
Serum CRP level	5 ± 8	4 ± 11	0.605
Serum gamma globulin level	0.1 ± 0.2	-0.1 ± 0.3	0.045
Serum IGF-1 level	2 ± 2	1 ± 1	0.041
Bone age	6 ± 4	2 ± 4	0.010
Height or age	0.3 ± 0.3	0.2 ± 0.4	0.001



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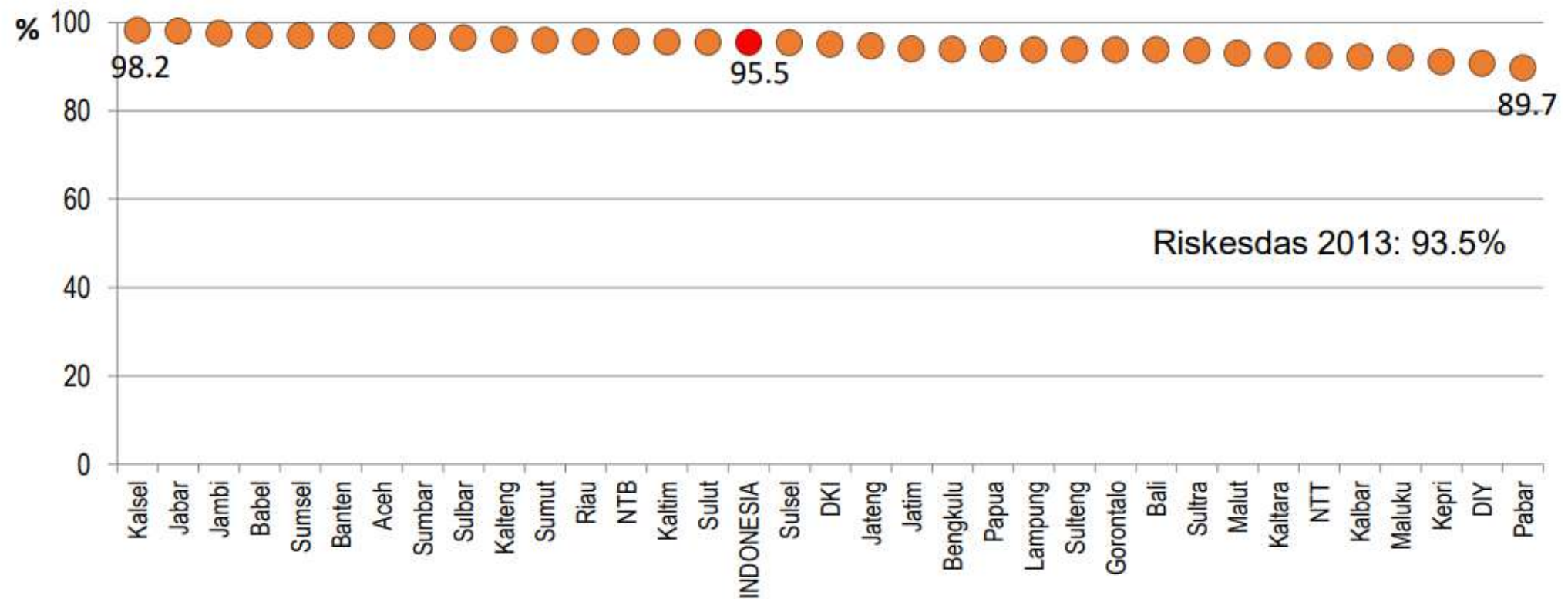


**Iodium** : ada dalam kelenjar tiroid, digunakan untuk sintesis hormon tiroksin, tetraiodotironin (T4) dan triiodotironin T3) yang dibutuhkan untuk pertumbuhan normal, perkembangan fisik dan mental, mengatur reproduksi, pembentukan sel darah merah dan perubahan karoten ke bentuk aktif vit A. **Sebagai dasar pembentukan sel otak**



# Indonesians do not consume enough fruits and vegetables.

Prevalence of fruits & vegetables consumption below recommendation (<5 times/day) among Indonesians aged  $\geq 5$  years, 2007-2018 (Riskesdas 2018)



# AKIBAT KEKURANGAN ZAT GIZI MAKRO DAN MIKRO

1. Jumlah sel syaraf berkurang
2. Ukuran sel syaraf akan lebih kecil
3. Komponen sel syaraf (akson, dendrit, sinaps, dan lain-lain) tidak sempurna terbentuk
4. Mielin (selubung syaraf) menjadi lebih tipis, berlubang, dan kemungkinan tidak terhubung, sehingga rangsangan otak tidak bisa ditransmisikan



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# Daily Supplementation With Egg, Cow Milk, and Multiple Micronutrients Increases Linear Growth of Young Children with Short Stature

Mustafa Mahfuz,<sup>1,2</sup> Mohammed Ashrafal Alam,<sup>1</sup> Subhasish Das,<sup>1</sup> Shah Mohammad Fahim,<sup>1</sup> Md Shabab Hossain,<sup>1</sup> William A Petri Jr,<sup>3</sup> Per Ashorn,<sup>2</sup> Ulla Ashorn,<sup>2</sup> and Tahmeed Ahmed<sup>1</sup>

<sup>1</sup>icddr, Dhaka, Bangladesh; <sup>2</sup>Faculty of Medicine and Life Sciences, University of Tampere, Finland; and <sup>3</sup>University of Virginia, Charlottesville, VA, USA



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**Background:** Childhood stunting is the most prevalent public health nutrition problem in low- and middle-income countries.

**Objective:** This study aimed to determine whether daily supplementation in 12–18-mo-old undernourished Bangladeshi children with egg, cow milk, and multiple micronutrients improves linear growth.

**Methods:** In the Bangladesh Environmental Enteric Dysfunction (BEED) study, a community-based intervention study, 12–18-mo-old children with length-for-age z score (LAZ) <1 were supplemented daily with an egg and 150 mL of milk for 90 feeding days, and 1 sachet of multiple micronutrient powder was provided daily for 60 feeding days. The change in LAZ over this period was compared with that in children of the same age and same baseline LAZ who were enrolled in the recently completed Etiology, Risk Factors, and Interactions of Enteric Infections and Malnutrition and the Consequences for Child Health (MAL-ED) Dhaka birth cohort study conducted in the same community where no nutrition intervention was provided. Difference-in-difference (DID) analysis was done and the effect size was adjusted for other possible covariates using a generalized estimating equation in a regression model.

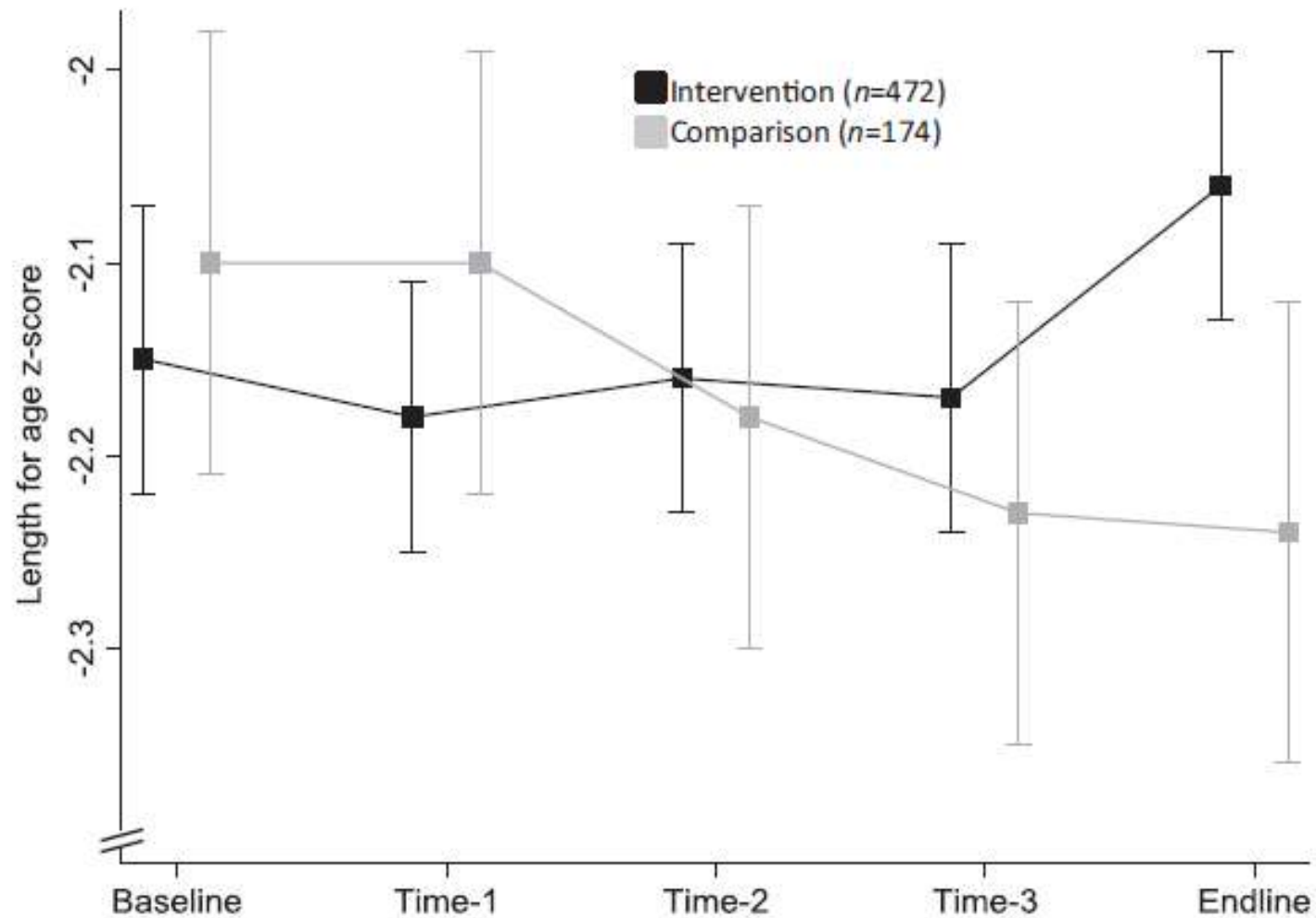
**Results:** A total of 472 children with LAZ <1 completed the intervention and data were available for 174 children in the comparison group. Compared with the comparison group, adjusted DID analysis revealed a change in LAZ in the intervention group of +0.23 (95% CI: 0.18, 0.29;  $P < 0.05$ ). In a subgroup analysis, the changes were +0.27 (95% CI: 0.18, 0.35;  $P < 0.05$ ) in stunted (LAZ <2) children and +0.19 (95% CI: 0.12, 0.27;  $P < 0.05$ ) in children at risk of stunting (LAZ –1 to –2). No allergic reactions or other adverse events related to milk and egg consumption were observed.

**Conclusions:** Daily directly observed milk, egg, and multiple micronutrient supplementation may improve linear growth of stunted children. A randomized controlled trial with longer duration of supplementation coupled with an additional intervention aimed at reducing pathogen burden is warranted to confirm these results. This trial was registered at [clinicaltrials.gov](https://clinicaltrials.gov) as NCT02812615. *J Nutr* 2020;150:394–403.

**TABLE 4** Nutritional content and estimated percentage of RDA of each component of nutrition intervention provided to the children of the intervention group<sup>1</sup>

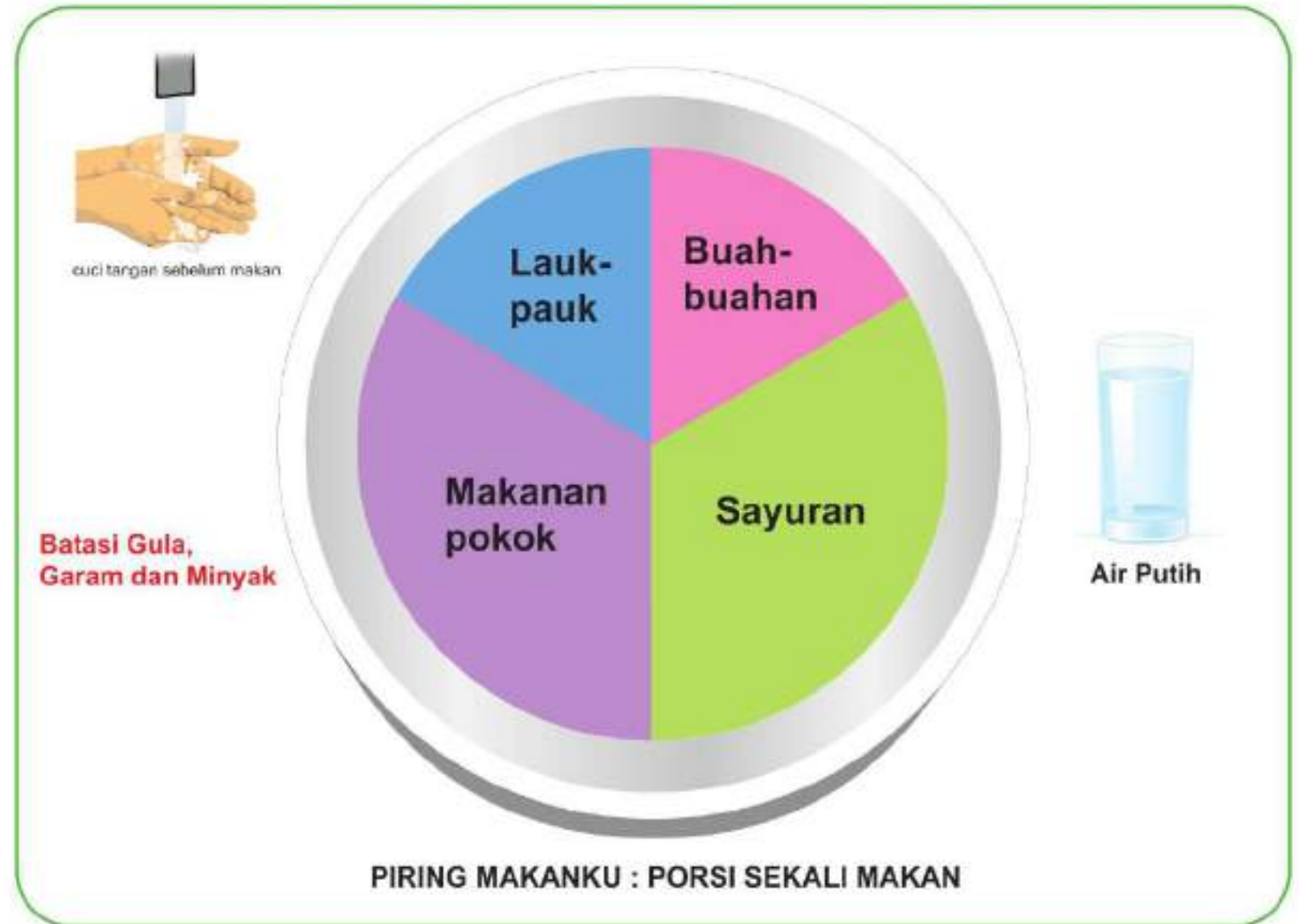
	RDA	Egg (56 g)	Milk (150 g)	MNP (1 g)	Total intake	% of RDA
Energy, kcal/d	548	86.8	92.6	0.00	179	32.7
Protein, g/d	13	7.04	4.97	0.00	12.0	92.4
Fat, g/d	ND	5.94	5.02	0.00	10.9	—
Carbohydrate, g/d	130	0.63	6.98	0.00	7.60	5.85
Calcium, mg/d	500	28.0	175	0.00	203	40.6
Iron, mg/d	7	0.67	0.05	12.5	13.2	189
Zinc, mg/d	3	0.59	0.62	5.00	6.21	207
Copper, mg/d	0.34	0.01	0.02	0.00	0.03	7.50
Vitamin C, mg/d	15	0.00	0.00	30.0	30.0	200
Thiamin, mg/d	0.5	0.04	0.06	0.00	0.10	19.6
Riboflavin, mg/d	0.5	0.29	0.28	0.00	0.57	114
Niacin, mg/d	6	0.04	0.17	0.00	0.20	3.35
Vitamin B-6, mg/d	0.5	0.07	0.05	0.00	0.12	23.6
Folate, µg/d	150	24.6	6.56	160	191	128
Vitamin B-12, µg/d	0.9	0.62	0.54	0.00	1.16	129
Vitamin A, µg/d	300	94.6	43.2	300	438	146
Vitamin E, mg/d	6	0.58	0.09	0.00	0.67	11.2

<sup>1</sup>MNP, micronutrient powder; ND, no available data. RDA is the average daily dietary intake amount, sufficient to meet the nutrient requirements of nearly 97–98% healthy individuals in a group (23, 24)



**FIGURE 2** Length-for-age z score of children in intervention and comparison groups over study period with 95% CI. The comparison group data were collected every 30 d and the intervention group data were collected every 28 d.

# My Plate (Indonesia)



# Effects of Maternal Weight Gain and Macronutrients Intakes During the Third Trimester of Pregnancy on Birth Weight: A Prospective Cohort Study in Pregnant Women in Sleman, Indonesia

Toto Sudargo<sup>1</sup>, Rahadyana Muslichah<sup>1</sup>, Althaf Setyawan<sup>2</sup>, Doddy Izwardy<sup>3</sup>

<sup>1</sup>Department of Nutrition and Health, <sup>2</sup>Department of Biostatistics, Epidemiology and Population Health, Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada, Yogyakarta, <sup>3</sup>Directorate of Public Health Nutrition, the Ministry of Health of Republic Indonesia, Jakarta, Indonesia

## Abstract

Ensuring optimum nutrition before and during pregnancy is a critical concern for both mother's and infant's growth. However, the evidence is inconsistent on the effects of maternal diet and weight gain (GWG) during a specific period of pregnancy on low birth weight (LBW) which this study aimed to investigate during late-term pregnancy. This cohort followed 139 pregnant women in Sleman, Indonesia during late-term pregnancy until delivery. Macronutrients intake was assessed using Semi Quantitative Food Frequency Questionnaire (SQ-FFQ). Maternal body weight was measured using a digital scale while pre-pregnancy anthropometry and birth weight were taken from pregnancy books. Statistical analysis was done using simple and multiple Poisson regression test with adjustment model. We found no effect of GWG on LBW. After adjustment for mother's education, parity and intakes of total energy, fat and carbohydrate, inadequate and excessive protein intakes reduced the risk of LBW by 78% (ARR 0.22; 95%CI 0.07-0.74) and 84% (ARR 0.16; 95% CI 0.03-0.99), respectively. In contrast, a 6-fold increase in risk of LBW was found among mothers with inadequate fat intake (ARR 5.82; 95% CI: 1.08-31.50). During late-term pregnancy, GWG does not affect LBW while inadequate fat intake is a risk factor of LBW.

*Keywords:* Gestational weight gain, maternal nutrition, late-term pregnancy, low birth weight.



# The effect of additional egg supplementation on vitamin and mineral fortification program on growth, cognitive development and hemoglobin in Indonesian underweight and stunting children

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Received 11 January 2018  
Revised 15 March 2018  
Accepted 17 March 2018

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Sugeng Eko Irianto  
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Yosephin Anandati Pranoto and Rathi Paramastri  
*Department of Nutrition and Health, Universitas Gadjah Mada,  
Yogyakarta, Indonesia*

## Abstract

**Purpose** – Stunting and being underweight in children are major nutritional problems especially in developing countries. The purpose of this study is to evaluate the effect of egg supplementation on a vitamin and mineral fortification program for growth, cognitive development and hemoglobin in underweight and



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### KOMPOSISI GIZI

#### KANDUNGAN PER 1 g BUBUK TABURIA

Vitamin A	417 mcg
Vitamin B1	0,5 mg
Vitamin B2	0,5 mg
Vitamin B3	5,0 mg
Vitamin B6	0,5 mg
Vitamin B12	1 mcg
Vitamin D3	5 mcg
Vitamin E	6 mg
Vitamin K	20 mcg
Vitamin C	30 mg
Asam Folat	150 mcg
Asam Pantotenat	3 mg
Yodium	50 mcg
Zat Besi (Fe)	10 mg
Seng (Zn)	5 mg
Selenium (Se)	20 mcg

#### CARA PAKAI

Taburkan satu bungkus Taburia pada makanan pagi balita yang siap dimakan dan harus dihabiskan.

# The effect of egg supplementation on growth parameters in children participating in a school feeding program in rural Uganda: a pilot study

Jamie I. Baum<sup>a</sup>, Jefferson D. Miller<sup>b</sup> and Brianna L. Gaines<sup>a</sup>

<sup>a</sup>Department of Food Science, University of Arkansas, Fayetteville, AR, USA; <sup>b</sup>Department of Agricultural Education, Communications and Technology, University of Arkansas, Fayetteville, AR, USA

## ABSTRACT

**Background:** School feeding programs have gained popularity in developing countries. Eggs are an inexpensive source of micronutrients and high-quality protein. Therefore, the objective of this study was to gain preliminary data regarding the impact of egg supplementation on growth in primary school students participating in a school feeding program in rural Uganda.

**Methods:** Children (ages 6–9;  $n = 241$ ) were recruited from three different schools located throughout the Kitgum District of Uganda. All participants in the same school received the same dietary intervention: control (no eggs (0 eggs);  $n = 56$ ), one egg five days per week (1 egg;  $n = 89$ ), or two eggs five days per week (2 eggs;  $n = 96$ ). Height, weight, tricep skinfold thickness (TSF), and mid-upper arm circumference (MUAC) were measured monthly over 6 months.

**Results:** Following six months of egg supplementation, participants receiving 2 eggs had a greater increase in height and weight compared to the 0 eggs and 1 egg groups ( $P < 0.05$ ). In addition, participants receiving 1 egg and 2 eggs had a significantly higher ( $P < 0.05$ ) increase in MUAC at six months compared to 0 eggs.

**Conclusion:** These results suggest that supplementation with eggs can improve parameters of growth in school-aged children participating in school feeding programs in rural Uganda.

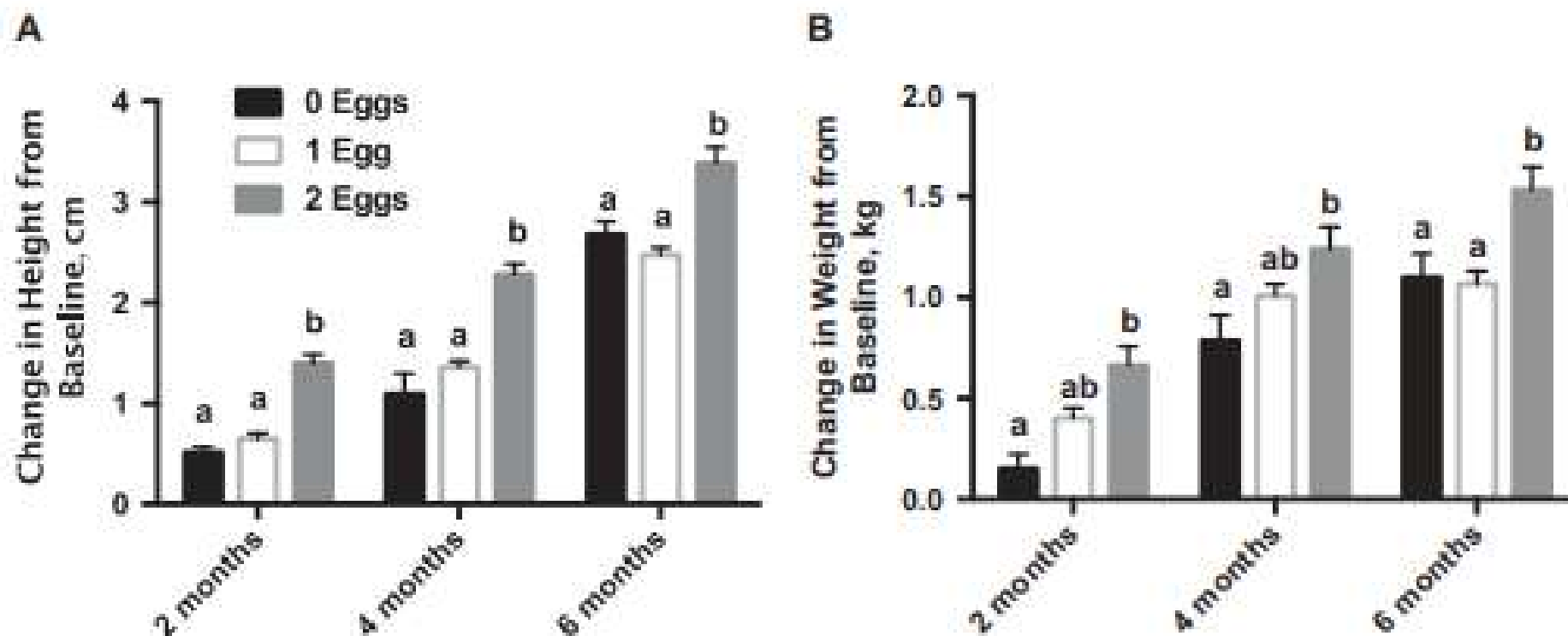
**Abbreviations:** MUAC: Mid-Upper Arm Circumference; TSF: Tricep Skinfold Thickness

## ARTICLE HISTORY

Received 22 December 2016  
Accepted 7 May 2017

## KEYWORDS

Children; Uganda; eggs; growth; mid-upper arm circumference; school feeding program; human nutrition



**Figure 2.** The effect of egg supplementation on height and weight over six months. (a) Change in height from baseline at two, four and six months. (b) Change in weight from baseline at two, four, and six months. Data expressed as means  $\pm$  SEM. Values not sharing the same letter are significantly different within a time point ( $P < 0.05$ ).

”  
**LET FOOD BE THY MEDICINE  
LET MEDICINE BE THY FOOD**

**HIPPOCRATES**



THANK YOU 😊