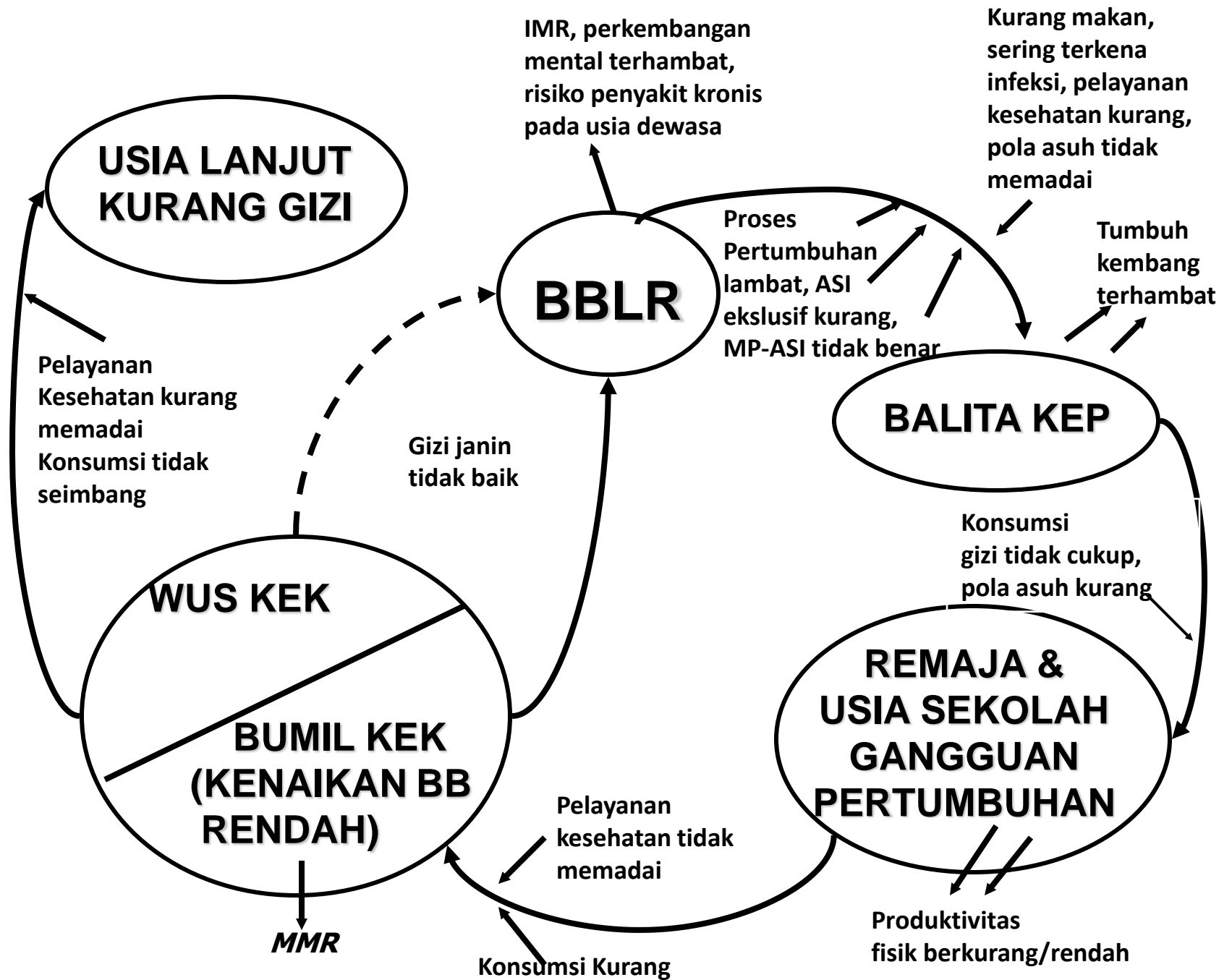


Kebutuhan gizi pada masa Tumbuh kembang

Dr Tirta Prawita Sari, MSc., SpGK

1. Kebutuhan gizi pada tumbuh kembang (CPB 29)
2. Makronutrien dan Mikronutrien untuk tumbuh kembang (khusus sistem saraf) (Sub CPB 29.1)
3. Penghitungan kebutuhan kalori dan gizi untuk tumbuh kembang (Sub CPB 29.2)
4. Kelainan tubuh (sistem saraf) akibat kekurangan/ kelebihan makronutrien dan mikronutrien (Sub CPB 29.3)





Pregnancy
Programming*
Fetal Origins*
Epigenesis

Old Age
Caloric Restriction

Childhood
Breast Feeding
Bonding
Likes/Dislikes
Intestinal Bacteria*

Maturity

- Diabesity
- Diet x Gene*
- Stress*
- CVD
- Cancer

Nutrition

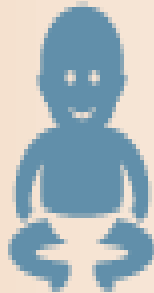
Adolescence
Eating Disorders
Food
Mood

Fertility
Mate Selection
Cultural Norms
Body Image

Nutrisi dibutuhkan untuk menghasilkan energi, untuk pertumbuhan, perbaikan jaringan yang rusak, metabolisme



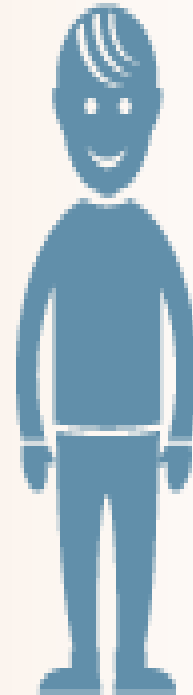
**preterm
newborn
infants**



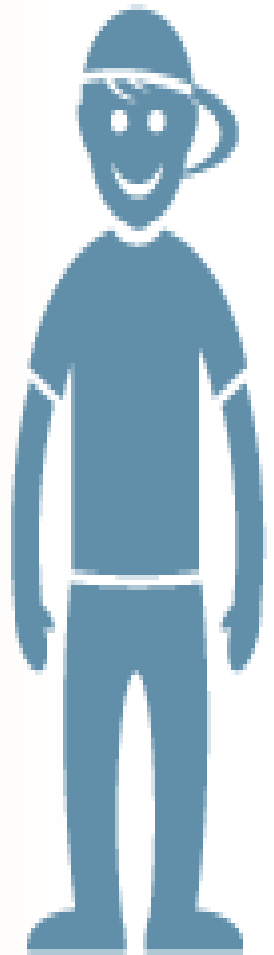
**term
newborn infants
(0 to 28 days)**



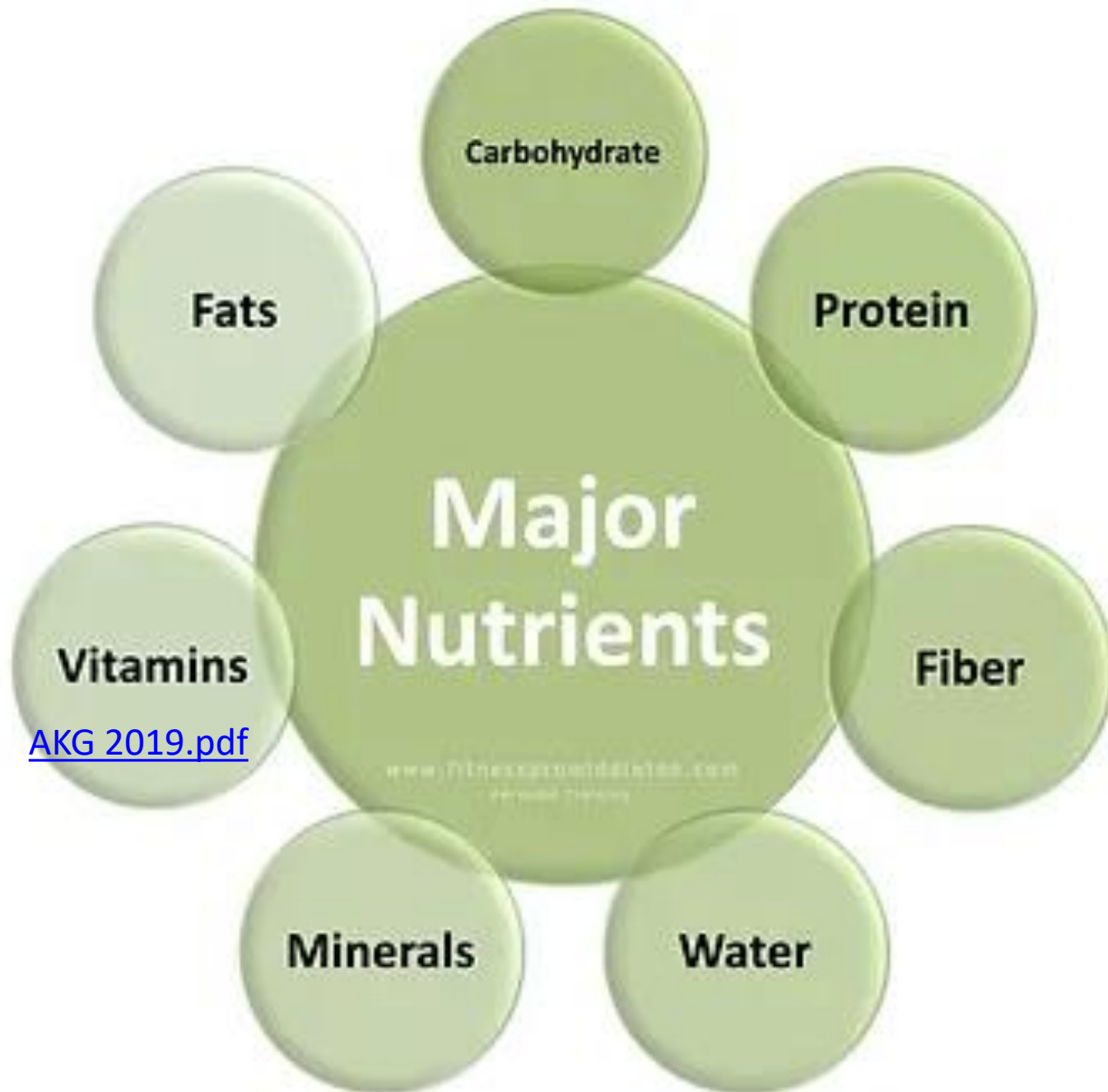
**infants and
toddlers
(> 28 days to
23 months)**



**children
(2 to 11 years)**



**adolescents
(12 to 18 years)**



[AKG 2019.pdf](#)

Batasi gula,
garam dan minyak

Gula

4 sendok makan

Garam

1 sendok teh

Minyak

5 sendok makan

2-4 porsi

+ minum air putih 8 gelas

3-4 porsi

2-3 porsi

3-4 porsi

mencuci tangan

memantau
berat badan

bermain
sepak bola

menyapu

berjalan

senam

bersepeda

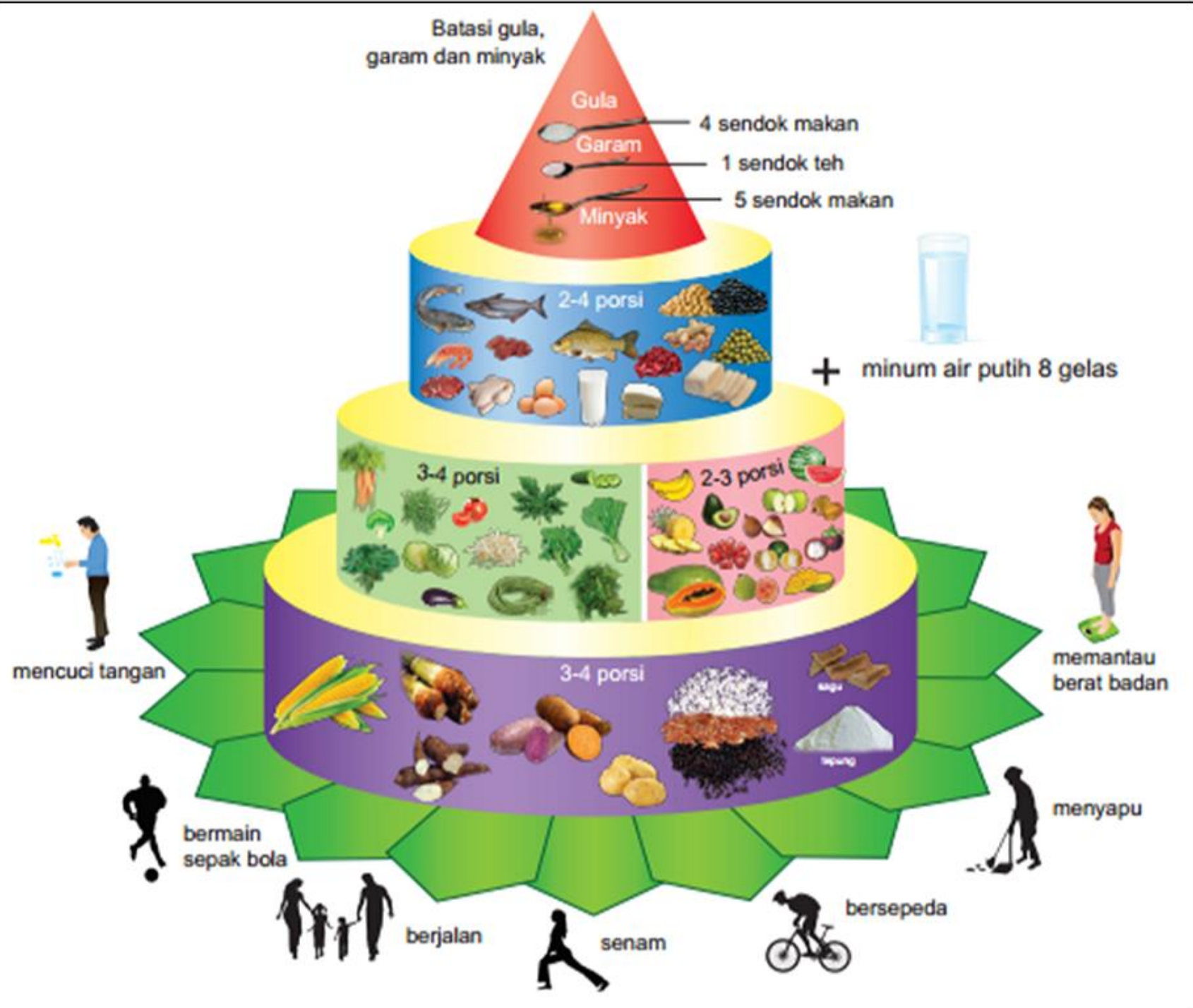
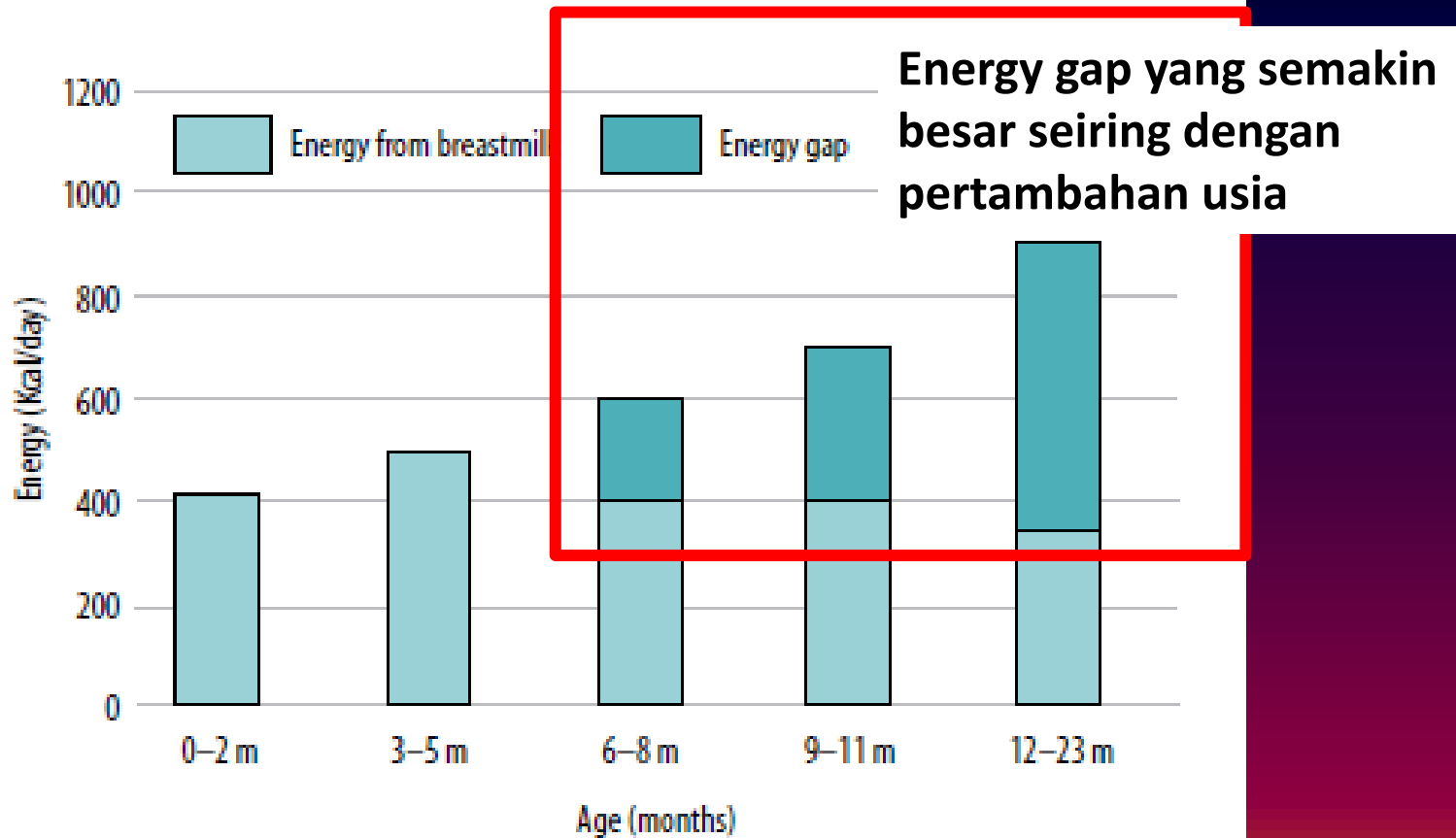


FIGURE 10

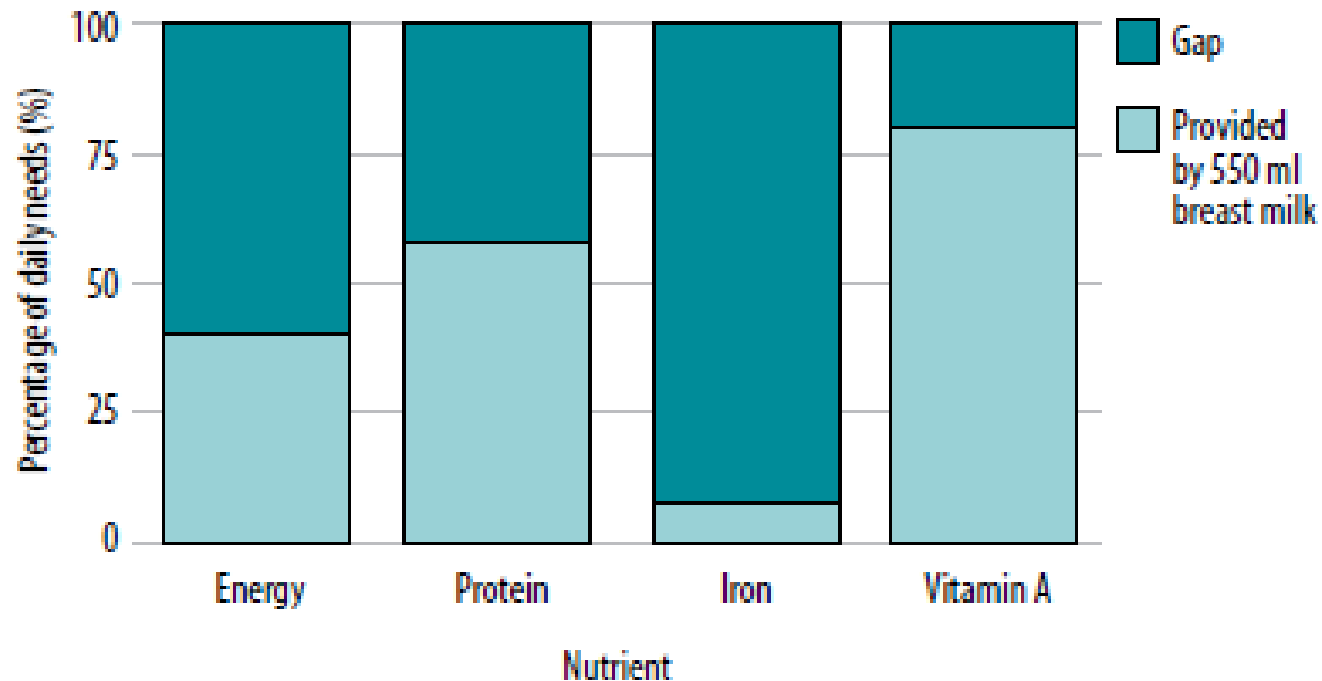
Energy required by age and the amount from breast milk



SETELAH BAYI MENCAPAI USIA 6 BULAN, ASI TIDAK LAGI MENCIKUPI KEBUTUHAN BAYI UNTUK TUMBUH OPTIMAL → MP ASI YANG ADEKUAT UNTUK MENGATASI NUTRIENT GAP YANG ADA

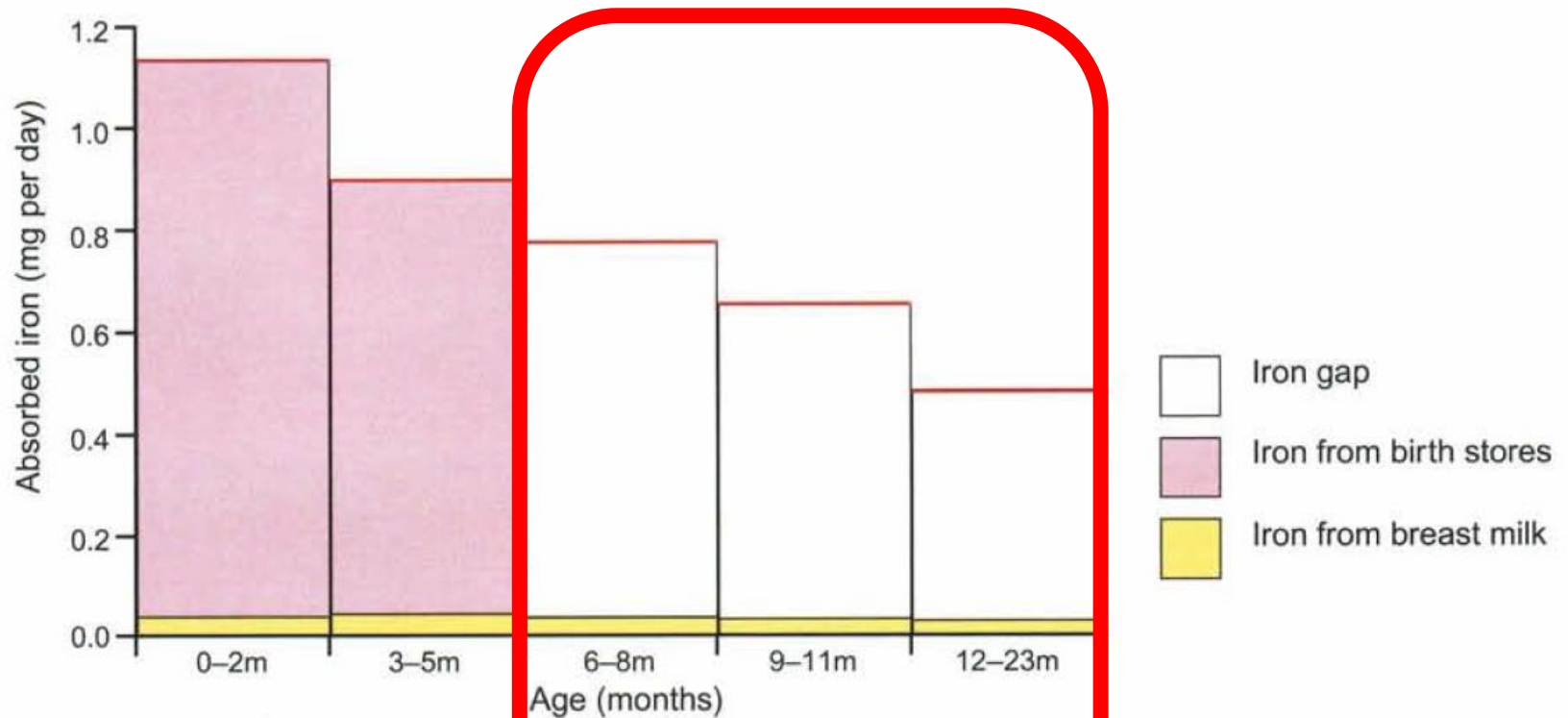
FIGURE 11

Gaps to be filled by complementary foods for a breastfed child 12–23 months



Setiap anak yang mendapatkan ASI sebanyak 550 ml setiap harinya berpotensi besar untuk kekurangan energi, protein, zat besi dan vitamin A bila tidak mendapatkan MP ASI yang adekuat

Figure 2 Absorbed iron needed (top line) and the amount from breast milk and body stores at birth.



**KELOMPOK USIA YANG RENTAN ANEMIA → GANGGUAN
PERTUMBUHAN**

Minimum Acceptable diet (MAD) among children aged 6–23 months

MAD for currently breastfeeding children



MDD

Consumed foods and beverages from at least five out of eight defined food groups* during the previous day



MMF

Consumed solid, semi-solid or soft foods at least the minimum number of times⁺ during the previous day

MAD for not currently breastfeeding children



MDD

Consumed foods and beverages from at least five out of eight defined food groups* during the previous day



MMF

Consumed solid, semi-solid or soft foods at least the minimum number of times⁺⁺ during the previous day



MMFF

Consumed at least two milk feeds[~] during the previous day

MINIMUM DIETARY DIVERSITY

GRAIN, ROOTS, TUBERS

LEGUMES AND NUTS

DAIRY PRODUCTS

FLESH FOODS

EGGS

**VITAMIN A RICH FRUITS
AND VEGETABLE**

**OTHER FRUITS AND
VEGETABLES**

**SETIDAKNYA 4 DARI 7 KELOMPOK BAHAN MAKANAN INI HARUS ADA
DALAM MP ASI ANAK**

MINIMUM MEAL FREQUENCY

2 KALI

- **UNTUK ANAK YANG MENDAPAT ASI USIA 6 – 8 BULAN**

3 KALI

- **UNTUK ANAK YANG MENDAPAT ASI USIA 9 – 23 BULAN**

4 KALI

- **UNTUK ANAK YANG TIDAK MENDAPAT ASI USIA 6 – 23 BULAN**

MEALS: TERMASUK DIDALAMNYA MAKANAN UTAMA DAN SELINGAN

Developmental course of human brain development

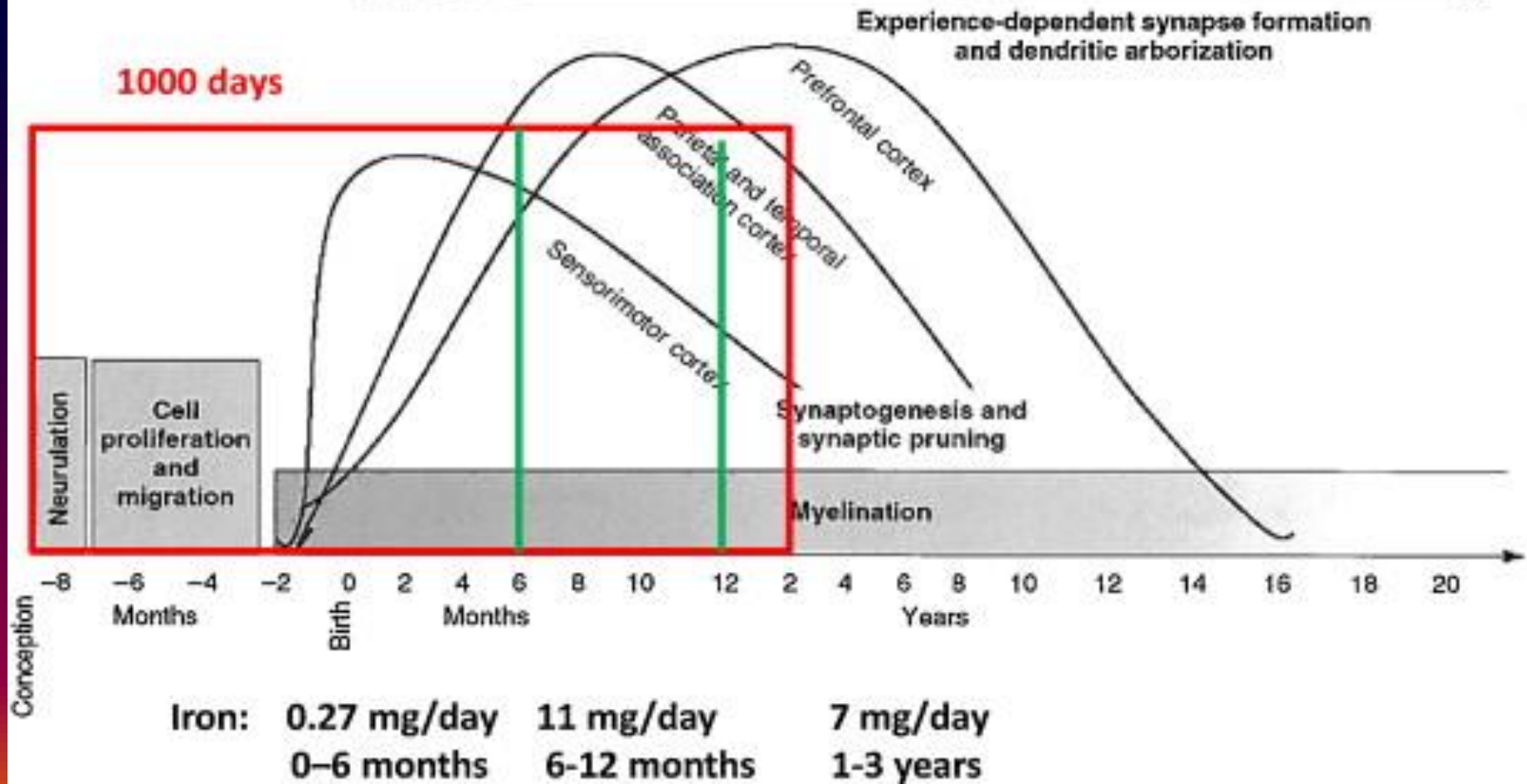


Table 1**Critical Processes During Neurodevelopment Affected by Specific Nutrients**

Neurologic Process	Cell Type	Function	Nutrient Example	At Risk During Late Gestation and 0–3 y
Anatomy				
	Neuron	Division (Neurogenesis) Migration Differentiation (Neurite outgrowth; synaptogenesis)	Protein, Carbohydrates, Iron, Copper, Zinc, LC-PUFA, Iodine, Vitamin A, Vitamin B6, Vitamin D, Vitamin C	Global, Hippocampus, Striatum, Cortex, Retina
	Oligodendrocyte	Myelination	Protein, Carbohydrates, Iron, Iodine, Selenium, Zinc, Vitamin B6, Vitamin B12	Global
Chemistry				
	Neuron Astrocyte	Neurotransmitter Concentration, Receptor, reuptake	Protein, Iron, Iodine, Copper, Zinc, Selenium, Choline, Vitamin B6, Vitamin D	Global, Hippocampus, Nucleus, Accumbens, VTA, Cortex, Cerebellum
Physiology & Metabolism				
	Neuron Oligodendrocyte	Electrical Efficiency	Glucose, Protein, Iron, Iodine, Zinc, Choline, Copper	Global

[Nutrition for brain](#)

VITAMIN CHEAT SHEET

more at cheatdaydesign.com

VITAMIN	WHAT WE USE IT FOR	GOOD SOURCES
A	For healthy vision, skin, bones, teeth & reproduction	Liver, Eggs, Fish, Milk, Carrots, Sweet Potato, Pumpkin, Spinach
B1 THIAMIN	Helps convert food into energy and is critical for nerve function	Pork, Soy, Watermelon, Tomato, Spinach
B2 RIBOFLAVIN	Helps convert food into energy and supports healthy skin, hair, blood & brain	Dairy, Meat, Green Leafy Veggies, Enriched Wheat, Oysters
B3 NIACIN	Helps convert food into energy and is essential for healthy nervous system	Beef, Chicken, Shrimp, Avocado, Peanuts, Tomato, Spinach
B6 PYRIDOXINE	Helps make red blood cells and improves sleep, appetite & mood	Chicken, Tofu, Banana, Watermelon, Fish, Legumes
B7 BIOTIN	Helps convert food to energy & break down glucose	Whole Grains, Eggs, Almonds, Soybeans, Fish
B9 FOLATE	Vital for new cell creation and DNA synthesis	Legumes, Spinach, Leafy Greens, Chickpeas, Tomato, Asparagus
B12	Breaks down fatty acids & amino acids, helps make red blood cells	Dairy, Beef, Pork, Poultry, Fish, Eggs
C	Acts as an antioxidant, helps make new cells, & improves immune system	Fruit & Fruit Juices, Pepper, Broccoli, Tomato, Spinach
D	Strengthens and helps form bones & teeth via calcium & phosphorus	Egg Yolk, Fatty Fish, Liver, Sunlight
E	Acts as an antioxidant, helps stabilize cell membranes	Nuts, Avocado, Tofu, Whole Grains, Seeds
K	Essential for blood clotting and helping to regulate blood calcium	Broccoli, Brussels Sprouts, Liver, Leafy Greens

Vitamins

Water-soluble

Non-B-Complex

Ascorbic acid (vitamin C)

B-Complex

Energy-releasing

- Thiamine (vitamin B₁)
- Riboflavin (vitamin B₂)
- Niacin (vitamin B₃)
- Biotin
- Pantothenic acid

Hematopoietic

- Folic acid
- Vitamin B₁₂

Other

- Pyridoxine (vitamin B₆)
- Pyridoxal
- Pyridoxamine

Fat-soluble

- Vitamin A (retinol, β -carotenes)

- Vitamin D (cholecalciferol)

- Vitamin K (phylloquinones, menaquinones)

- Vitamin E (tocopherols)

Infant Growth

- Occurs in genetically predetermined way
 - Can be compromised by nutritional status
 - calorie or nutrient undernutrition or imbalance.
- Undernutrition:
 - First affects weight gain
 - If severe enough, affects linear growth

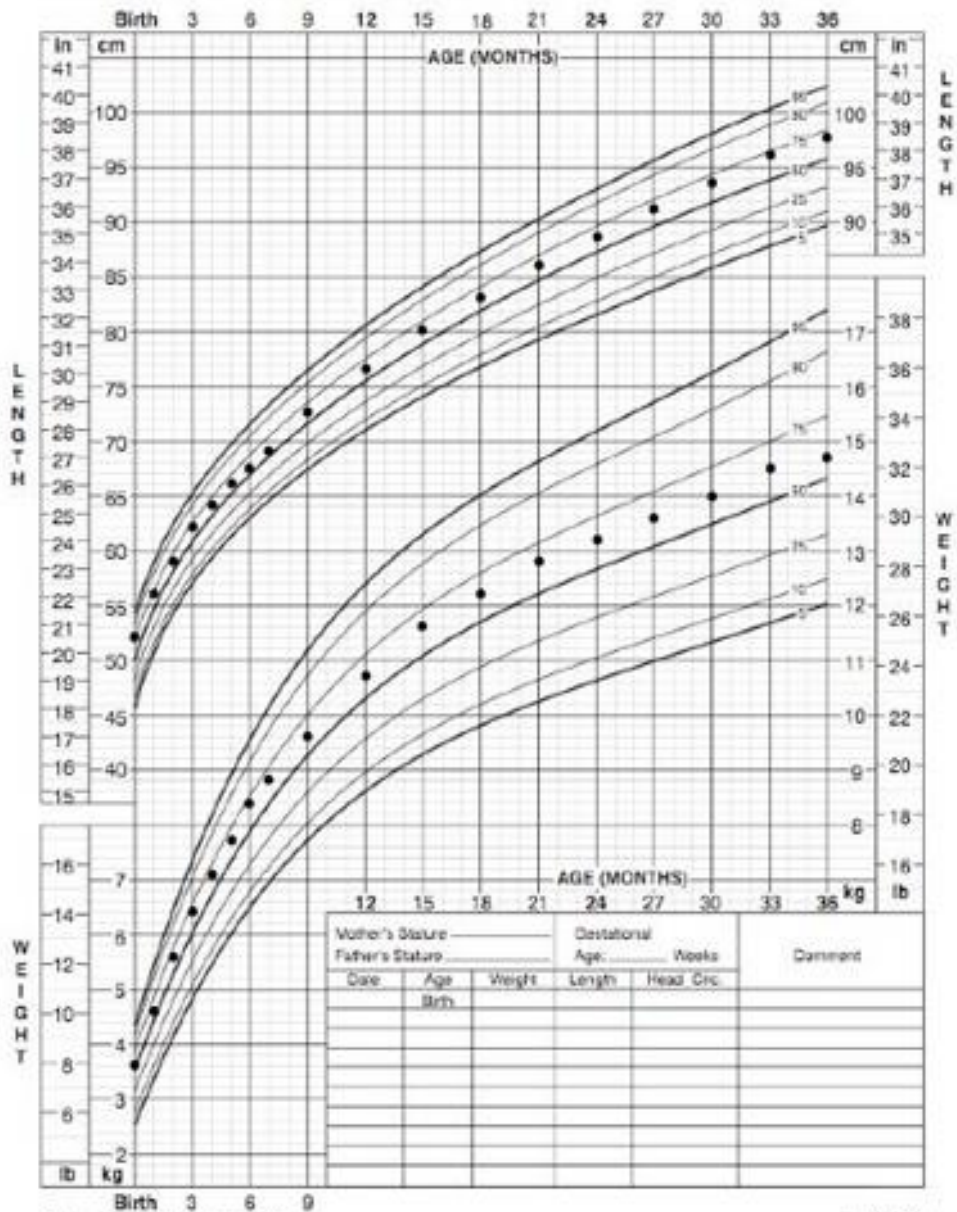
Growth

- After birth genetic influences are target seeking
- Catch Up Growth: Grow faster to get closer to genetically determined size
 - Usually shift growth channels by 3 to 6 months
- Lag Down Growth:
 - Usually shift growth channels by 13 months

Birth to 36 months: Boys
Length-for-age and Weight-for-age percentiles

NAME _____

RECORD # _____



Mother's Stature _____		Gestational Age _____ Weeks		Comment
Father's Stature _____				
Date	Age	Weight	Length	Head Circ.
Birth				

Published May 30, 2000 (modified 4/20/01)
SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000)
<http://www.cdc.gov/growthcharts>



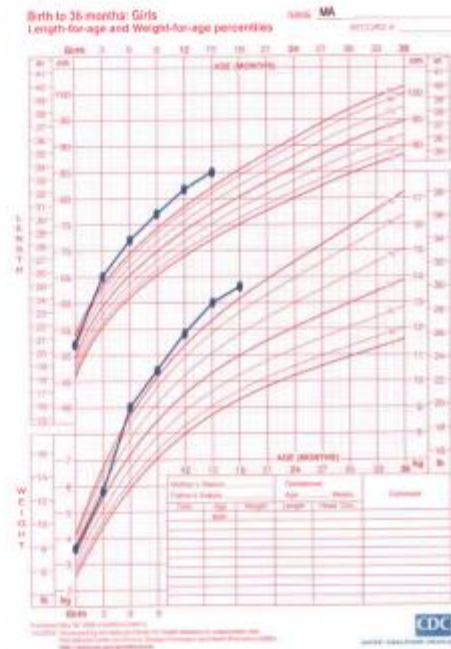
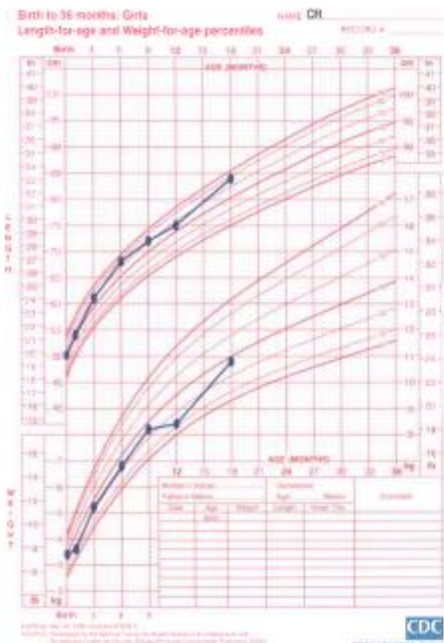


FIGURE 6-1 Two girls born just 1 month apart with only a 1-lb difference in birth weight; note the marked difference in growth. (The girls are approximately 20 months of age.) In the growth chart, note M.A.'s early catch-up growth to above the 95th percentile for height and weight by 6 months of age. In addition, note the effect of an illness on C.R.'s weight gain and linear growth at the age of 12 months, as well as the subsequent catch-up growth. (Data from *The National Center for Health Statistics, in collaboration with the National Center for Chronic Disease Prevention and Health Promotion, 2000, <http://www.cdc.gov/growthcharts>.)*

Rules of Thumb

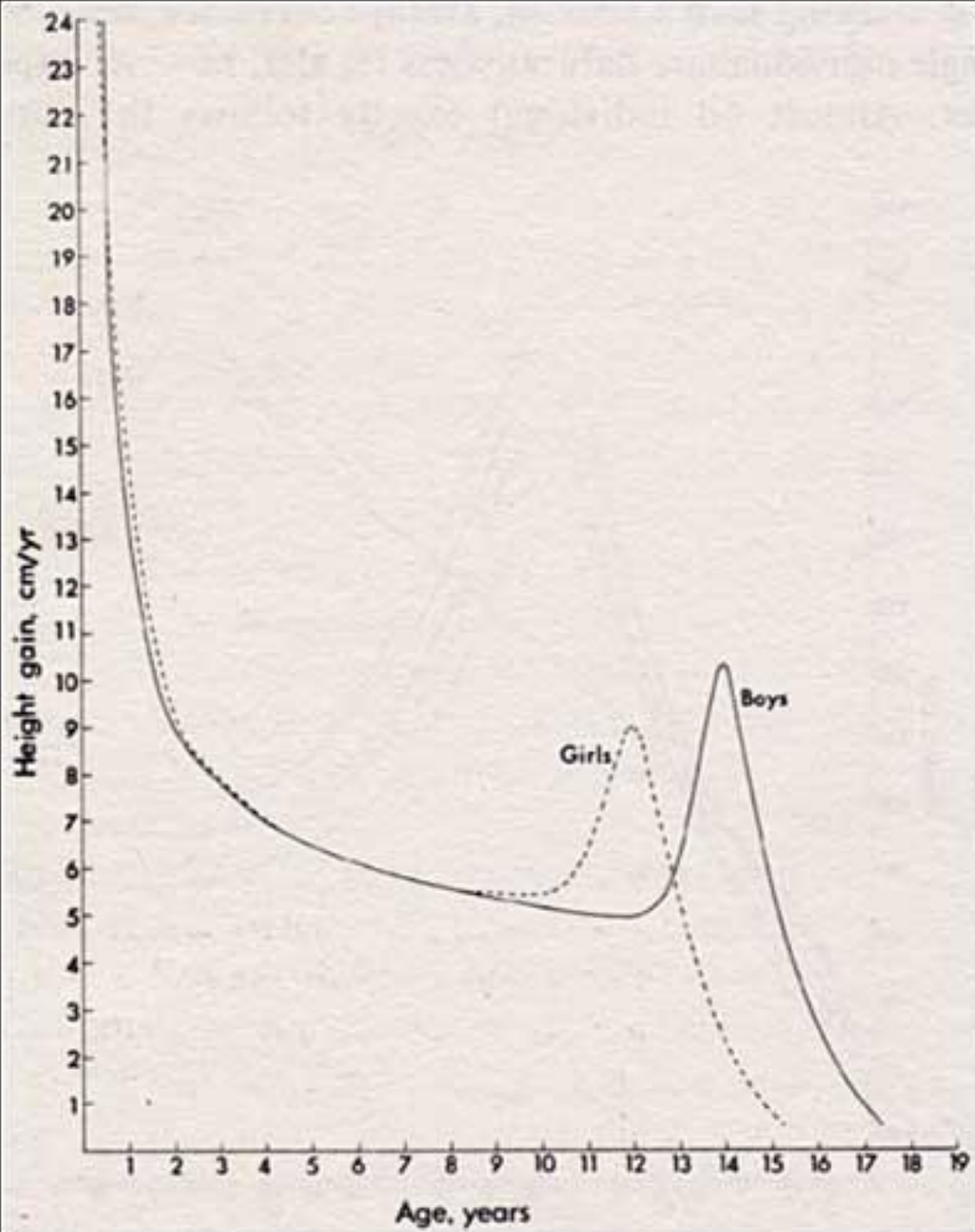
- Weight:
 - 4 months: Double birth weight
 - 12 months: Triple birth weight
 - then 2.3 kg/year until 9 or 10
 - then adolescent growth spurt

Growth: Height

- 1 year: 50% increase in height
- 4 years: double birth length
- 13 years: triple birth length
- Adolescence: rapid increase

Adolescent Growth Spurt

- 2 years later in males than females
- intensity, duration highly variable
- Growth continues until after the epiphysis closes
- Generally by 4 years post onset of puberty



Collecting and Assessing Food Intake

- 24-hour recall
- Diet history
- Diet Record 1, 3 and 7 day or more
- FFQ

Who should be asked about Diet Intake?

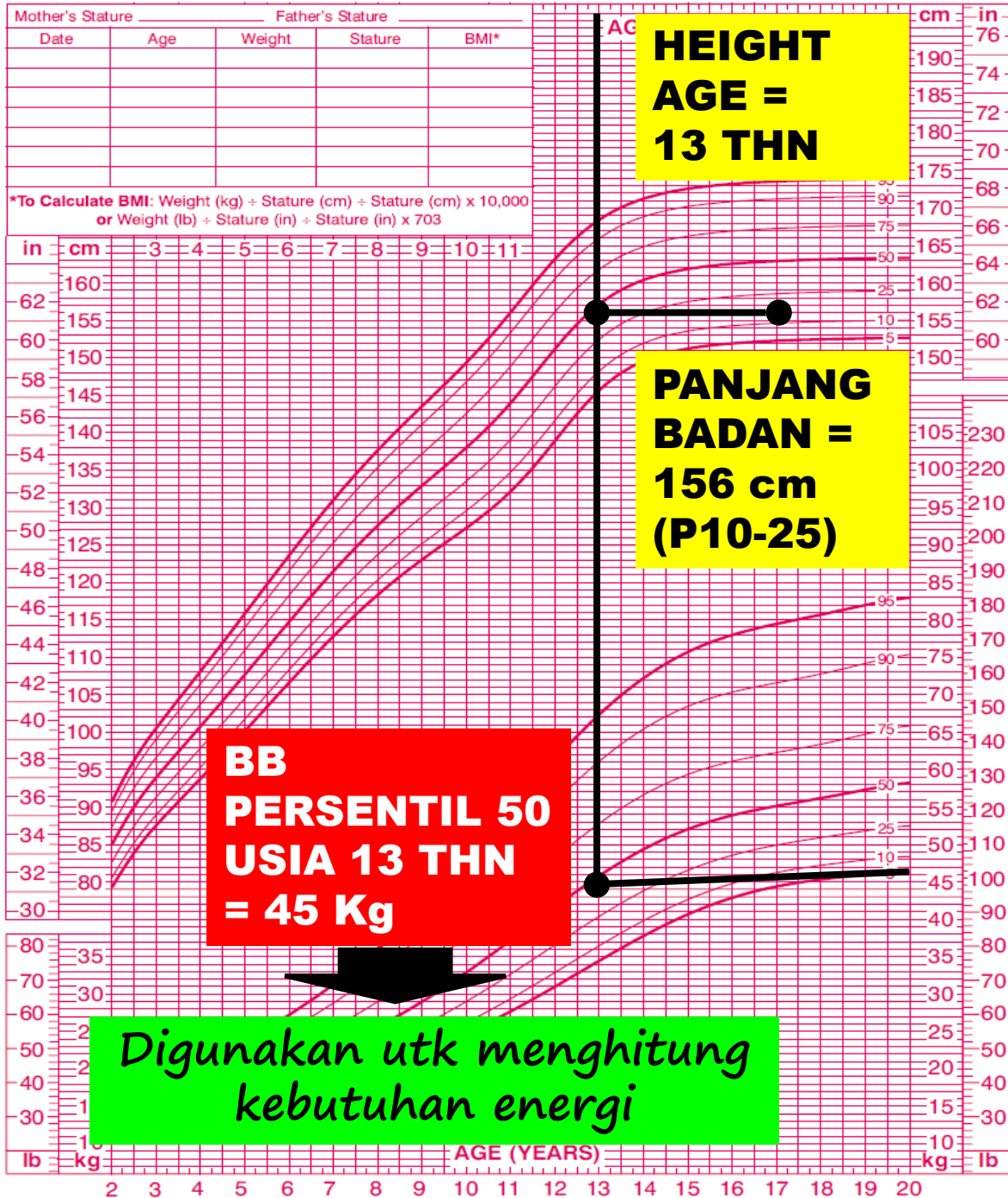
- If the subject is a boy < 13 or 14 years of age, the caregiver should be asked.
- If a girl under 12 years of age, caregiver.
- Why?

After diet has been taken accurately, then analysis is required

- How?
- Food Guide Pyramid
- Nutrient analysis using food composition table/ computer analysis

Energy requirement/kg BW

age	male	female
0 – 1	110 - 120	110 – 120
1 – 3	100	100
4 – 6	90	90
7 – 9	80 - 90	60 – 80
10 – 14	50 -70	40 - 65
14 – 18	40 - 50	40



S T A T U R E

S T A T U R E

W E I G H T

W E I G H T

AGE (YEARS)

Protein

- Infant requirements based on amount found in breast milk
- Extrapolation from nitrogen balance studies
- RDA's
- Age Protein
- ≤ 6 mo 2.2 g/kg
- 6-12 months 1.6 g/kg
- 1 – 10 yrs 1 – 2 g/kg
- > 10 yrs 0,85 – 0,95 g/kg

Fat

- No RDA but 40 to 50 % of infant Kcals
- Fat energy spares protein from being used as an energy source
- 45 to 50 % of infant formulas kcals are from fat
- 55% of human milk kcals are from fat
- Essential fat recommendation > 1.2% of kcals (linoleic and linolenic acid)

Fats, Oils & Sweets
USE SPARINGLY

KEY

■ Fat (naturally occurring and added)

▼ Sugars (added)

These symbols show fats and added sugars in foods.

**Milk, Yogurt &
Cheese Group**
2-3 SERVINGS



**Meat, Poultry, Fish, Dry Beans,
Eggs & Nuts Group**
2-3 SERVINGS



Vegetable Group
3-5 SERVINGS



Fruit Group
2-4 SERVINGS



**Bread, Cereal,
Rice & Pasta
Group**
**6-11
SERVINGS**



Jumlah bahan makanan dari tiap kelompok makanan untuk anak usia 2 – 5 tahun

Energi	1000	1200	1400	1600
Nasi & sejenisnya	300 gram/setara	400 gram/setara	500 gram/setara	500 gram/setara
Sayuran	1 gelas	1,5 gelas	1,5 gelas	2 gelas
Buah	1 gelas	1 gelas	1,5 gelas	1,5 gelas
Susu	2 gelas	2 gelas	2 gelas	2 gelas
Daging & kacang2an	200 gram/setara	300 gr/setara	400 gram/setara	500 gram/setara

When to reduce fat intake in kids?

- Fat shouldn't be a concern until after 2 years of age.
 - Then start incorporating lower fat food items into the diet
 - reduced fat milk and milk products are ok
 - If these are accepted early, the risk of chronic disease could be reduced
 - Controversy: Am Ac of Pediatrics says don't worry until after puberty: too late

Water

- Age Amount
- 3 days 80-100 ml/kg/day
- 10 days 125-150 ml/kg/day
- 3 mo 140-160 ml/kg/day
- 6 mo 130/155 ml/kg/day
- 9 mo 125-145 ml/kg/day
- With BF and formula: none additionally needed

Baseline fluid needs

Weight in Kg	Fluid needs
1 – 10 kg	100 ml/kg
11 – 20 kg	1000 mL + 50 ml/kg for each > 10 kg
> 20 kg	1500 ml + 20 ml/kg for each kg > 20 kg