Dasar-dasar gizi masyarakat

Dr.dr. JokoWahyu Wibowo, MKes

STATUS GIZI

- ZAT GIZI (NUTRIENT)

  Adalah zat-zat makanan yang diperlukan oleh tubuh untuk berbagai proses pertumbuhan, aktivitas, pemeliharaan proses biologi, penyembuhan penyakit, daya tahan tubuh
- GIZI (NUTRITURE/NUTRITION)

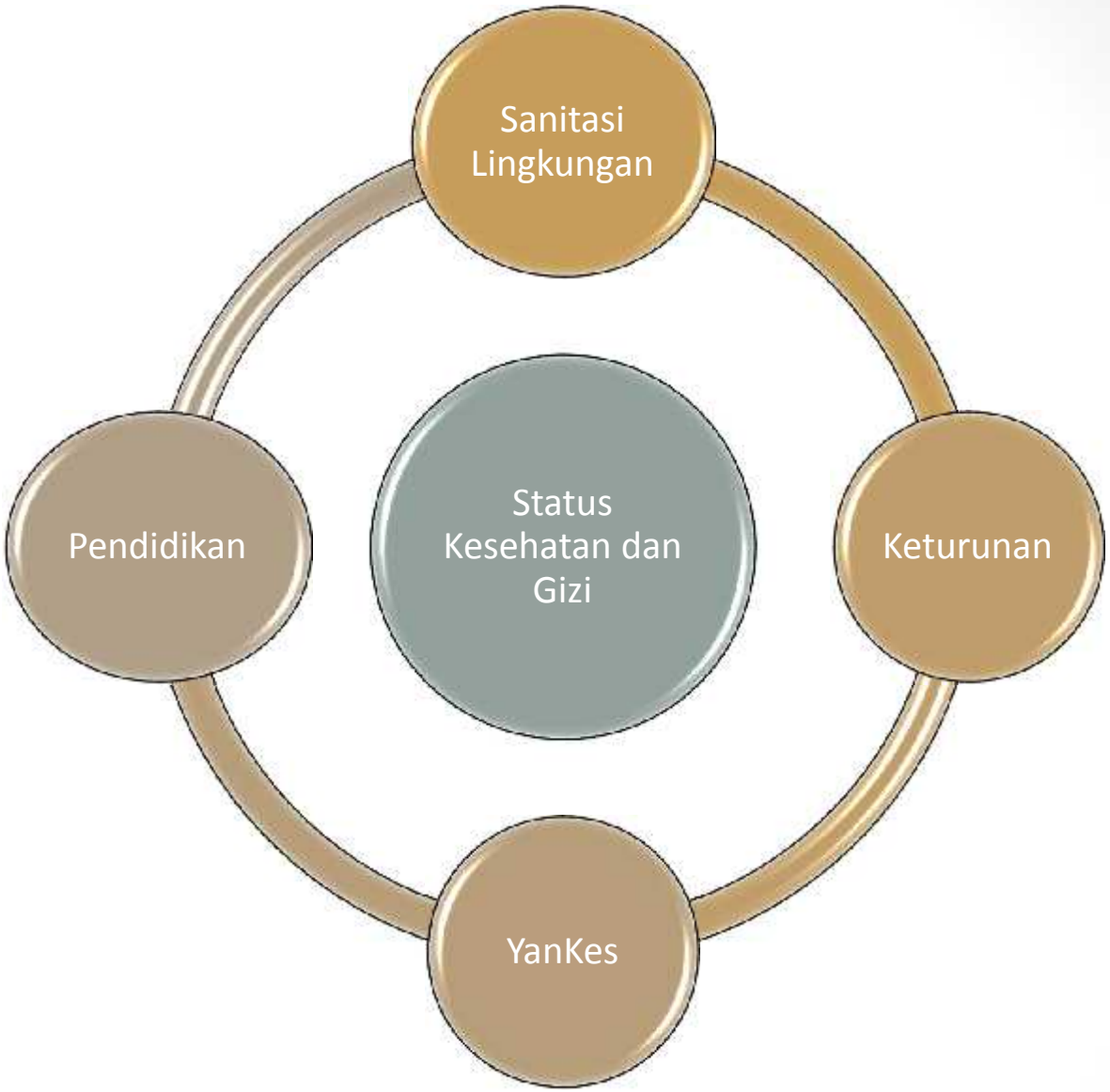
  Adalah keseimbangan antara zat gizi yang masuk ke dalam tubuh (intake) dan yang digunakan untuk keperluan proses pertumbuhan, aktivitas dan lainnya (dari segi kuantitas maupun kualitas)

Lanjutan…

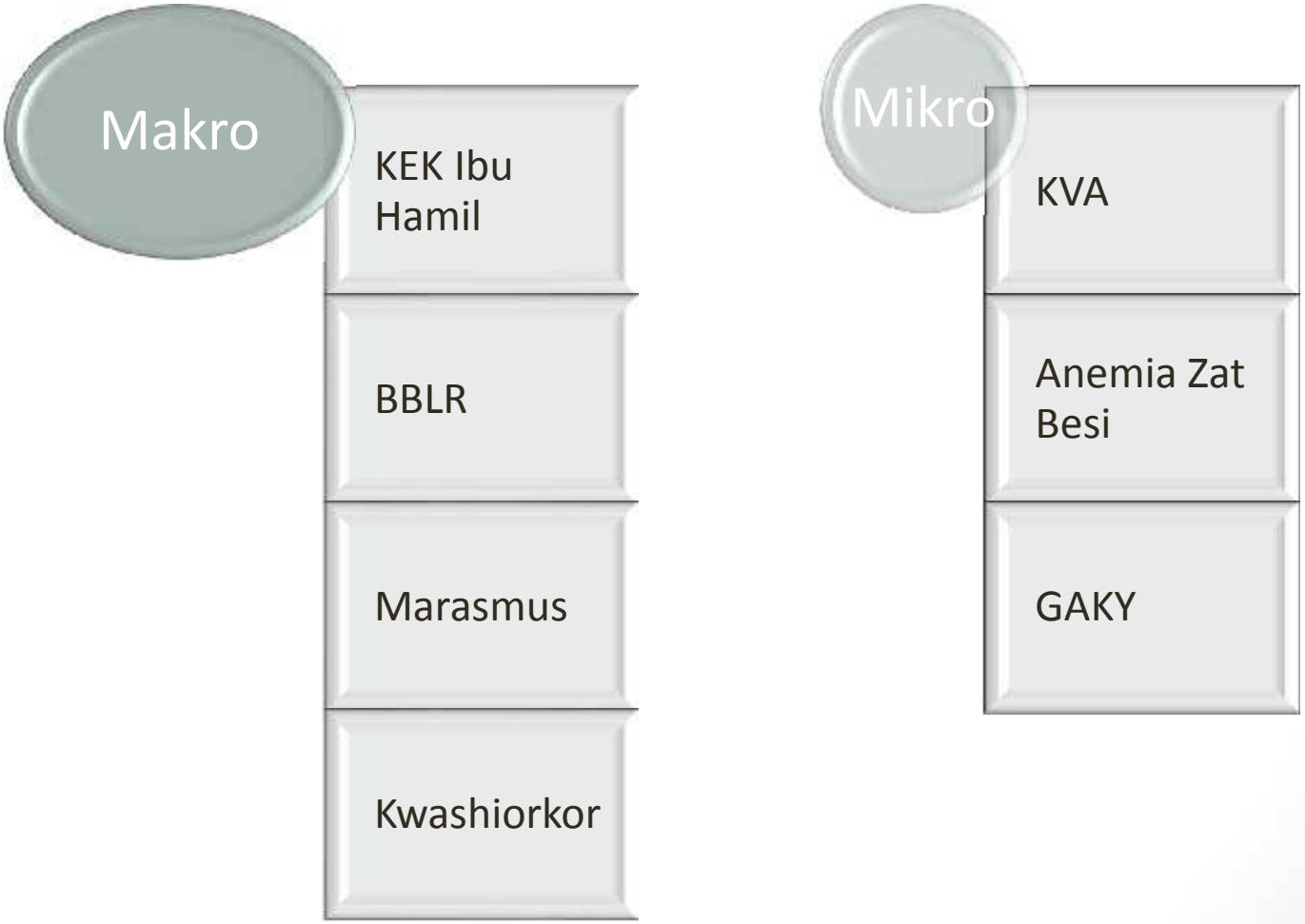
- STATUS GIZI (NUTRITION STATUS)

  Adalah keadaan yang diakibatkan oleh keseimbangan antara asupan dan kebutuhan zat gizi oleh tubuh
- INDIKATOR STATUS GIZI

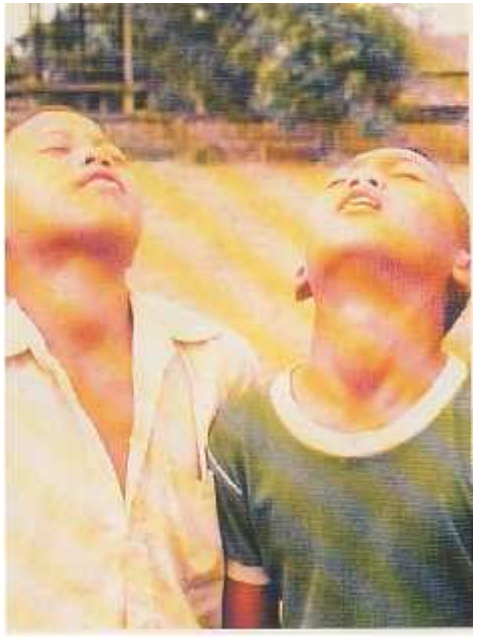
  Adalah tanda-tanda yang dapat memberikan indikasi tentang status gizi seseorang

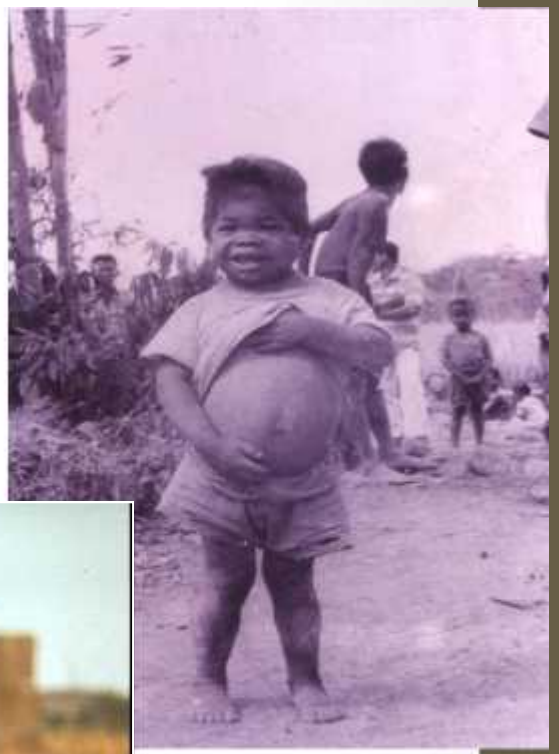

Sanitasi Lingkungan
Pendidikan
Status Kesehatan dan Gizi
Keturunan
YanKes

MASALAH GIZI DI MASYARAKAT

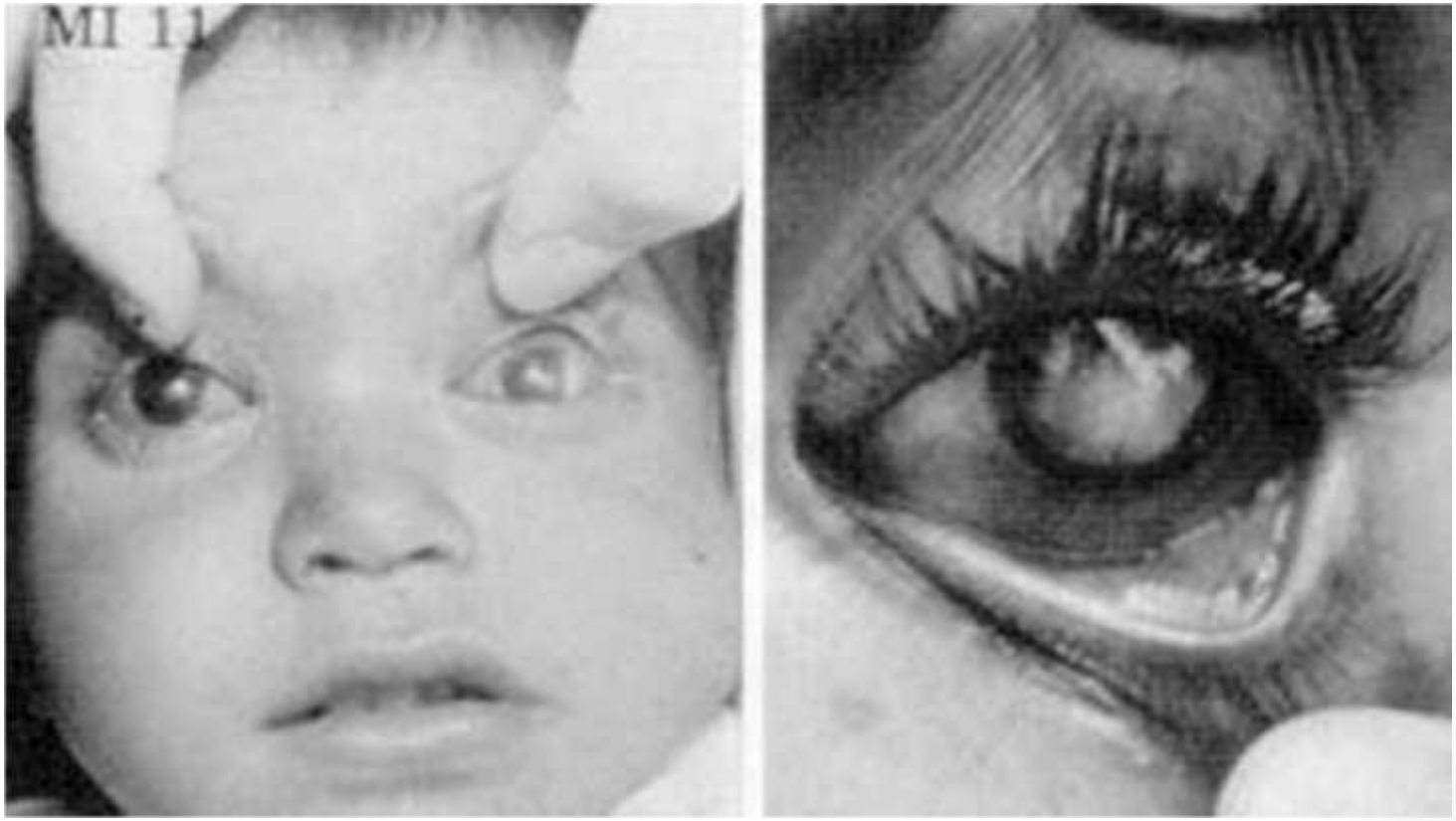


Iodine deficiency disorders





Kurang vitamin A



FAKTOR-FAKTOR YANG MEMPENGARUHI MASALAH GIZI

- Faktor Manusia/ Host (pejamu)

  Faktor-faktor yang mempengaruhi kondisi tubuh manusia:

  1. genetis
  2. umur
  3. jenis kelamin
  4. kelompok etnik
  5. fisiologis
  6. imunologik
  7. kebiasaan seseorang

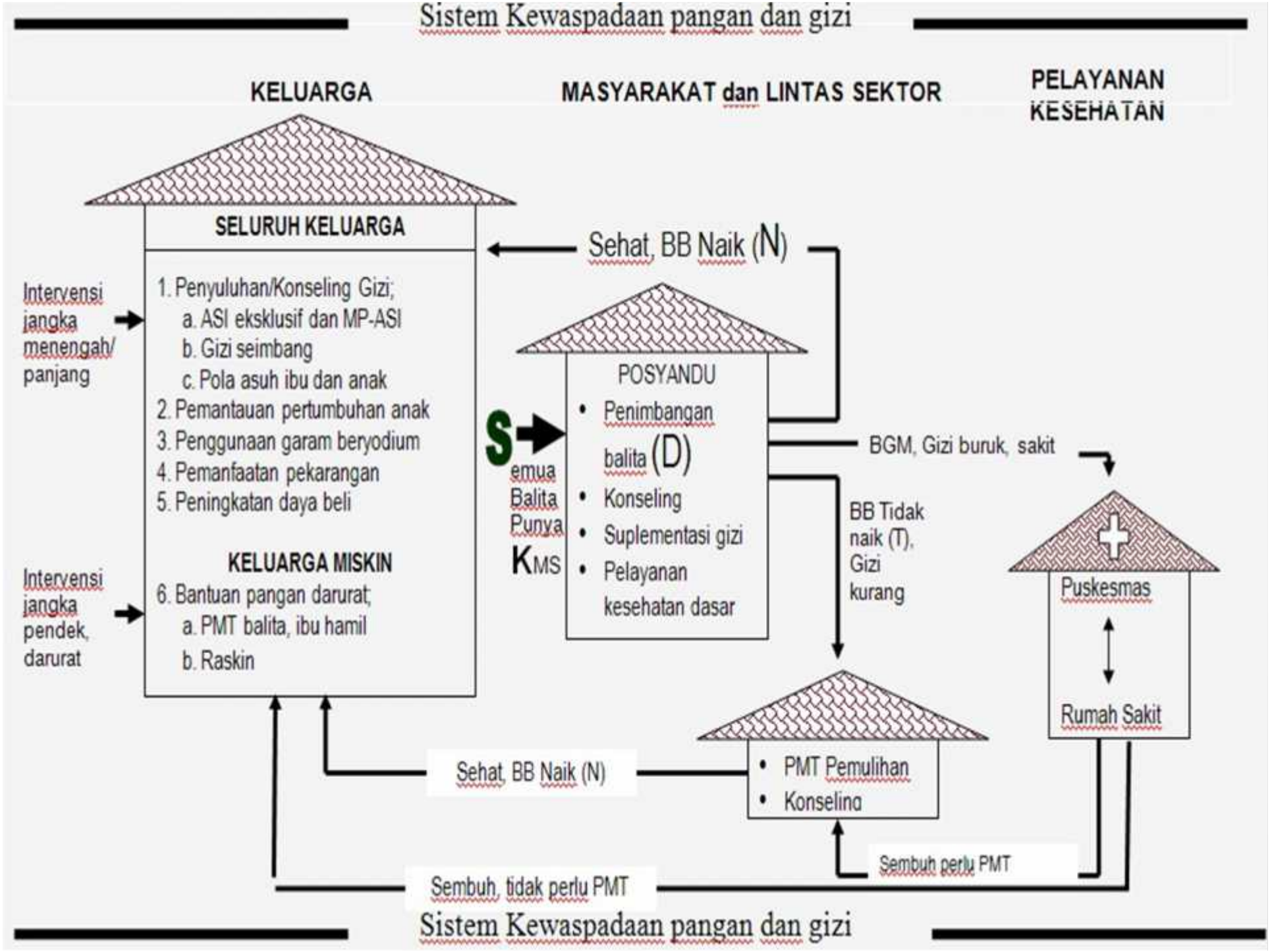
- Faktor Sumber/ Agent (zat gizi kurang/lebih, penyakit)
- Faktor Lingkungan/ Environment (fisik, biologis, ekonomi, bencana alam)

  - Faktor yang berpengaruh terhadap ada tidaknya ‘agent’
  - Faktor yang berpengaruh terhadap kebutuhan gizi ‘pejamu’
  - Faktor yang berpengaruh terhadap konsumsi makanan ‘pejamu’

Lanjutan...

- **Ketersediaan bahan makanan yang kurang di pasaran:**
  - **Krisis ekonomi yang berkepanjangan**
  - **Kegagalan produksi pertanian**
- **Ketersediaan bahan makanan yang kurang di tingkat rumah tangga/ individu**
  - **Keadaan sosial ekonomi kurang memadai**
  - **Daya beli yang kurang/ menurun**
  - **Tingkat pengetahuan yang kurang**
  - **Kebiasaan/ budaya yang merugikan**
- **Penyakit-penyakit infeksi**

Sistem Kewaspadaan pangan dan gizi



Sistem Kewaspadaan pangan dan gizi

INDIKATOR STATUS GIZI

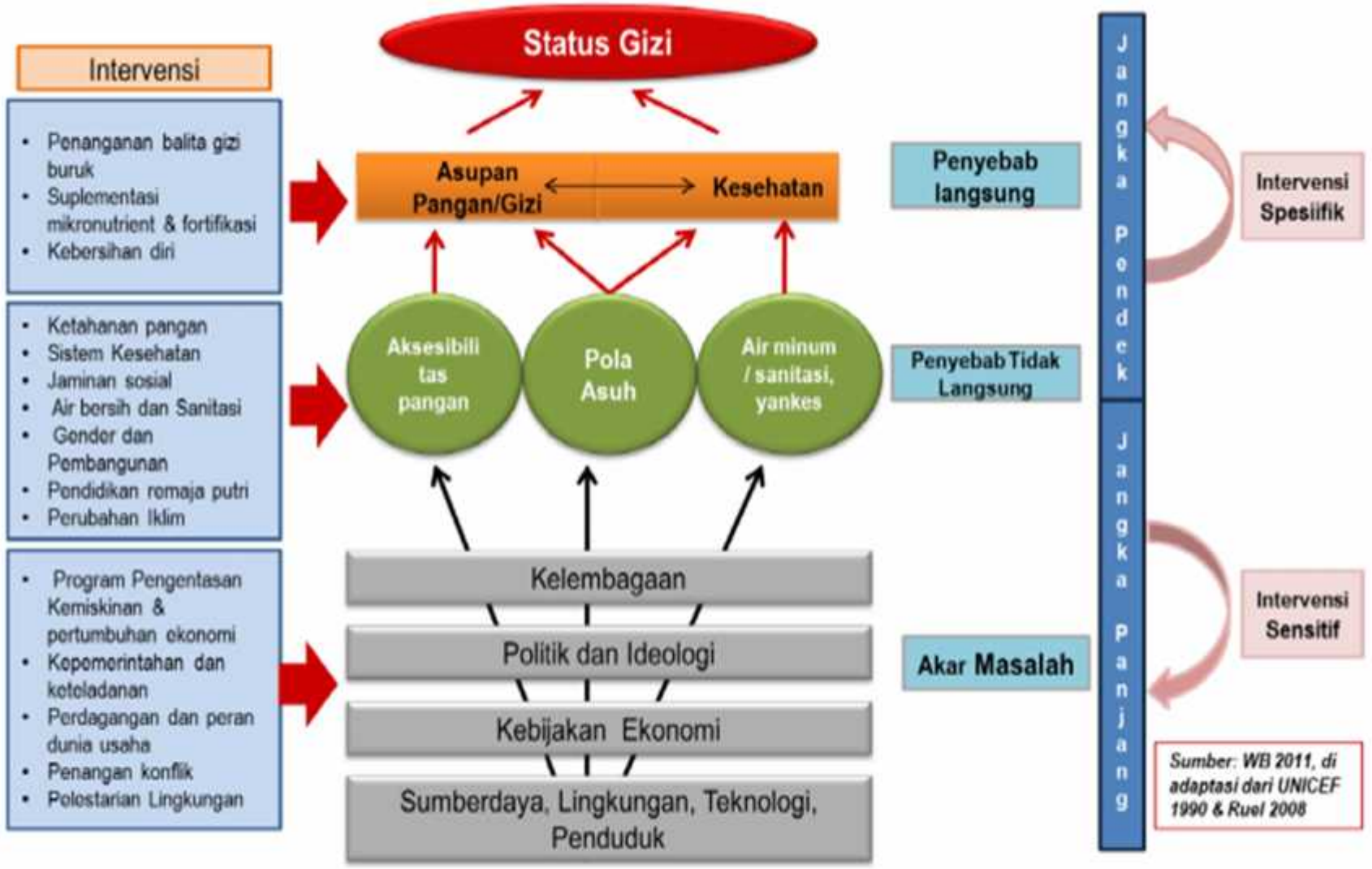
- Tanda-tanda yang memberikan indikasi tentang keseimbangan antara intake dan kebutuhan gizi (nutriture)
- Didasarkan pada dampak dari nutriture (pertumbuhan fisik, perkembangan mental, motorik dan perilaku serta proses biologis).
- Dapat diukur secara kuantitatif maupun kualitatif dengan metode pengukuran/ observasi yang baku dan tersedia rujukannya.
- Metode pengukuran yang digunakan ada yang mudah, murah dan secara luas. Ada pula yang memerlukan keahlian khusus dan mahal biayanya.

- **Beberapa contoh indikator status gizi:**

- Antropometri (gambaran pertumbuhan fisik)
- Kadar Hb darah
- Pembesaran kelenjar gondok
- Kadar vitamin A dalam darah
- Aktivitas (gambaran motorik)
- Perkembangan mental dan perilaku (psikologis)

GAMBAR 1.

KERANGKA PIKIR PENYEBAB MASALAH GIZI



Sumber: World Bank 2011, diadaptasi dari UNICEF 1990 & Ruel 2008 dan disesuaikan dengan kondisi Indonesia

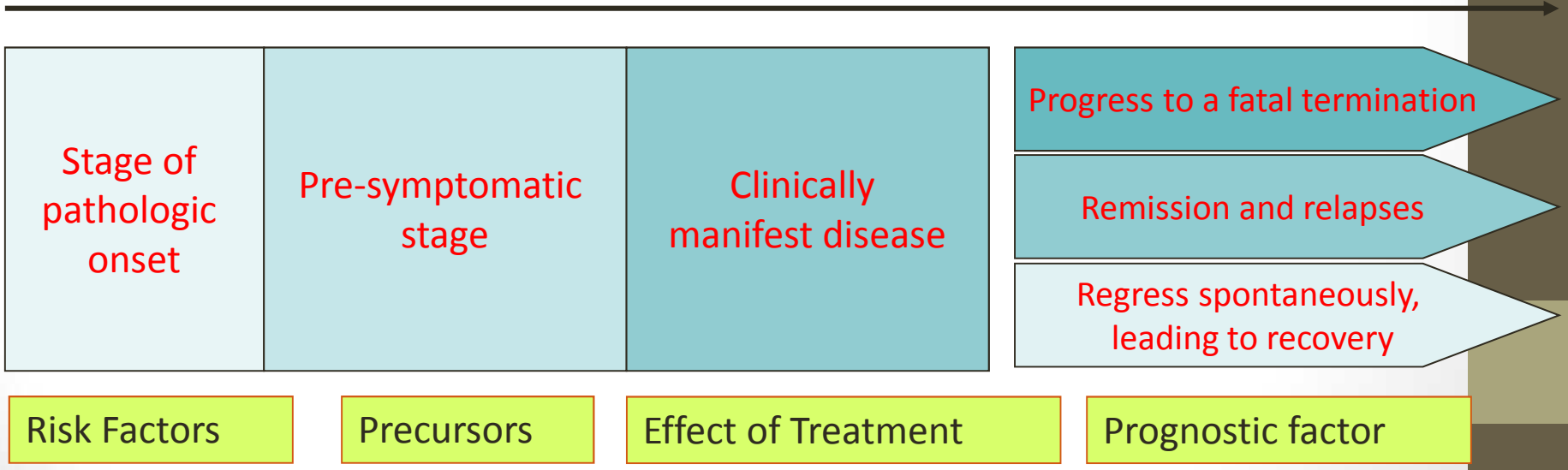
THE NATURAL HISTORY OF A DISEASE			
STIMULUS to the HOST	HOST REACTION		RECOVERY
interrelation of Agent, Host and Environmental factors	Latent Period (Pre-symptomatic)	Symptoms, Signs(Clinical)	with or without Defects, Disability
PREPATHOGENESIS	PERIOD OF PATHOGENESIS		
Health Promotion Specific Protection	Early Diagnosis and Prompt Treatment,		Disability Limitation Rehabilitation
PRIMARY PREVENTION	SECONDARY PREVENTION	TREATMENT	TERTIARY PREVENTION

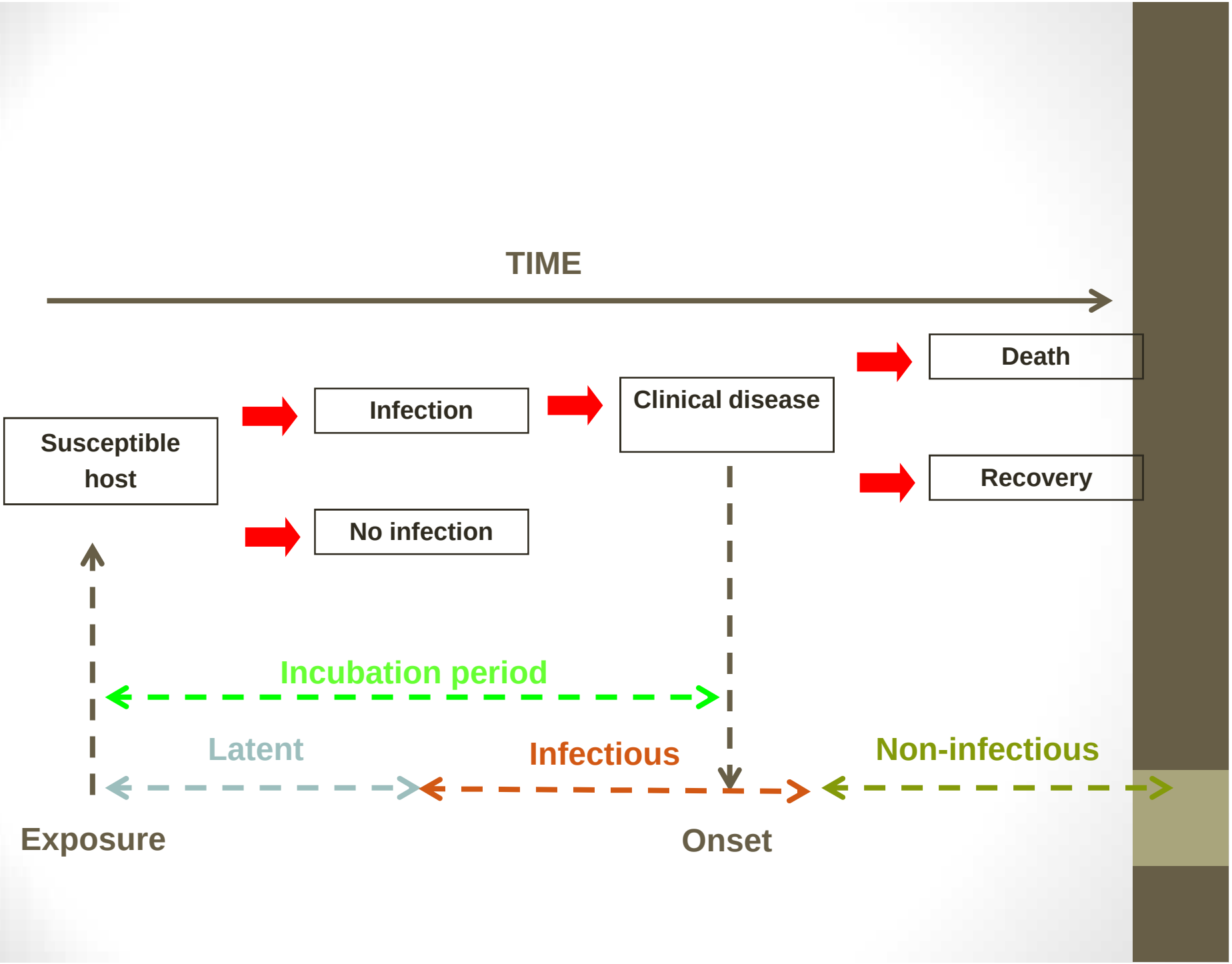
(Leavell's Level of Application of Preventive Medicine)

Definition & Stages

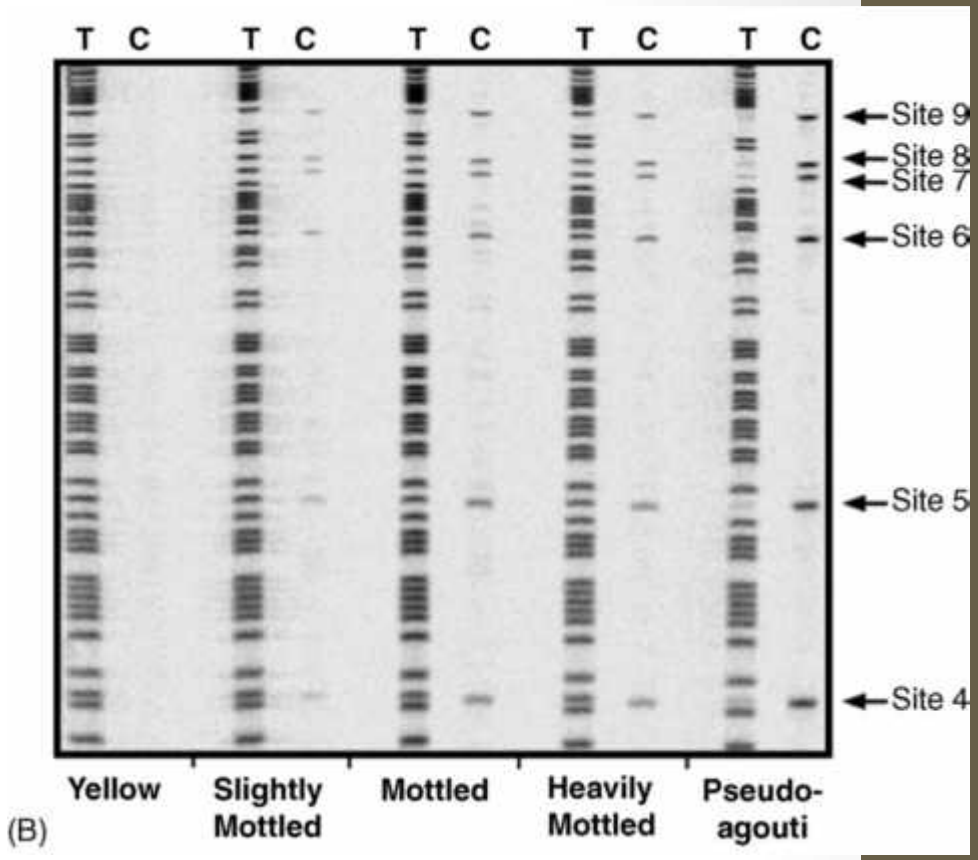
- Definition ; The course of a disease from onset (inception) to resolution.

- Stages

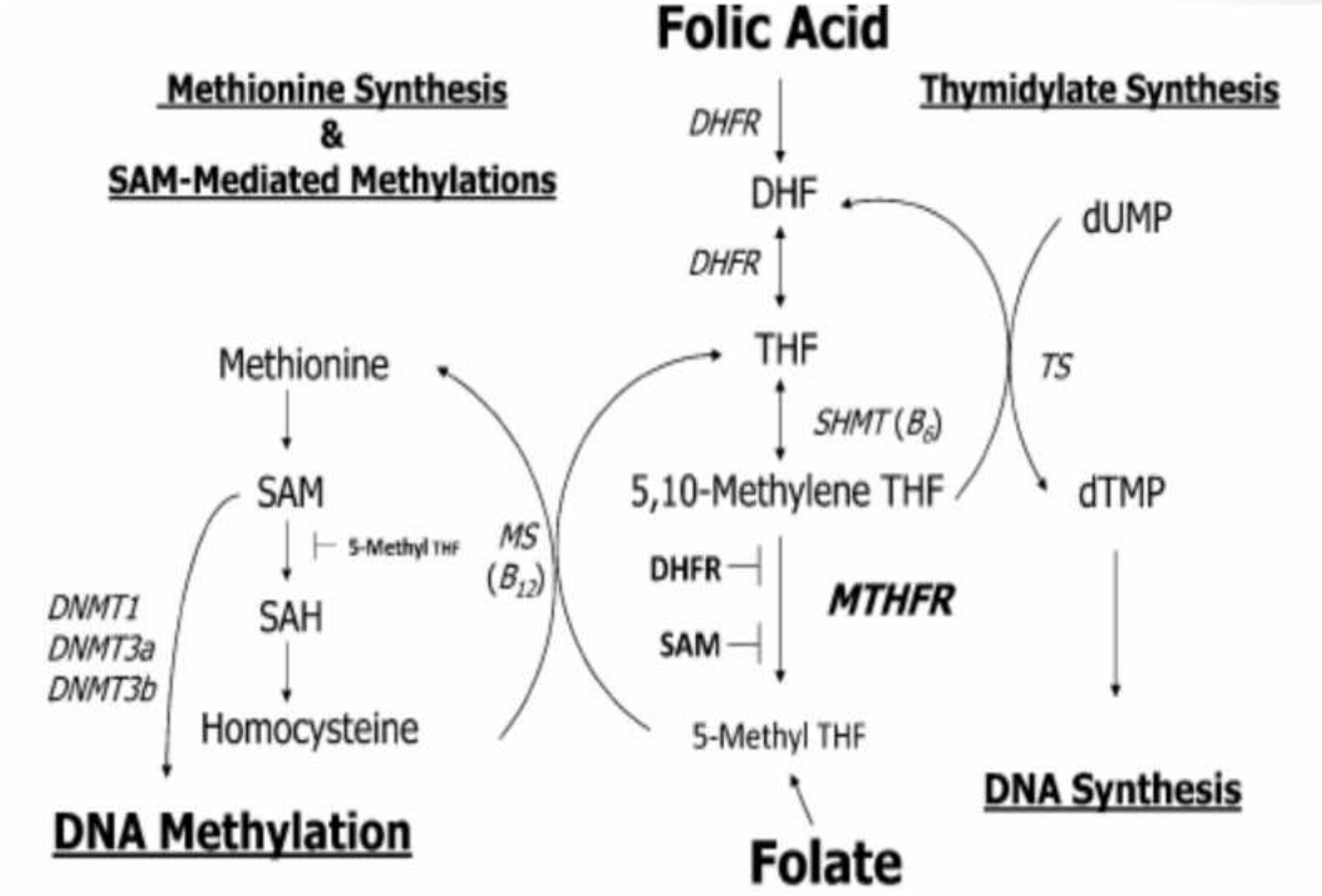


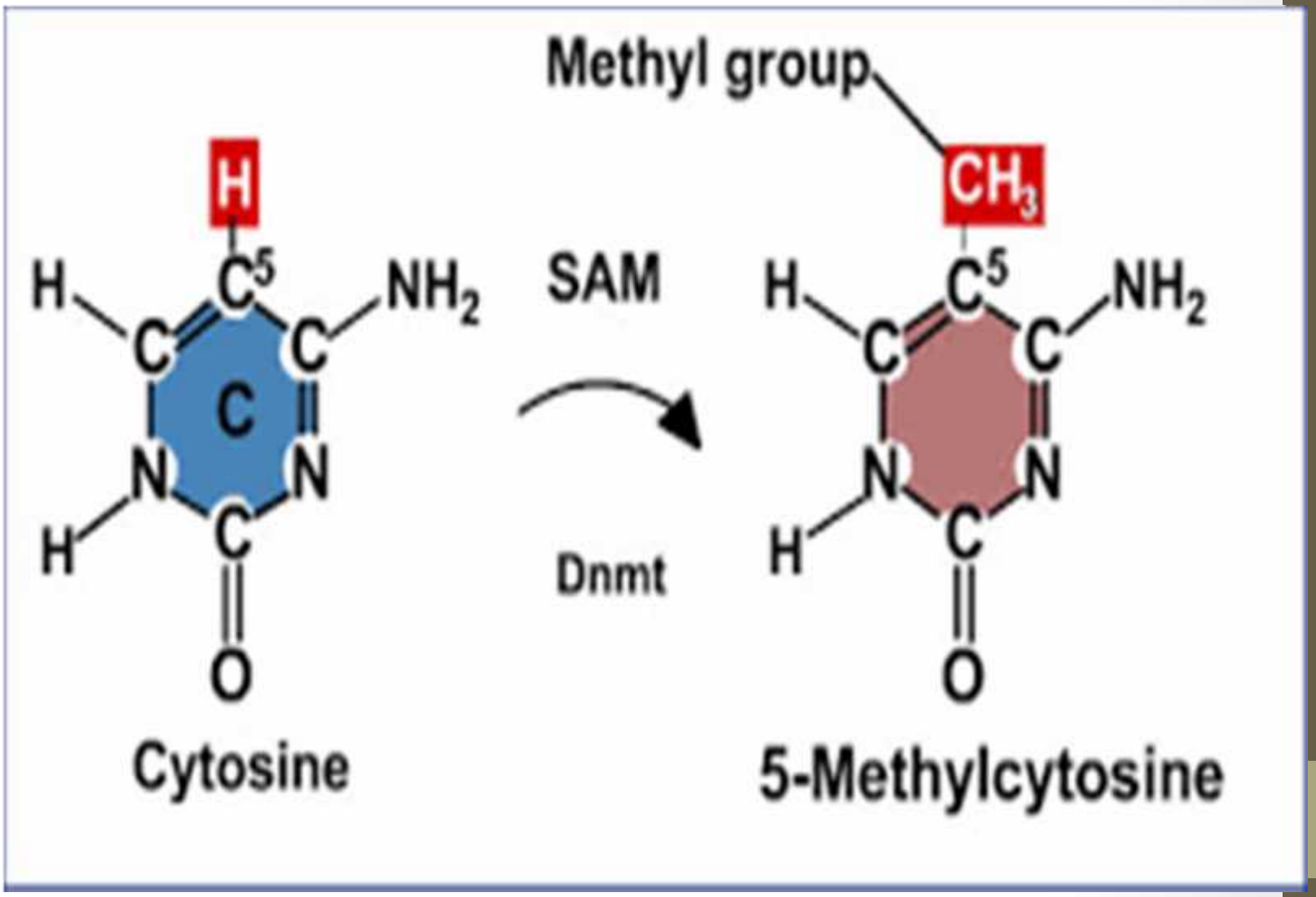

TIME
Death
Infection
Clinical disease
Susceptible host
Recovery
No infection
Incubation period
Latent
Infectious
Non-infectious
Exposure
Onset

Agouti “Twin” Sisters

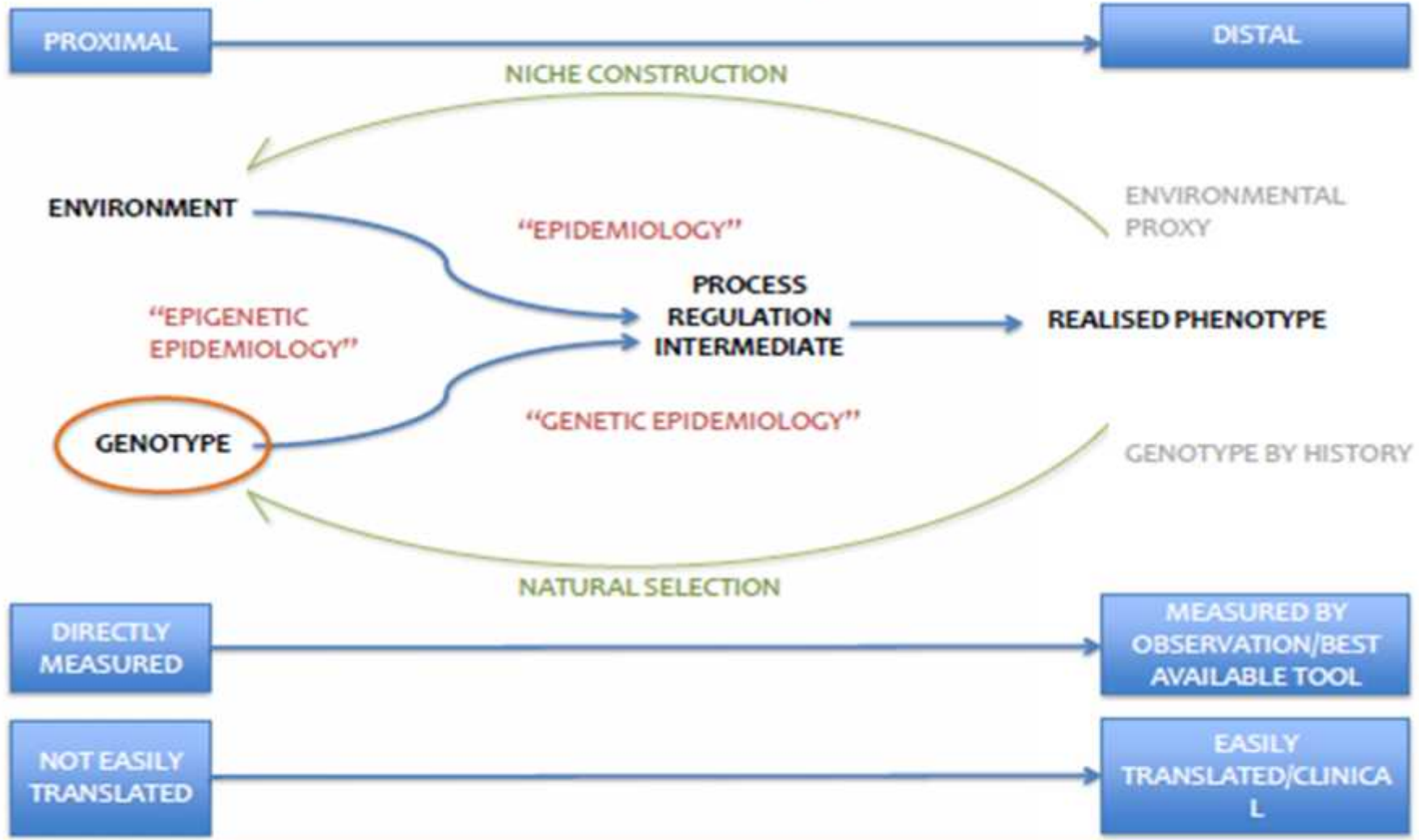


Coat color serves as a sensor for the degree of methylation present


Folic Acid
Methionine Synthesis
&
SAM-Mediated Methylations
Thymidylate Synthesis
DHFR
DHF
DHFR
dUMP
THF
TS
Methionine
SHMT (B_6)
SAM
5,10-Methylene THF
dTMP
5-Methyl THF
MS
(B_{12})
DHFR
MTHFR
SAM
DNMT1
DNMT3a
DNMT3b
SAH
Homocysteine
5-Methyl THF
DNA Synthesis
DNA Methylation
Folate

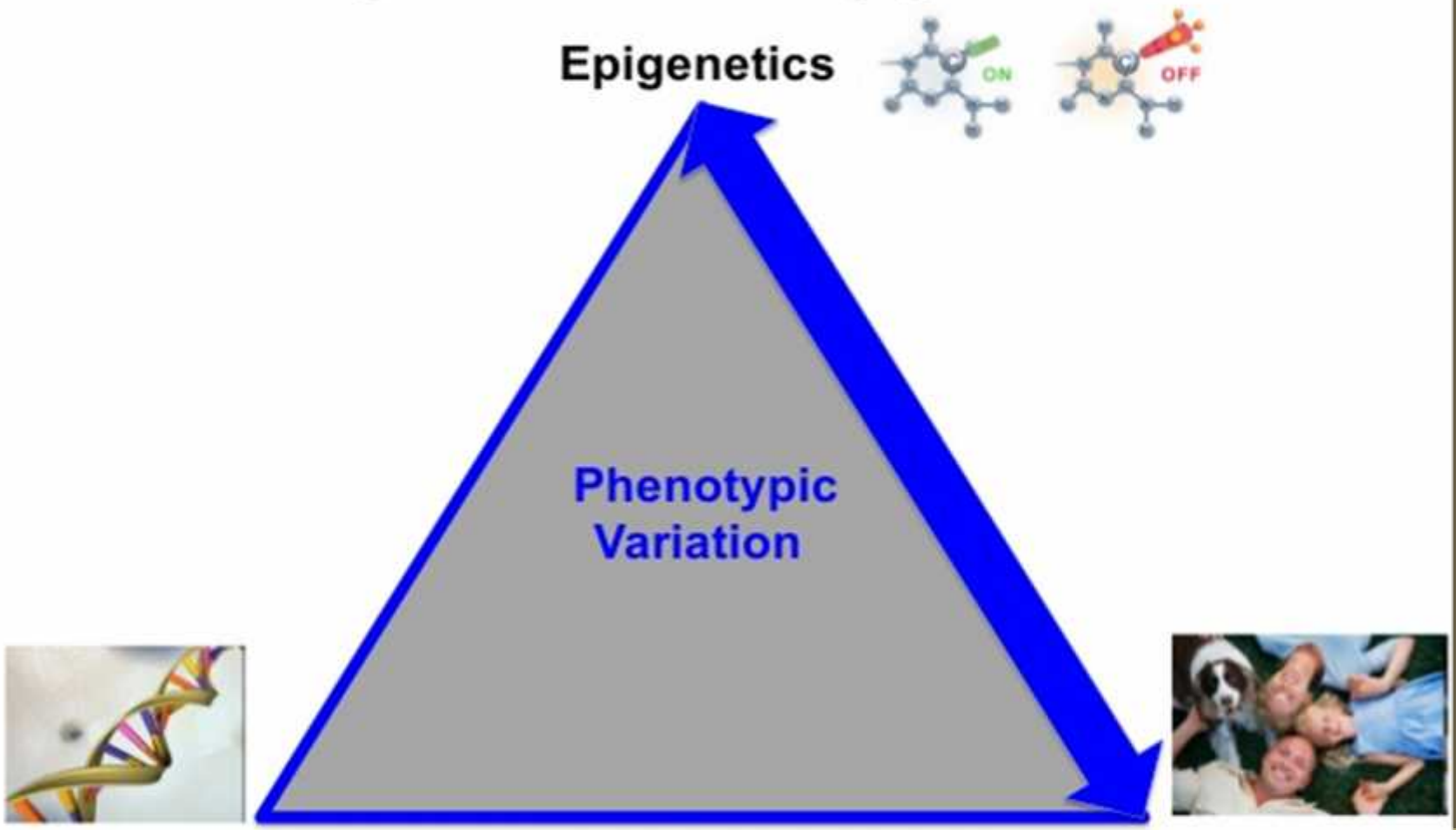

Methyl group
H
CH3
SAM
Dnmt
Cytosine
5-Methylcytosine

Epidemiology – "epi" & "demos" – should consider in the general context of measurement...




Diet
Psychological state
Diurnal/Seasonal correlations
EPIGENETIC
MODULATION
Social Interactions
Disease exposure
Alternative medicine
Toxic Chemicals
Therapeutic Drugs
Drugs of Abuse
Microbiome
Exercise
Financial Status

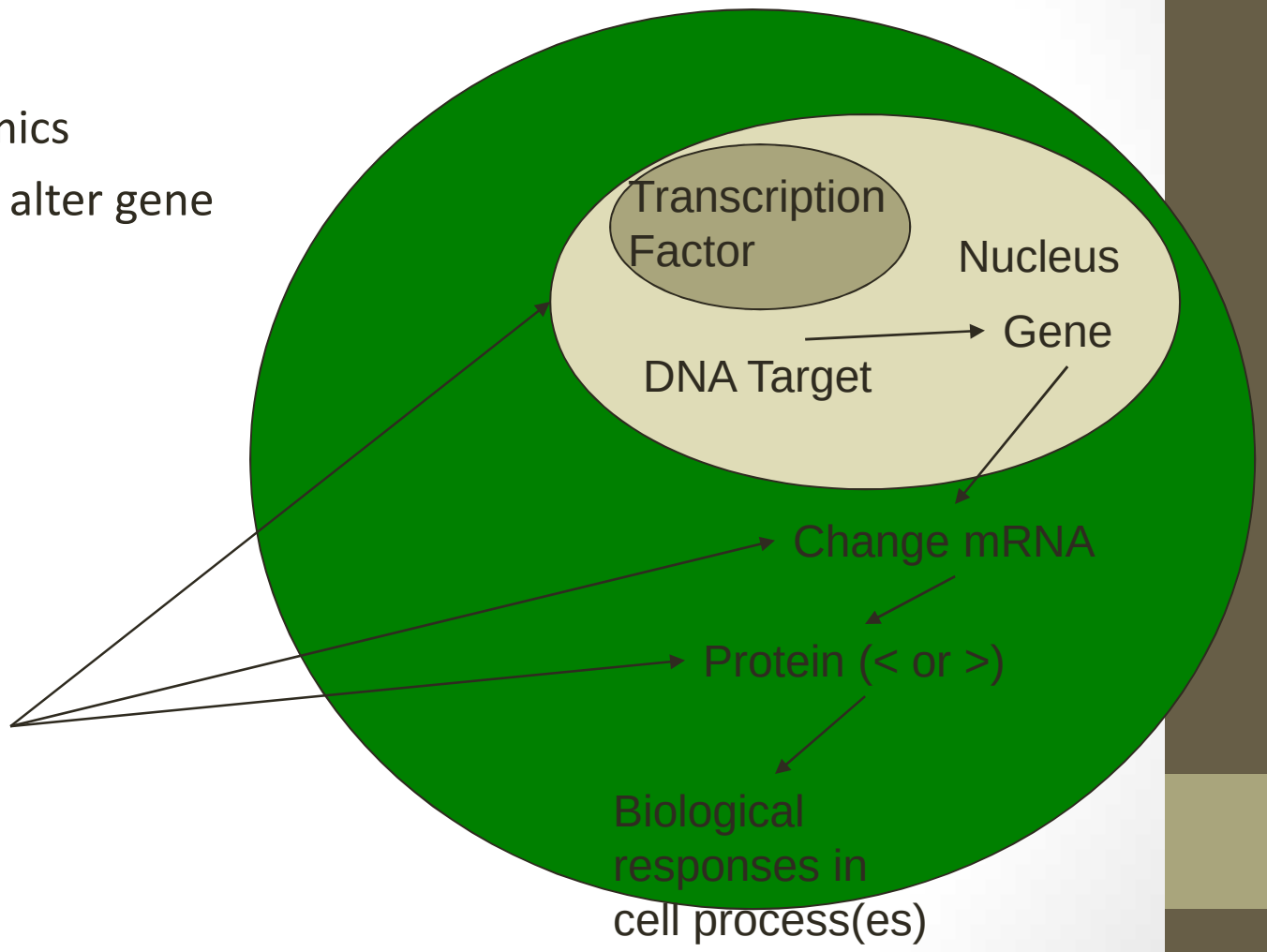
Integrative Model of Epigenetics



Do individuals vary in their DNA methylation pattern?

Nutrigenomics (Nurture)

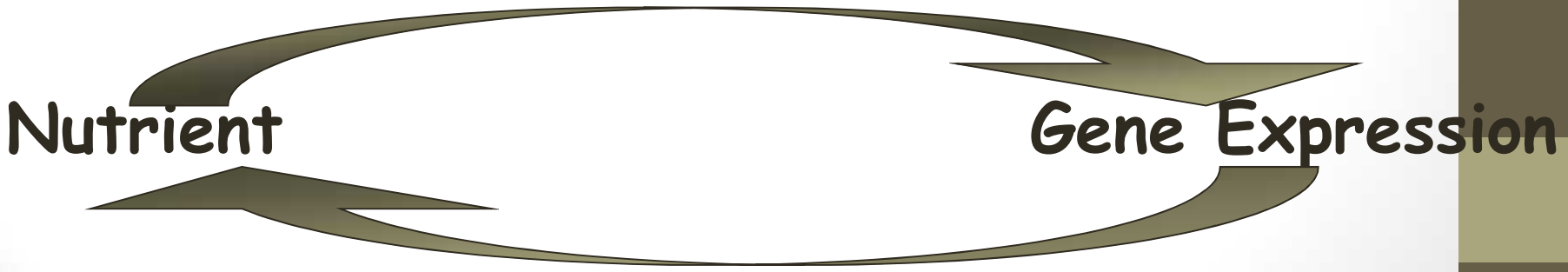
- Nutrigenomics
  - Nutrition + genomics
  - How do nutrients alter gene expression?



Nutrigenomics

- *Analyzing the effects of diet on the activity of on individual's genes and health and the effect of an individuals genes on metabolism of dietary chemicals*
- ***Diet*** = *nutritional science*
  Activity of genes = *molecular biology*
  Individual = *genetics/genomics*
  Health = *physiology*
- A systems biology science : Multi - disciplinary

Nutrient is independent variable



Gene expression is independent variable

Nutrigenomics

Foods
Nutrition

Target Genes
Mechanisms
Pathways

Signatures
Profiles
Biomarkers

Molecular Nutrition & Genomics

- Identification of dietary signals
- Identification of dietary sensors
- Identification of target genes
- Reconstruction of signaling pathways

Small research groups
Small budgets

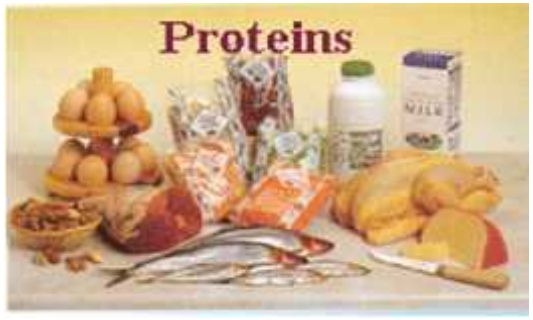
Nutritional Systems Biology

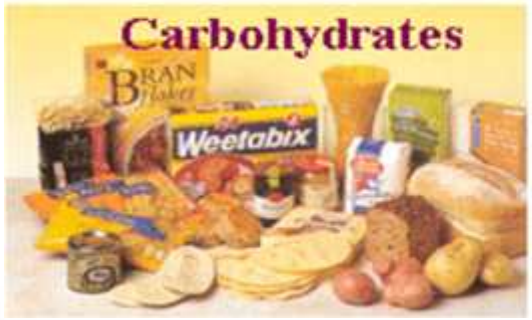
- Measurement of stress signatures
- Identification of early biomarkers

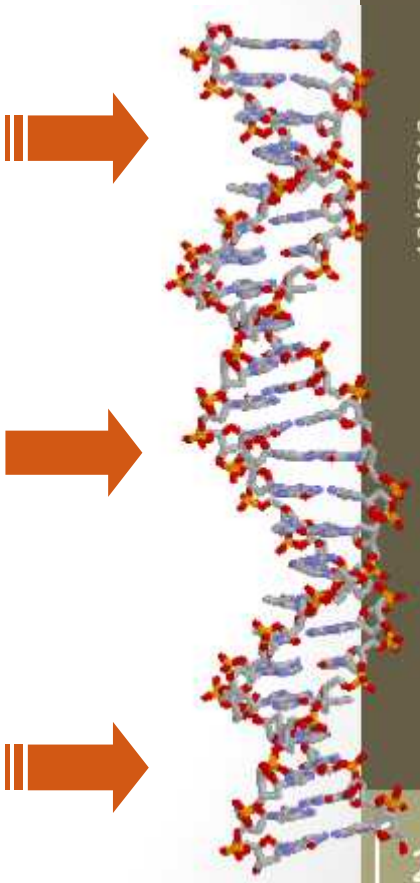
Large research consortia
Big money

Complexity

Molecular nutrition

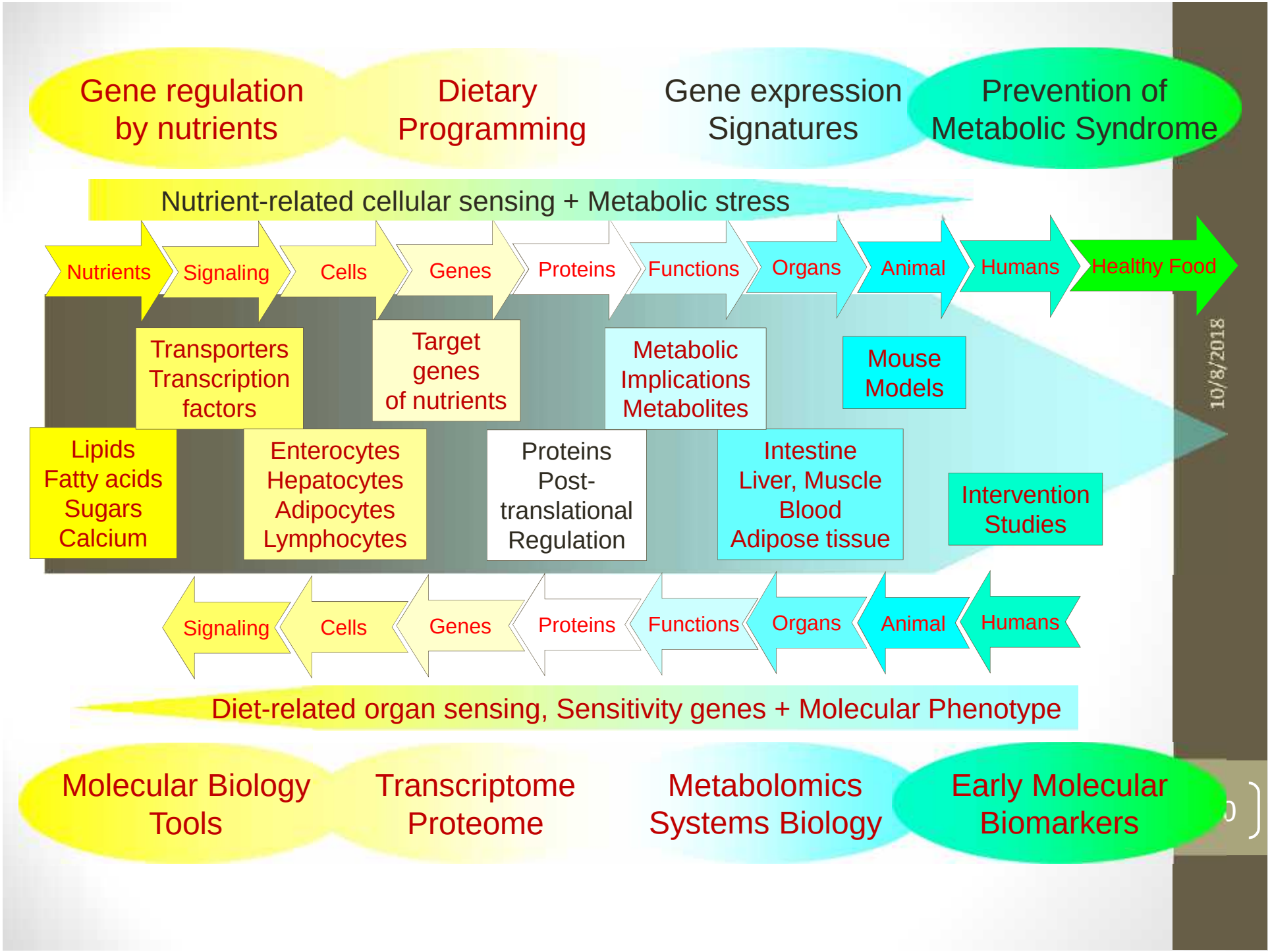






Transcription-factor pathways mediating nutrient-gene interaction

Nutrient	Compound	Transcription factor
Macronutrients		
Fats	Fatty acids Cholesterol	PPARs, SREBPs, LXR, HNF4, ChREBP SREBPs, LXRs, FXR
Carbohydrates	Glucose	USFs, SREBPs, ChREBP
Proteins	Amino acids	C/EBPs
Micronutrients		
Vitamins	Vitamin A Vitamin D Vitamin E	RAR, RXR VDR PXR
Minerals	Calcium Iron Zinc	Calcineurin/NF-ATs IRP1, IRP2 MTF1
Other food components		
	Flavonoids Xenobiotics	ER, NFκB, AP1 CAR, PXR


Gene regulation by nutrients
Dietary Programming
Gene expression Signatures
Prevention of Metabolic Syndrome
Nutrient-related cellular sensing + Metabolic stress
Nutrients
Signaling
Cells
Genes
Proteins
Functions
Organs
Animal
Humans
Healthy Food
Transporters Transcription factors
Target genes of nutrients
Metabolic Implications Metabolites
Mouse Models
Lipids Fatty acids Sugars Calcium
Enterocytes Hepatocytes Adipocytes Lymphocytes
Proteins Post-translational Regulation
Intestine Liver, Muscle Blood Adipose tissue
Intervention Studies
Signaling
Cells
Genes
Proteins
Functions
Organs
Animal
Humans
Diet-related organ sensing, Sensitivity genes + Molecular Phenotype
Molecular Biology Tools
Transcriptome Proteome
Metabolomics Systems Biology
Early Molecular Biomarkers
10/8/2018

Nutrigenetics Definition

- Effects of individual genetic variation in response to nutrient
- Any two individuals share 99% of their DNA sequence
- Most common form of variation

  - Single nucleotide polymorphism (SNP)
  - Changes in single base pair
  - Occur ~ 1 in every 1000bp of human genome
    (~ 3 million in human genome)

- SNPs may alter regulation of gene expression, mRNA processing (splicing, half-life etc) and protein activities

Micronutrients that act directly or indirectly as antioxidants or influence DNA expression

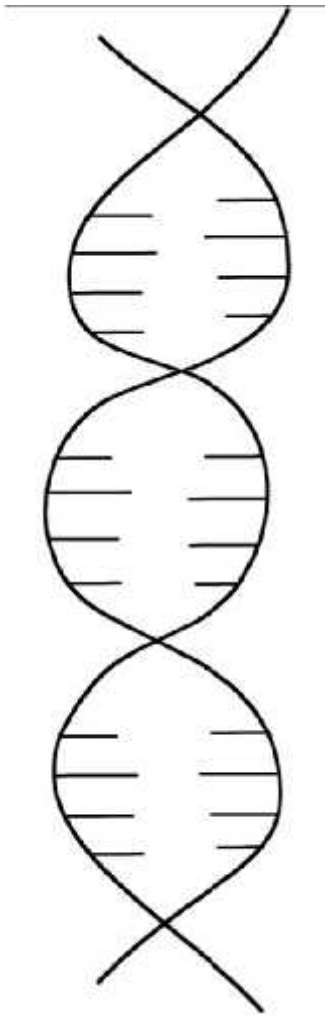
Vitamin A

Vitamin B12

Vitamin E

Folic acid

Vitamin D



Vitamin C

Vitamin B_6

Vitamin B3

Vitamin B2

Zn,Se,Fe Mg, Cu

Do nutrients affect gene expression?

- Vitamin E regulates protein kinase C activity in smooth muscle cells (Azzi 1991)
- Modulates the expression of the hepatic alpha-tocopherol transfer protein (Hosomi 1997)
- Tocopherol-dependent transcription factor (tocopherol associated protein, TAP) has been identified (Stocker 1999)
- CoQ10 in human muscle cells has shown effects on 12,000 genes (Linnane 2002)
- Vitamin D3 affects 20,000 genes in human prostate cancer cells (Krishnan 2003)
- EGb 761 alters mRNA levels of the GLUT3 in hippocampal neurons, increasing neuronal glucose supply in rats (Loffler 2001)
- L-leucine interacts with multiple genes via mTOR and Akt pathways

Contrasting phenotypes

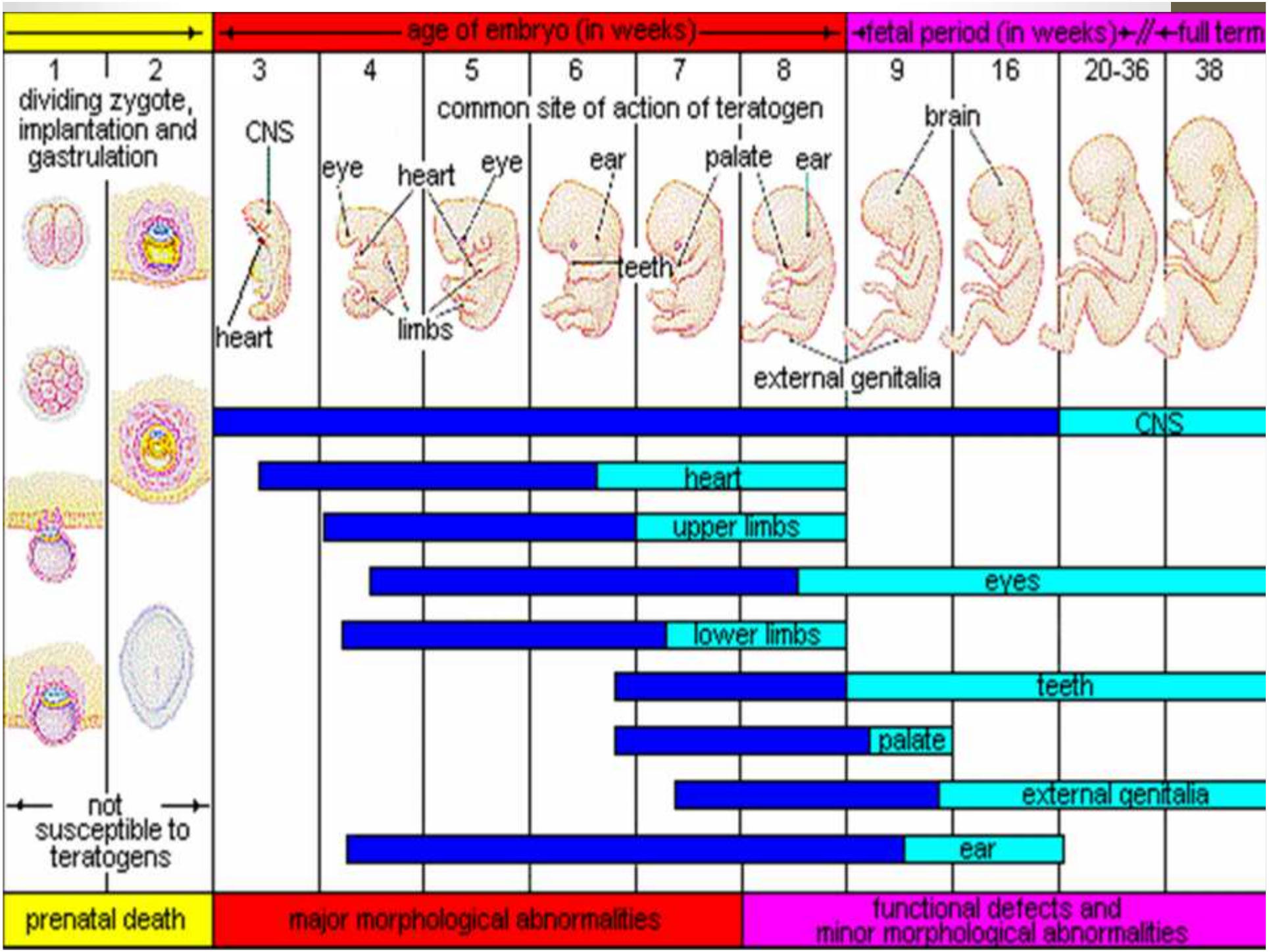
deletion

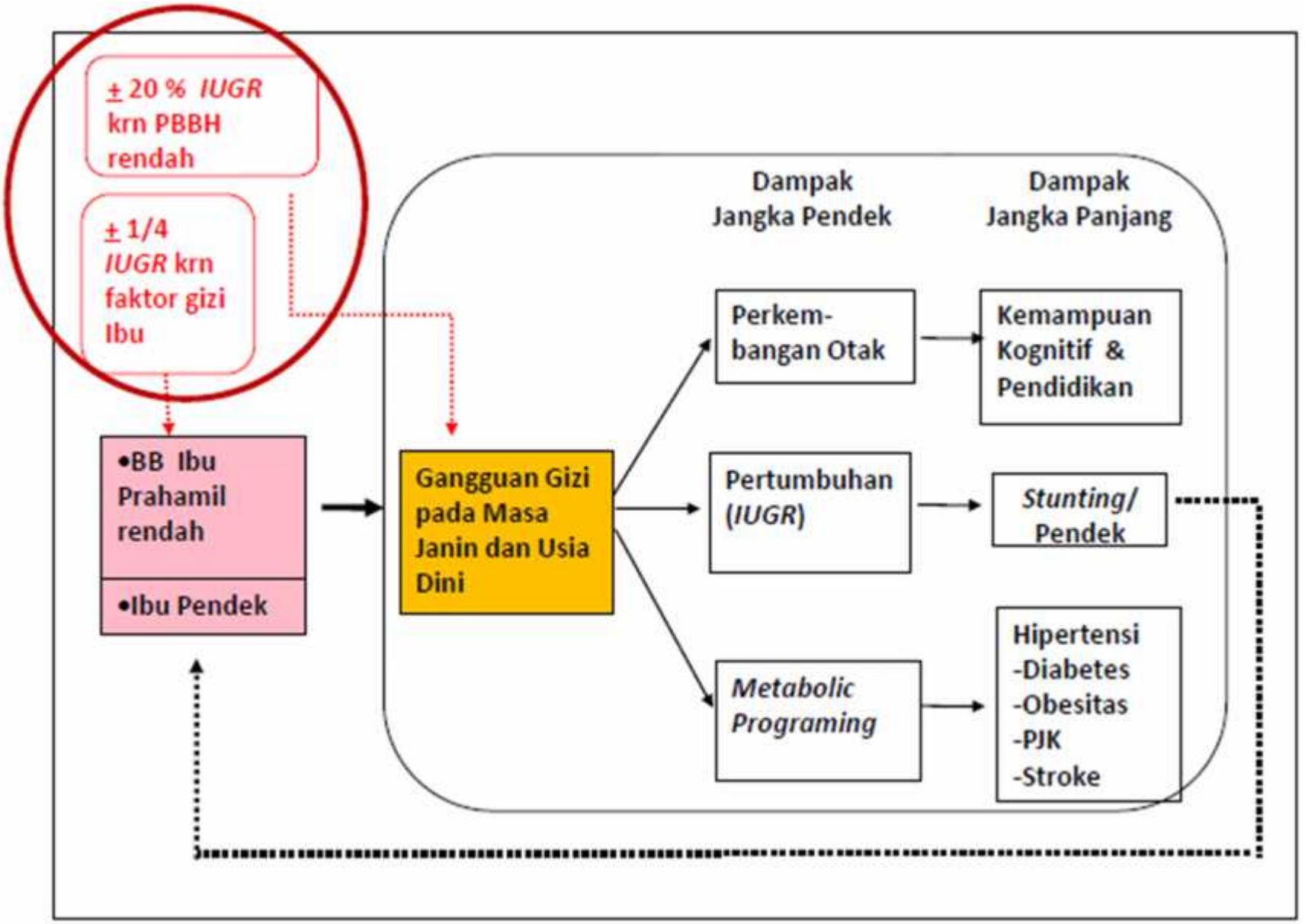
normal dosage

duplication

Environment &Epigenome

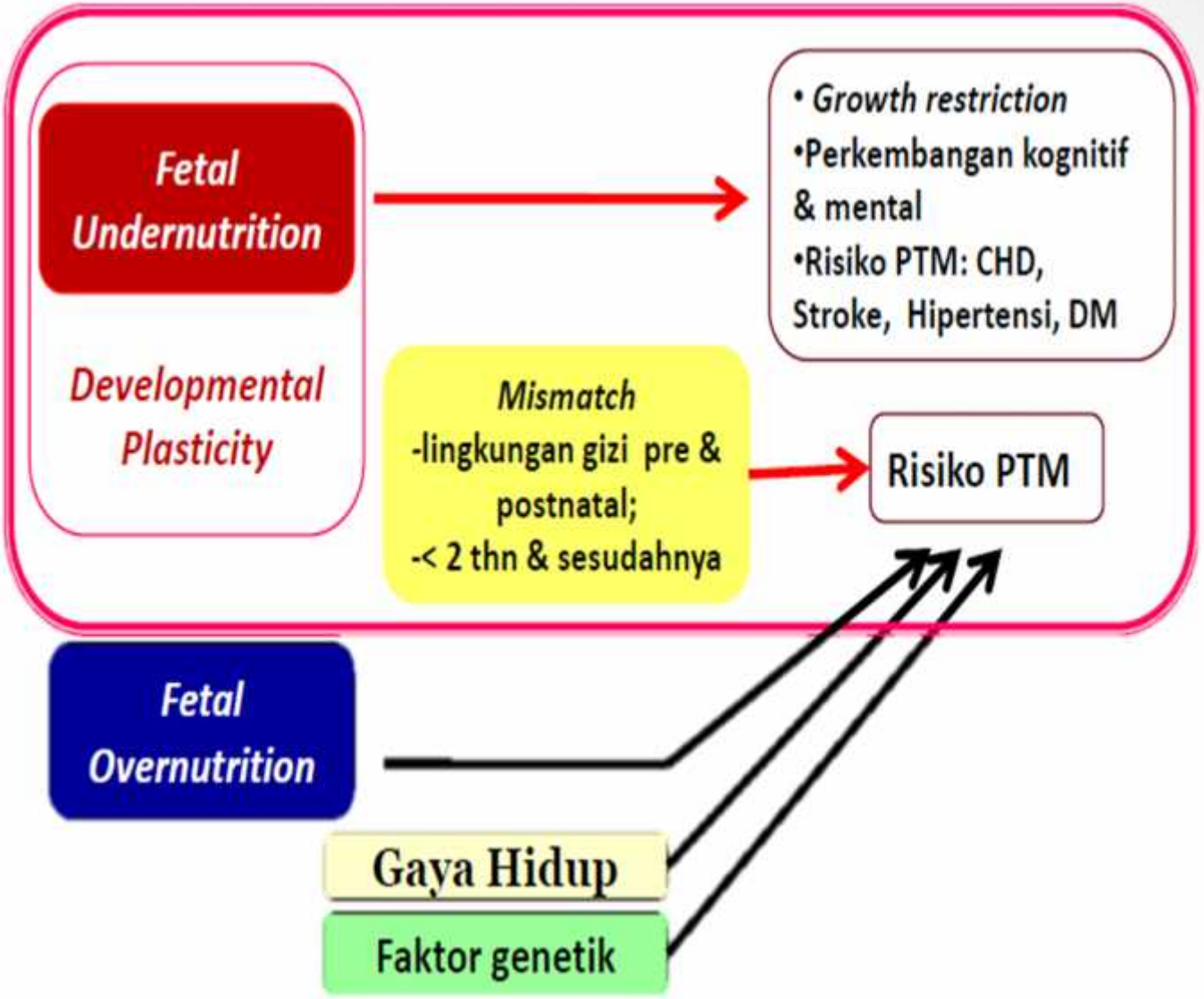
Mounting evidence suggests that fetuses are surprisingly susceptible to outside influences such as environmental pollutants, pesticides, and other toxins.


age of embryo (in weeks)
fetal period (in weeks)
full term
1
2
3
4
5
6
7
8
9
16
20-36
38
dividing zygote, implantation and gastrulation
common site of action of teratogen
CNS
heart
eye
heart
eye
limbs
ear
teeth
palate
ear
external genitalia
brain
CNS
heart
upper limbs
eyes
lower limbs
teeth
palate
external genitalia
ear
not susceptible to teratogens
prenatal death
major morphological abnormalities
functional defects and minor morphological abnormalities



Sumber : Modifikasi dari Rajagopalan, S, Nutrition and challenges in the next decade, Food and Bulletin vol 24 no.3, 2003

Dampak yang terjadi saat terjadi gangguan 1000 HPK

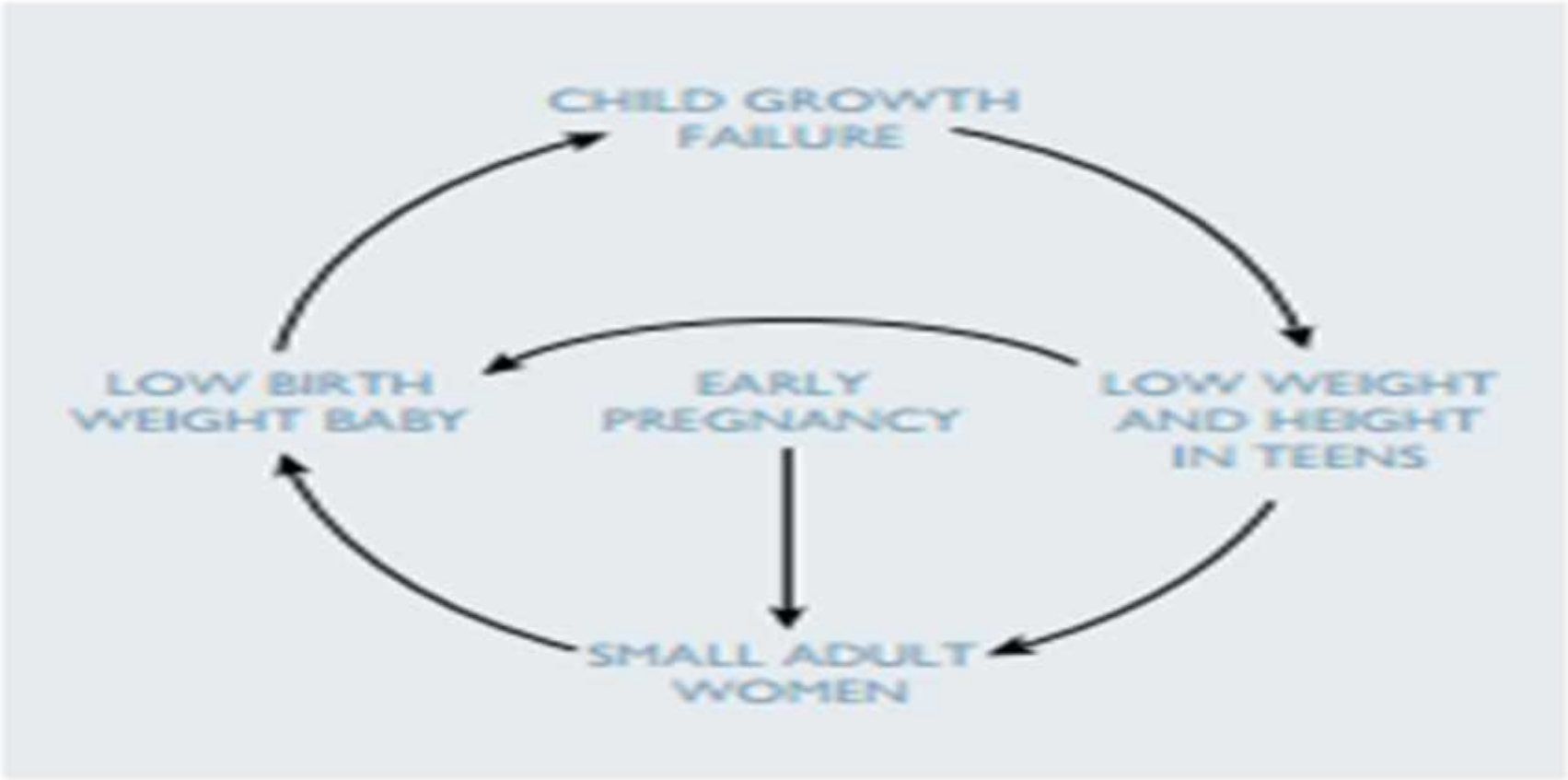


PENGARUH GIZI IBU

Key Nutrition Interventions in the First 1,000 Days

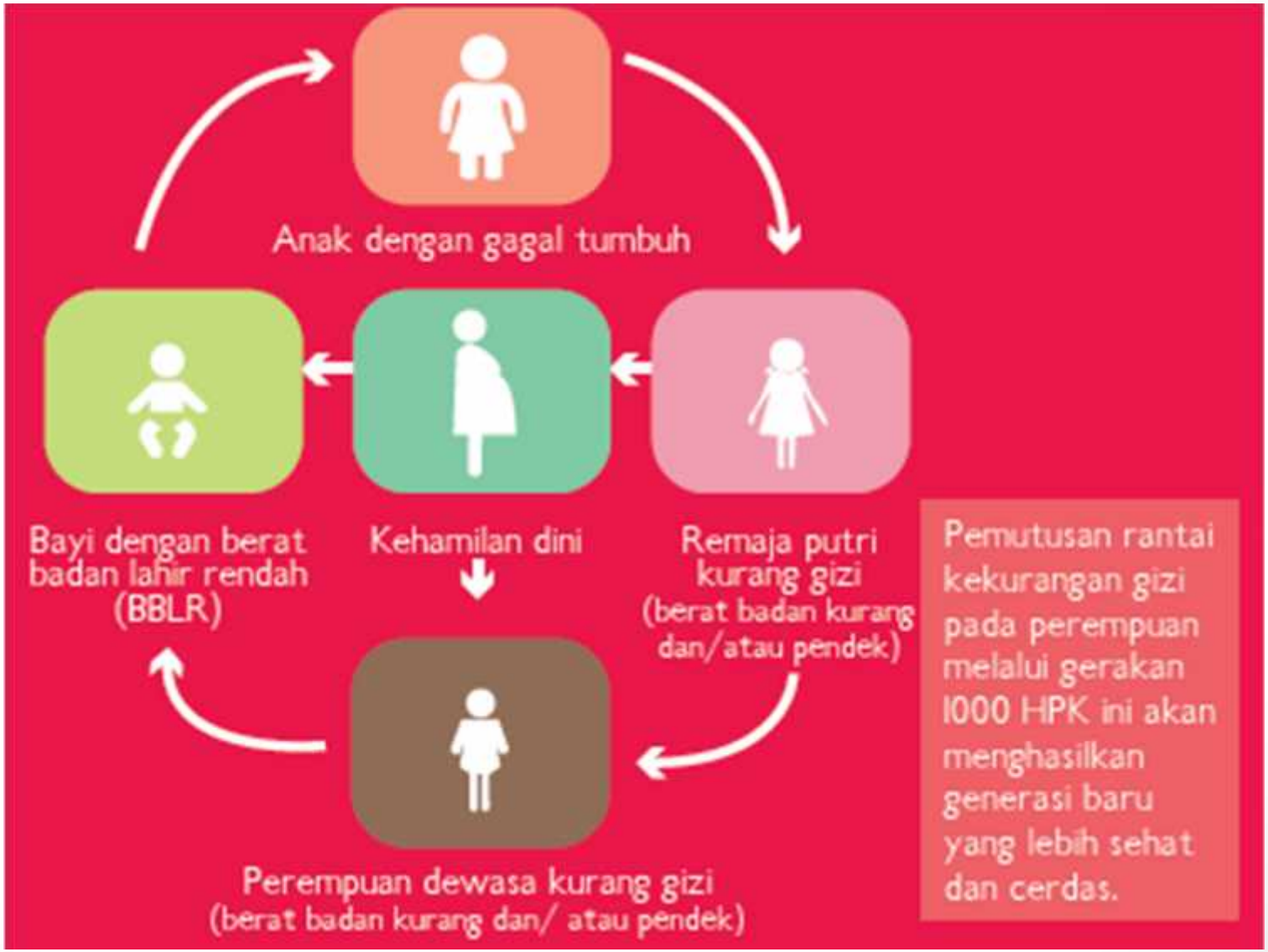
Malnutrition can be greatly reduced through the delivery of simple interventions at key stages of the lifecycle – for the mother during pregnancy and while breastfeeding; for the child, in infancy and early childhood. If effectively scaled up, these key interventions will improve maternal and child nutrition and reduce the severity of childhood illness and under-5 mortality. Good nutrition is also important for children after the first 1,000 days, and interventions such as vitamin A supplementation, zinc treatment for diarrhea, and management of acute malnutrition are also critical for these young children.

The Intergenerational Cycle of Growth Failure

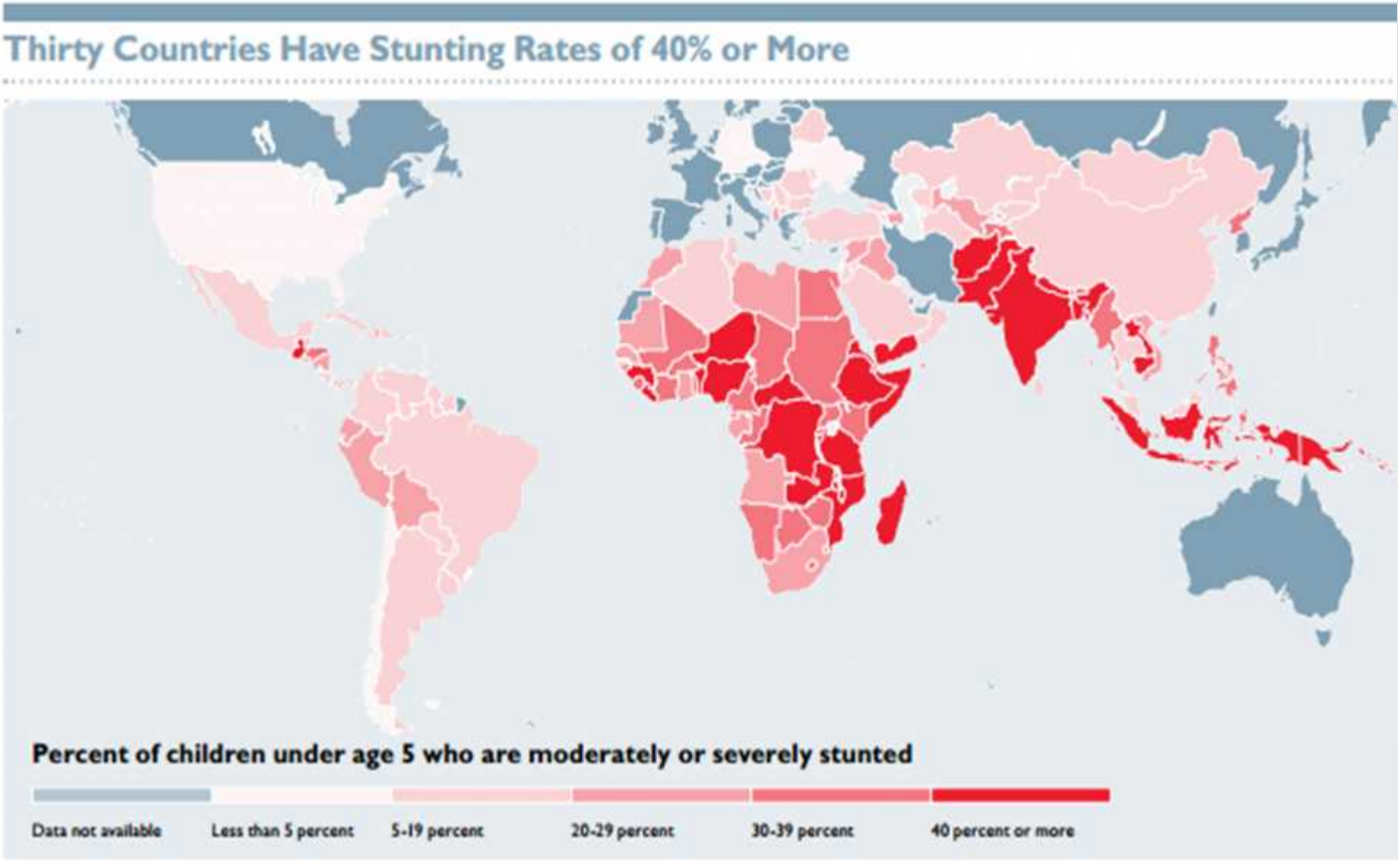


Adapted from Administrative Committee on Coordination/ Subcommittee on Nutrition (United Nations), *Second Report on the World Nutrition Situation* (Geneva: 1992).

Perempuan perlu perhatian khusus??

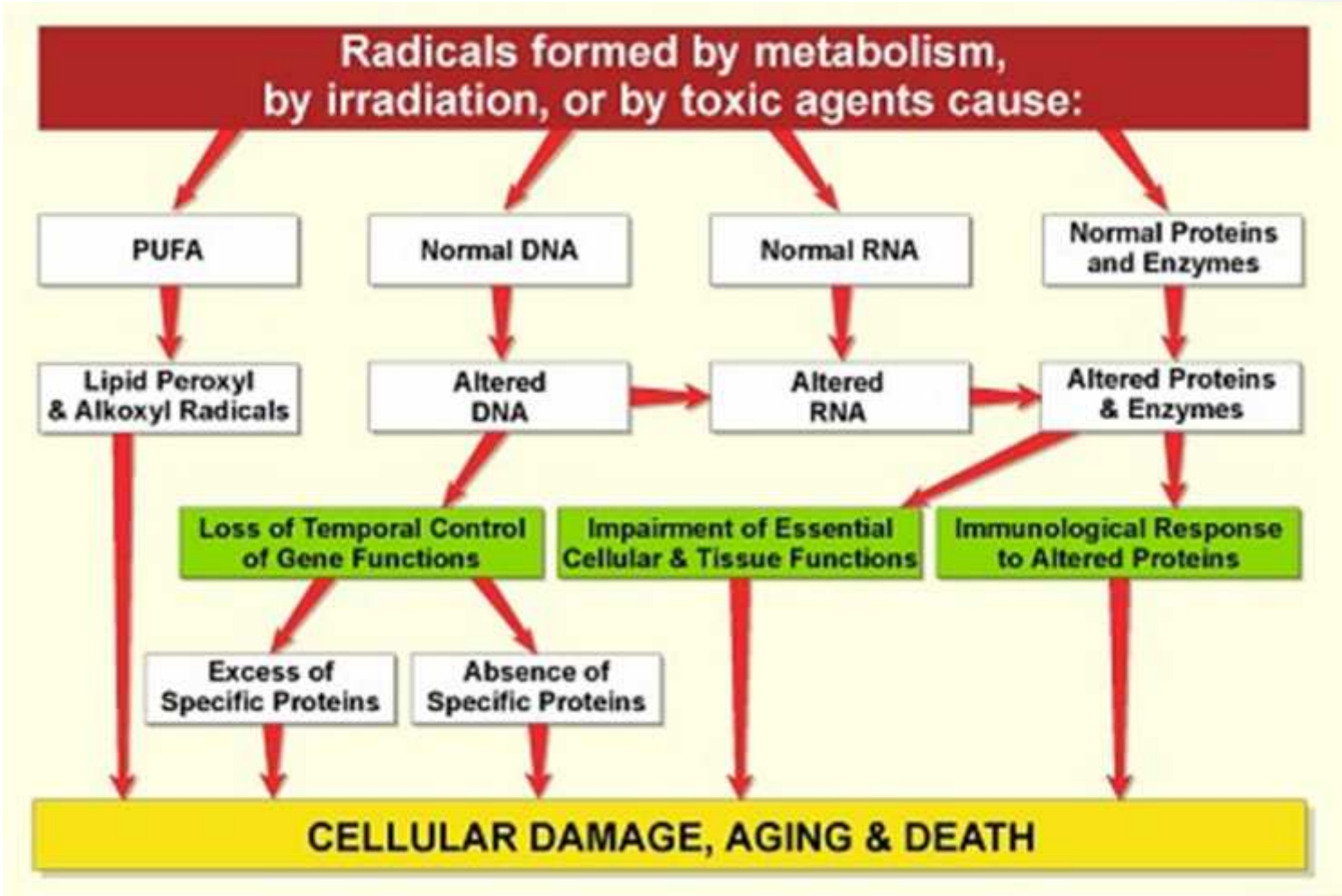


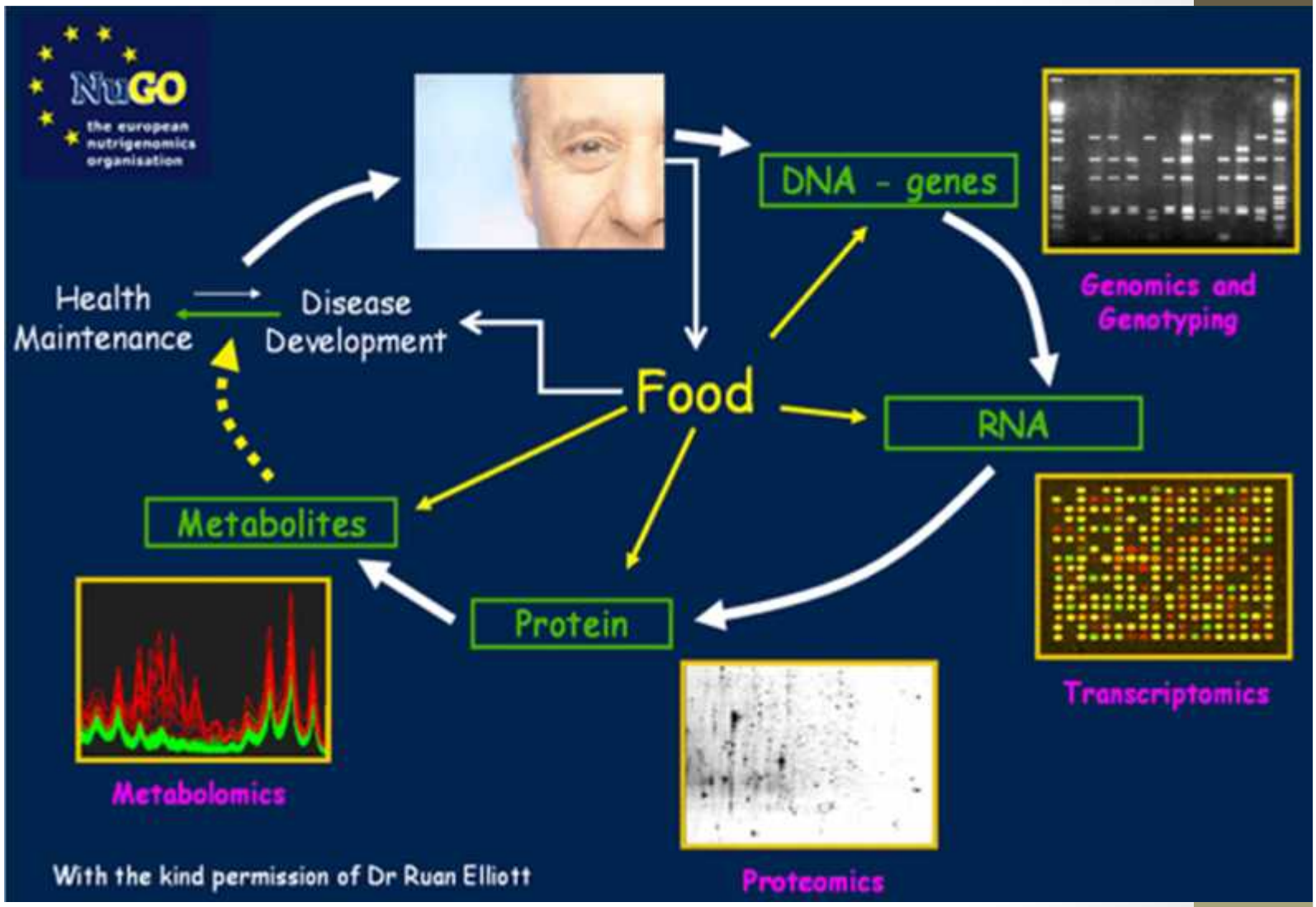
Akar trans-generasi penyakit kronis



INDONESIA MEMILIKI ANGKA PENDERITA STUNTING >40%

Indonesia termasuk salah satu dari 17 negara dari 193 negara yang mempunyai 3 masalah gizi tinggi pada balita: Stunting, Wasting dan Gemuk


Radicals formed by metabolism,
by irradiation, or by toxic agents cause:
PUFA
Normal DNA
Normal RNA
Normal Proteins and Enzymes
Lipid Peroxyl & Alkoxyl Radicals
Altered DNA
Altered RNA
Altered Proteins & Enzymes
Loss of Temporal Control of Gene Functions
Impairment of Essential Cellular & Tissue Functions
Immunological Response to Altered Proteins
Excess of Specific Proteins
Absence of Specific Proteins
CELLULAR DAMAGE, AGING & DEATH


NuGO
the european nutrigenomics organisation
DNA - genes
Genomics and Genotyping
Health Maintenance
Disease Development
Food
RNA
Metabolites
Protein
Transcriptomics
Metabolomics
Proteomics
With the kind permission of Dr Ruan Elliott

Human growth is influenced by

1. Biological determinants :

sex, intra uterine environment, birth order, birth weight, parental size, genetic constitution

2. Environmental :

Nutrition, Climate, living condition,socio-economic condition, diseases,

psychological factor etc

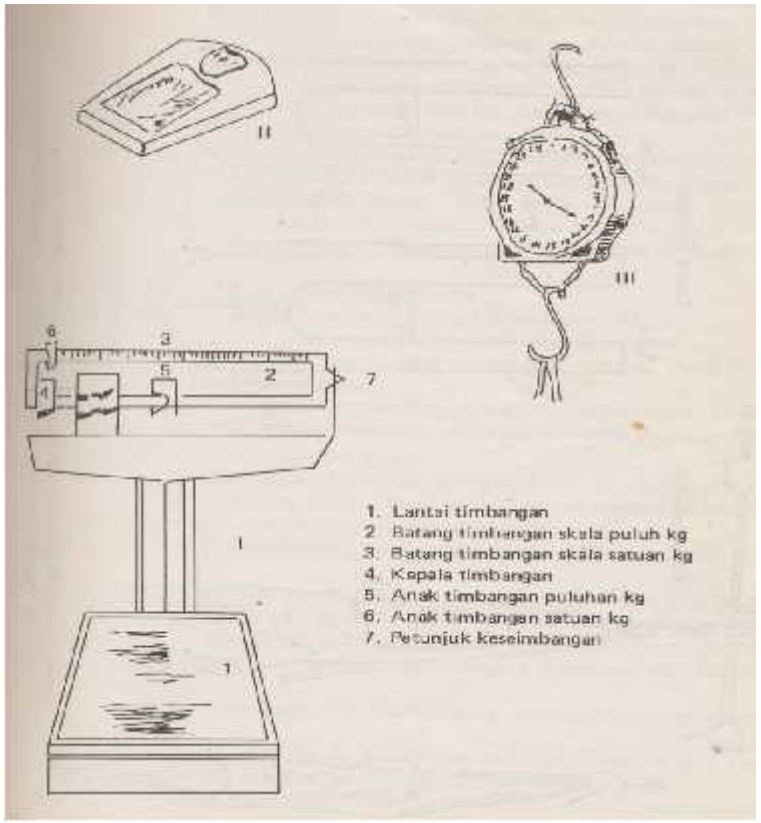
***Anthropometric Measurements =**

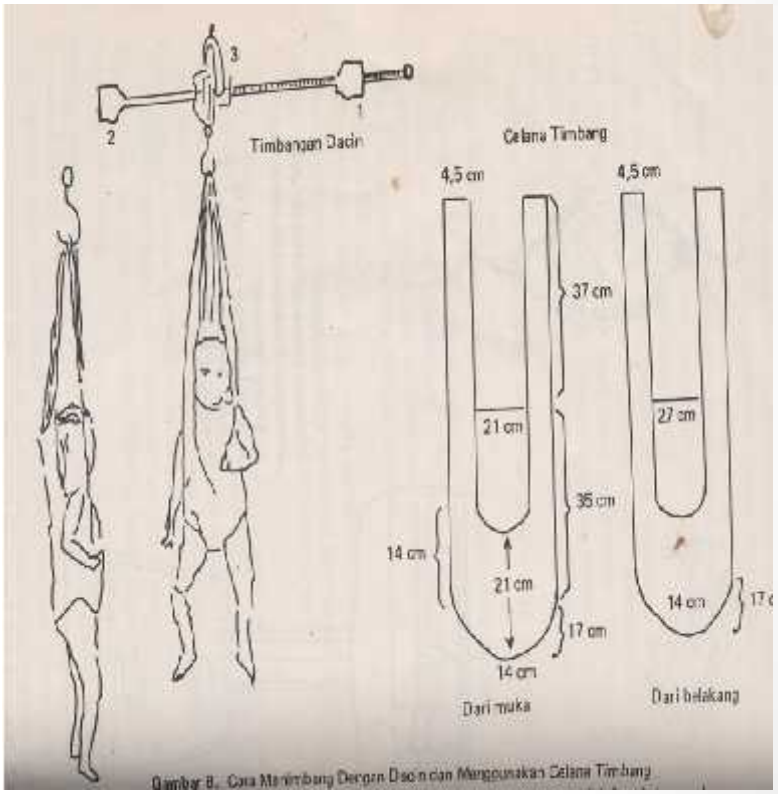
picture of human growth at different age level (from fetoes to adulthood):

- **height/length, weight**
- **upper arm circumference (UAC/LILA)**
- **head circumference**
- **BMI (body Mass Index)**
- **Skinfold thickness**

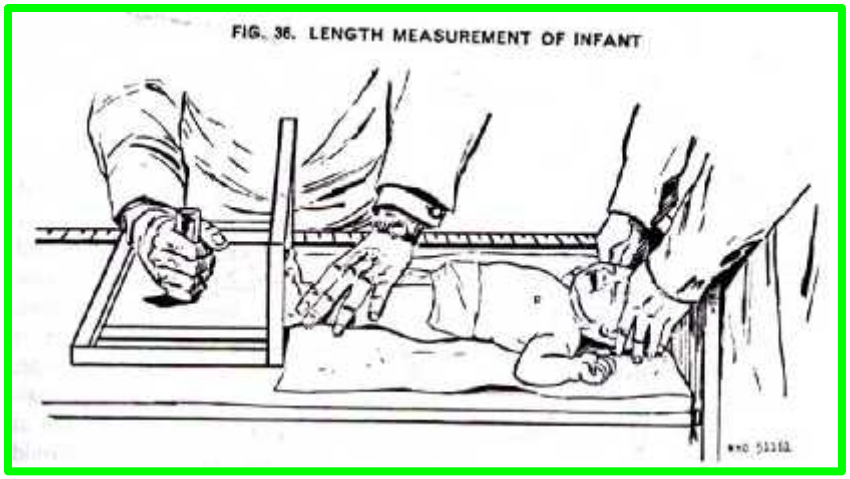
➔ **raw measurements do not mean anything, if not compared to REFERENCE or STANDARDS.**

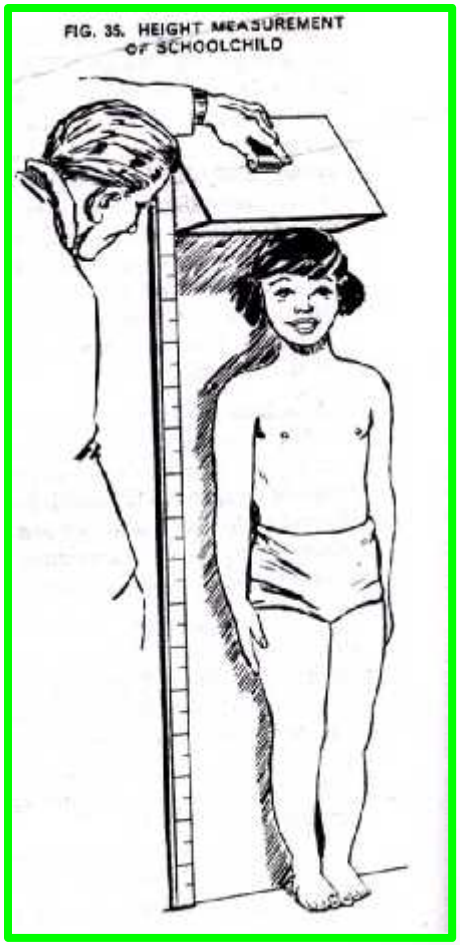
Body weight


II
III
6
3
5
2
7
1
1. Lantai timbangan
2. Batang timbangan skala puluh kg
3. Batang timbangan skala satuan kg
4. Kepala timbangan
5. Anak timbangan puluhan kg
6. Anak timbangan satuan kg
7. Petunjuk keseimbangan

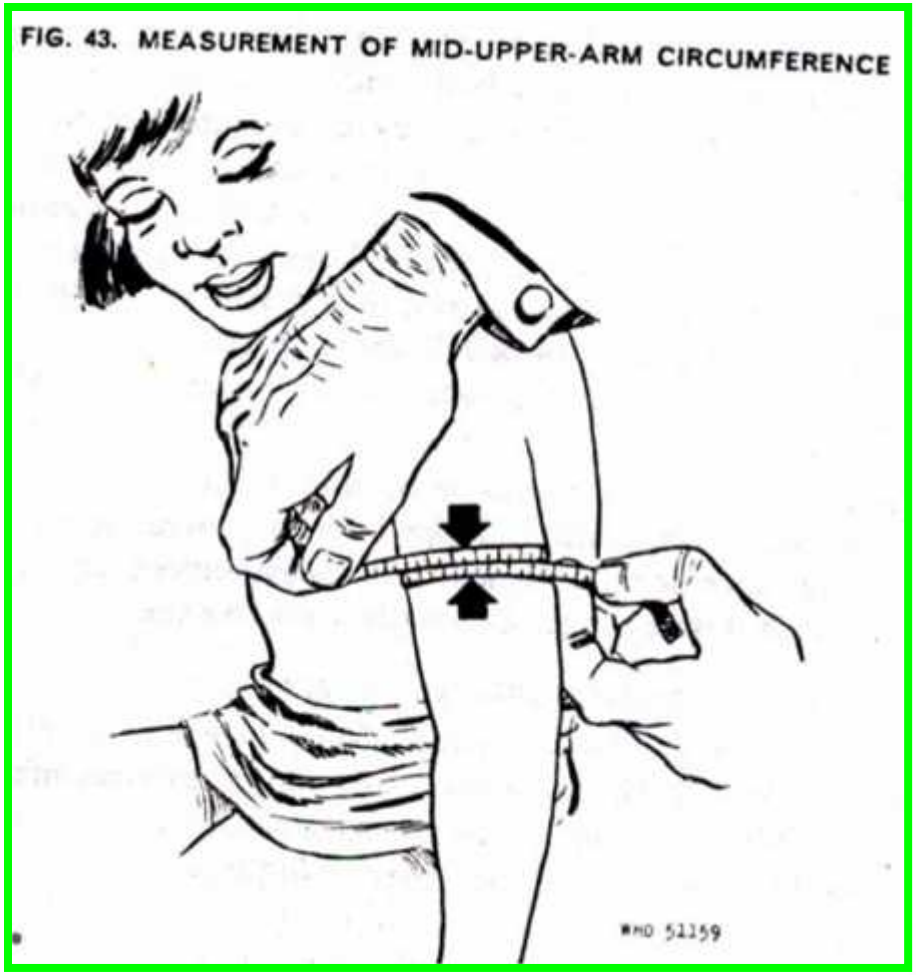

3
2
1
Timbangan Dacin
Celana Timbang
4,5 cm
4,5 cm
37 cm
21 cm
27 cm
35 cm
14 cm
21 cm
17 cm
14 cm
14 cm
Dari muka
Dari belakang

Body length & height

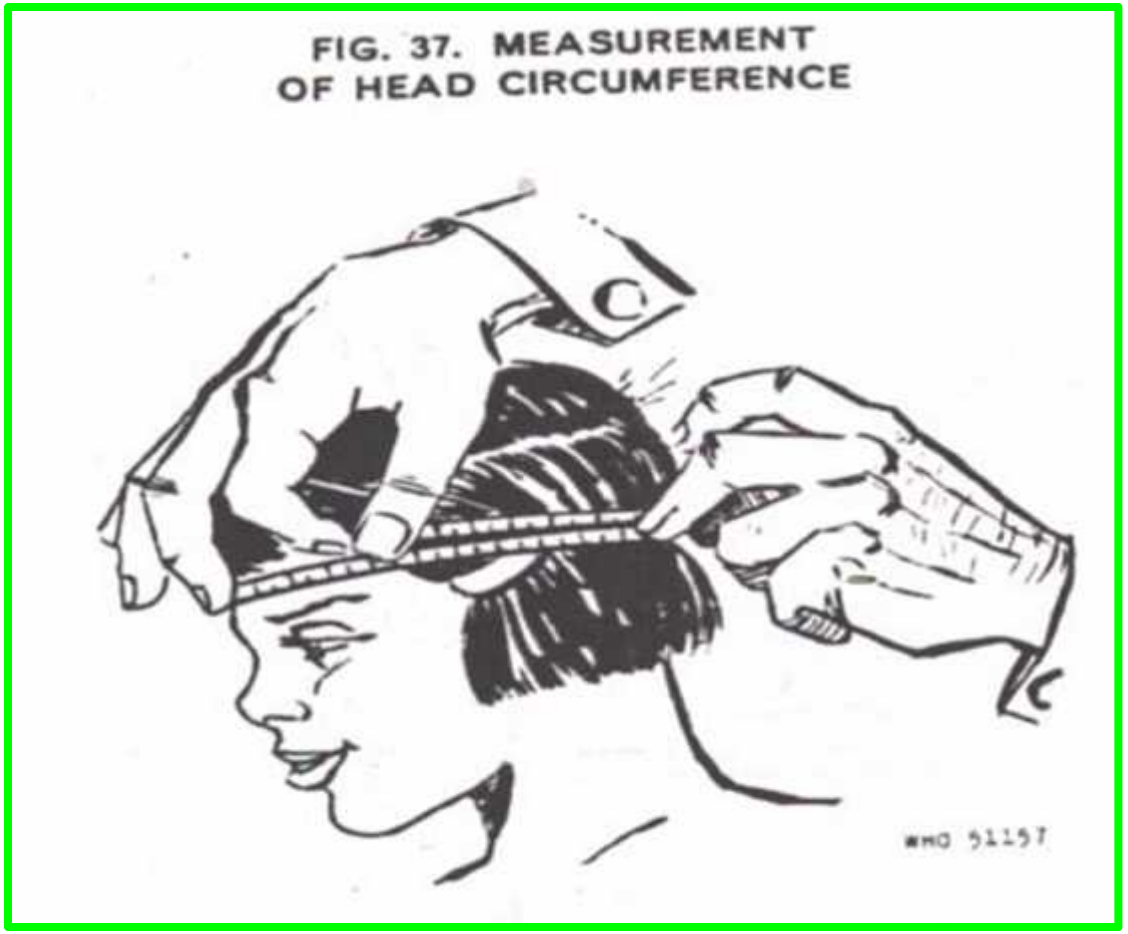




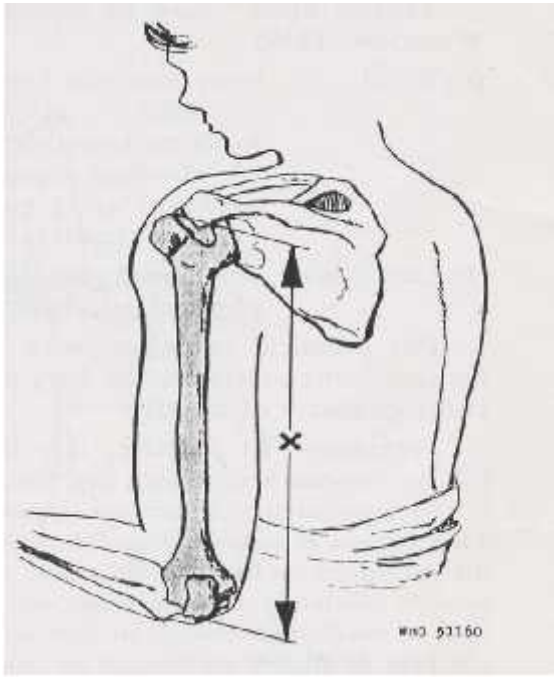
Mid Upper Arm Circumference

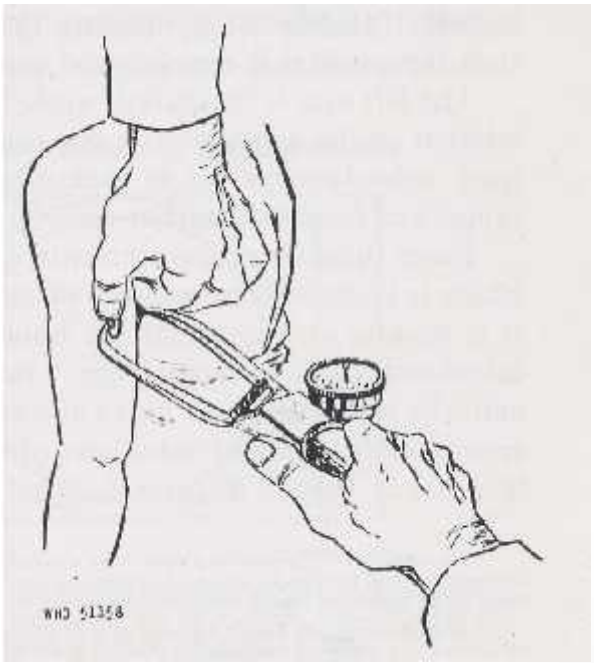


Head circumference



Triceps Skin Fold





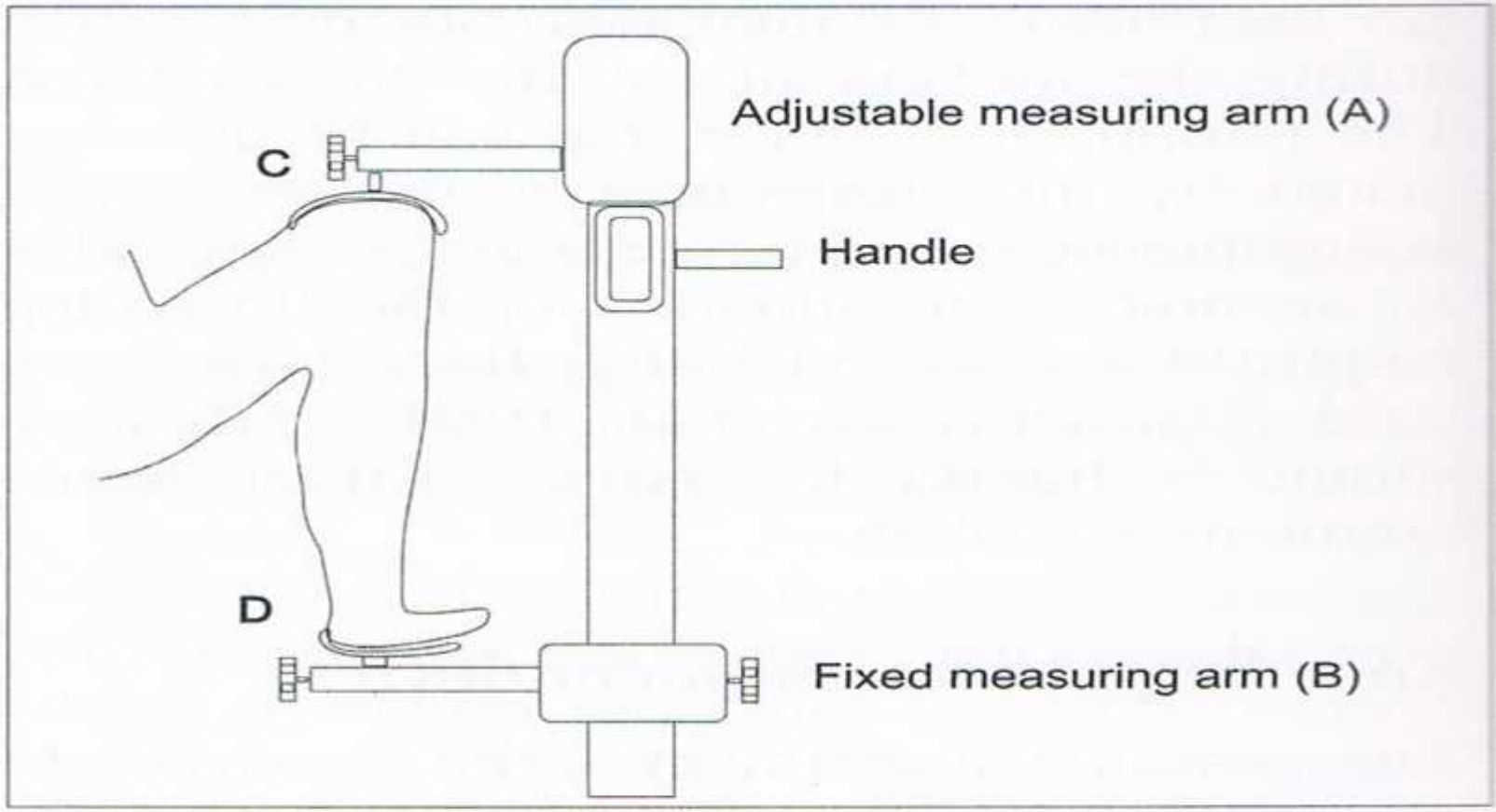


Figure 10.6: Diagram of a mini-knemometer: measuring arms (A and B); metallic holders for knee and heel (C and D). The arms are spring-loaded so that a constant pressure is applied during measurement. From Hermanussen and Seele, Annals of Human Biology 24: 307–313, 1997.

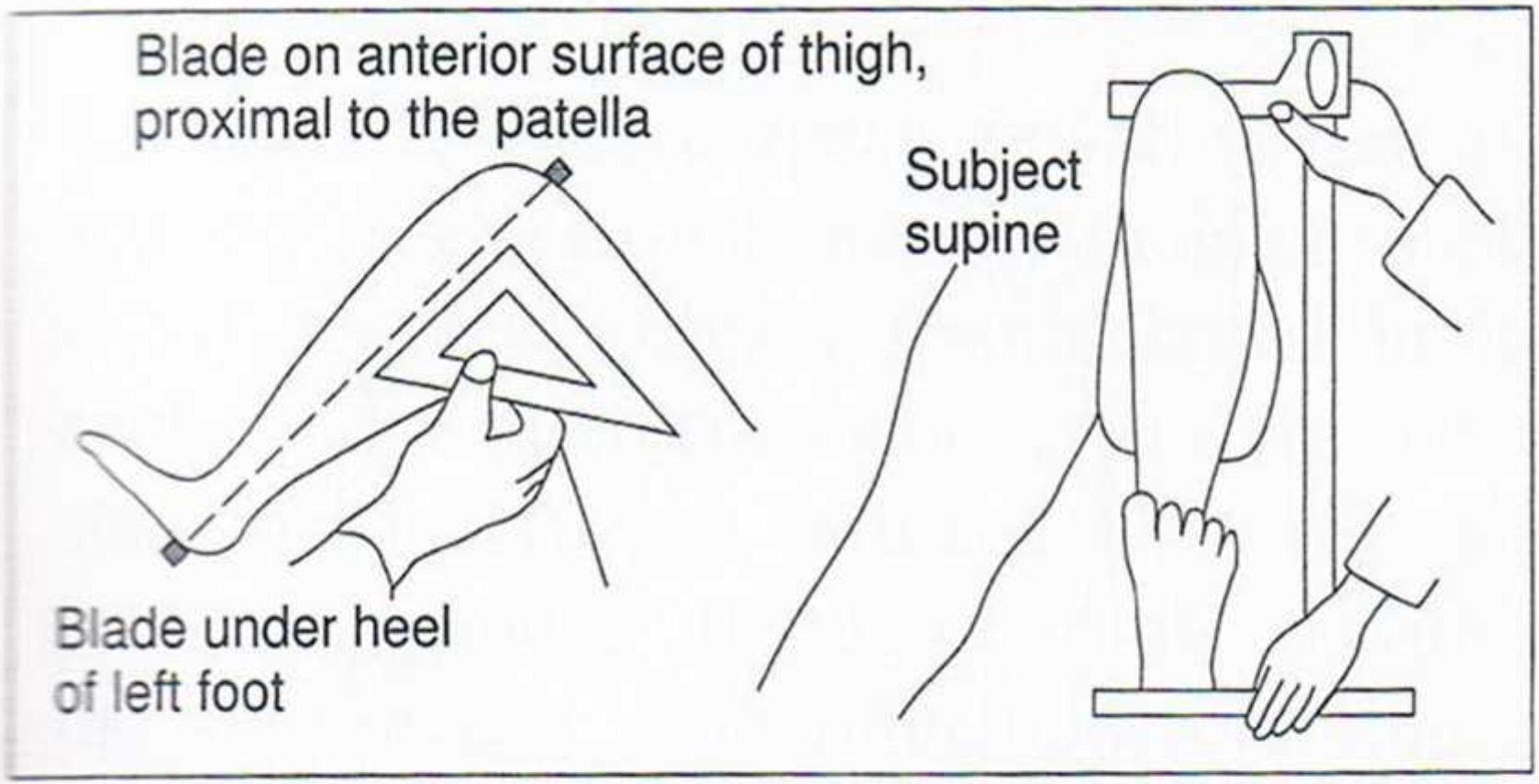


Figure 10.7: Measurement of knee height in adults.

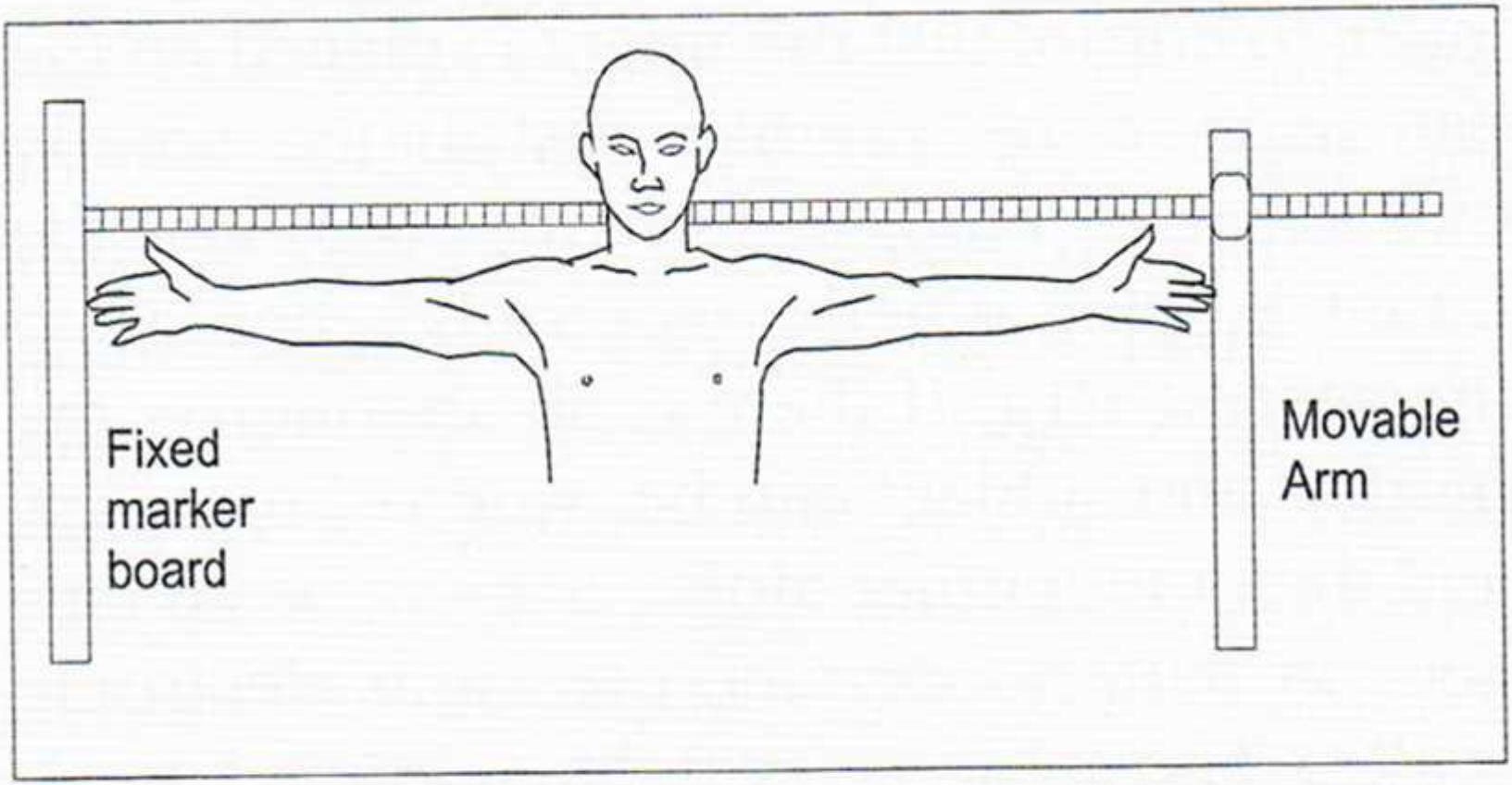


Figure 10.8: Measurement of arm span.

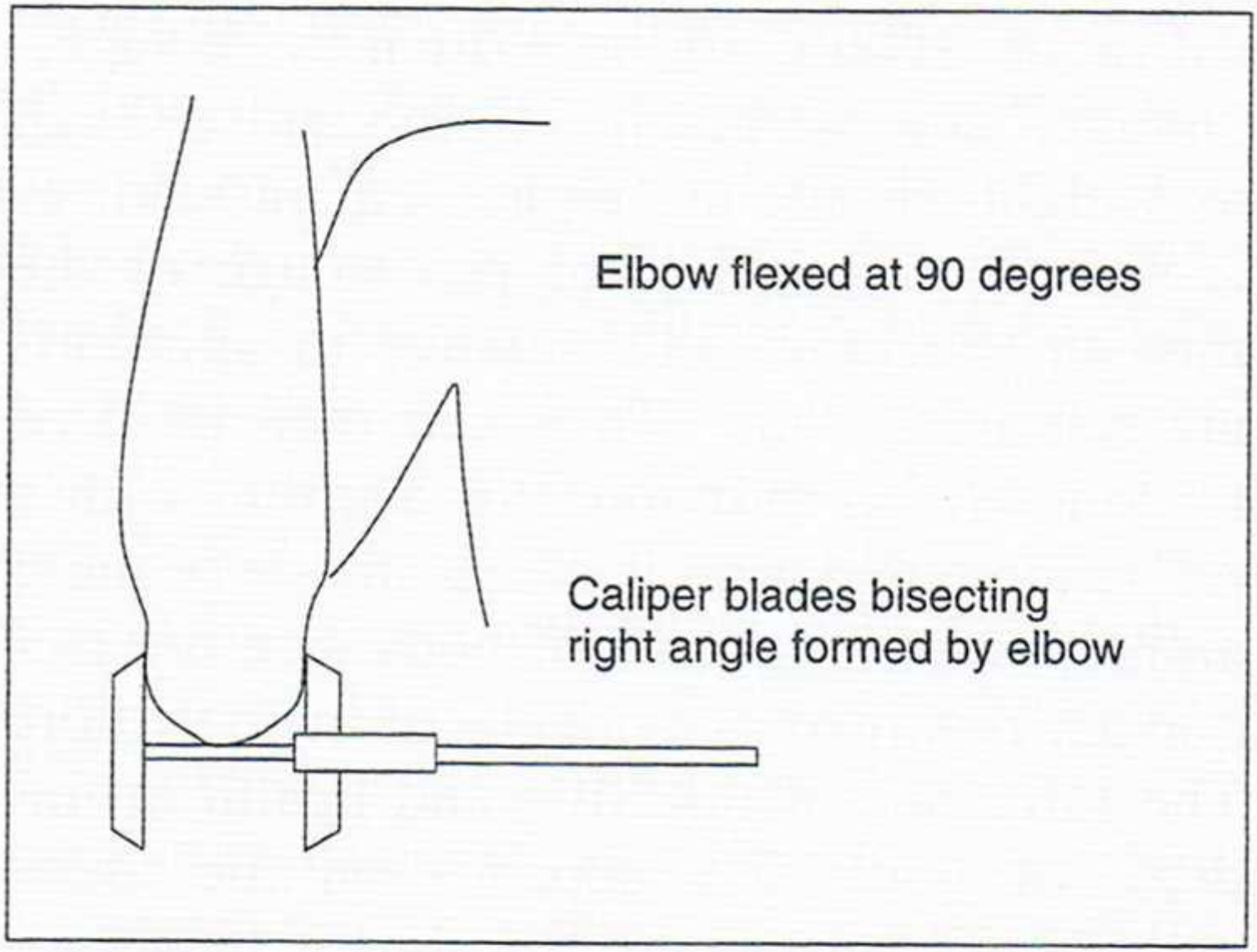
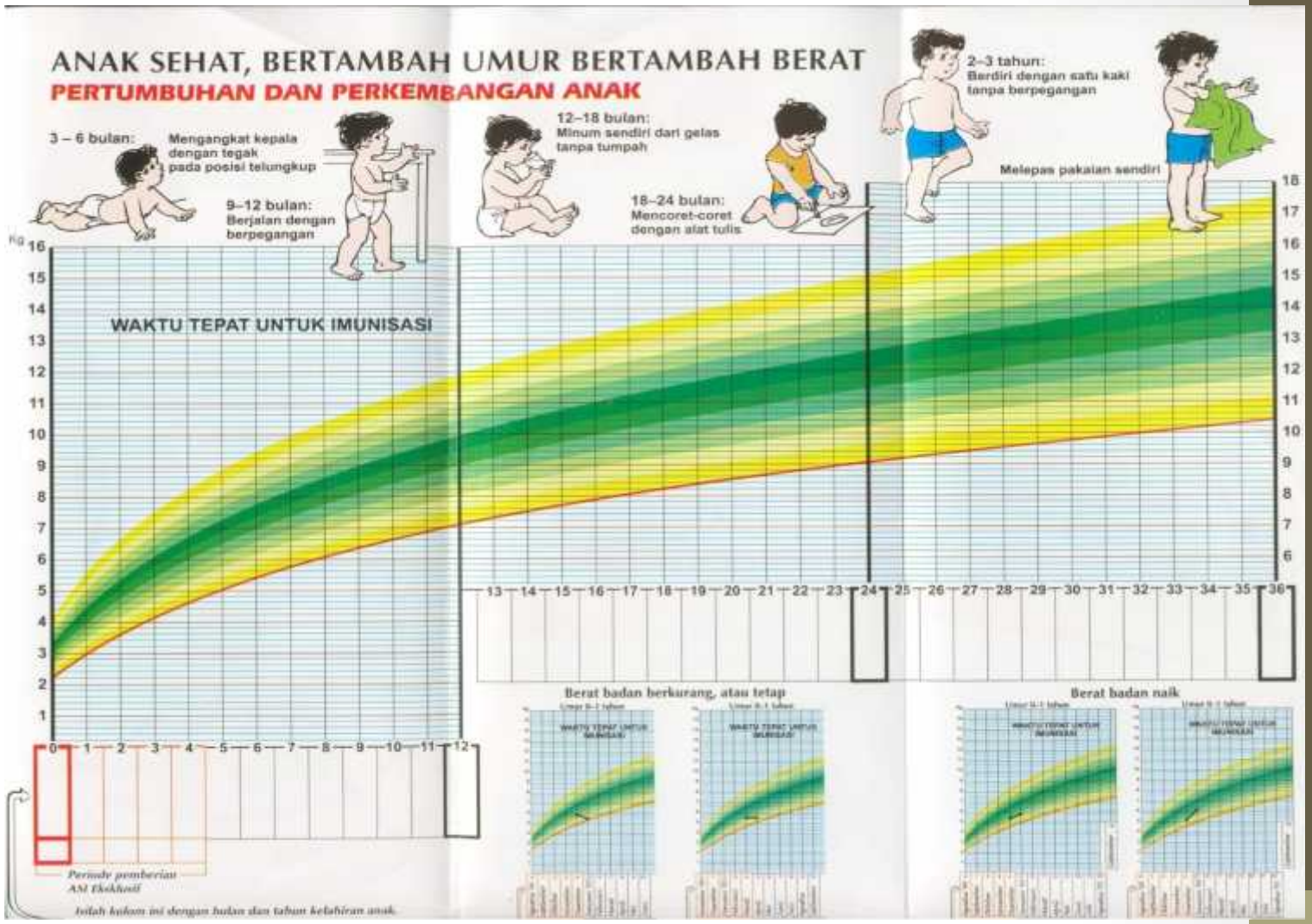


Figure 10.11: Measurement of elbow breadth.

Interpretation and evalution of anthropometric data

- Anthropometric indices, not the raw measurements, are interpreted and evaluated
- For chidren: WHZ (for wasting) & HAZ (for stunting) are the preferred anthropometric indices of body size.
- Anthropometric indices can be used at individual and population levels for : assess nutritional status, screening & response during intervention
- At population level can be also used to identify the determinants and consequences of malnutrition and for nutritional surveillance.

KMS


ANAK SEHAT, BERTAMBAH UMUR BERTAMBAH BERAT
PERTUMBUHAN DAN PERKEMBANGAN ANAK
3 – 6 bulan:
Mengangkat kepala dengan tegak pada posisi telungkup
9–12 bulan:
Berjalan dengan berpegangan
12–18 bulan:
Minum sendiri dari gelas tanpa tumpah
18–24 bulan:
Mencoret-coret dengan alat tulis
2–3 tahun:
Berdiri dengan satu kaki tanpa berpegangan
Melepas pakaian sendiri
WAKTU TEPAT UNTUK IMUNISASI
Berat badan berkurang, atau tetap
Berat badan naik
Periode pemberian ASI Eksklusif
Isilah kolom ini dengan bulan dan tahun kelahiran anak.

Selecting the appropriate indices

1:excellent, 4: poor

	WHZ	HAZ	WAZ
Usefullness in populations where age is uncertain	1	4	4
Usefullness in identifying wasted children	1	4	3
Sensitivity to weight change over a sort period of time	1	4	2
Usefullness in identifying stunted children	4	1	2

Klasifikasi status gizi

Indeks	Status	Keterangan
BB/U	Gizi lebih Gizi baik Gizi kurang Gizi buruk	>= 2 SD - 2 SD s/d +2 SD -2 SD s/d – 3 SD < - 3 SD
TB/U	Normal Pendek (stunted)	-2 SD s/d + 2 SD < - 2SD
BB/TB	Gemuk Normal Kurus (wasted) Sangat kurus	>= 2 SD -2 SD s/d + 2 SD < -2 SD s/d – 3 SD < - 3 SD

Interpretasi berdasar kombinasi indikator

Combination	Interpretation
BB/TB: N, BB/U: R, TB/U: R	Normally fed, with past history of malnutrition
BB/TB: N, BB/U: N, TB/U: N	Normal
BB/TB: N, BB/U: T, TB/U: T	Tall, normally nourished
BB/TB: R, BB/U:R, TB/U: T	Presently underfed ++
BB/TB: R, BB/U: R, TB/U: N	Presently underfed +
BB/TB: R, BB/U: N, TB/U: T	Presently underfed
BB/TB: T, BB/U: T, TB/U: R	Obese ++
BB/TB: T, BB/U: N, TB/U: R	Overfed with past history of malnutrition
BB/TB: T, BB/U: T, TB/U: N	Overfed but not necessarily obese

The advantages of anthropometric assessment

- simple, safe, inexpensive, non invasive
- unskilled personnel can perform measurement procedures
- precise and accurate
- may be used to evaluate changes in nutritional status over time and from one generation to the next
- can assist in the identification of mild to moderate malnutrition, as well as severe states of malnutrition

Limitations of anthropometric assessment

Relatively insensitive, cannot detect disturbance in nutritional status over short periods of time or identify specific nutrients deficiencies

Unable to distinguish disturbances in growth or body composition induced by specific nutrient (e.g. Zinc) deficiencies from those caused by imbalances in protein and energy intake

Certain non-nutritional factors (disease, genetics, diurnal variation) can reduce the specificity and sensitivity

Sources of error in nutritional anthropometry

- Measurements error : examiner, instrument, object
- Alteration in the composition and physical properties of certain tissues (tissue hydration, oedema, hepatomegaly)
- Invalid assumptions : e.g. skin fold

  in fact the relationship between subcutaneous and internal fat is non linier

Anthropometric assessment of body composition

- Skinfold thickness measurements:
  - Triceps skinfold
  - Biceps skinfold
  - Subscapular skinfold
  - Suprailiac skinfold
  - Midaxillary skinfold
- Multiple skinfold measurements can be used for measuring percent body fat

Anthropometric assessment of body composition

- Waist hip circumference ratio: >1.0 for men & >0.85 for women indicated abdominal fat accumulation & increase risk of cardiovascular complications
- Waist circumference: alone is the preferred indicator of fat loss. For urban Asians: >80cm for women & >90cm for men indicated central obesity
- Limb fat area: to estimate body fat
- Percent body fat can be predicted by several skinfld measurements

TERIMAKASIH

Wassalamualaikum wr.wb