



Childhood Obesity

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Medical Update

University of Mauritius

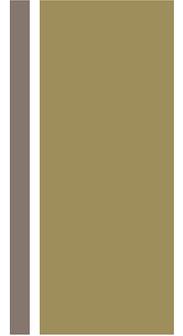
19th Sept 2012



Overweight



+ (Childhood) Obesity

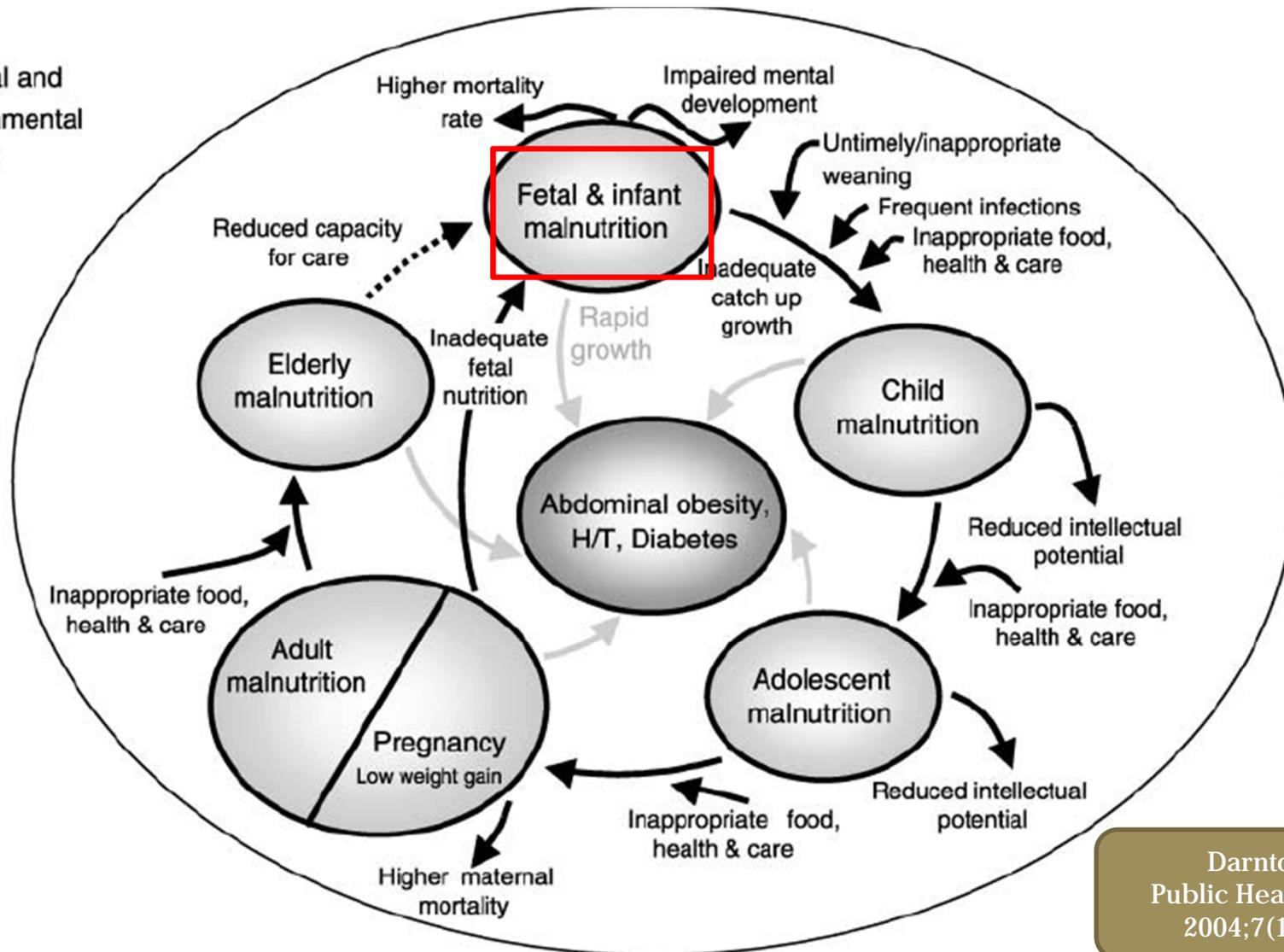


- Life cycle
- Infant Nutrition
- Epigenetics
- Transgenerational process
- « Globesity »



Life Course : 5 stages of life

Societal and environmental factors



Darnton-Hill et al.
Public Health Nutrition
2004;7(1A), 101-121

Fetal life

Life cycle

Infant
Nutrition

Epigenetic

Trans-
generation

Globesity

- Factors associated with higher rates of non communicable diseases (diabetes, obesity, cardiovascular diseases and stroke)
 - IUGR (undernutrition)
 - Overnutrition

Mother's diet and nutrient stores

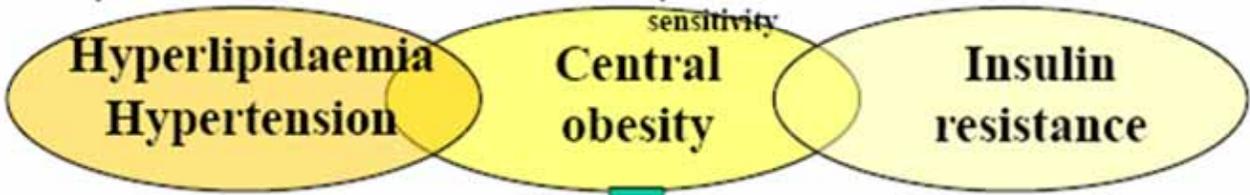
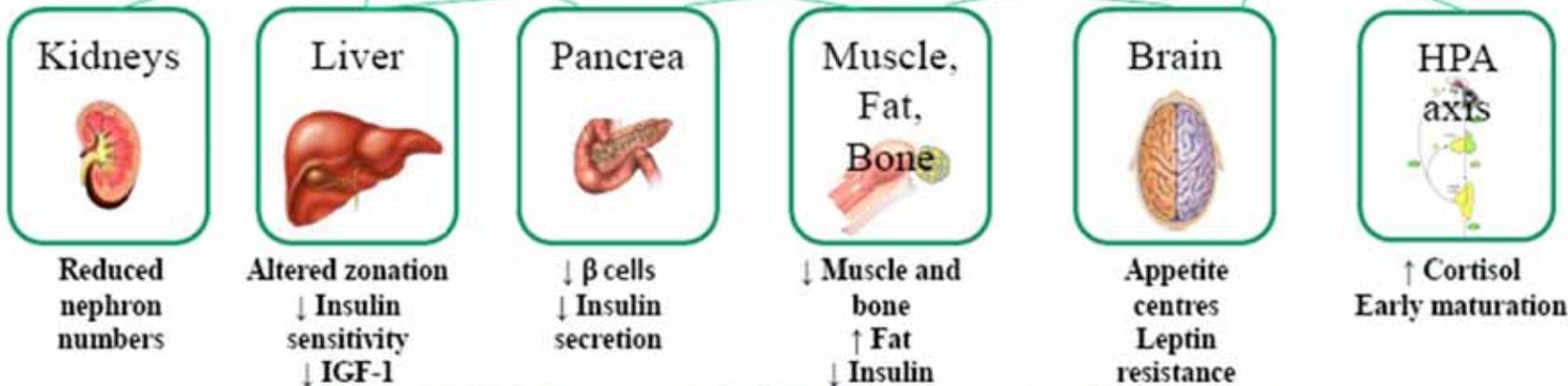
Mother's ability to mobilise and transport nutrients

'Supply-line' to the foetus
Uterine blood flow
Placental structure and function

**Mother unable to supply nutrients to satisfy foetal demand
FETAL UNDERNUTRITION**

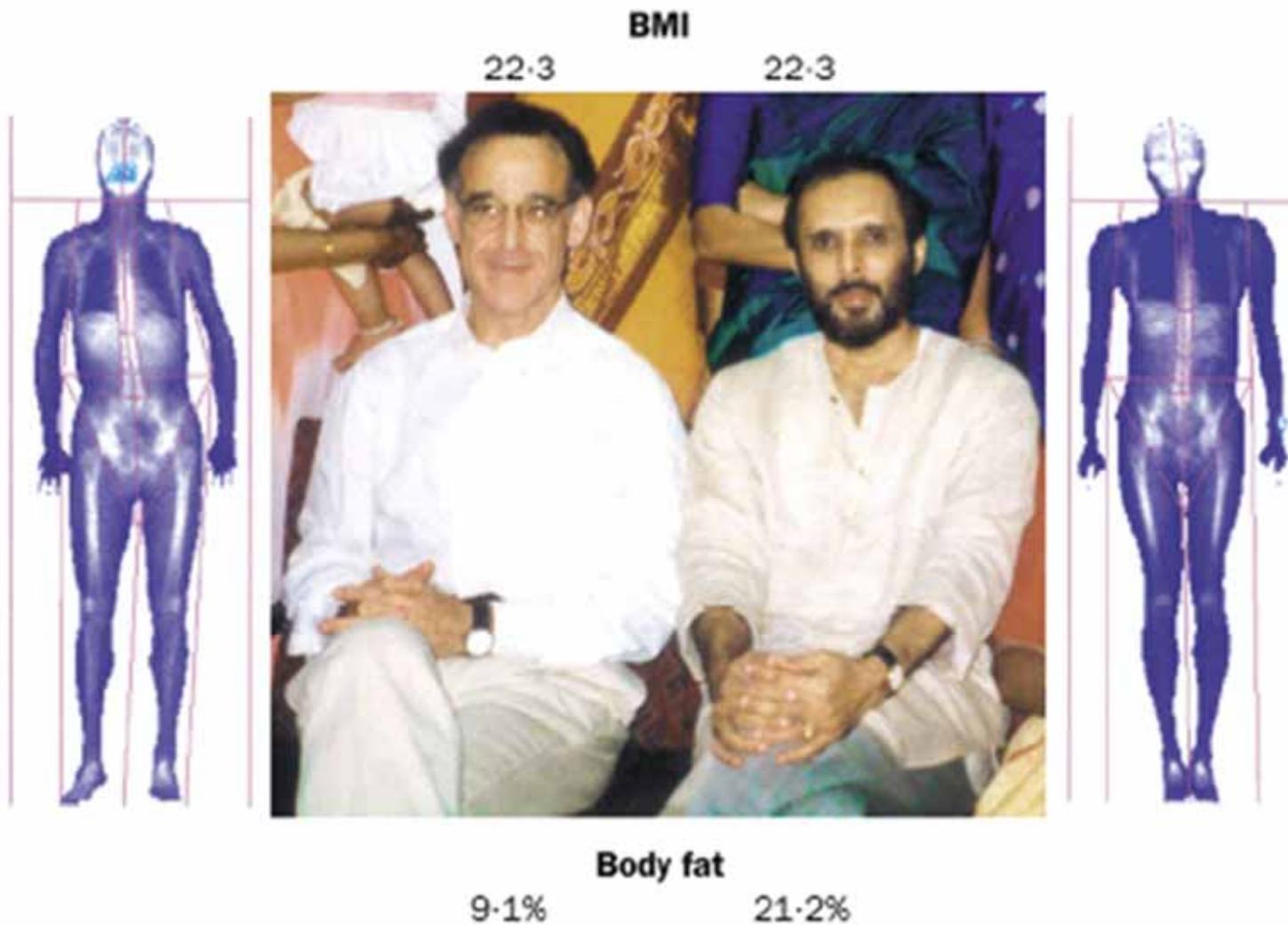
Inadequate 'building blocks'

Adaptation to reduce demand



**Type 2 diabetes
Coronary heart disease**

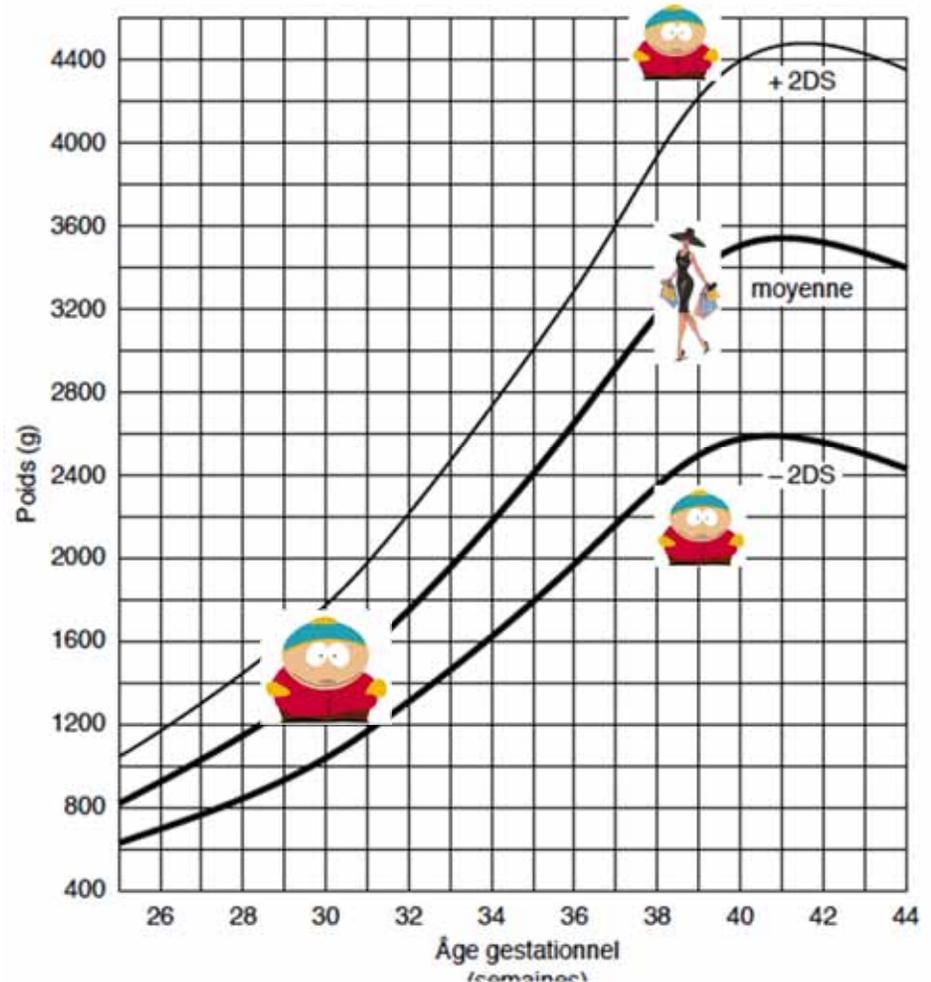
+ Thin fat phenotype



+ Adult cardiovascular diseases

- Thin fat phenotype
- Prematurity
- Small for gestational age

Annexe 1B Croissance pondérale prénatale



Adiposity rebound

Life cycle

Infant
Nutrition

Epigenetic

Trans-
generation

Globesity

PEDIATRICS®

OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

Early Adiposity Rebound and the Risk of Adult Obesity

Robert C. Whitaker, Margaret S. Pepe, Jeffrey A. Wright, Kristy D. Seidel and
William H. Dietz

Pediatrics 1998;101:e5

Adiposity rebound

Life cycle

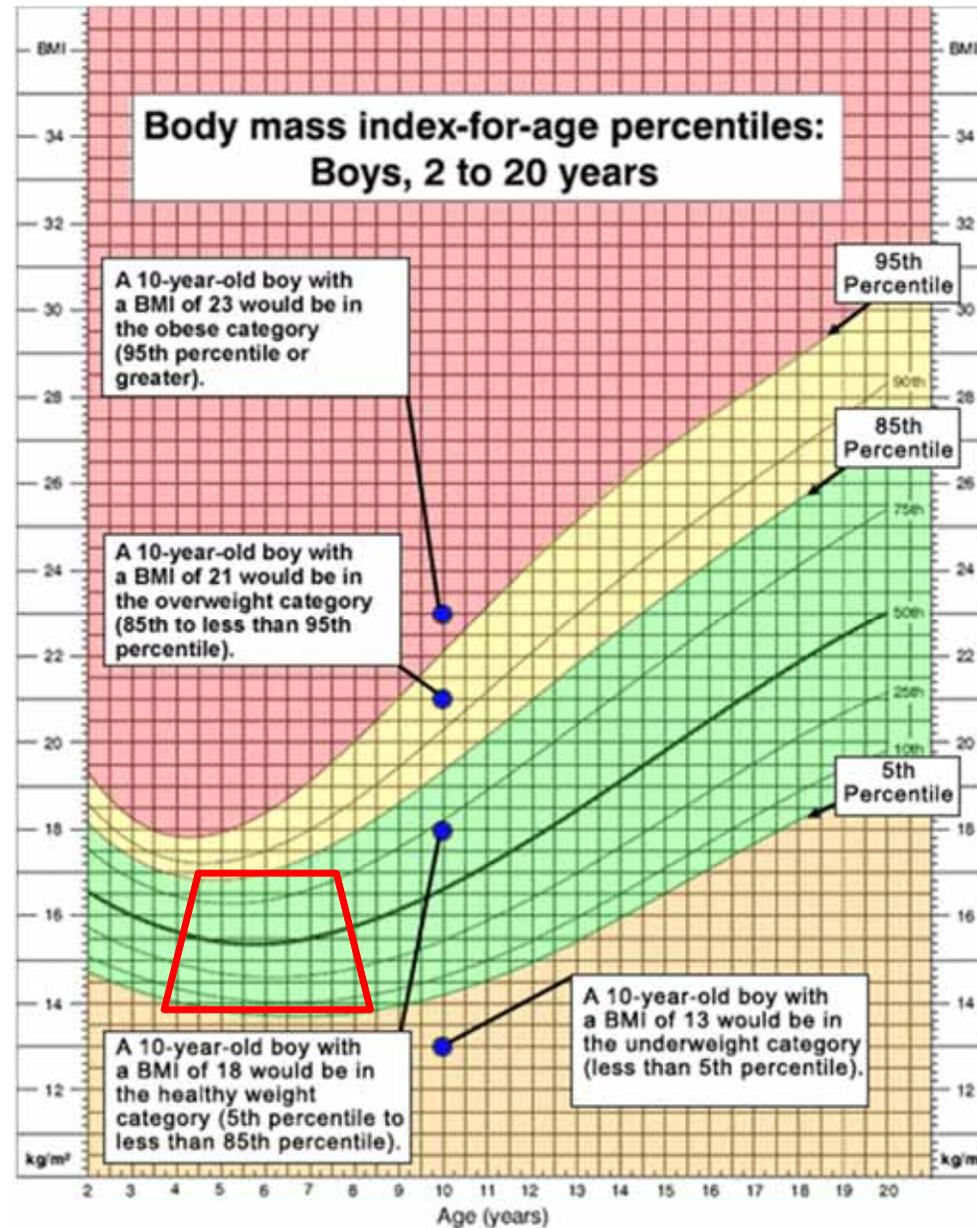
Infant
Nutrition

Epigenetic

Trans-
generation

Globesity

Adiposity
rebound



Adiposity rebound

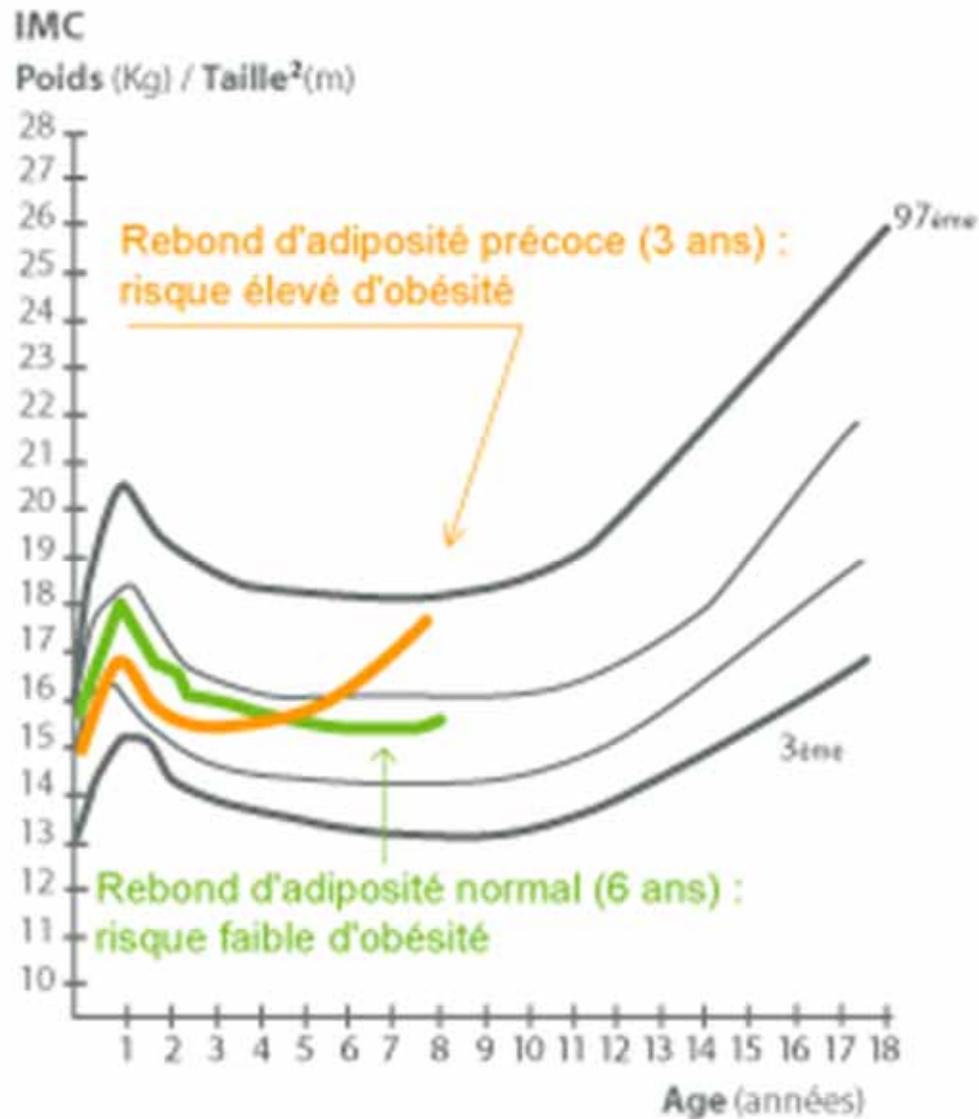
Life cycle

Infant
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Epigenetic

Trans-
generation

Globesity



Excess Proteins in
infant diet

Life cycle

**Infant
Nutrition**

Epigenetic

Trans-
generation

Globesity

Lower protein in infant formula is associated with lower weight up to age 2 y: a randomized clinical trial¹⁻⁴

Berthold Koletzko, Rüdiger von Kries, Ricardo Closa, Joaquín Escribano, Silvia Scaglioni, Marcello Giovannini, Jeannette Beyer, Hans Demmelmair, Dariusz Gruszfeld, Anna Dobrzanska, Anne Sengier, Jean-Paul Langhendries, Marie-Francoise Rolland Cachera, and Veit Grote for the European Childhood Obesity Trial Study Group

Am J Clin Nutr
2009;89:1836-45.

RCT - 1138

Life cycle

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Nutrition

Epigenetic

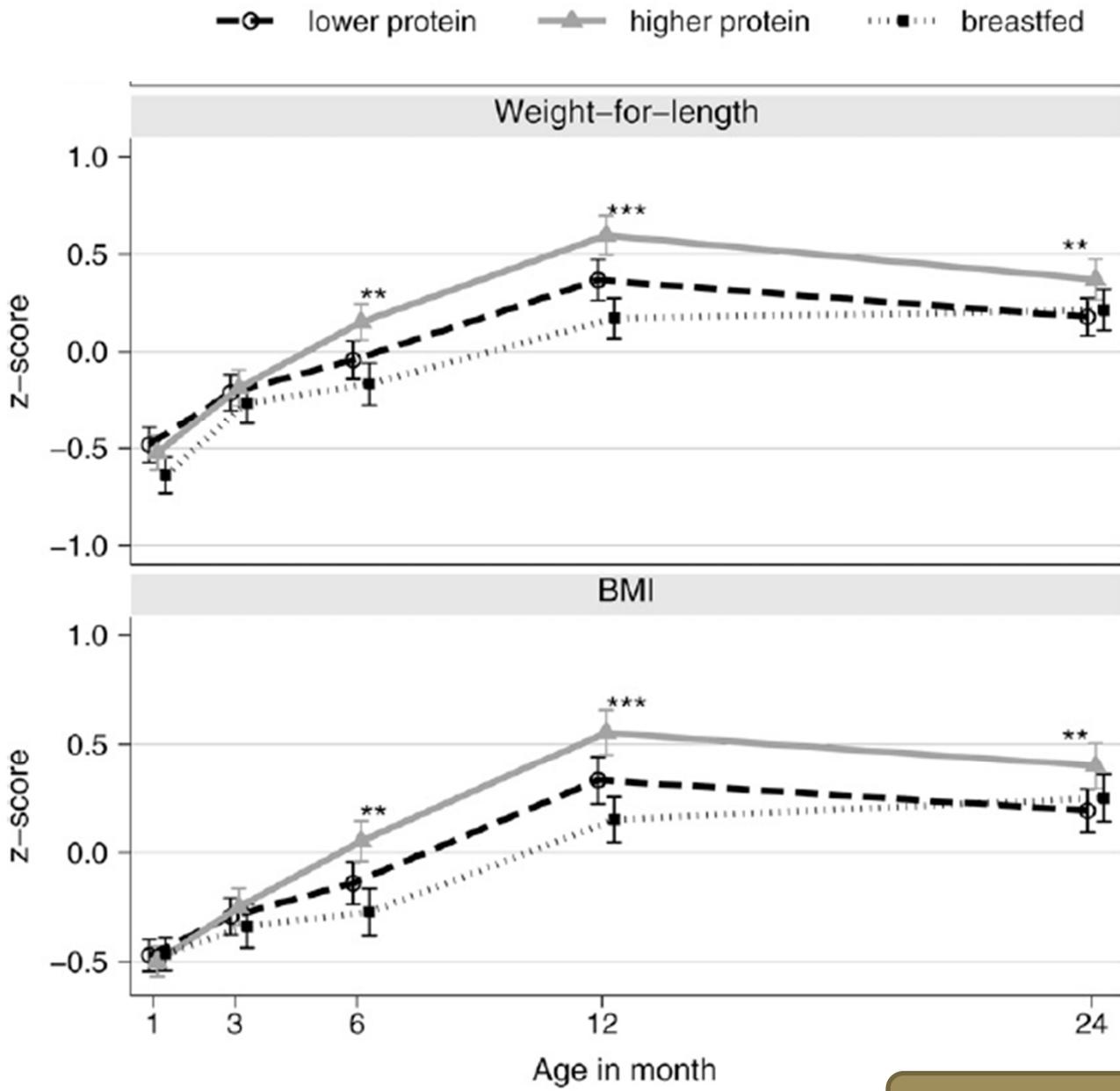
Trans-
generation

Globesity

	Infant formulas		Follow-on formulas	
	Lower protein	Higher protein	Lower protein	Higher protein
Whey:casein ratio	1:4	1:4	1:4	1:4
Energy (g/100 mL)	69.9	69.8	72.7	72.5
Proteins (g/100 mL)	1.25	2.05	1.6	3.2
Proteins (g/100 kcal)	1.77	2.9	2.2	4.4
Proteins (% of energy)	7.1	11.7	8.8	17.6
Lipids (g/100 mL)	3.9	3.5	4.0	3.27
Carbohydrates (g/100 mL)	7.5	7.5	7.6	7.6
Lactose (%)	100	100	100	100

Protein quality between these two groups : identical formula

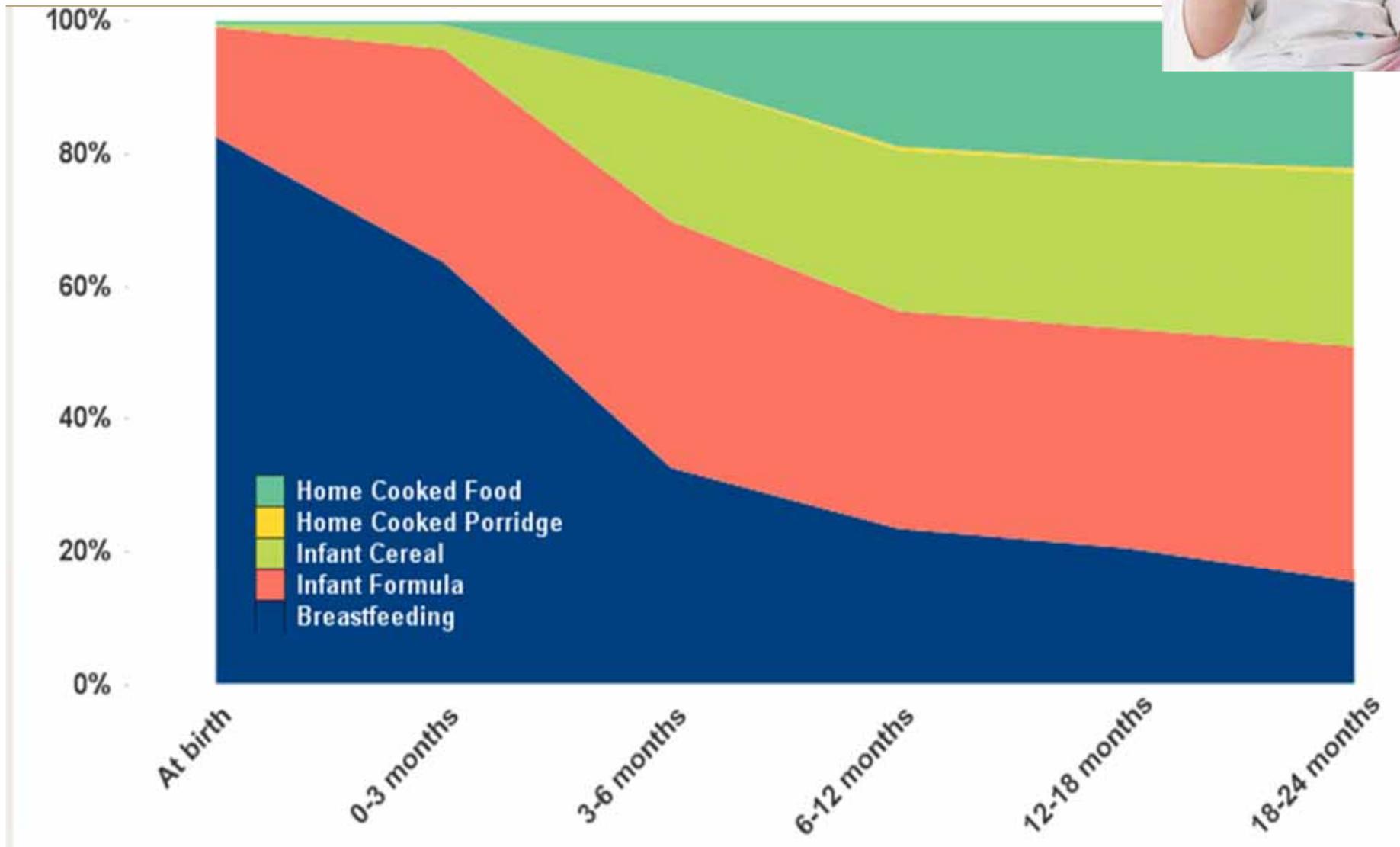
Life cycle
Infant Nutrition
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Trans-generation
Globesity



+ Weaning

What do Mauritian mother's introduce?

(WHO Database)



Infancy and childhood

Life cycle

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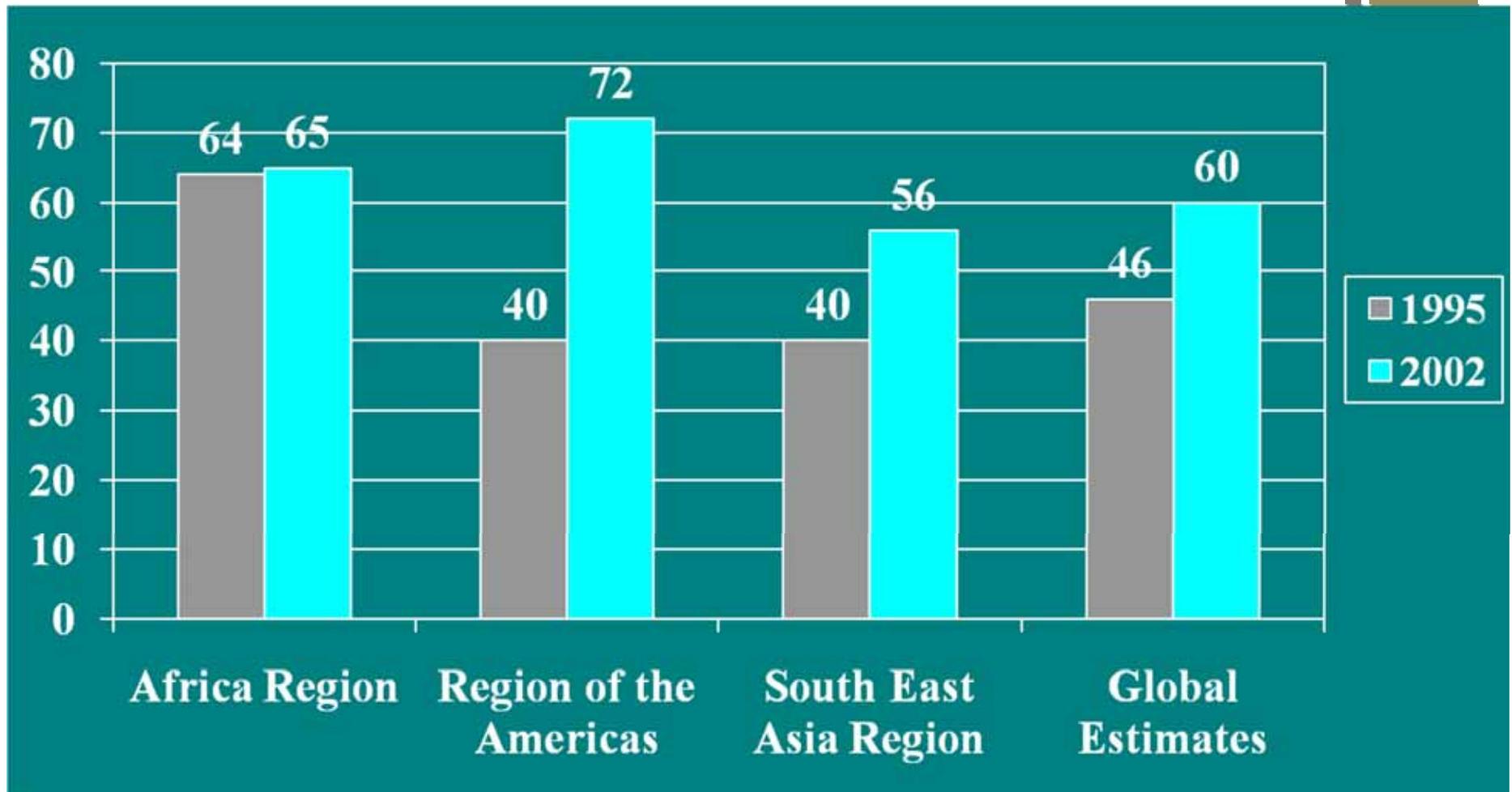
Indicators for later non communicable diseases

- Poor gain weight
- Poor height gain : indicating low socioeconomic background
- Crossing of percentiles
- Early adiposity rebound

Breastfeeding

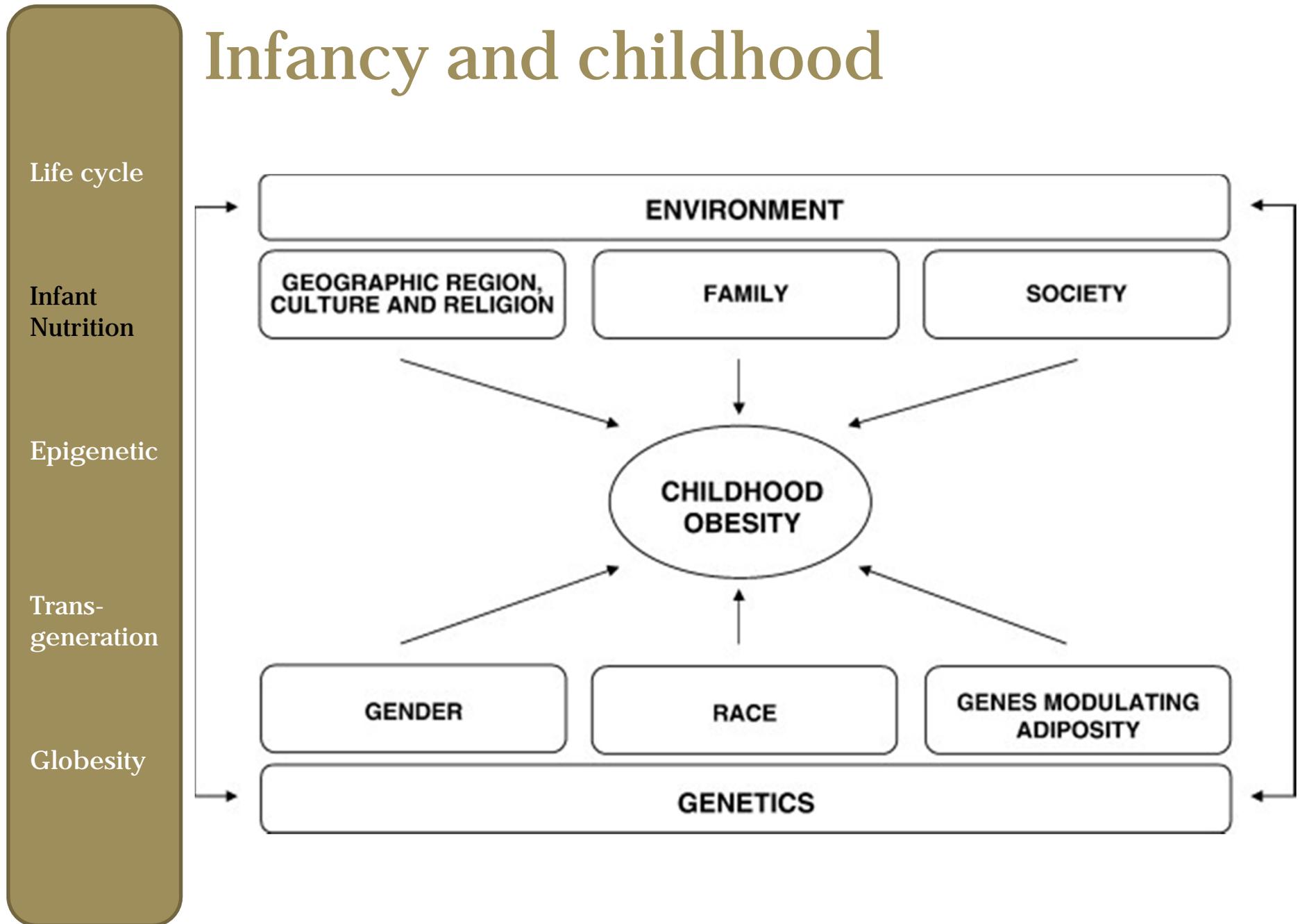
- Length of exclusive breastfeeding period

+ Weaning



Prevalence of Timely Complementary Feeding, 1995 and 2002 (WHO Database)

Infancy and childhood



Infancy and childhood

Life cycle

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Nutrition

Epigenetic

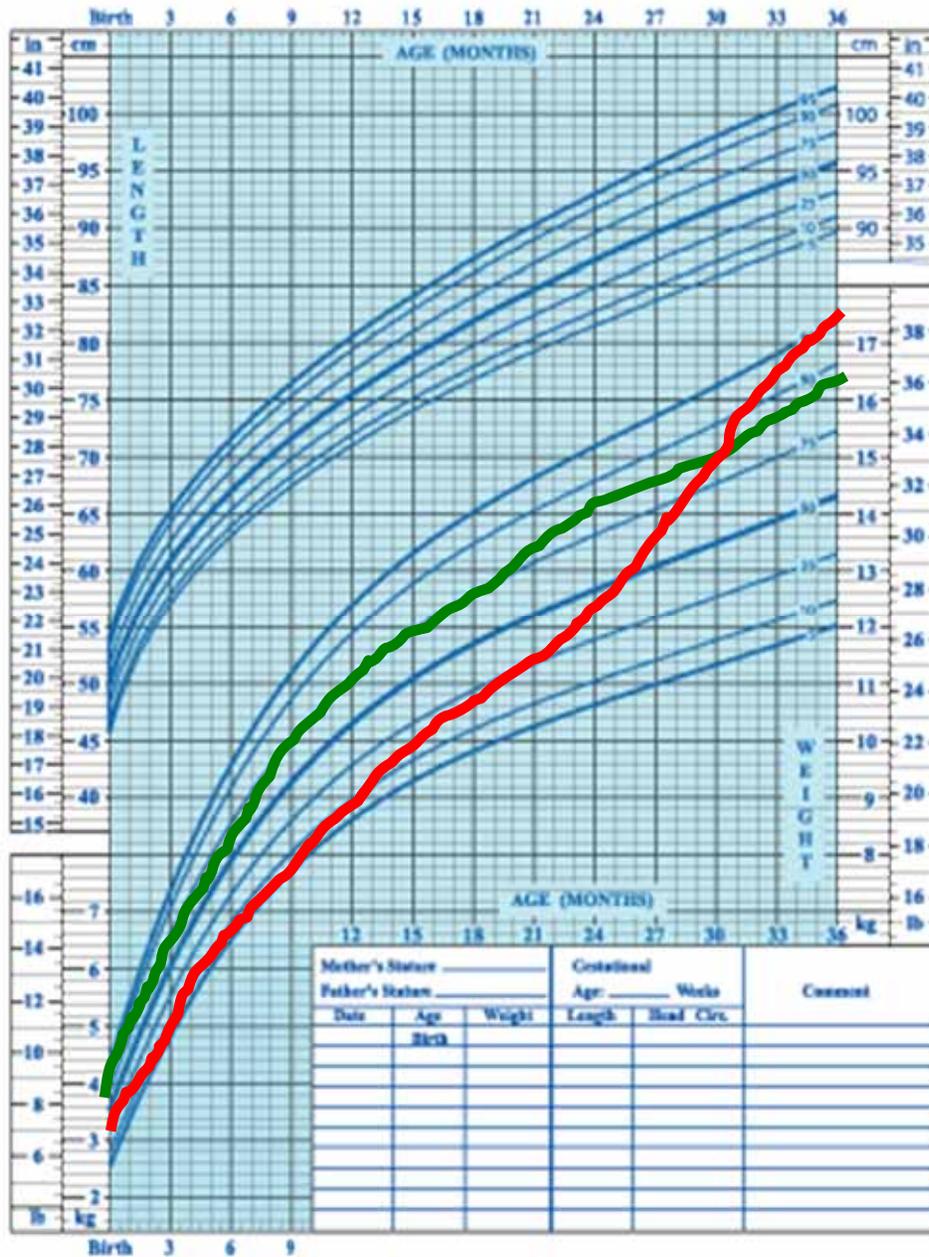
Trans-
generation

Globesity

- Rapid weight gain in infancy is associated with an increased risk of later obesity in a large number of observational studies summarized in 3 recent systemic reviews (1–3).
 - 1. Baird J, Fisher D, Lucas P, Kleijnen J, Roberts H, Law C. Being big or growing fast: systematic review of size and growth in infancy and later obesity. *BMJ* 2005;331:929–31.
 - 2. Monteiro POA, Victora CG. Rapid growth in infancy and childhood and obesity in later life - a systematic review. *Obes Rev* 2005;6:143–54.
 - 3. Ong KK, Loos RJF. Rapid infancy weight gain and subsequent obesity: systematic reviews and hopeful suggestions. *Acta Paediatr* 2006;95: 904–8.

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

NAME _____



Higher risk for CVD

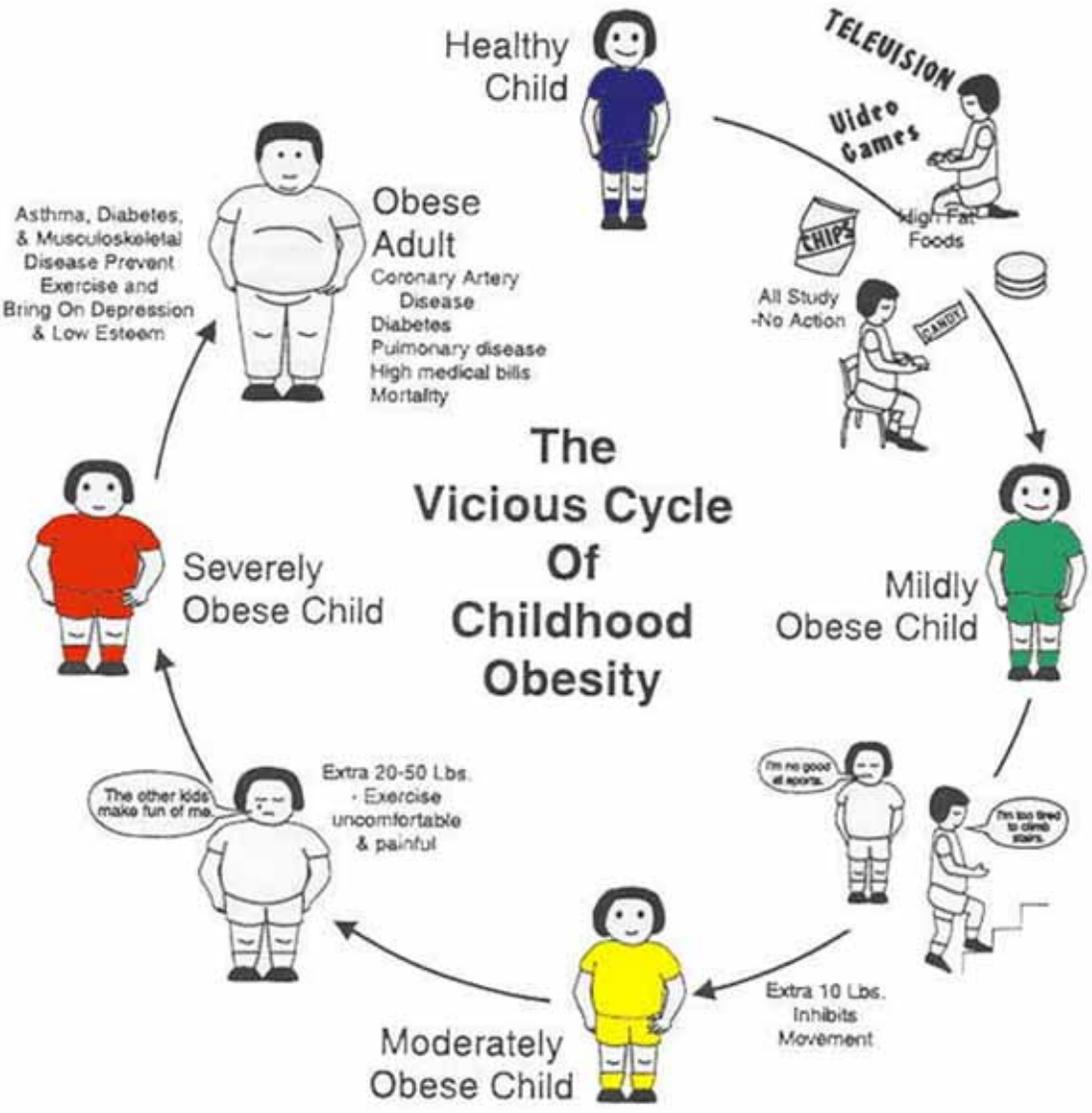
Lower risk of CVD



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.zc.gov/growthchart>

Childhood

Life cycle
Infant Nutrition
Epigenetic
Trans-generation
Globesity



Trend starts early.

Life cycle

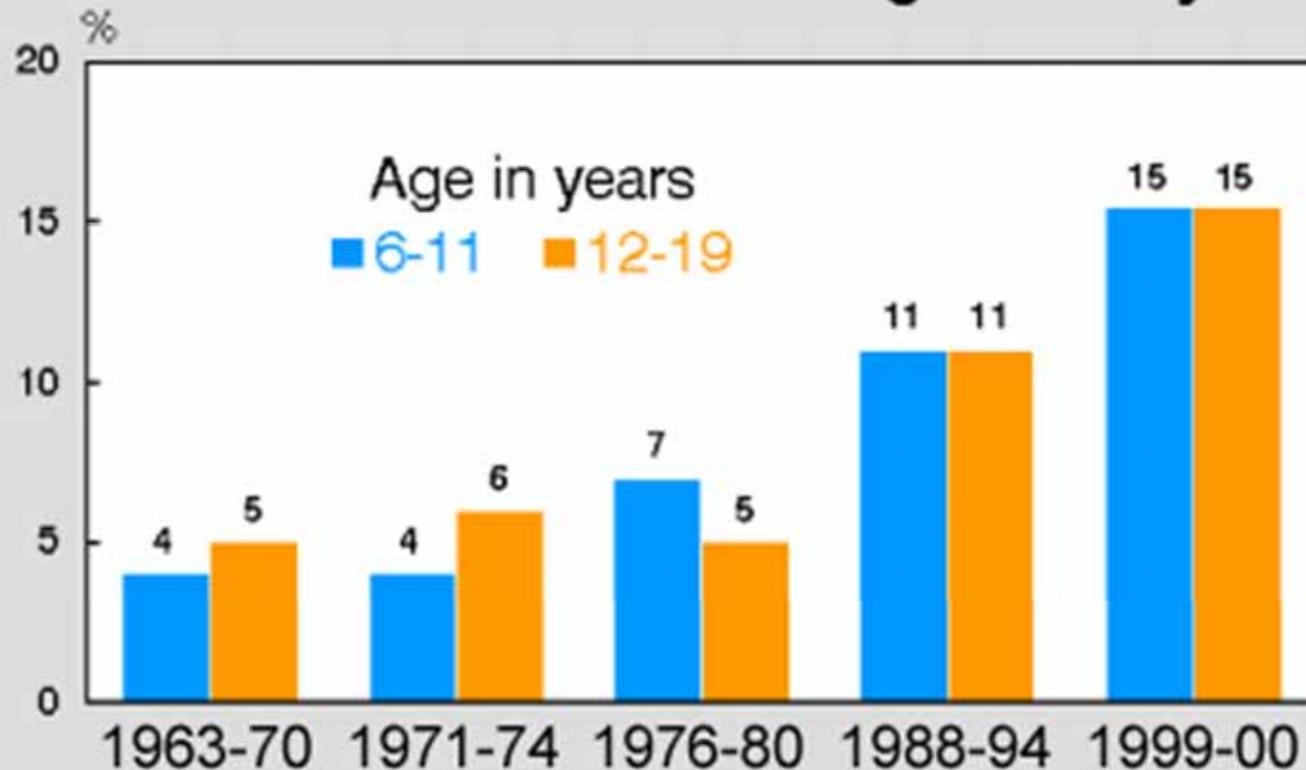
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Figure 1. Prevalence of overweight among children and adolescents ages 6-19 years



NOTES: Excludes pregnant women starting with 1971-74. Pregnancy status not available for 1963-65 and 1966-70. Data for 1963-65 are for children 6-11 years of age; data for 1966-70 are for adolescents 12-17 years of age, not 12-19 years.
SOURCE: CDC/NCHS, NHES and NHANES.

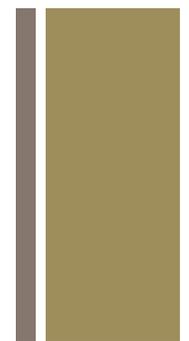
Life cycle

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Epigenetics : DNA isn't everything

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These Two Mice are Genetically Identical and the Same Age

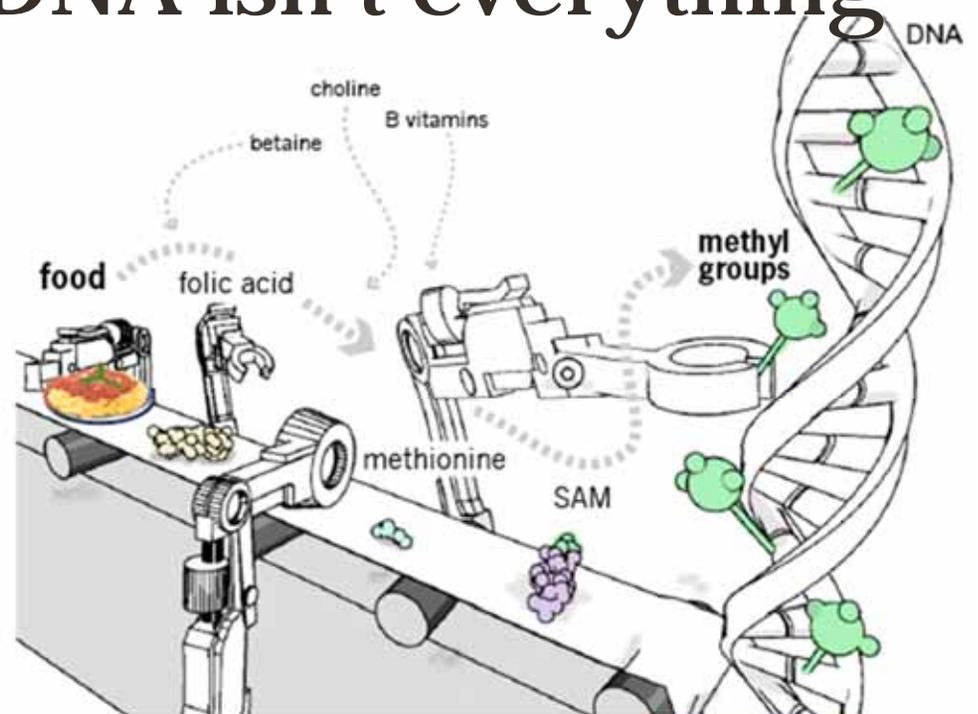
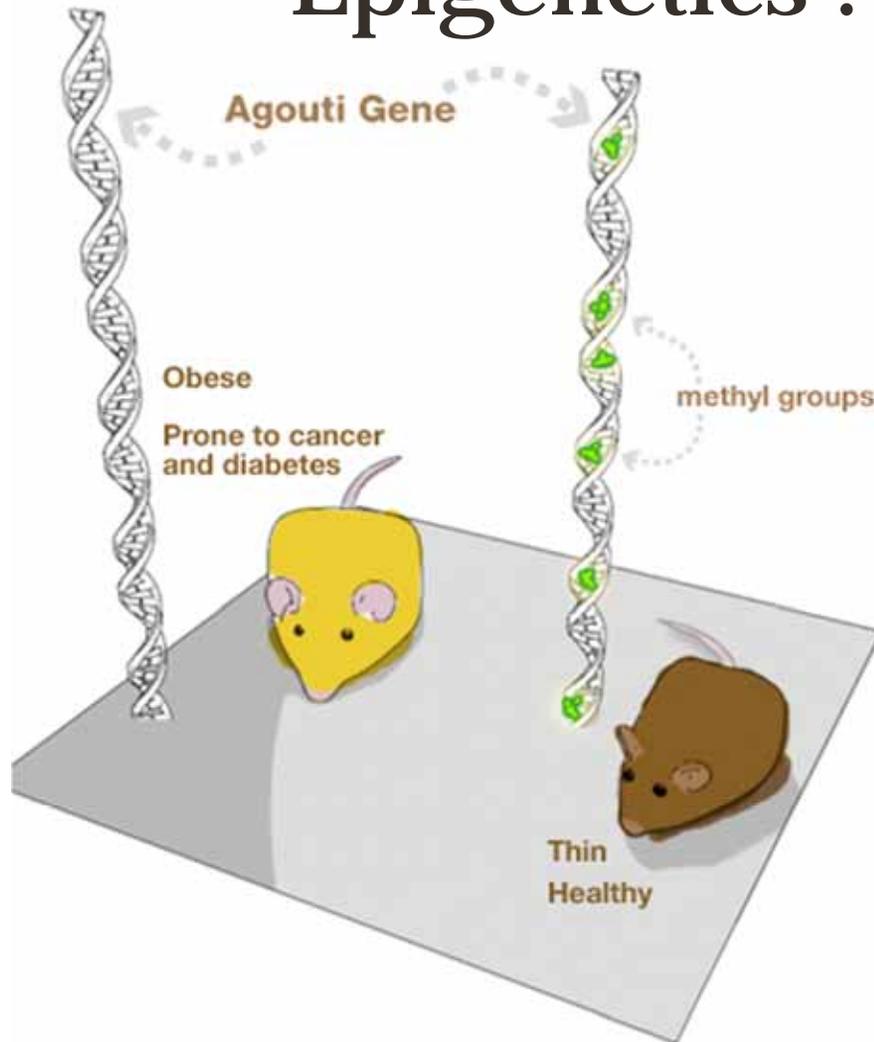


While pregnant, both of their mothers were fed Bisphenol A (BPA) but **DIFFERENT DIETS:**

The mother of this mouse received a **normal mouse diet**

The mother of this mouse received a diet **supplemented** with choline, folic acid, betaine and vitamin B12

Epigenetics : DNA isn't everything



Permanent programming

Transgeneration

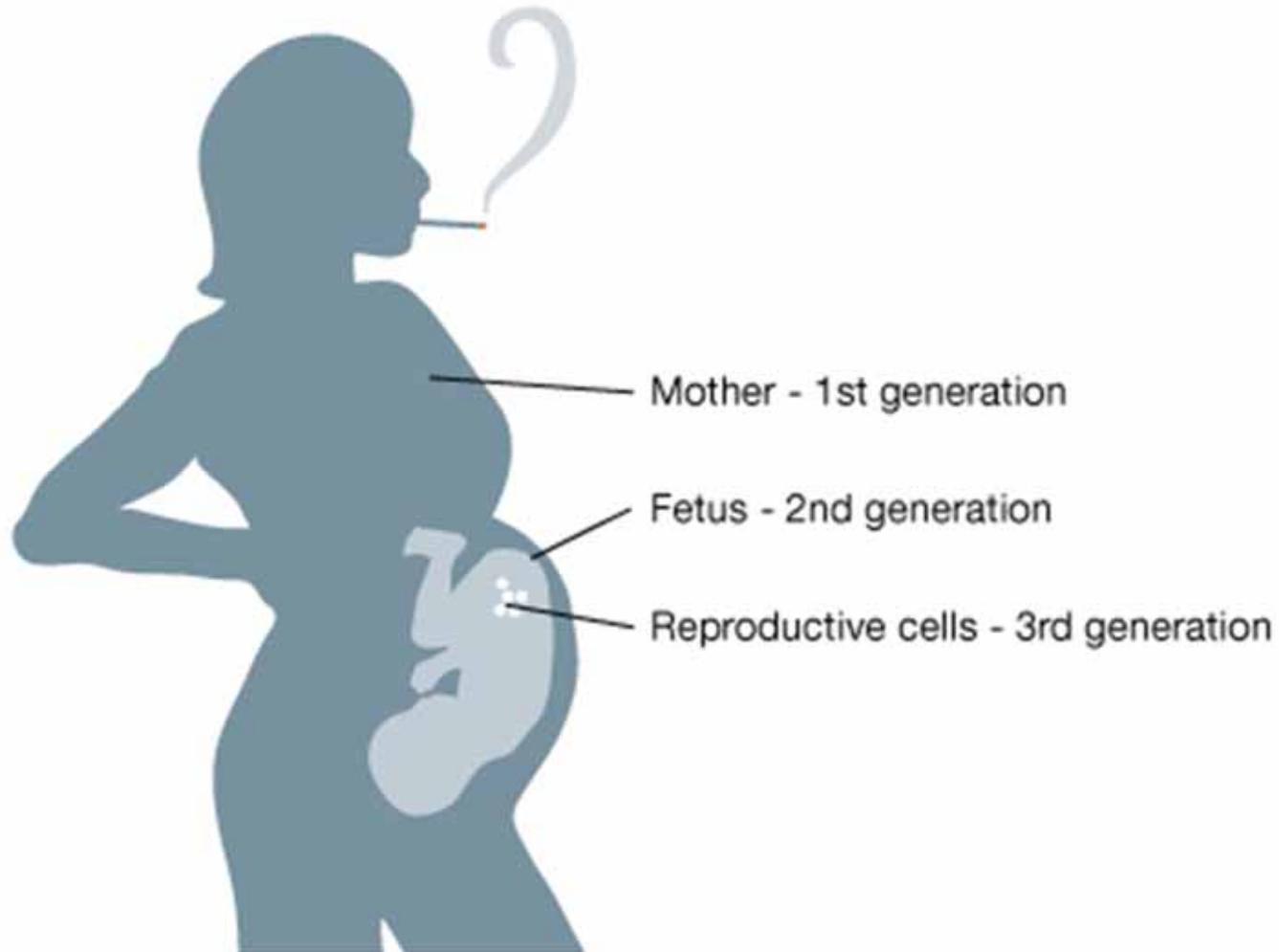
Life cycle

Infant
Nutrition

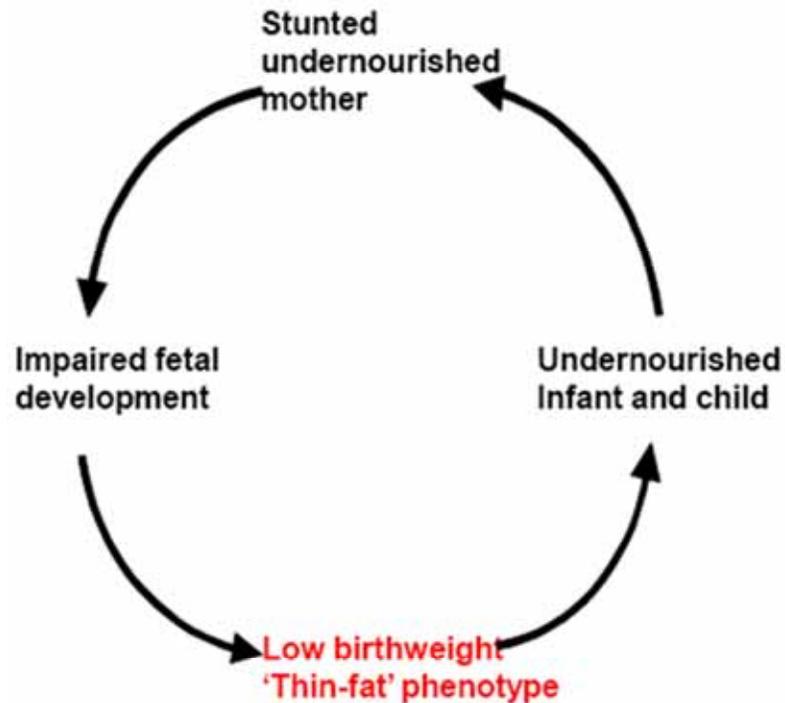
Epigenetic

**Trans-
generation**

Globesity



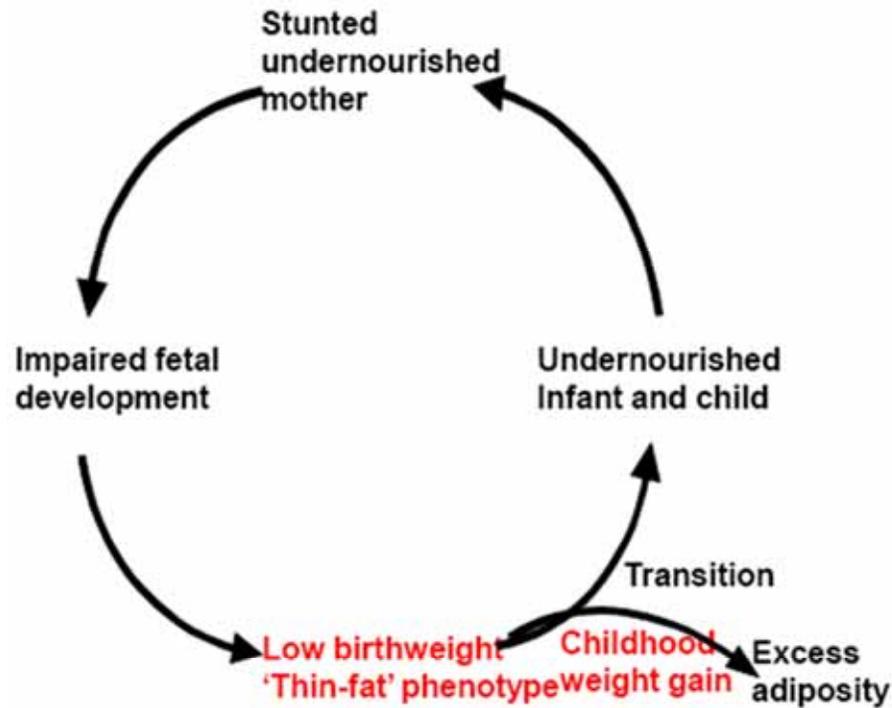
Obesity and malnutrition



Long-term effects

- ↓ Muscle mass
- ↑ Adiposity
- ↑ Insulin resistance
- ↓ Cognitive ability
- ↓ Bone mass and stunting

Obesity and malnutrition



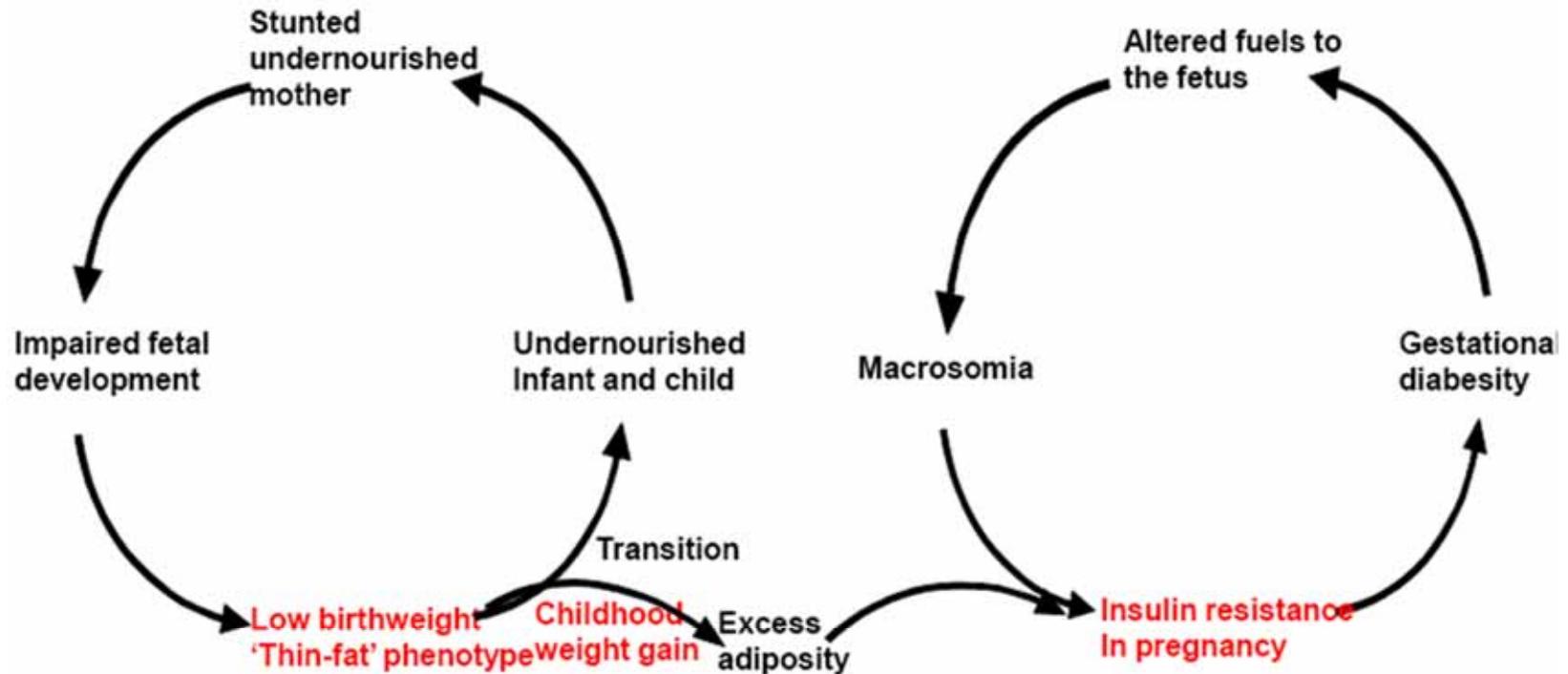
Long-term effects

- ↓ Muscle mass
- ↑ Adiposity
- ↑ Insulin resistance
- ↓ Cognitive ability
- ↓ Bone mass, stunting

Long-term effects

- ↑ ↑ Insulin resistance
- ↑ Lipids
- ↑ Inflammation
- Diabetes and CVD

Obesity and malnutrition



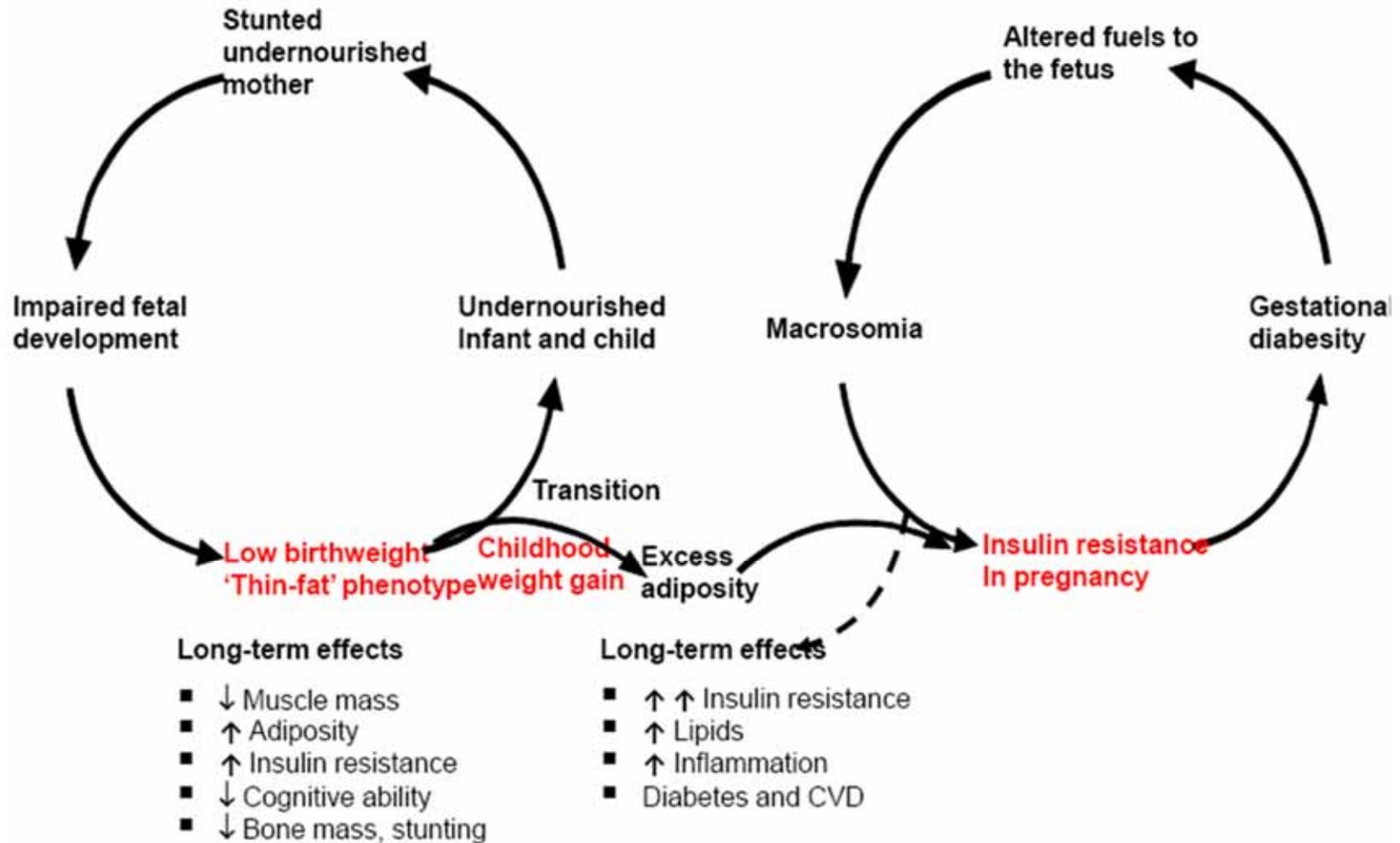
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Obesity and malnutrition



« Globesity »

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Globesity

- Socioeconomic disparities
 - Within country and Internationally
 - Poor disadvantaged

- Lifestyle
 - Less manual work
 - Less physical activity
 - Indoor activities
 - Fastfood vs Homemade

- Behavioral issues concerning infant nutrition
 - Compensation with snack
 - Spoilt child
 - No parental authority

« Globesity »

Life cycle

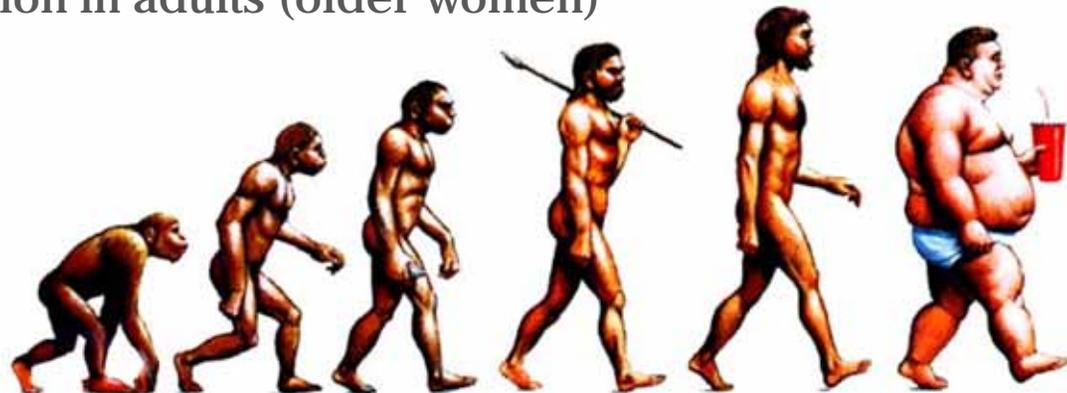
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Globesity

- Non communicable diseases
 - Obesity
 - Diabetes type 2 : x 2.5 (84-228 million in 2025)
 - Cardiovascular diseases
 - Stroke
- NCD will appear earlier
- Double burden in same countries/households
 - Undernourished infants, children, women
 - Overnutrition in adults (older women)



+ Take home message (Paediatrics)

- Encourage breastfeeding
- Genetic and permanent programming
 - Tendancy to grow fat
 - Programmation of taste
- Weaning is too early
 - Honey
 - Cereals after 6 months
- Excess protein !!!
- Adiposity rebound



Fat doctors 'far less likely to help obese patients lose weight'

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