

Nutrition and NCDs: The Scientific Link

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Introduction

- Diet and nutrition are important factors in the promotion and maintenance of good health throughout the entire life course
- Role as determinants of chronic NCDs is well established
- Occupy a prominent position in prevention activities

This discussion.....

Chronic Diseases in later life may have their origin during early life nutritional conditions

de Magalhães JP. Programmatic features of aging originating in development: aging mechanisms beyond molecular damage? FASEB J. 2012; 26, 4821–4826

Gluckman PD, Hanson MA, Low FM. The role of developmental plasticity and epigenetics in human health. Birth Defects Res C Embryo Today. 2011; 93, 12–18

Hanson M, Godfrey KM, Lillycrop KA, Burdge GC, Gluckman PD. Developmental plasticity and developmental origins of non-communicable disease: theoretical considerations and epigenetic mechanisms. Prog Biophys Mol Biol. 2011; 106, 272–280

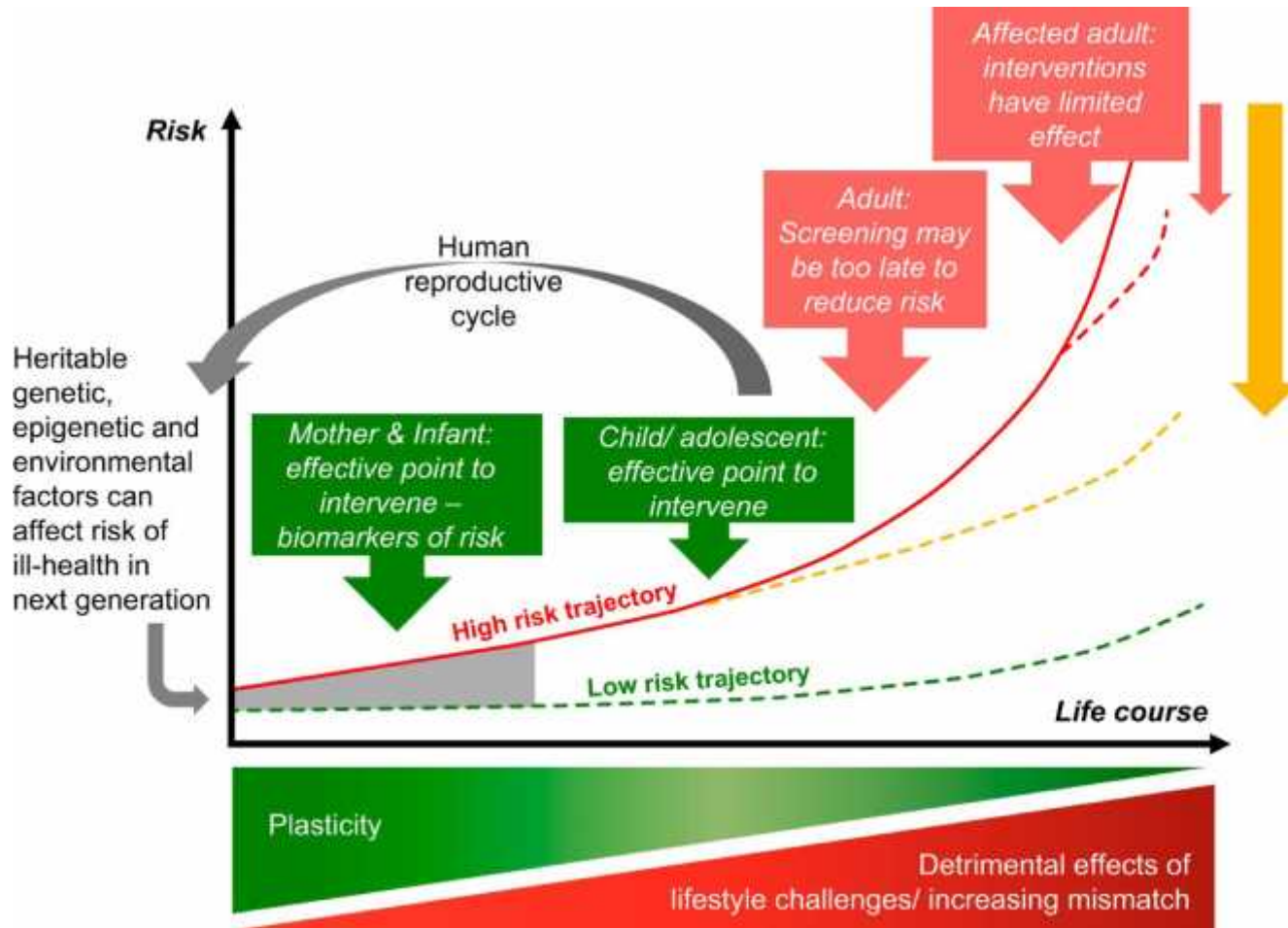
NCDs are interconnected

- Sharing many of the same risk factors
- acting as risk factors for each other
- Overweight and obesity significantly increase the risk for cardiovascular disease many cancers and diabetes
- Diabetes increases the risk for cardiovascular disease
- The main modifiable behavioural risk factors for NCDs are **diet** and physical inactivity

Focus on 4 NCDs and 4 risk factors for NCDs

	Tobacco use	Unhealthy diet	Physical inactivity	Harmful use of alcohol
Heart disease and stroke	✓	✓	✓	✓
Diabetes	✓	✓	✓	✓
Cancer	✓	✓	✓	✓
Chronic respiratory disease	✓			

Early Developmental Conditioning of Later Health and Disease



M. A. Hanson, P. D. Gluckman

Physiological Reviews Published 1 October 2014 Vol. 94 no. 4

Maternal Under-nutrition During Pregnancy

IUGR conditions are associated with

- Reprogramming of the HPA axis and GH/IGF axis during the fetal development
- Decreased levels of anabolic hormones
 - sex steroids
 - Insulin
 - GH
 - IGF-1
- Increased concentrations of catabolic hormones
 - Glucocorticoids
 - Higher apoptosis rate

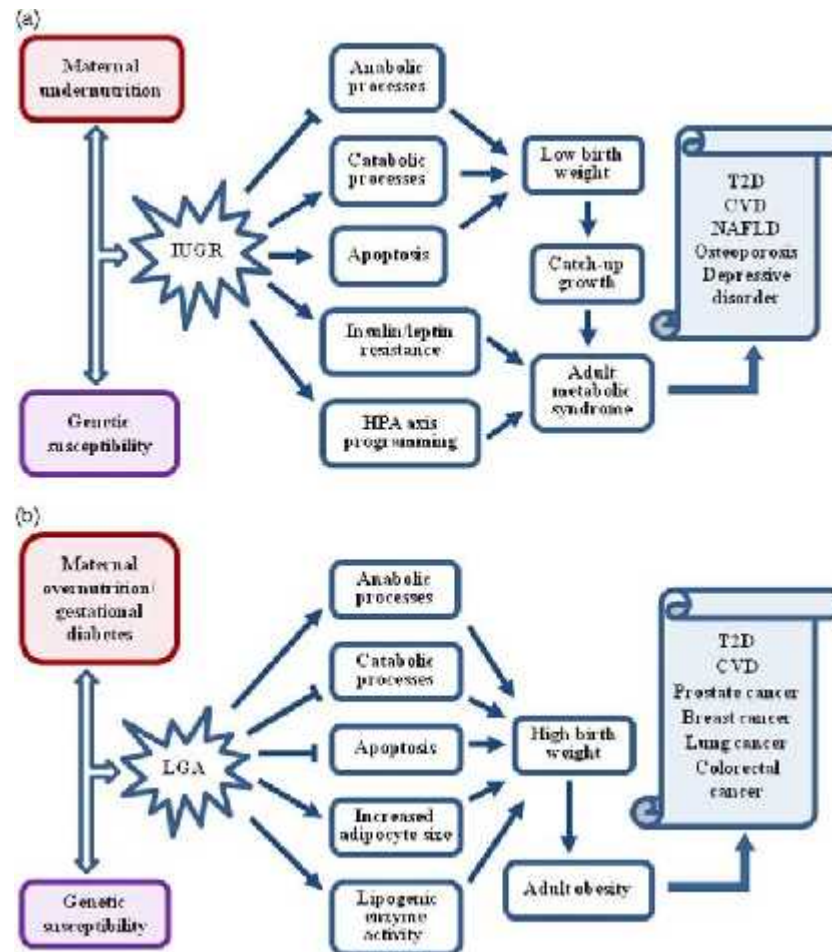
IUGR

- low birth weight (<2.5 kg)
- Subsequent rapid catch-up growth
- This is followed by higher risk for metabolic complications in adulthood

Maternal Over-nutrition/ Gestational Diabetes

- LGA conditions (≥ 4.0 kg)
 - Upregulation of adipogenic genes
 - Increased anabolic
 - Decreased catabolic hormone levels
 - Enhanced cell proliferation
 - Increased adipocyte cell size
 - High activity of lipogenic enzymes.,
- Impaired development of the central appetite regulatory system

Mechanisms linking maternal undernutrition and overnutrition during pregnancy with adverse fetal and adult outcomes



Micronutrient Deficiencies

Vitamin Deficiency Diseases

- Retinol (Vitamin A) → xerophthalmia / night blindness
- Ascorbic acid (Vitamin C) → scurvy or scorbutus
- Calciferol (Vitamin D) → rickets.
- Niacin (Vitamin B₃) → pellagra
- Thiamin (Vitamin B₁) → beriberi



There is overwhelming evidence that vitamin deficiencies are associated with the chronic disease process and the overall condition of one's health.

"Inadequate intake or subtle deficiencies in several vitamins are risk factors for chronic diseases such as cardiovascular disease, cancer and osteoporosis."

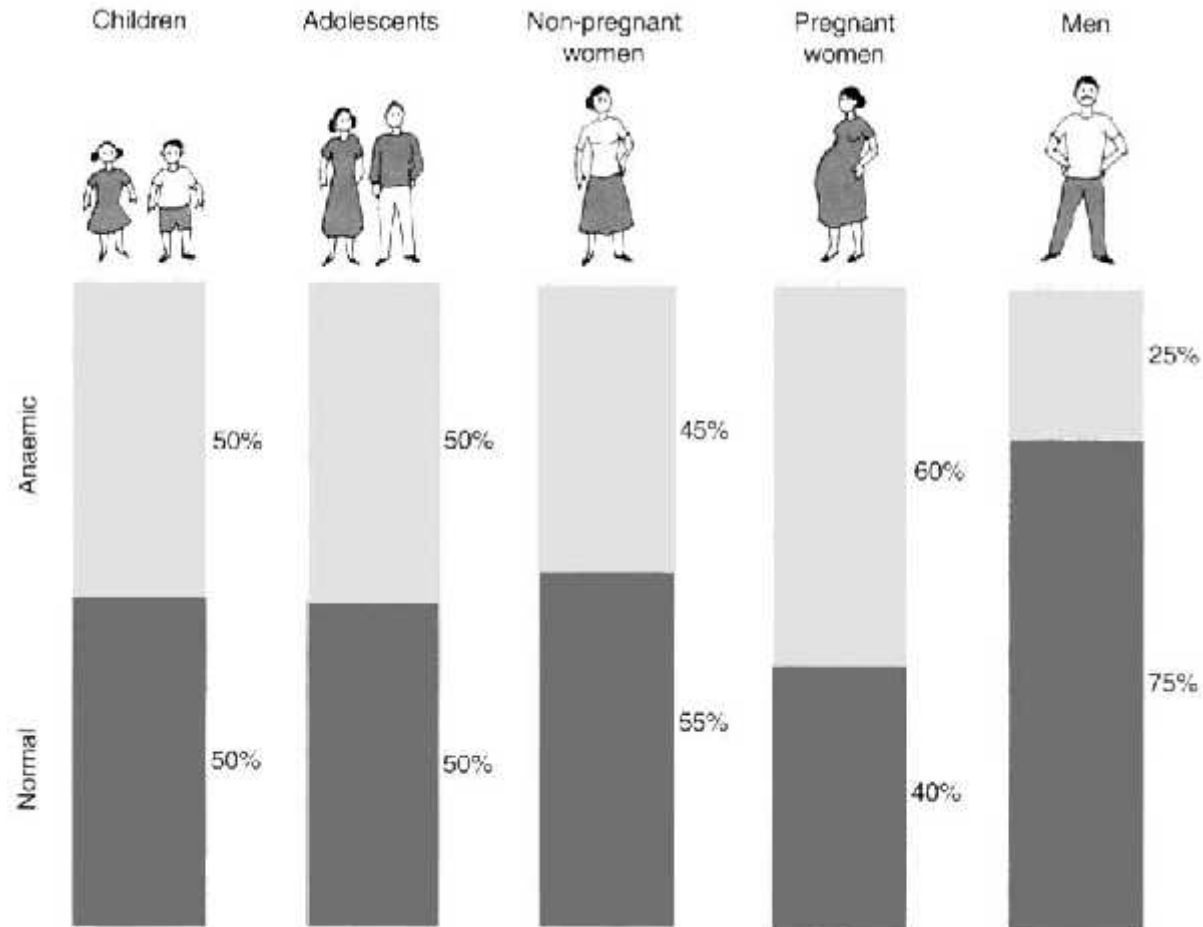
Journal of the American Medical Association (JAMA), June 15, 2001 - Vol. 285, No. 24

Mineral Deficiency Diseases

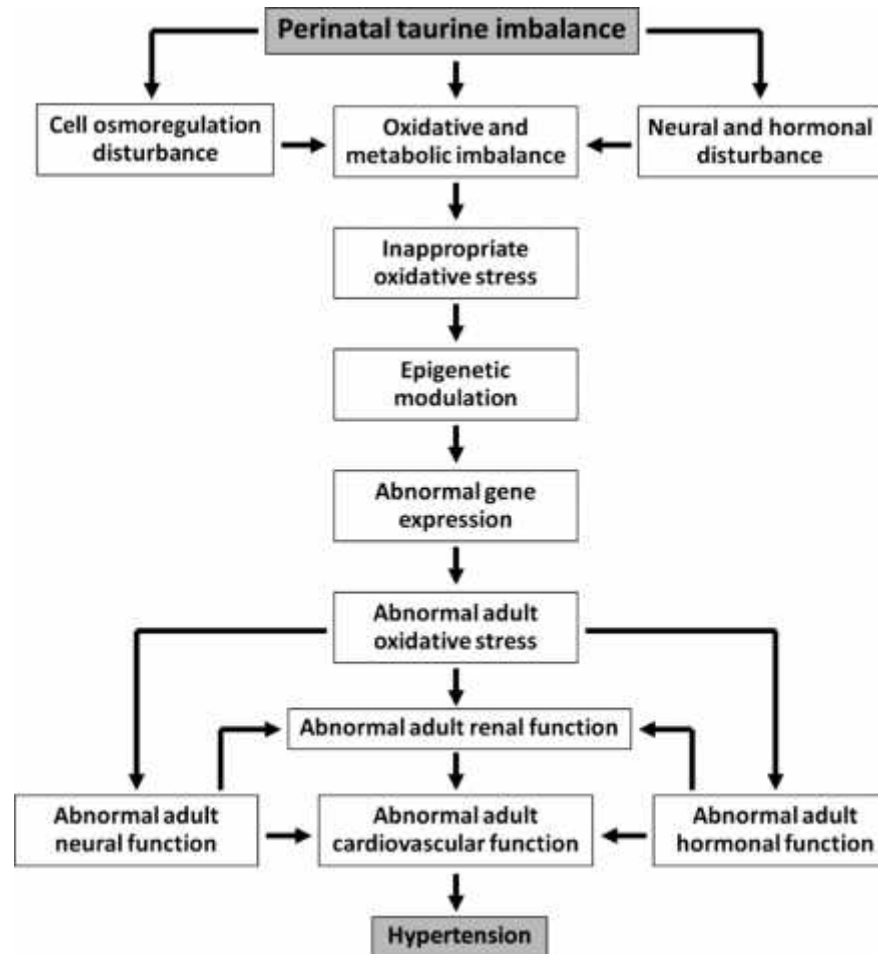
- Iron — anemia
- Iodine — goiter



Proportion of people in developing countries who are anaemic



Perinatal Taurine Effects on Adult Oxidative Stress



Risk factor prevalence –overweight & obesity Quintiles in selected SSA countries

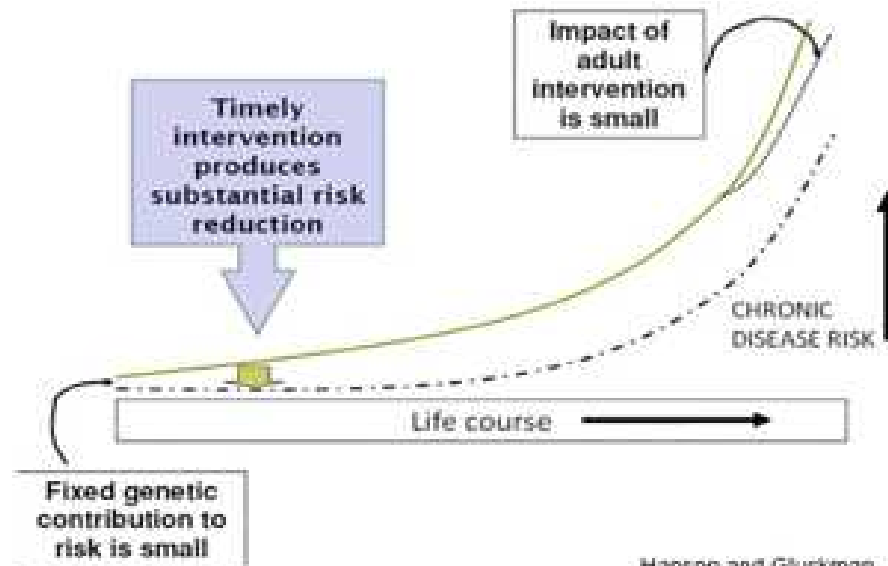
Overweight and obesity among women aged 15-49years by SES 2003

		Normal Weight	Overweight	Obesity	Underweight
Burkina Faso	Q1	71.4	1.9	0.4	26.3
	Q5	63.4	18.7	8.5	9.4
Ghana	Q1	76.7	6.4	1.3	15.6
	Q5	50.2	27.4	18.0	4.4
Cameroon	Q1	77.4	11.4	1.6	9.6
	Q5	52.4	28.9 (28.8)	14.9 (21.3)	3.8
Kenya	Q1	68.3	7.3	1.6	22.8
	Q5	55.2	27.1	13.2	4.5
Zambia*	NE	74.6	4.9	2.0	18.5
	HE	56.3	22.3	13.3	8.1

Africa DHS, courtesy, Catherine Kyobutungi, 2008

Window of Opportunity in Prevention

Development is Most Important Time to Intervene to Prevent Disease



Hanson and Gluckman

Final Remarks

- Nutrition forms the basic foundation of life from the womb to the tomb
- Nutrition significantly affect epigenetic processes and therefore offers great promise for health promotion and disease prevention
- “Beyond the rhetoric, this epidemic can be halted – the demand for action must come from those affected. The solution is in our hands” WHO

Thank You