

Thank you to:

The Late David JP Barker & Helsinki Epidemiology Group

OHSU Pregnancy & Fetal Development Group

Center for Developmental Health
Knight Cardiovascular Institute (~60 Scientists)

Moore Institute for Nutrition and Wellness Staff and Program Experts

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National Institute of Child Health & Human Development
National Institute of Heart, Lung and Blood
National Institute of Diabetes and Digestive and Kidney Diseases
National Institute of Aging
M. Lowell Edwards Endowment

TOPICS

Chronic Disease in the USA

Is It Genetic?

Developmental Roots of Disease

Transgenerational Effects of Diet

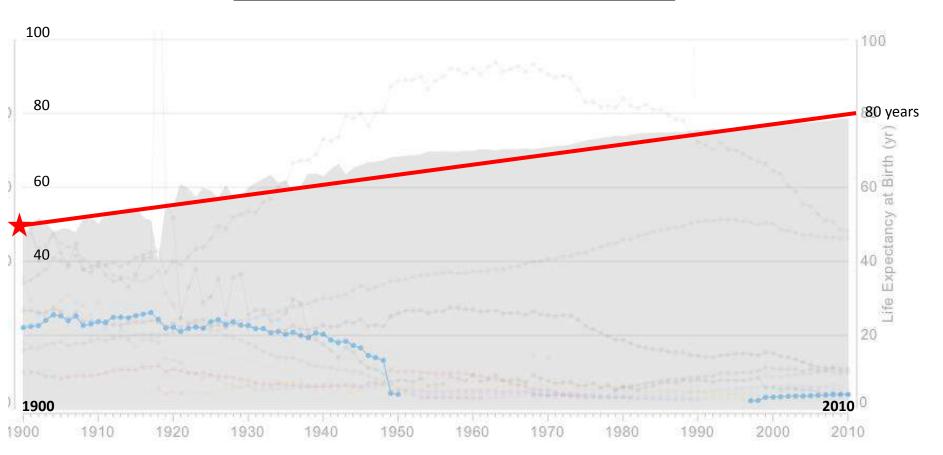
Diet before Pregnancy

Nutrients and Whole Grains

Epigenetic Influences

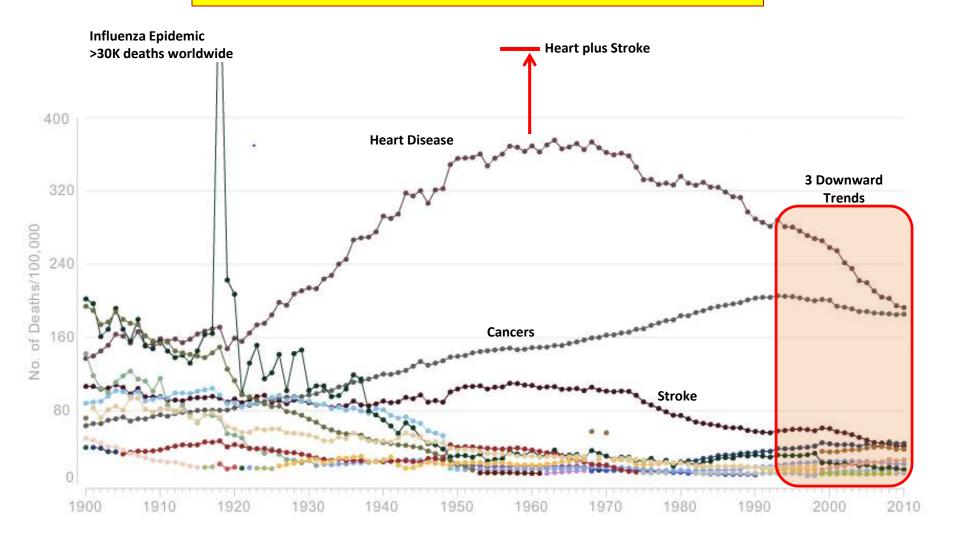
Let's Eliminate Chronic Disease!

Average Life expectancy in years: 1900 - 2010



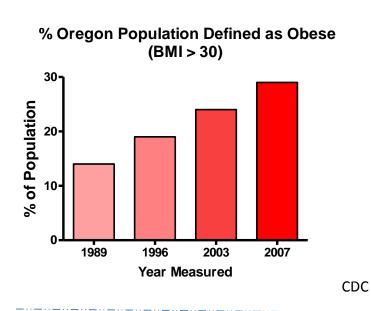
David S. Jones, M.D., Ph.D., Scott H. Podolsky, M.D., and Jeremy A. Greene, M.D., Ph.D. N Engl J Med 2012; 366:2333-2338

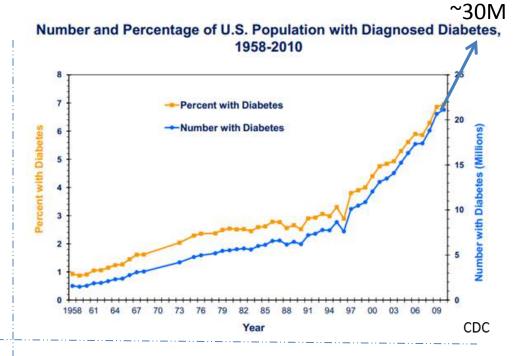
US Death Rates from Different Causes Since 1900



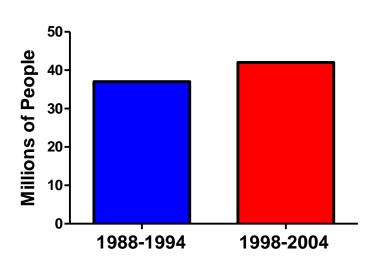
http://www.nejm.org/doi/full/10.1056/NEJMp1113569

The Worsening Health of the American Population





Uncontrolled Hypertension, USA

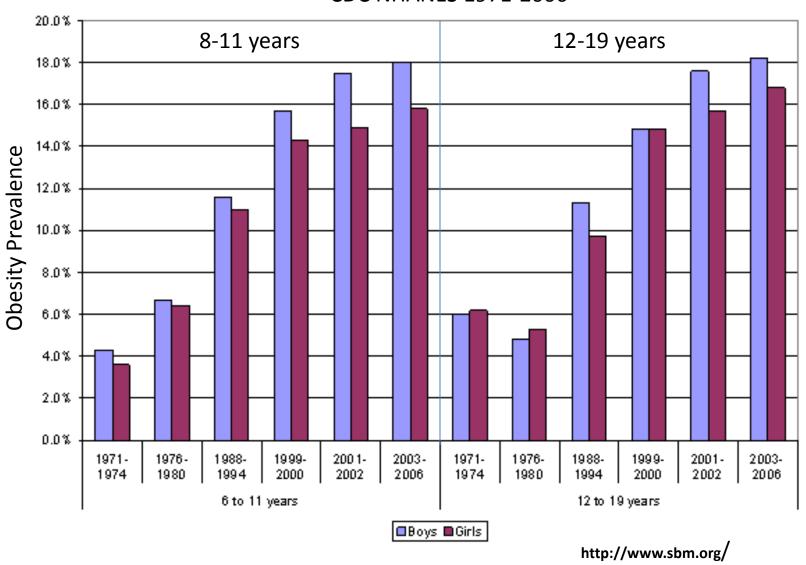


Obesity, Type 2 Diabetes and Hypertension are risk factors for coronary **heart disease** and stroke.

--Heart disease costs> \$1.0 x 109 per day

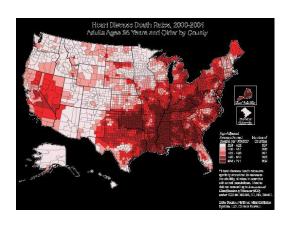
--Costs will double by 2026 (Source: AHA 2014)

CDC NHANES 1971-2006

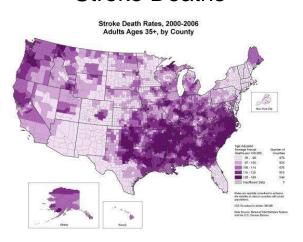


Are Increases in Disease Prevalence Genetic?

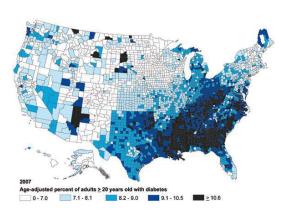
Heart Deaths



Stroke Deaths

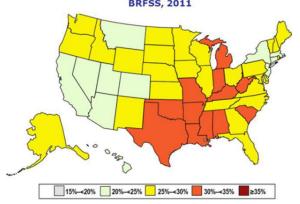


Adults with Diabetes



Obesity

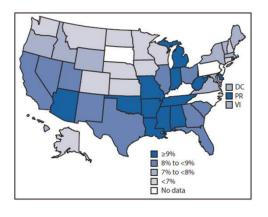
Prevalence of Self-Reported Obesity Among U.S. Adults BRFSS, 2011



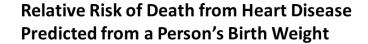
Percentage of Adults Aged 20 Years and Older Who Have Been Told They Have High Blood Pressure, 2007

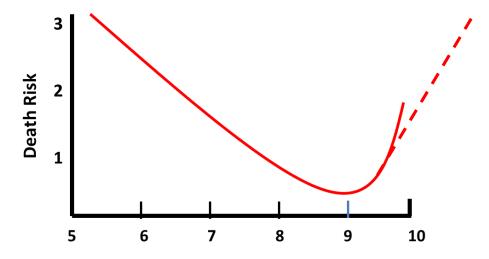


Depression Prevalence 2006



Early Life "Programming" of Chronic Disease





Birthweight at Term Delivery (lb)

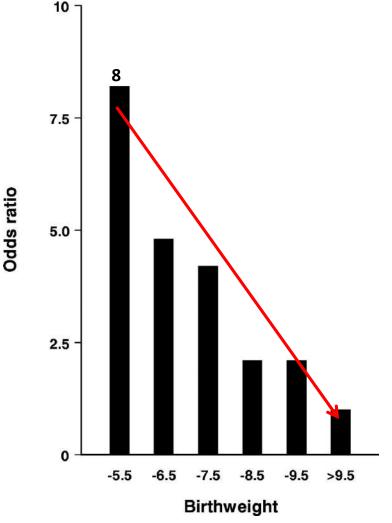
Original Data from Barker et al., 1989

Birthweight Predicts:

- ✓ Type 2 Diabetes
- ✓ Obesity
- √ Hypertension
- ✓ Osteoporosis
- ✓ Asthma
- ✓ Cognitive Function

Poor growth before birth results in a weakened body for life

Risk for impaired glucose tolerance or type 2 diabetes according to birth weight among 370 men aged 64 years born in Hertfordshire (adjusted for adult body mass index).

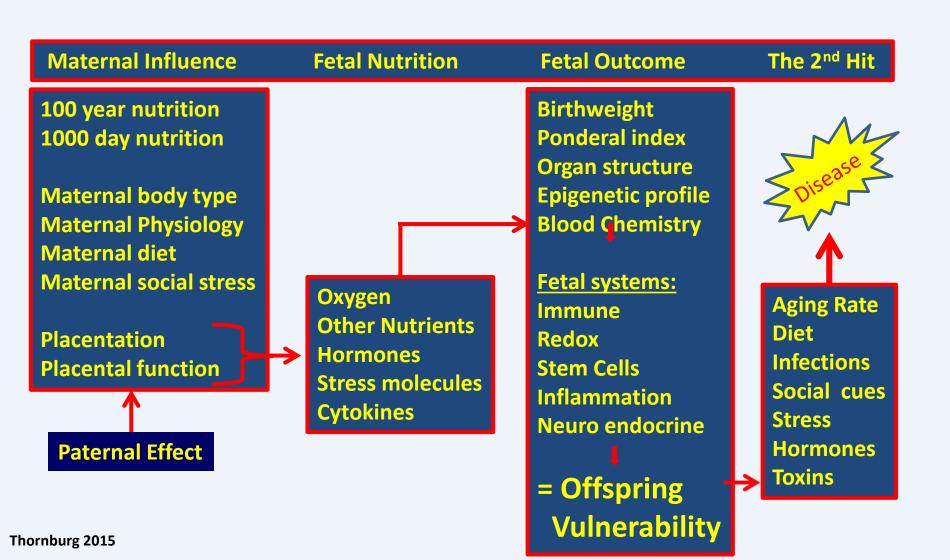


Hales C N, Barker D J P Br Med Bull 2001;60:5-20

Diabetes is a vascular disease In the USA 65% of people with type 2 diabetes die of heart disease or stroke. American Heart Association

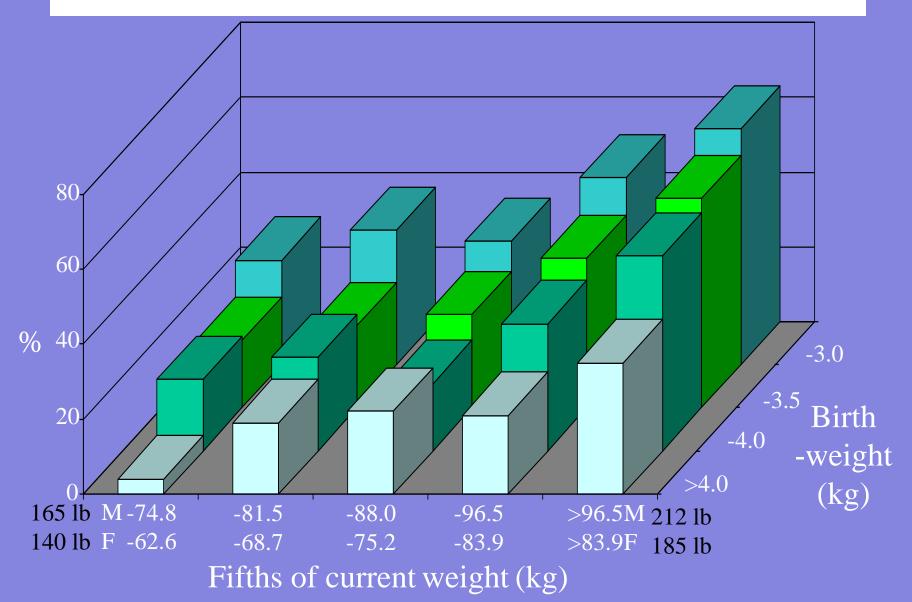


Maternal Role in Programmed Disease



Prevalence of Hypertension

Helsinki Birth Cohort (Eriksson et al.,)



Beyond Birthweight



Maternal Body Type

Height, weight, muscle mass, fat mass, skeletal dimensions hormone profile, blood lipids.__

Preconception

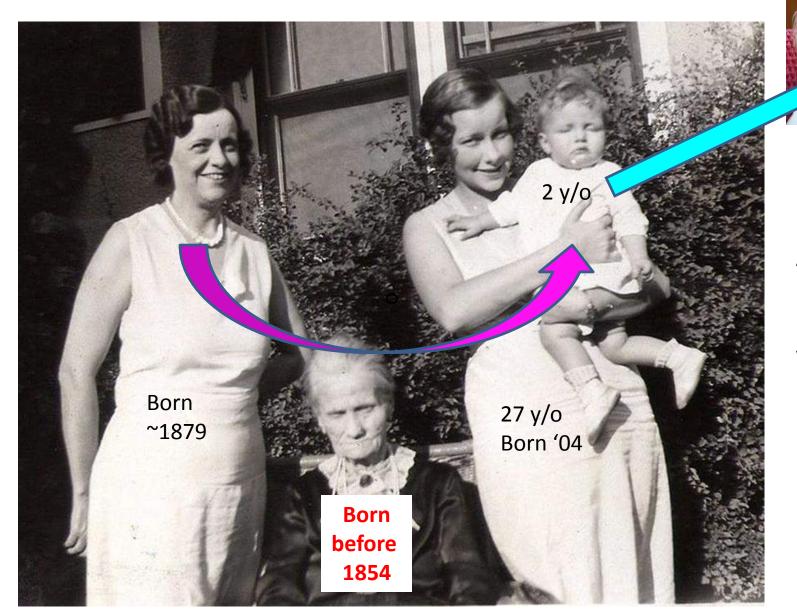
Paternal Effects

How the Fetal Body is Constructed



Weight, width, length, thickness, number of cotyledons, cord insertion and length

Four Generations of Women, (1931 Photo) Nutritional Flow Across Generations



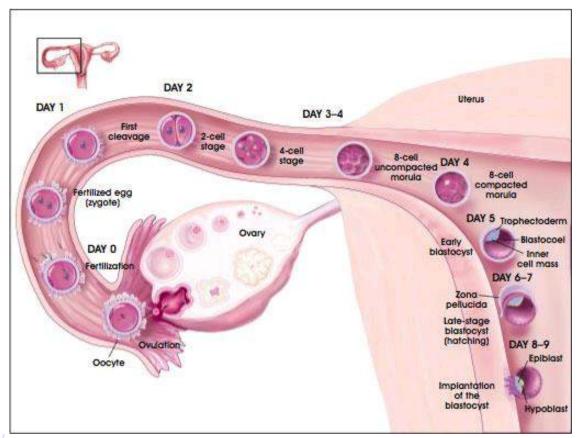
86 y/o in 2015

Her "egg age" ~110 years old

Her mother was born in 1904, now would be 111 y/o

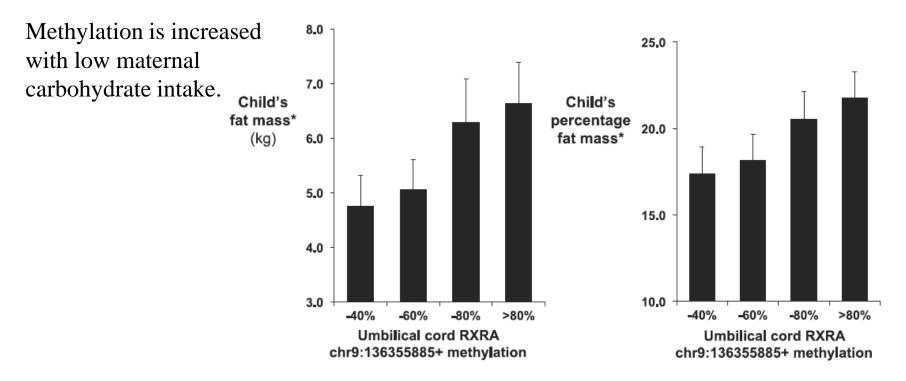
In rats, a low protein diet during embryo transit leads to cardiovascular disease in offspring and epigenetic changes in CV regulatory genes.

T. Flemming et al., 2006



Epigenetic Gene Promoter Methylation at Birth Is Associated With Child's Later Adiposity

Keith M. Godfrey, ^{1,2,3} Allan Sheppard, ^{4,5} Peter D. Gluckman, ^{4,6} Karen A. Lillycrop, ¹ Graham C. Burdge, ¹ Cameron McLean, ^{4,5} Joanne Rodford, ^{1,3} Joanne L. Slater-Jefferies, ¹ Emma Garratt, ^{1,3} Sarah R. Crozier, ² B. Starling Emerald, ⁶ Catharine R. Gale, ² Hazel M. Inskip, ² Cyrus Cooper, ^{2,3} and Mark A. Hanson ^{1,3} *Diabetes* 60:1528–1534, 2011

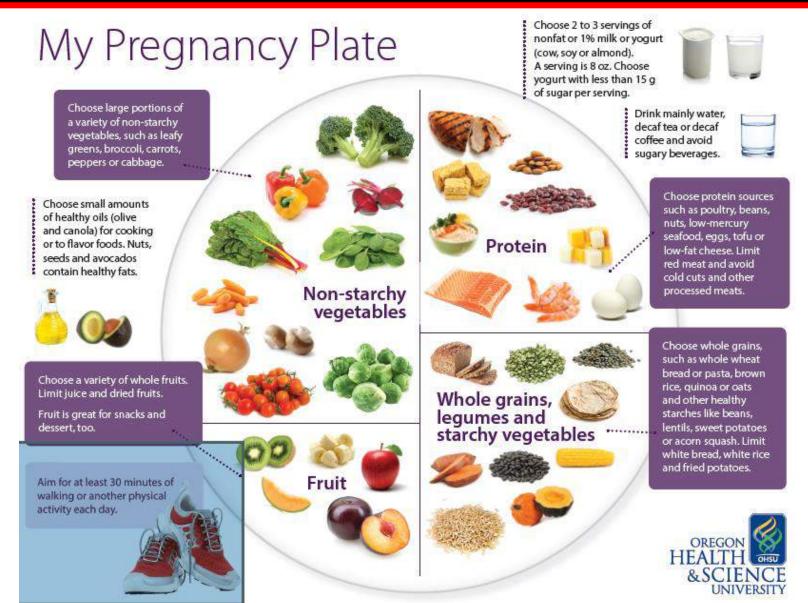


9 year olds, n = 64

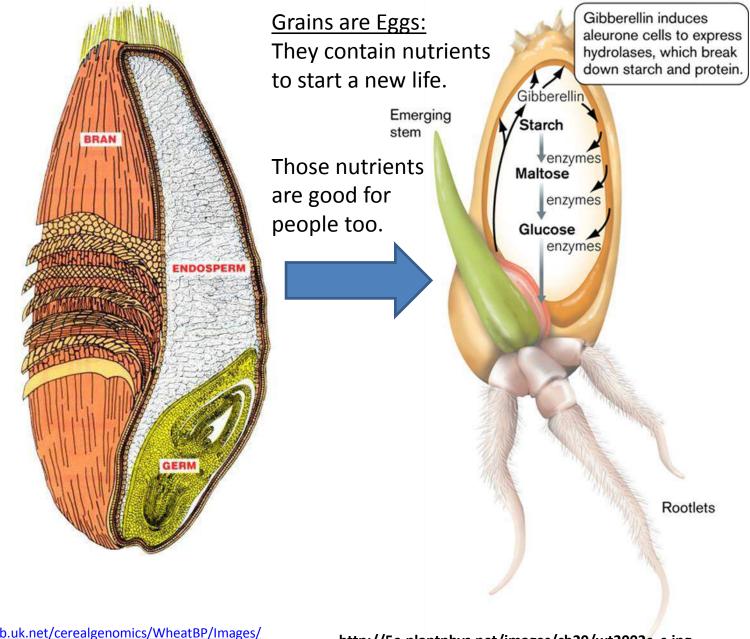
FIG. 2. Child's %fat mass and fat mass at age 9 years increase with higher umbilical cord RXRA chr9:136355885+ methylation in the PAH cohort. Values are means + SEM. *Fat mass and percentage fat mass are preadjusted for sex.



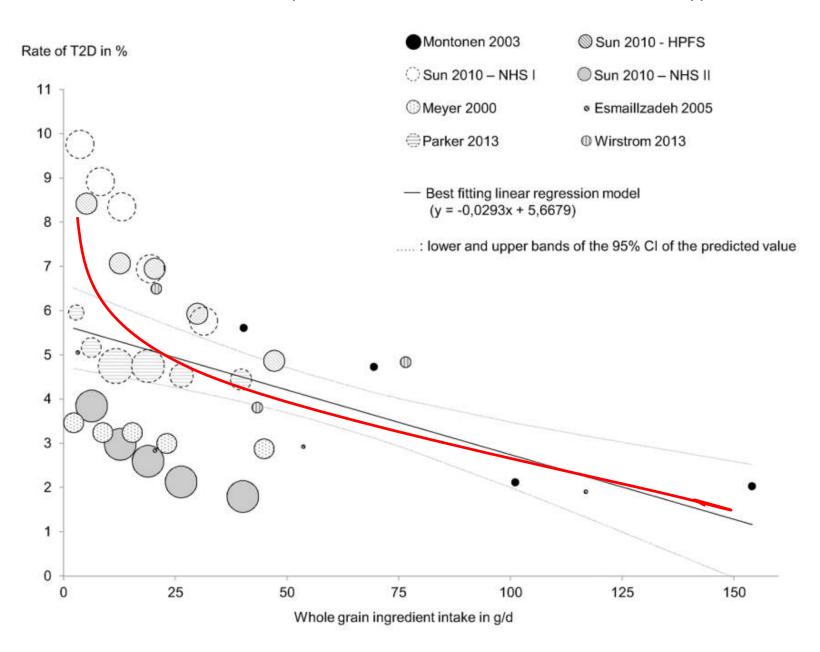
The New Frontier: Nutrient Regulation of Epigenetic Gene Regulation



Courtesy: Christie Naze, RD, Dept Ob/Gyn, OHSU



Whole Grain Consumption Is Associated with Lower Rates of Type 2 Diabetes



PLOS ONE | DOI:10.1371/journal.pone.0131377 June 22, 2015

Fernando J. Prados et al. Hum. Reprod. 2012;humrep.des22

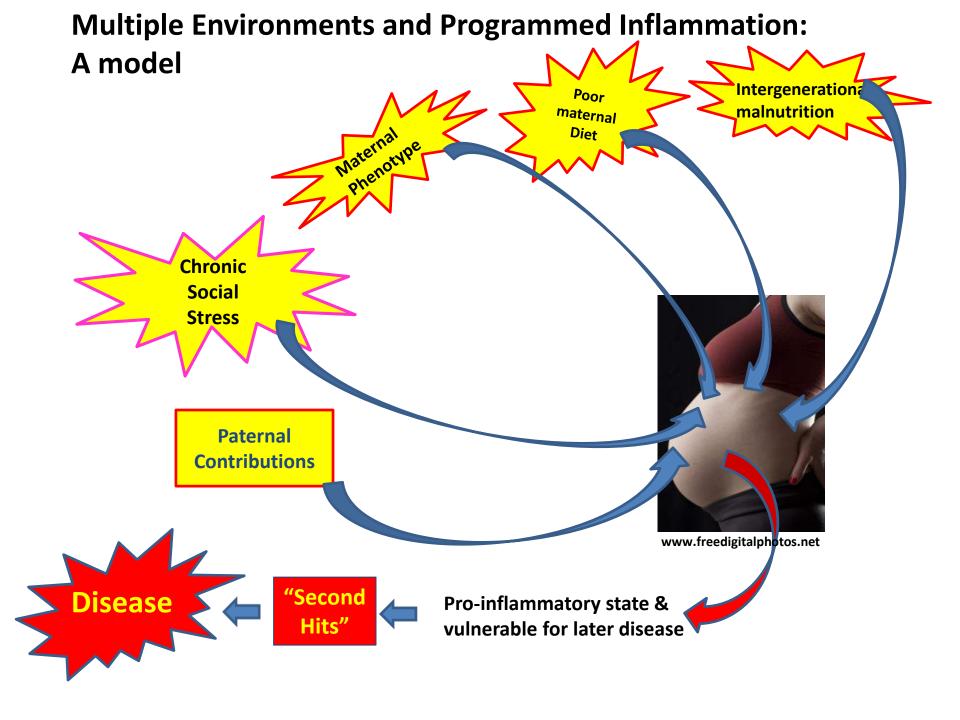




"The consumption of cereals, vegetables and fruits positively influenced the embryo quality at the cleavage stage."



Reprod Biomed Online. 2015 Mar 27. pii: \$1472-6483(15)00148-0. doi: 10.1016/j.rbmo.2015.03.007. [Epub ahead of print]



TAKE HOME MESSAGES

We will never overcome the increasing rates of chronic disease by treating ONLY adults or improving their diets.

We will never overcome increases in diabetes and obesity unless we halt the vulnerability of people at birth and in infancy.

The key to reversing rising disease rates is to change the food culture:

- We must dramatically decrease consumption of processed foods
- We must increase consumption of whole nutritious foods.
- Whole grains are key ingredients of a wholesome diet.