Preventing Chronic Disease

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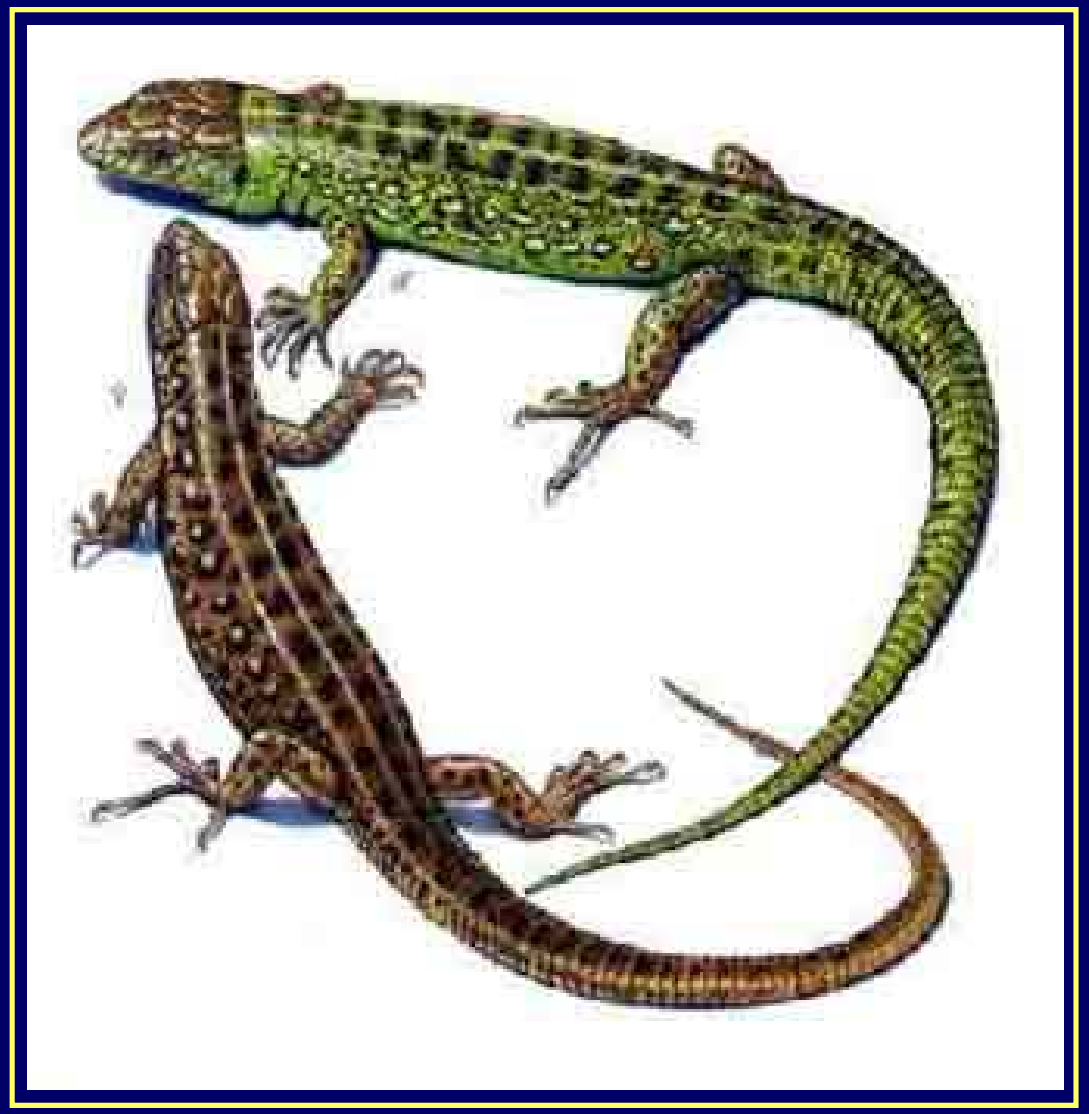
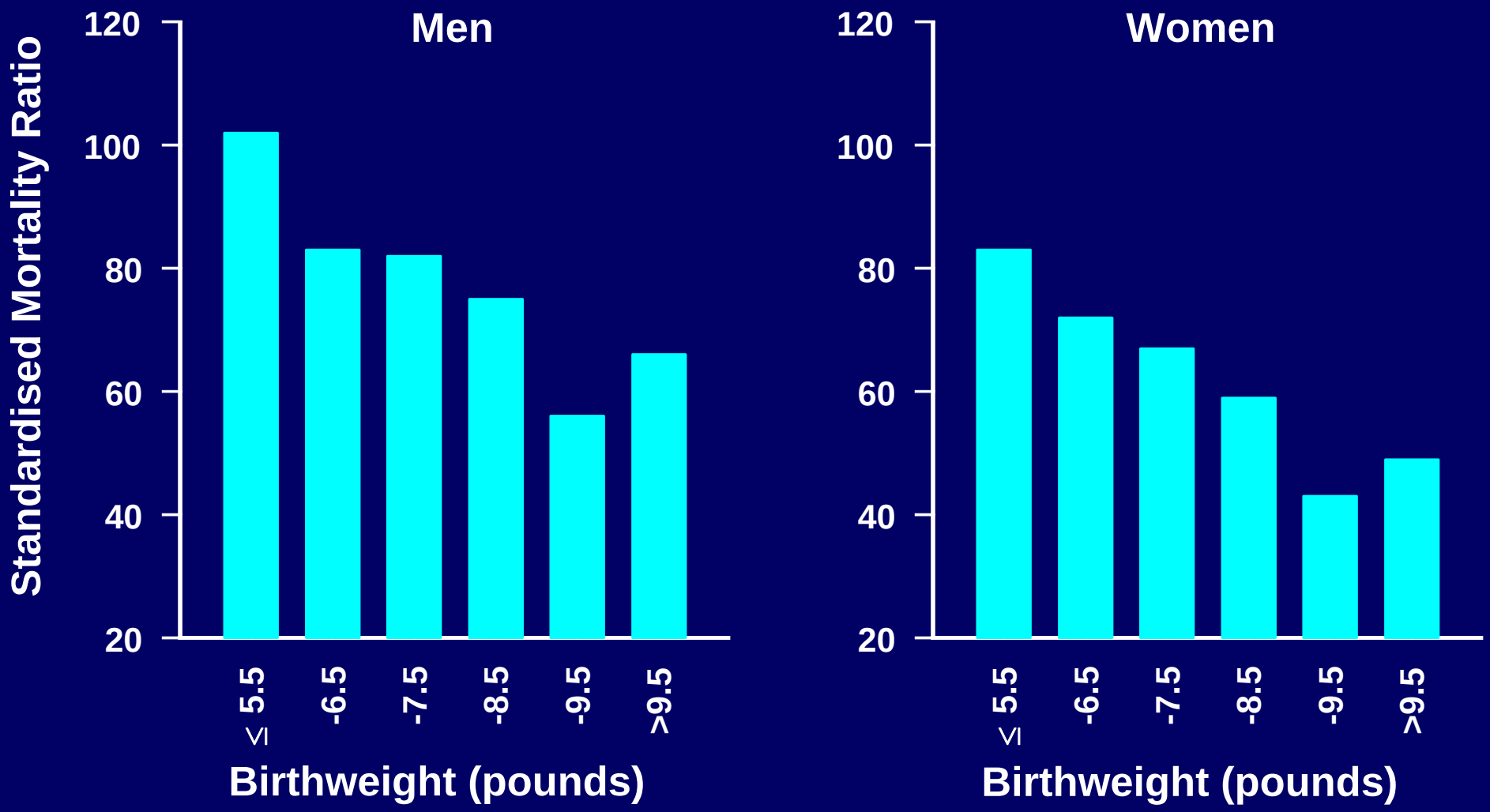


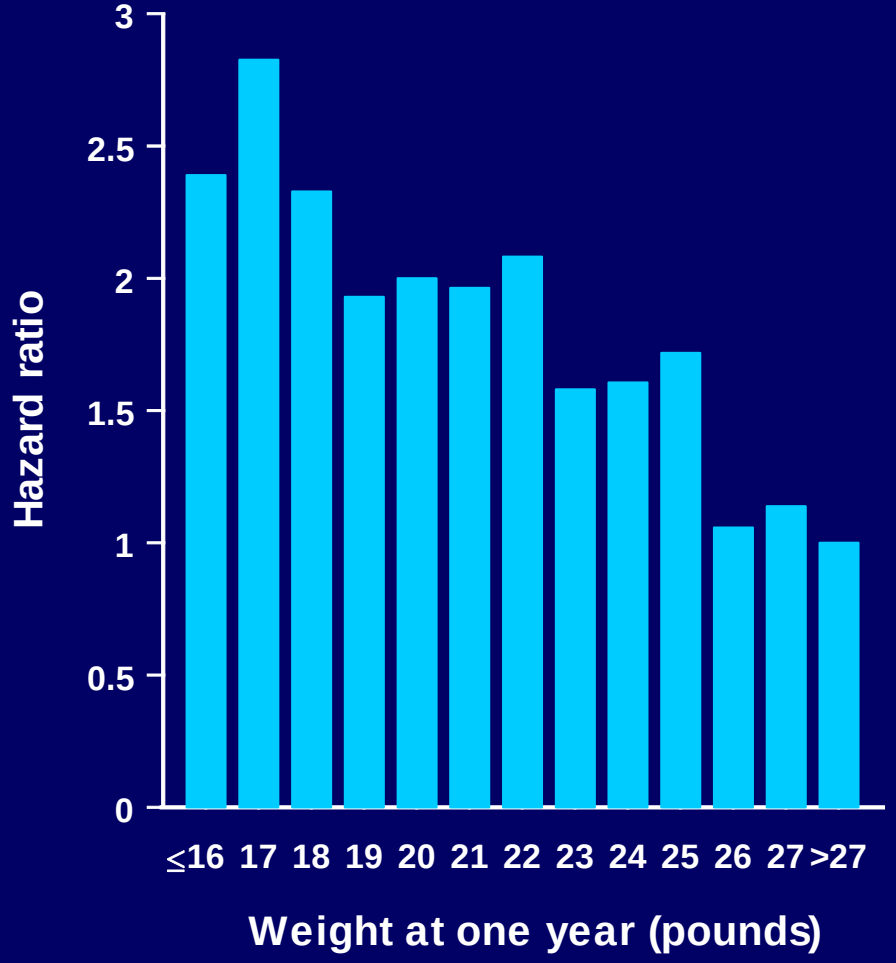
Programming

Malnutrition and other adverse environmental exposures during development alter gene expression and programme the body's structures and functions for life. Adverse exposures also result in slow growth and small body size.

Mortality from coronary heart disease in 15726 men and women in Hertfordshire



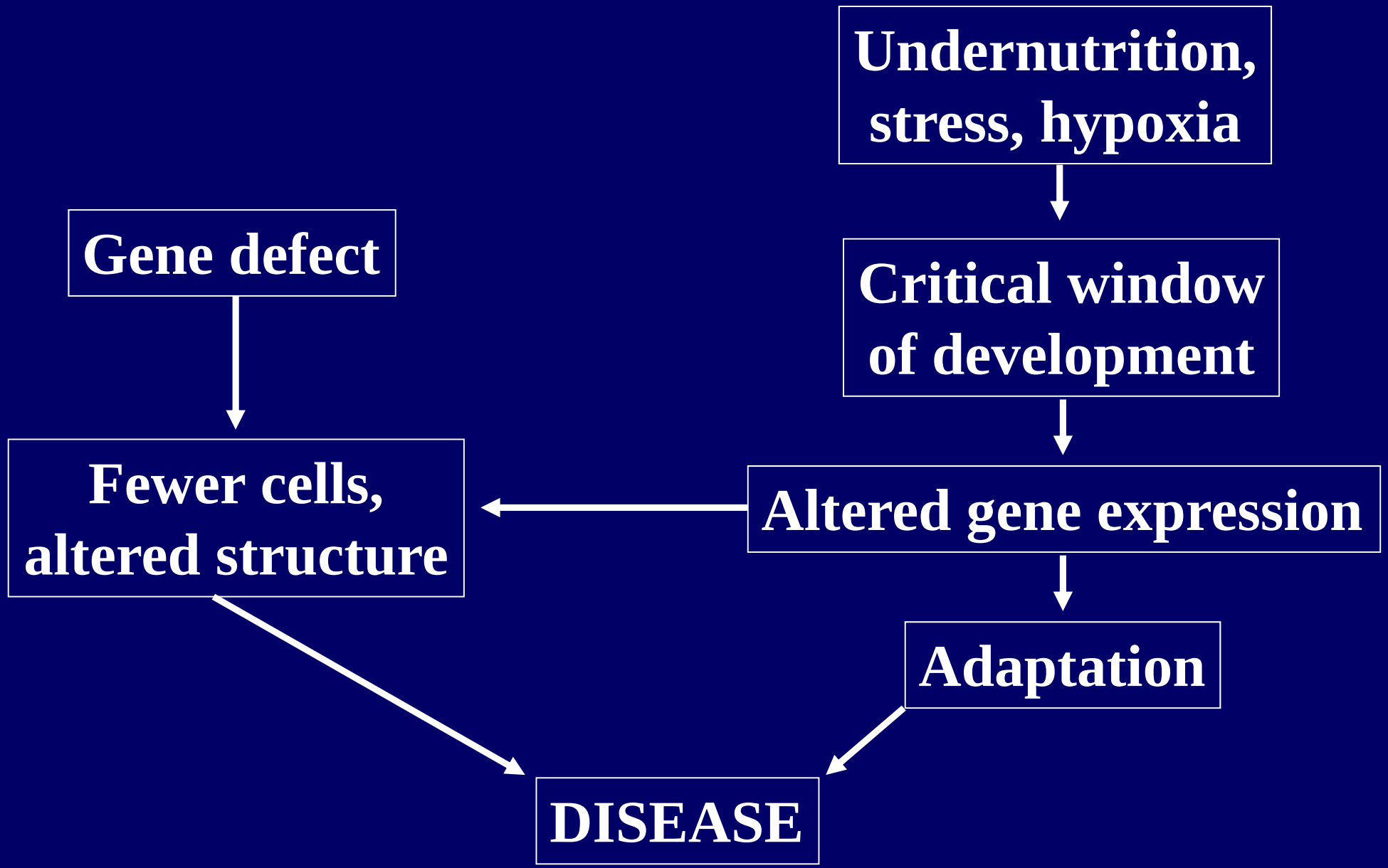
Hazard ratios for coronary heart disease in men



The fetal origins theory

Coronary heart disease, stroke, type 2 diabetes, hypertension and osteoporosis, originate through developmental plasticity, in response to malnutrition during fetal life and infancy.

Certain cancers,including breast cancer,also originate in fetal life.

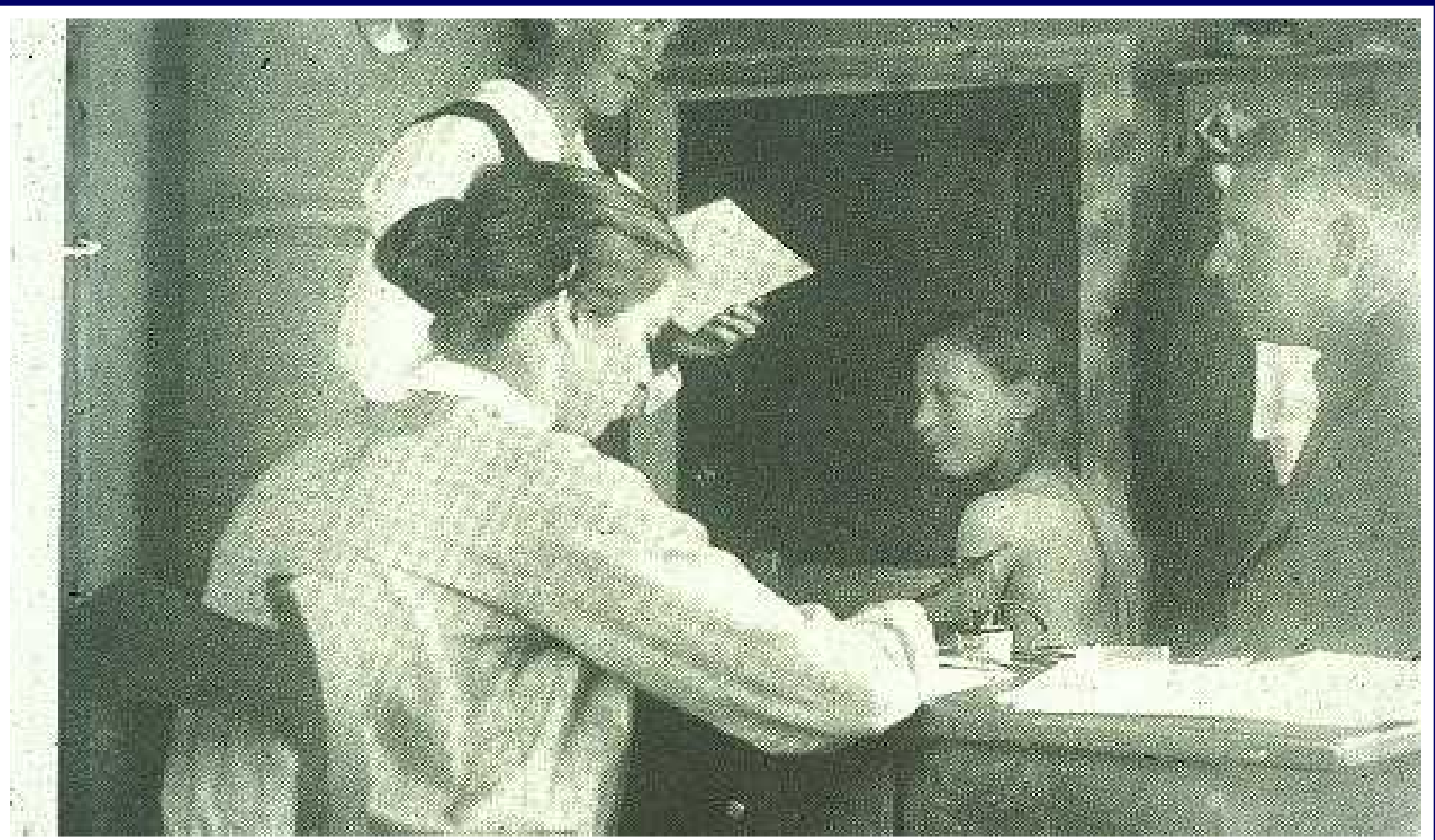

Undernutrition, stress, hypoxia
Gene defect
Critical window of development
Fewer cells, altered structure
Altered gene expression
Adaptation
DISEASE

Small body size at birth

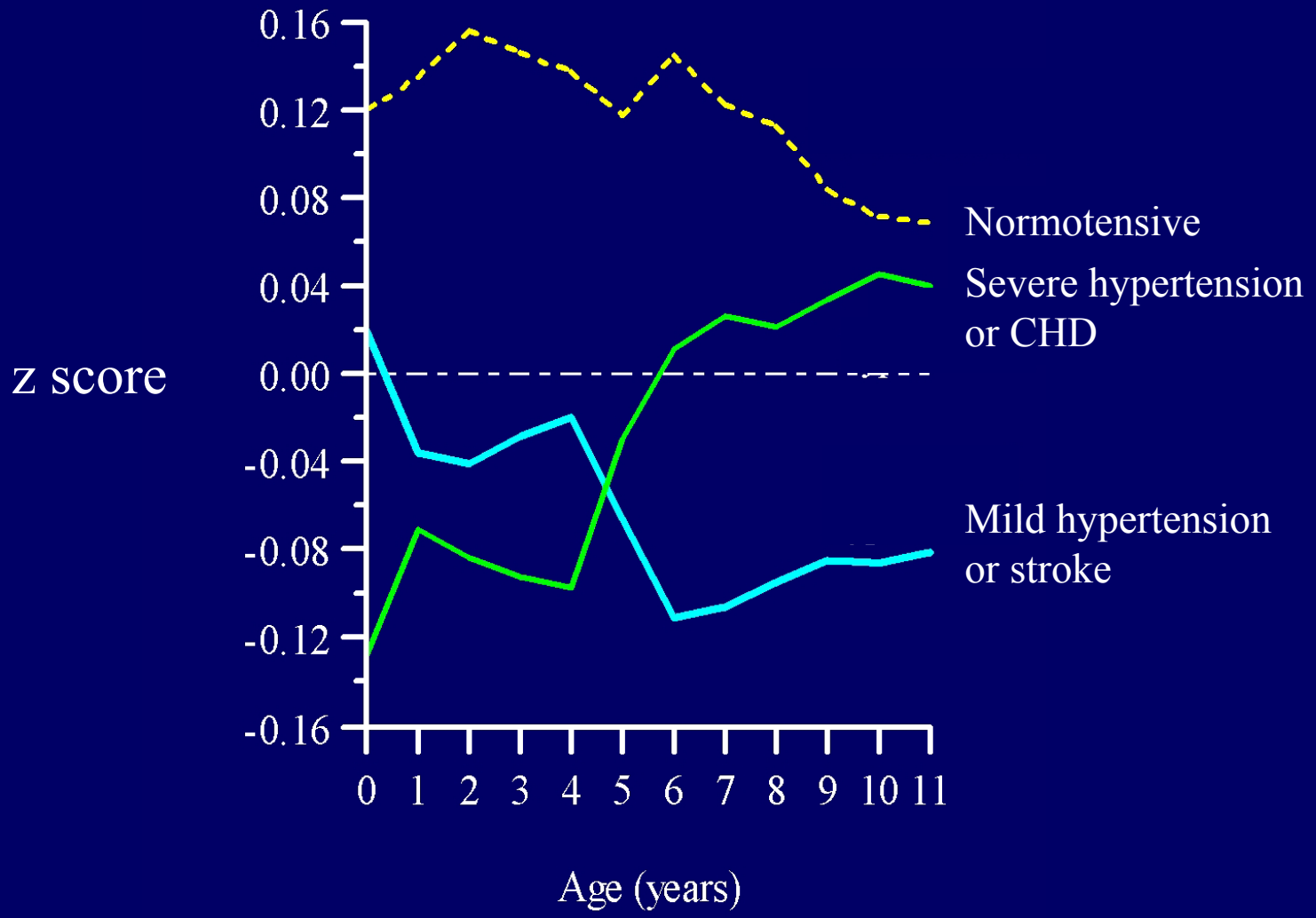
People who were small at birth are biologically different:

- Reduced functional capacity e.g. fewer nephrons, less muscle
- Altered metabolic settings e.g. insulin resistance
- Altered hormonal production e.g. stress responses, sex hormones

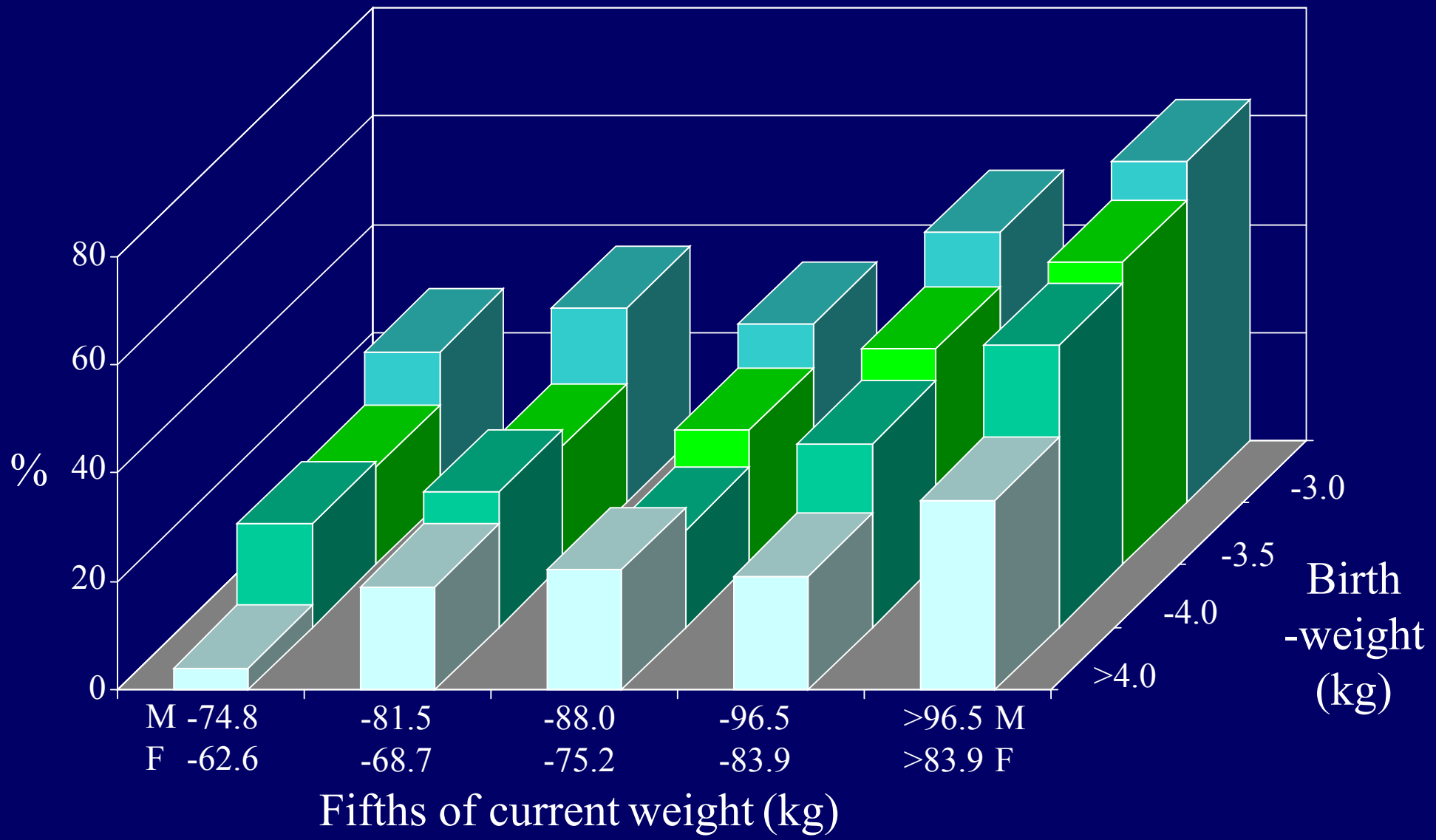
“Their life is the life of savages with vicissitudes of extreme hardship and occasional excess. Their food is of the coarsest description, and their only luxury is drink”
C Booth. Life and labour of the people in London. 1902



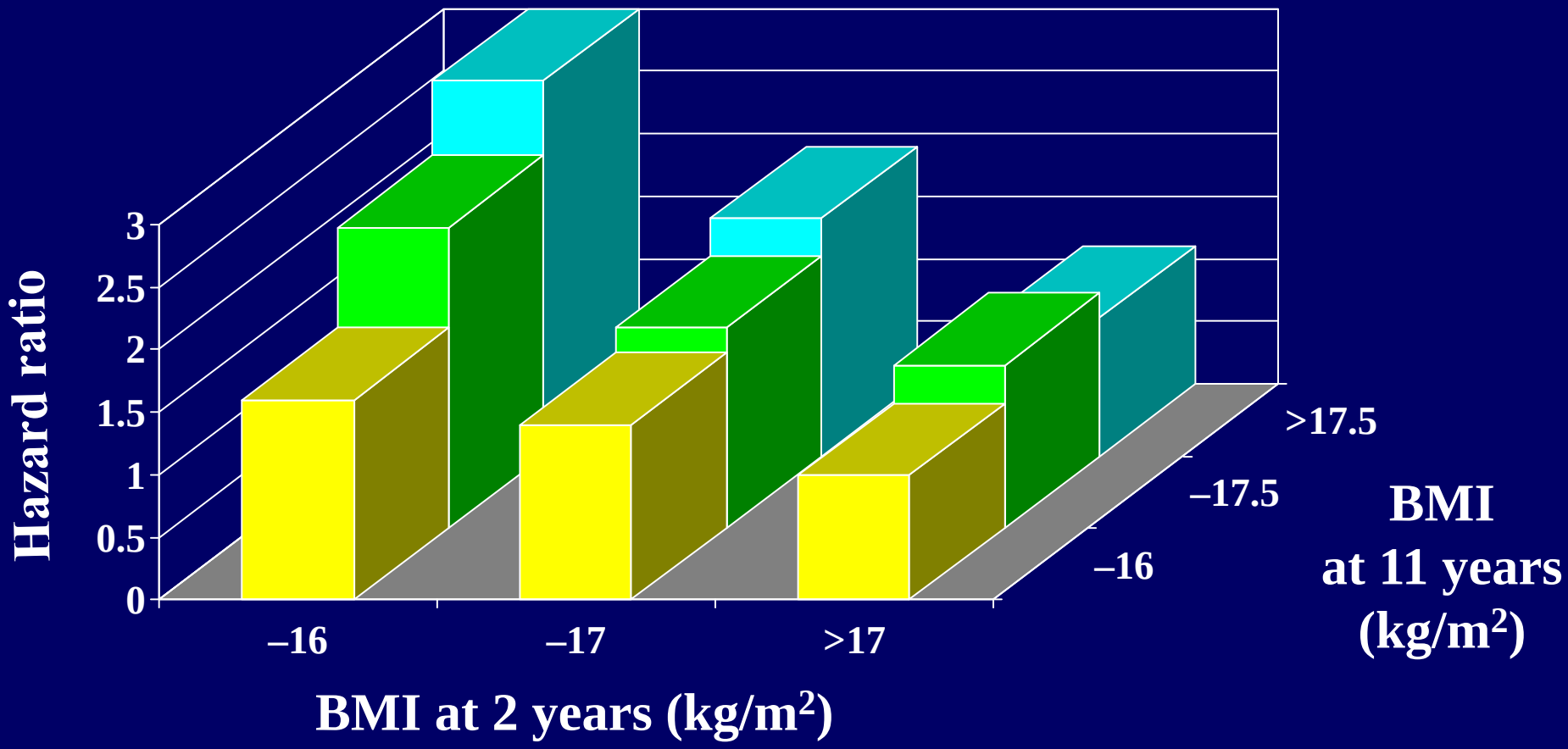
Weight gain in childhood and later disease



Prevalence of hypertension

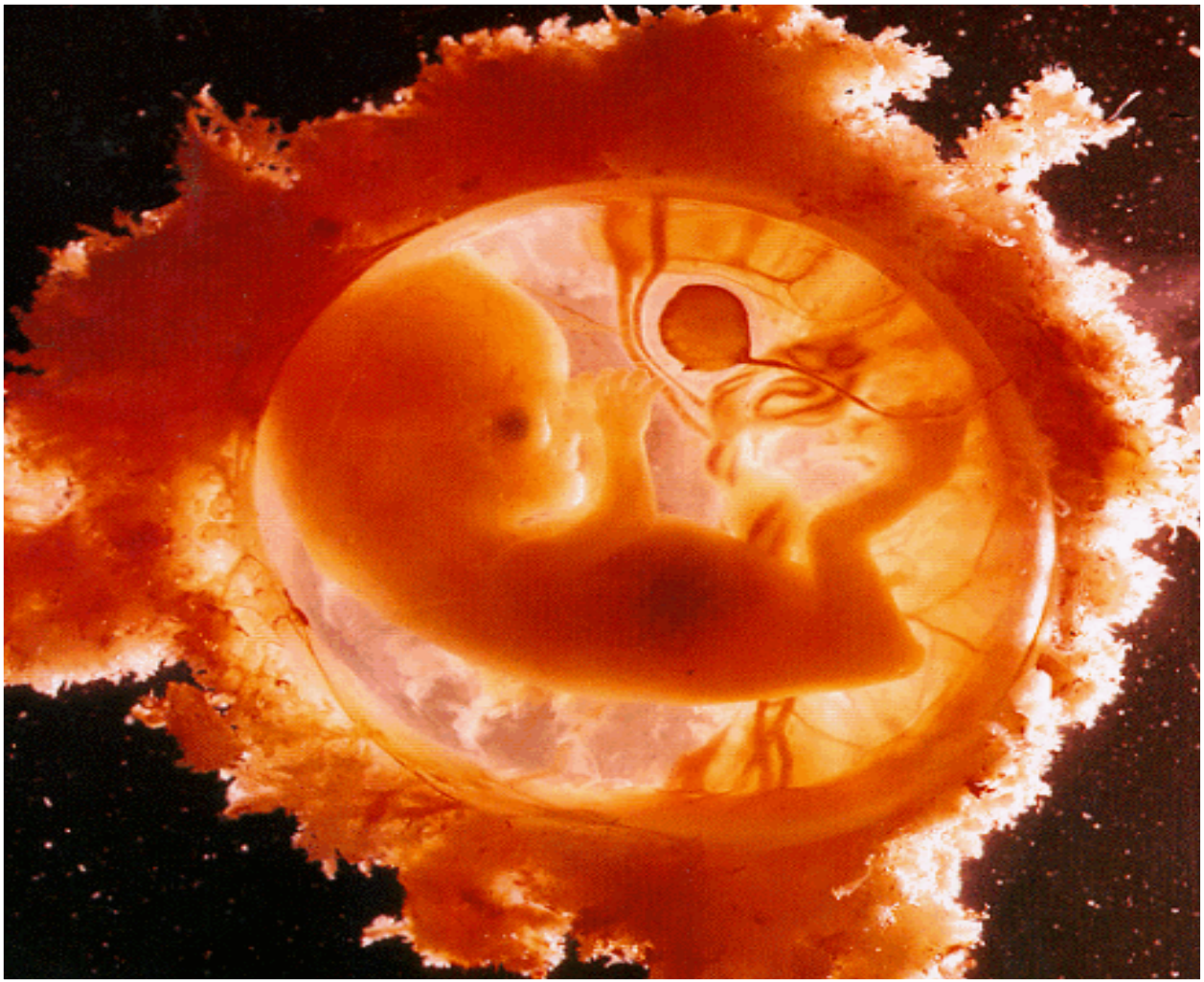


Hazard ratios for coronary heart disease among 8760 men and women



Barker DJ, Osmond C, Forsen TJ, Kajantie E, Eriksson JG. N Engl.J Med. 2005;353:1802-9

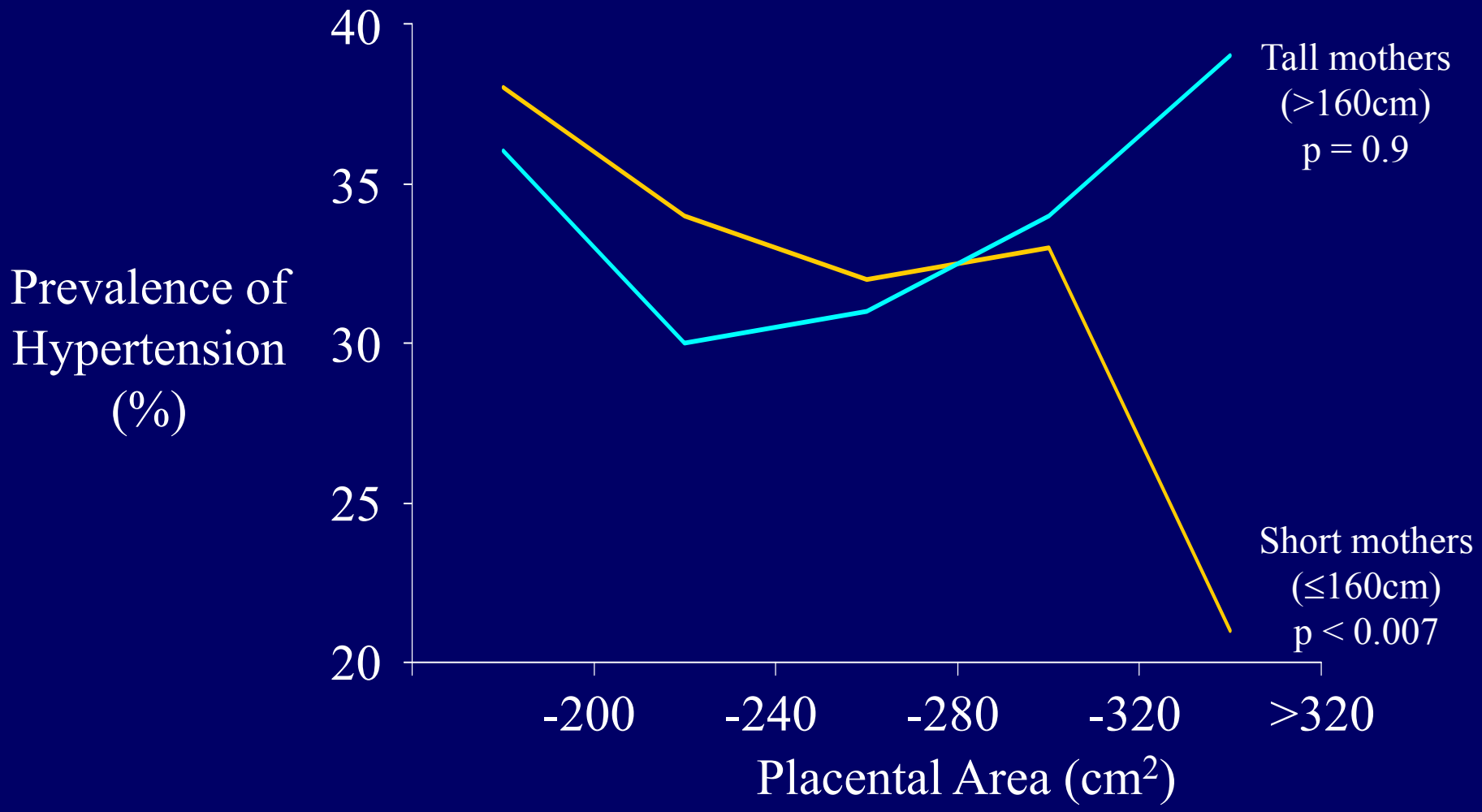
Associations between early growth and later disease extend across the range of fetal and infant growth. This implies that what are regarded as normal variations in the supply of nutrients to the baby have important long–term effects.



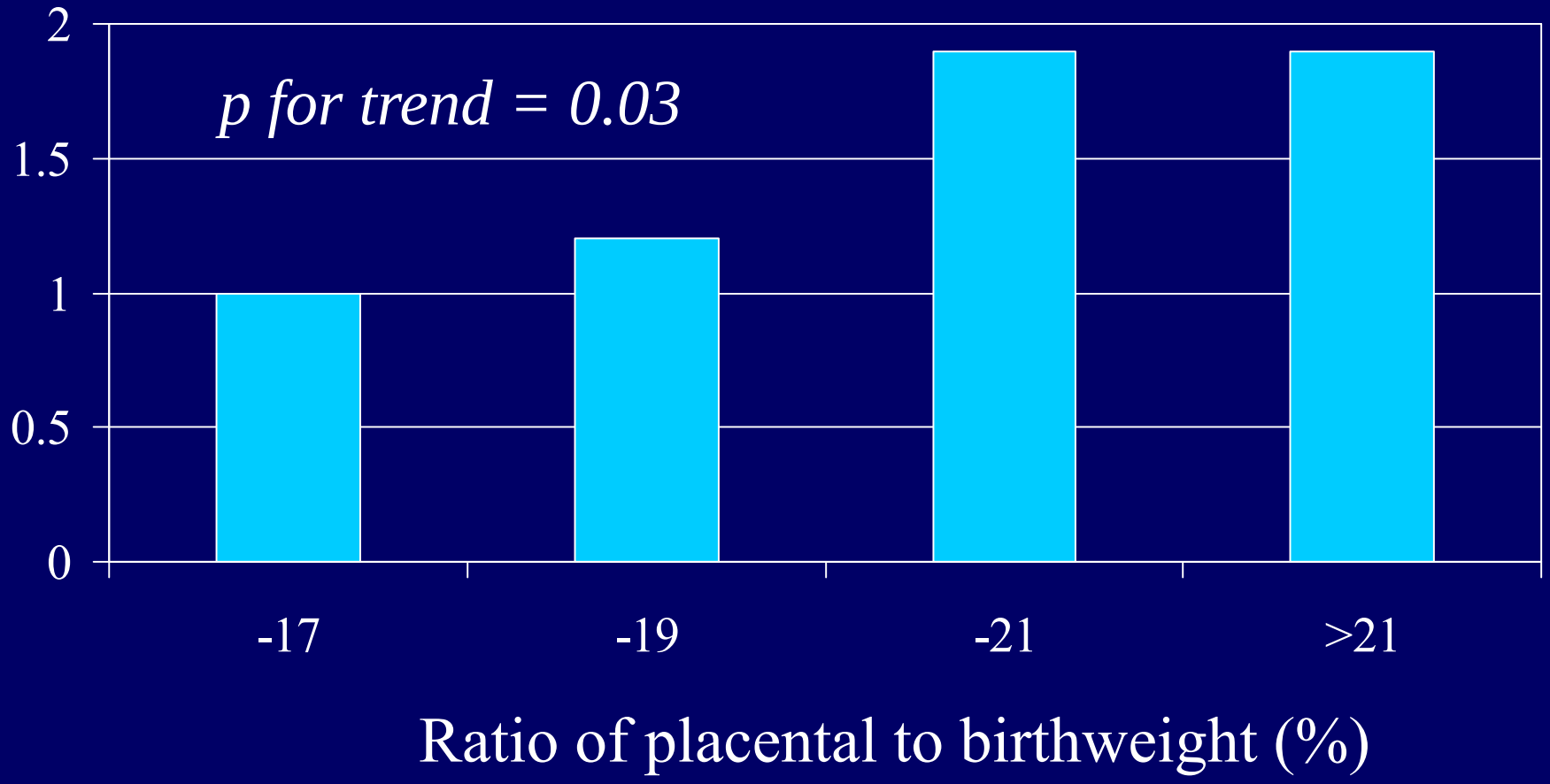
Mean systolic blood pressure of men and women, aged 50, born at term.

Birth weight (pounds)	Placental weight (pounds)			
	≤ 1.0	- 1.25	- 1.5	> 1.5
- 6.5	149	152	151	167
- 7.5	139	148	146	159
> 7.5	131	143	148	153

Prevalence of hypertension according to placental area and mothers' height



Odds ratios for hypertension in people whose mothers were tall and middle class

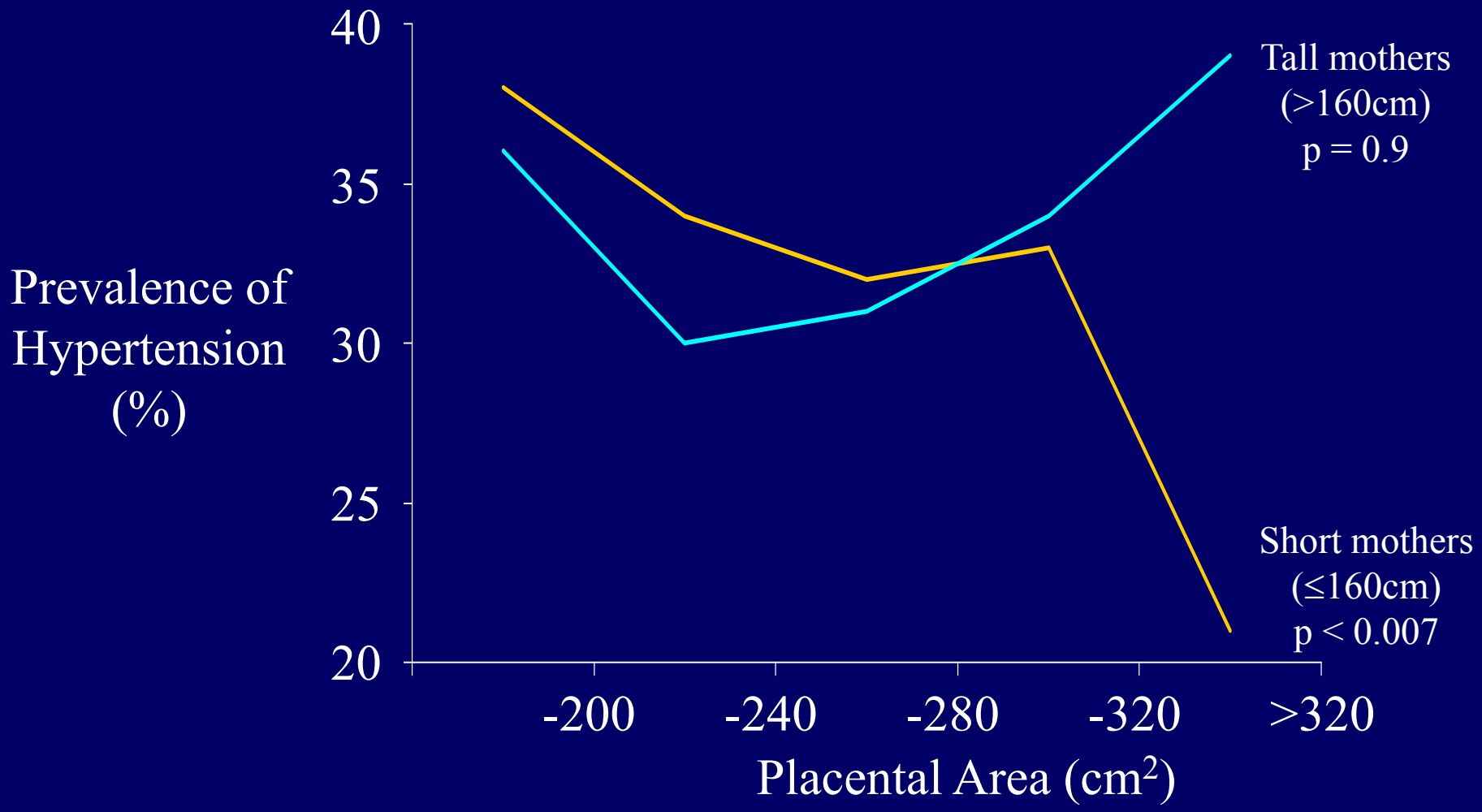


Conclusions

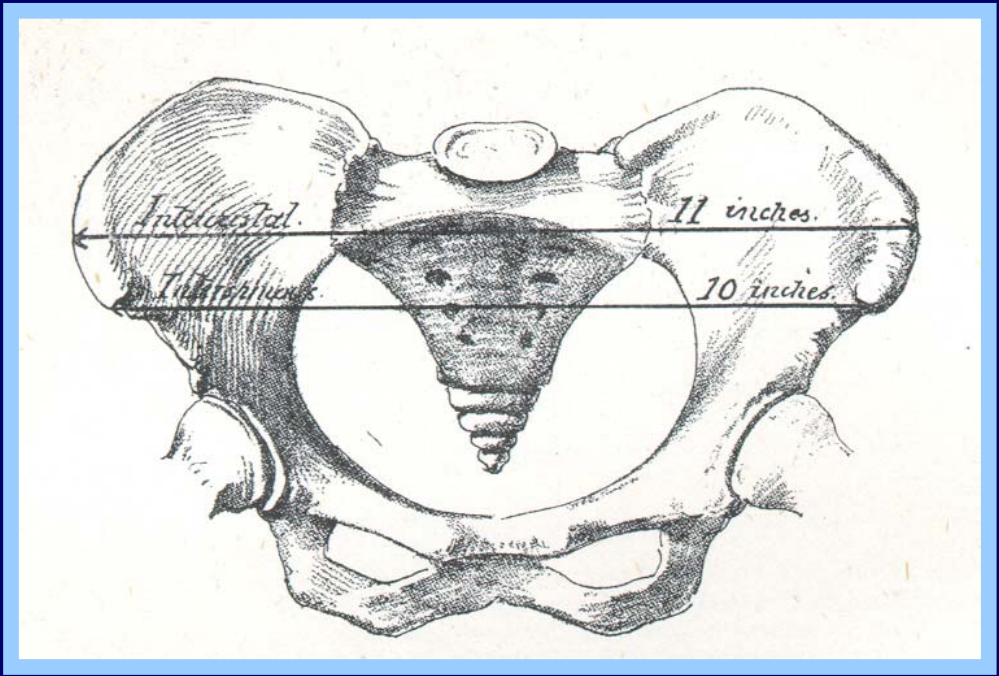
(1) A small placental surface area is associated with later cardiovascular disease

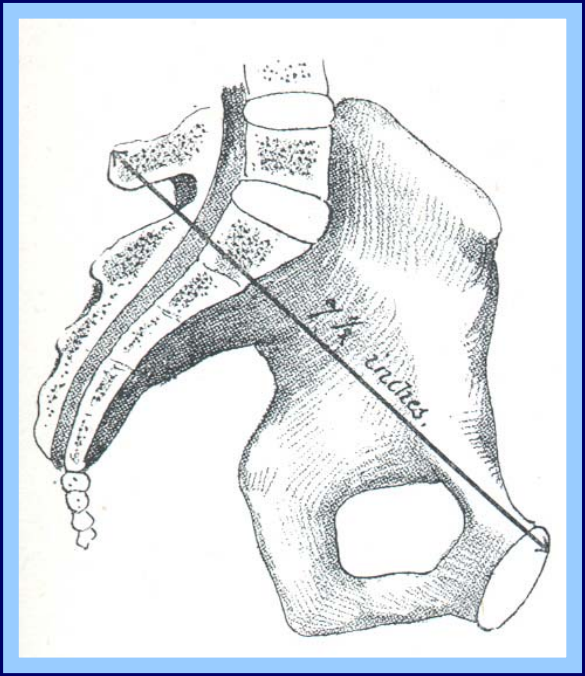
(2) In well nourished mothers the placental surface can expand to compensate for fetal malnutrition. This has long-term costs that include cardiovascular disease and cancer

Prevalence of hypertension according to placental area and mothers' height



Pelvic diameters





The **external conjugate diameter** is the distance between the spine of the fifth lumbar vertebra and the front of the pubic bone. A diameter of less than 18 centimetres (7 inches) was used as a marker of a "flat" pelvis, the result of rickets or lesser degrees of malnutrition in early childhood.

32 percent of mothers born during December and January had external conjugate diameters of less than 18 centimetres compared with 20 percent among mothers born in the remaining months ($p=0.0005$)

Odds ratios (95% confidence intervals) for stroke and hypertension

		Stroke	Hypertension
Mother's pelvic external conjugate diameter (cm)	-18	1.62 (1.30 to 2.02)	1.89 (1.30 to 2.76)
	>19	1.0	1.0

In a simultaneous regression of the effects of height and external conjugate on newly diagnosed hypertension, only the trend with external conjugate remained statistically significant (p=0.009)

Conclusion

Malnutrition during infancy, including lack of Vitamin D, leads to persisting changes in protein metabolism which prejudice the early nutrition and growth of the next generation and lead, in adult life, to an atherogenic lipid profile, hypertension and stroke.

The poor diets of girls and young women are causing disease in the next generation

Preventing chronic disease

Chronic disease may be prevented in the next generation by improving :-

- Children's growth
- The diets of mothers before and during pregnancy
- Transport of nutrients across the placenta
- The diets of girls