



DST-NRF Centre of Excellence
in Human Development

Individual and Society



Why early child development matters for HIV

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Durban, 21st July 2016

Early child development is important

*“The Sustainable Development Goals recognize that **early childhood development** can help drive the transformation we hope to achieve over the next 15 years”*



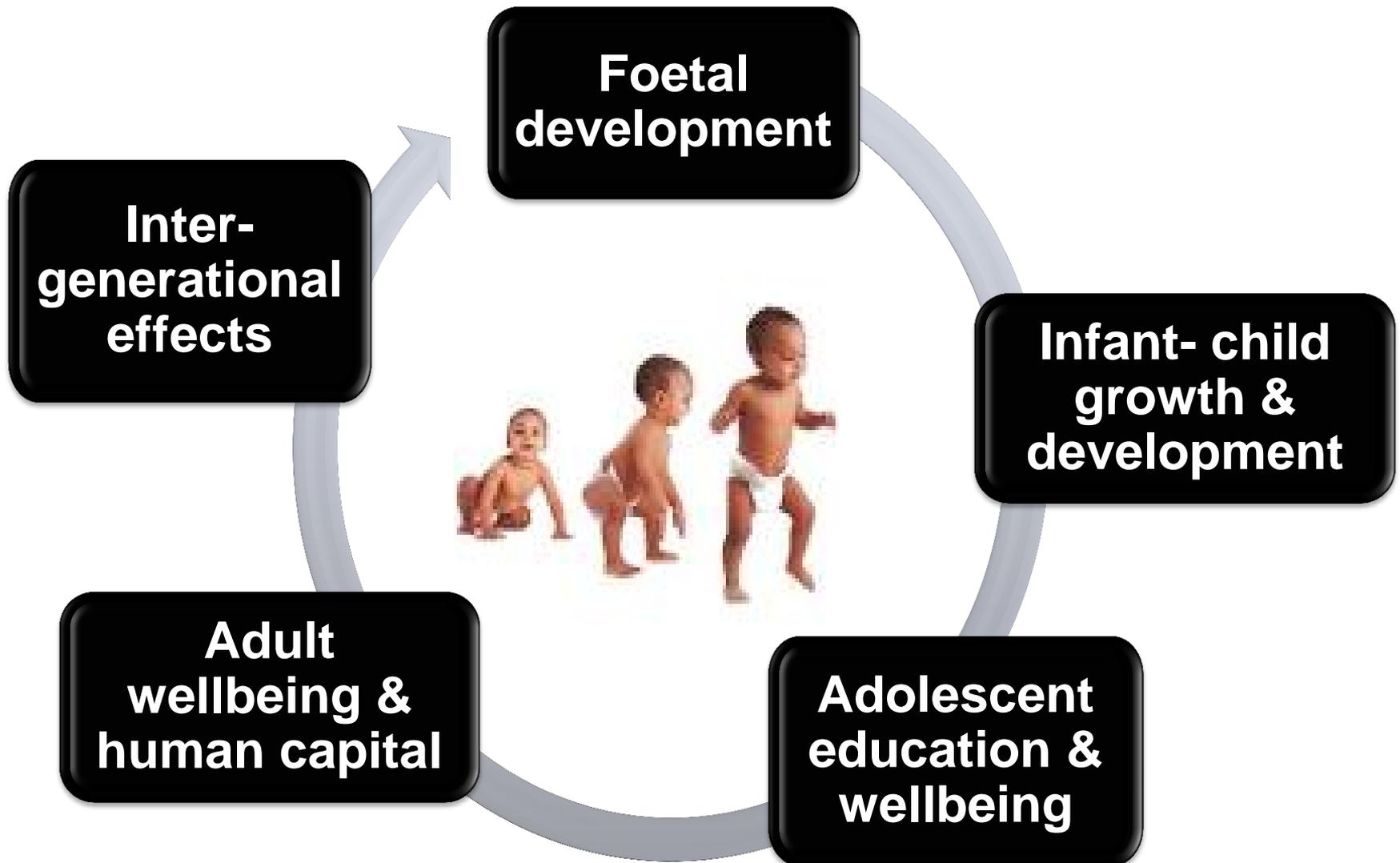
UN Secretary-General Ban Ki-moon,
UN Headquarters
22 September 2015

Why?

What the foetus and young child experience has a **strongly determining** effect on:

- The life course through childhood, adolescence, adulthood and old age
- Affecting health, wellbeing and earnings
- Also into the next generation

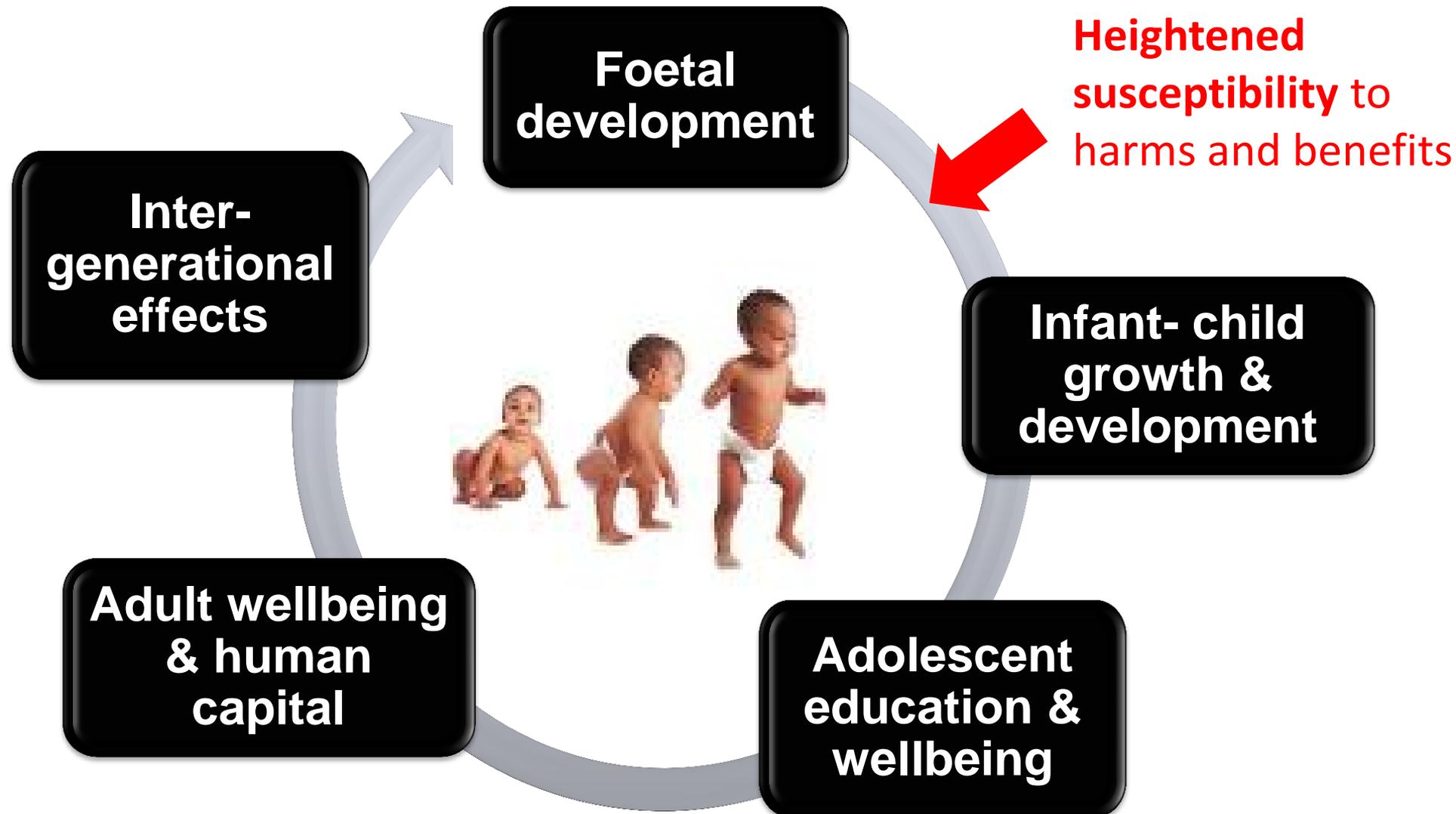
Life course development



Early development

- Development is **extremely rapid** during pregnancy and the first two years of life
- **All systems** – psychological and biological – are developing
- **Foundations** are being laid down
- As a result, a period of **heightened susceptibility** to harms and benefits

Life course development



The first 1000 days

Pregnancy (9mo = 270 days)

+ Year 1 (12mo = 365 days)

+ Year 2 (12mo = 365 days)

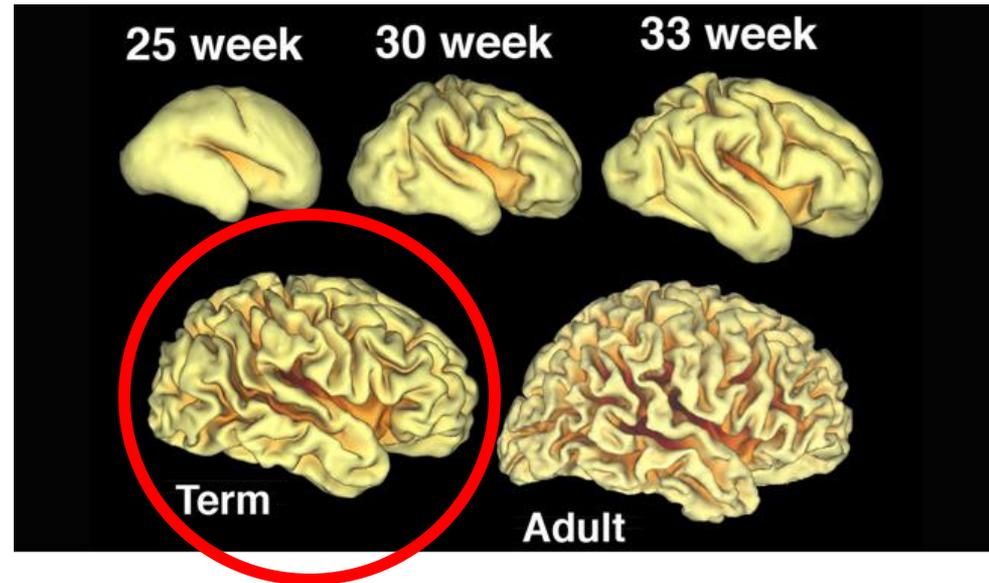
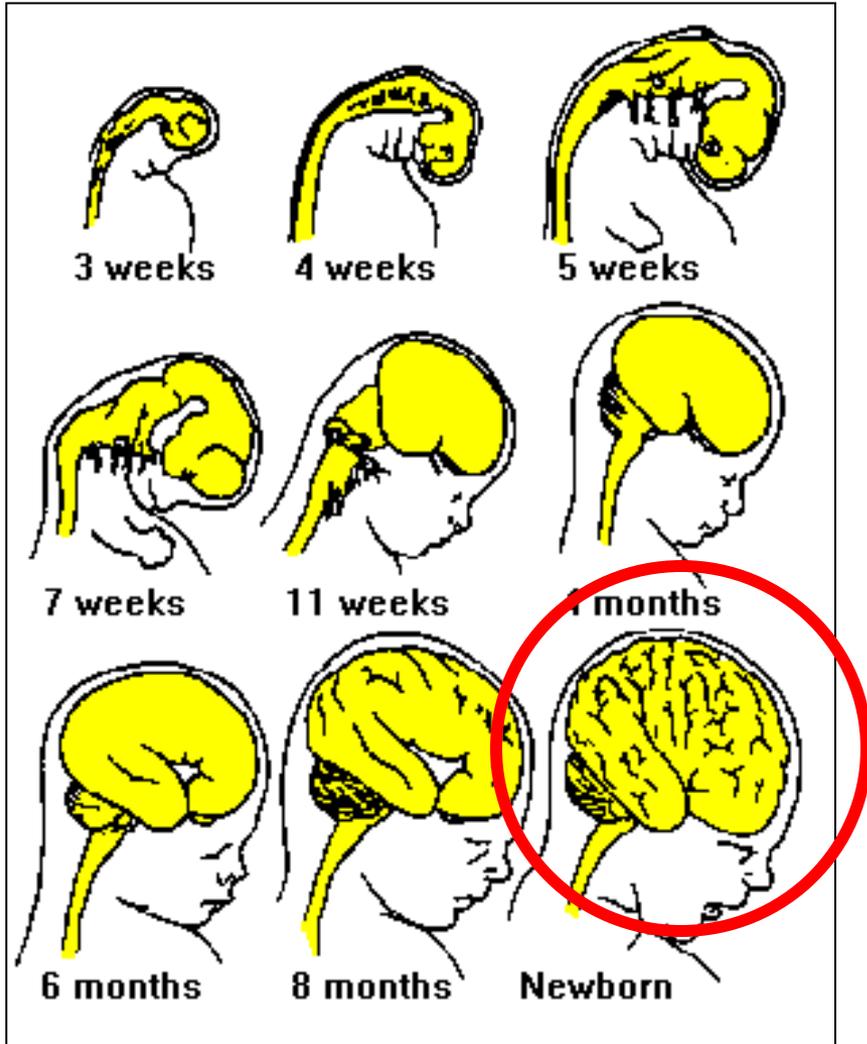
= 1000 days



Development in pregnancy (40w)



Brain development before birth



During the 40 weeks of pregnancy, **learning and adapting to the specific context** in which a child is born

Illustrative functions before birth

Fetal Growth From 8 to 40 Weeks



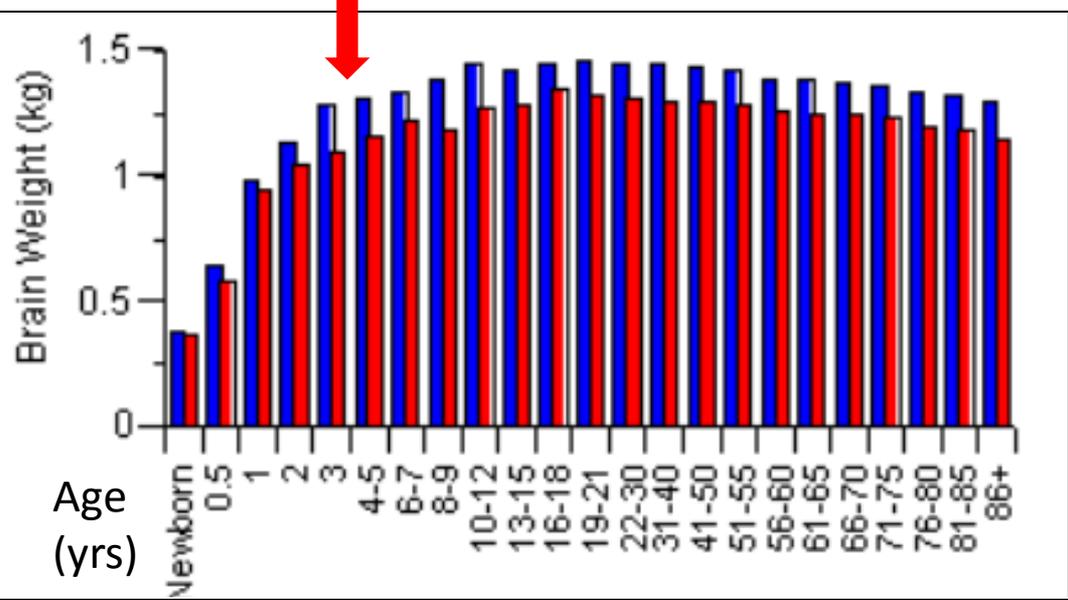
By 4 months a sense of hearing and after birth recognition of music heard during pregnancy

Illustrative functions before birth

Fetal Growth From 8 to 40 Weeks



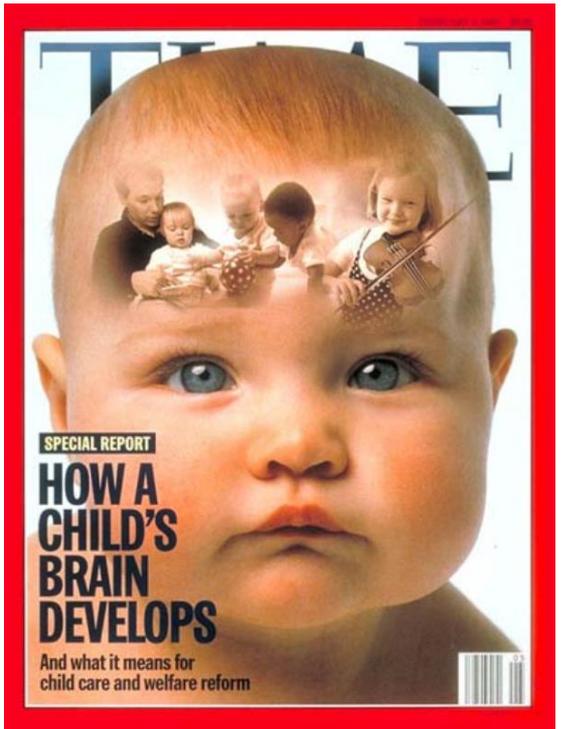
By 6 months a basic sleep-wake cycle with open and closed eyes



Grows 1% heavier per day for the first 3 months

At 3 years, is +80% the size of the adult brain

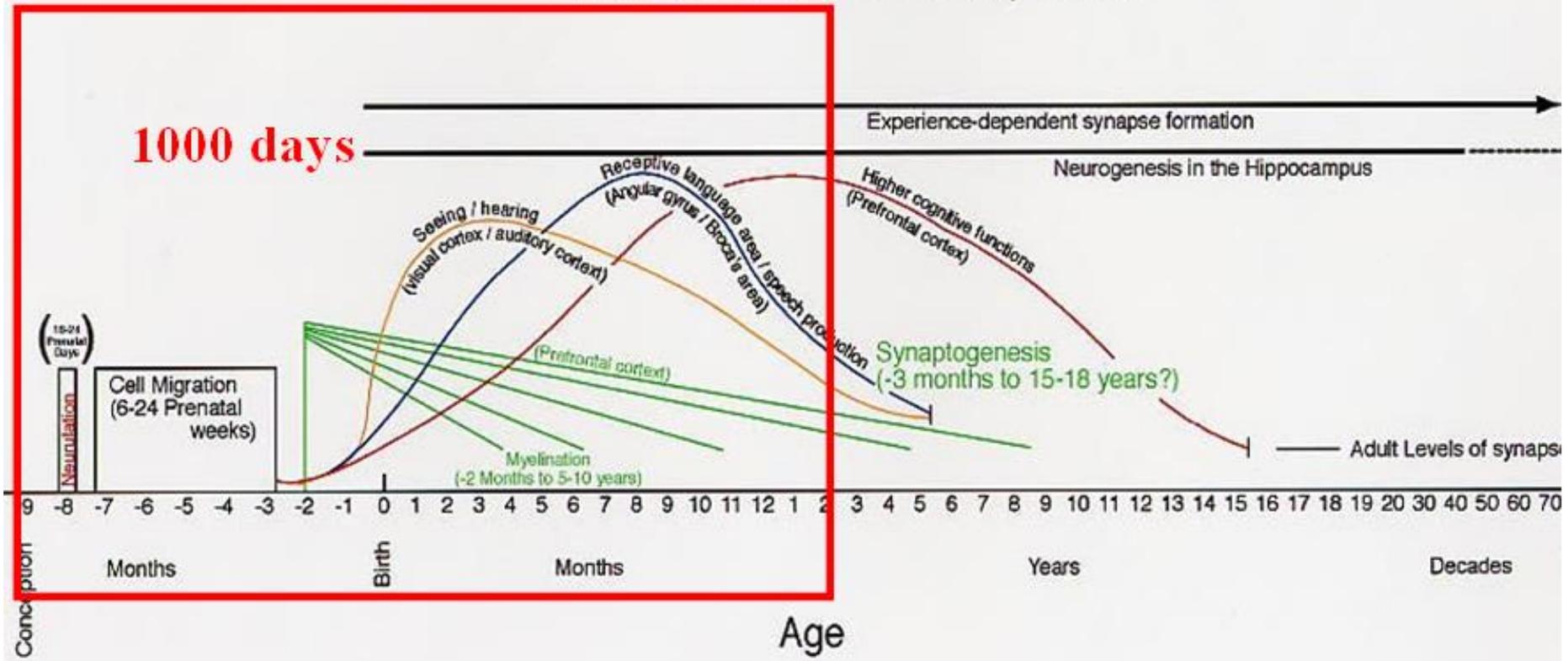
Rapid brain development after birth



Rapid functional development



Human Brain Development



Structural features of the brain supporting sensory, language and cognitive functions are developed by 2 years of age

Learning to be a person



Meltzoff & Moore (1977) *Science*



- The ability of babies to recognize, imitate & **learn from people from birth**
- Based on an **innate mirroring capacity**

Emotional learning



Walk (1968) *Science*

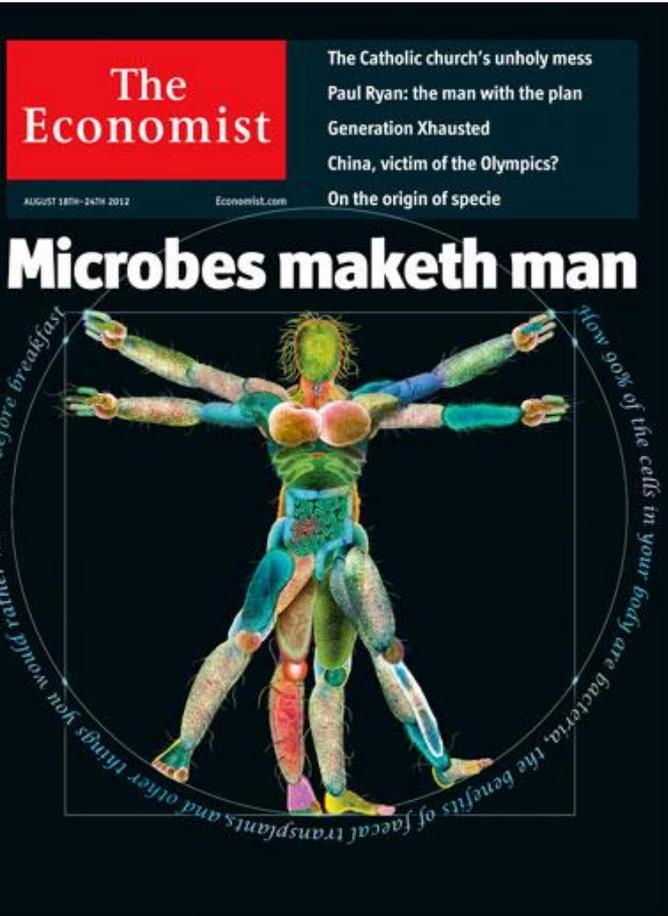
- How babies learn from the emotional states of people they trust

Genetic adaptations (epigenesis)

- Genes adapt to the environment during pregnancy and early childhood
- Turning on-off, up-down
- Most dramatic during very early development
- Epigenesis “programmes” our lifelong physiological and psychological functioning



Microbiology

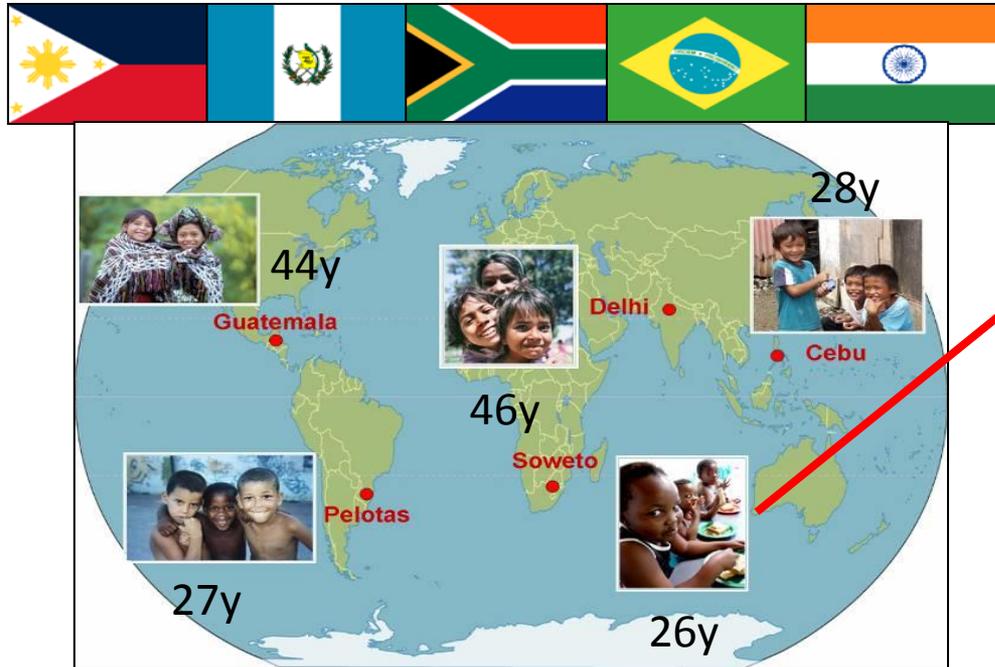


The trillions of microbes that live with and in us:

- Are exchanged among us, especially between **mother and child during pregnancy, delivery and immediately after birth**
- Kickstarts and shapes the infant's immune system
- Affects health and wellbeing, including psychological and neuro-development

Johnson & Versalovic (2012),
Pediatrics

Birth cohort studies eg COHORTS



Our study, **Birth to Twenty Plus (Bt20+)** enrolled 3 273 children before birth, with follow-up to age 26y

Martorell et al (2010), *Journal of Nutrition*;
Fall et al (2015), *Lancet Global Health*

Links between early growth (<2y) and adult outcomes:

- height, schooling, diabetes and cardiovascular disease risk, birthweight of third generation

What if babies experience adversity?



Brief increases in heart rate,
mild elevations in stress hormone levels.



Serious, temporary stress responses,
buffered by supportive relationships.



Prolonged activation of stress
response systems in the absence
of protective relationships.

Harm can prevented and mitigated



- Nurturing care (love, protection, stimulation) by stable caregivers
- Early intervention

Burturing care

Love and comfort reduce infant stress and promote learning and wellbeing



Smith (1968) *Advances in Neonatal Care*



Intervene early

- **Romania: Institutionalization**

- Children fostered before 2y achieved normal IQ in **late childhood** whereas children fostered after 2y didn't

- **Guatemala: Nutrition**

- Children given a protein supplement before but not after 2y, had a 46% increase in **adult** wages (for men)

- **Jamaica: Nutrition and stimulation**

- Children who received supplementary nutrition and home stimulation during the first 2 years achieved 24% higher wages as **adults** than controls

How apply to HIV affected children?

- The benefits of **nurturing care** and **early intervention** apply to helping all HIV affected children
 - Cope with illness and stress, maintain their developmental trajectory
- Including **HIV Exposed but Uninfected Children (HEU)**
 - Exposed to the virus during pregnancy, delivery and breastfeeding, who do not become infected

HIV exposed but uninfected children

- Declining paediatric infections
 - Increasing exposed but uninfected children
 - 1.5m pregnant HIV+ women a year
 - 30% of all children born in S & E Africa
 - Evidence of increased developmental risks:
 - Still births, prematurity and low birth weight
 - Mortality in the first 2 years, 2-3 times that of Unexposed Uninfected children (HUU)¹
 - Poorer growth and stunting
 - ? Developmental delay, behavioural difficulties
- Higher risk of cognitive difficulties, poor school performance, lower earnings

Why?

- **Biological factors**
 - Severity of mother viral load, illness
 - Inflammation, immune suppression)¹, other infections (CMV?)²
 - ARV exposure? Toxicity
 - **Fetal programming**
- **Social factors**
 - Lack of breastfeeding, compromised care (maternal death, poverty, depression, stress)
- **Almost certainly multiply determined**
- **But creating new burden of poor development**

Rapidly expanding field

- **Longstanding concerns** expressed about HIV exposure on uninfected infants
- **Few methodologically robust studies** – pre- and post-ART, control groups (HIV unexposed children), large sample sizes, follow up
- More than 10 reviews 2015-2016
- Many and increasing numbers of studies on HEU children

HEU outcomes can be improved

- Outcomes are better amongst children:
 - Whose mothers are virally suppressed
 - Less sick
 - Breastfed and well nourished
 - Live in better socio-economic conditions
- For example, longer-term follow up studies:
 - Jahansad et al (2015) Thailand – did better on developmental tests
 - Nicolson et al (2015) Zambia – achieved better school results
- Indicate the potential for supportive interventions

The key is EFFECTIVE and EARLY

- **Nurturing care**
 - Promotes young children's development
 - Helps them cope with toxic stress
- **Early**
 - Means early
 - Like provision of ARVs during pregnancy and early childhood to prevent and treat HIV disease!

Human development

Nurturing care - a “pouch” of human contact, love and protection



**Foetal
development**

**Infant- child growth
& development**

**Inter-
generational
effects**

**Adolescent
education &
wellbeing**

**Adult wellbeing &
human capital**

