Why early child development matters for HIV

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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
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

- Foetal development
- Infant-child growth & development
- Adolescent education & wellbeing
- Adult wellbeing & human capital

Inter-generational effects
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

- Foetal development
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- Adult wellbeing & human capital
- Intergenerational effects

Heightened susceptibility to harms and benefits
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

By 4 months a sense of hearing and after birth recognition of music heard during pregnancy.
Illustrative functions before birth

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

Learning to be a person

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

Meltzoff & Moore (1977) Science
Emotional learning

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

Walk (1968) Science
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


Links between early growth (<2y) and adult outcomes:
- height, schooling, diabetes and cardiovascular disease risk, birthweight of third generation
What if babies experience adversity?

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

**TOLERABLE**
Serious, temporary stress responses, buffered by supportive relationships.

**TOXIC**
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)
  - 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

Adult wellbeing & human capital

Adolescent education & wellbeing

Inter-generational effects