HIV and early childhood development – new frontiers

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Durban, 15-16th July 2016
BIG SUCCESS: Child survival & growth

- Child mortality more than halved between 1990-2015 (drop of 53%)
- Child stunting dropped 40% from between 1990-2014
BIG SUCCESSES: Child HIV

- Vertical transmission halved in the 21 top priority countries (22.4% → 8.9%)

- New infections among children dropped 60% per annum in the 21 highest burden (6 countries achieved a 75% reduction)

- Child access to treatment more than doubled, from 15% (275 700) to 51% (727 000)

- AIDS-related child deaths under 5y dropped 62% since 1990 (partly driven by successes in 3 of the 21 high priority countries)\(^1\)
Big challenges remain

Child mortality and human development

• 16,000 children under the age of 5 years continue to die each day\(^1\)

• More than 1/3 of children in LMICs are at elevated risk of not reaching their developmental potential because their poor environments deprive them of essential nutrition, nurture and opportunities to learn\(^2\)

• 60% of women of child-bearing age are in the labour-force – day care for young children?\(^3\)
Big challenges remain

HIV infection

• Only half of HIV+ people on treatment
  – New infections coming down very slowly (4% S E Africa 2010-15)
  – Many parent/prospective are and will become HIV+

• Poor retention of women and children in care
  – Lack of retention/adherence - infections during b’feeding + pregnancy & delivery (4.2% + 4.7% = 8.9%)

• Lack of attention to the child post-birth
  – Infant diagnosis has stalled - 51% tested within the first two months of life, same as in 2014

• Inadequate primary prevention of new infections among women
  – Only 5% reduction between 2009 and 2015 – 4.5m new infections in 21 high priority countries¹
These challenges are related

1. HIV and child survival
   - Reductions in maternal deaths; orphaning; vertical transmission; AIDS-related child deaths contribute to increased child survival in sub-Saharan Africa\(^1\)

2. HIV and stunted child growth
   - Children infected and affected by HIV show poorer growth\(^2\)

3. HIV and poor child development
   - Children infected and affected by HIV more likely to have
     - Delayed and/or disrupted development
     - Difficulties with socio-emotional adjustment\(^3\)
Links: HIV - early child development

CLEAR LINKS

• Maternal HIV is a risk factor for:
  – Adverse birth outcomes: Still birth, neonatal death, preterm delivery and smallness (SGA)¹

• Adverse birth outcomes are risk factors for:
  – Poor growth and neurodevelopmental disabilities²

• Especially in challenging family conditions associated with HIV³

EMERGING LINKS

• HIV and the significance of early child development for health and human capital across the lifecycle
Life course development & inter-generational effects

Foetal development

Inter-generational effects

Infant-child growth & development

Adult wellbeing & human capital

Adolescent education & wellbeing
New evidence about early childhood

Re-thinking early child development as a result of scientific advances in:

- Psychological science
- Neuroscience
- Genetics, genetic adaptations
- Microbiology
- Longitudinal studies
  - Birth cohort cohorts
  - Intervention outcome studies

All tell us that early childhood – the first 1000 days of life – is a very special time in human development
Psychological science - examples

- The ability of babies to recognize, imitate & learn from people from birth

Meltzoff & Moore (1977) *Science*
Psychological science - examples

- The ability of babies to recognize, imitate & learn from others from birth
- The way babies’ brains activate when they interact with people vs objects
Psychological science - examples

- The ability of babies to recognize, imitate & learn from others from birth
- The way their brains activate when they interact with others
- How babies learn from the emotional states of people they trust

Walk (1968) Science
Psychological science - examples

- The ability of babies to recognize, imitate & learn from others from birth
- The way their brains activate when they interact with others
- How babies learn from the emotional states of others
- How love and comfort reduce infant stress and promote learning and wellbeing

Smith (1968) Advances in Neonatal Care
The power of parenting

We (men & women) are all born with capacities to parent, evident in, a.o:

- Hormonal & emotional changes in pregnancy and post-natally
- Behavioural & neuropysiological sensitivity to infant cues
- Heart rate acceleration to infant cries and vocalizations
- Approach responses to the "cuteness" of baby faces
- Spontaneous "motherese" talk to babies
- Bonding & motivation

Rilling & Young (2014), *Science*
Rapid early brain development

The brain develops extremely rapidly during pregnancy and the first few years of life, learning and adapting to the specific context in which a child is born.
The brain grows faster during the first 3 months of life than at any other time

- Grows 1% bigger per day
- The brain gets 64% larger from birth to 3m
- From 3m growth slows down to 0.4% per day
Rapid functional development

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

Genetic adaptations (epigenesis)

- From conception our genes start figuring out what kind of environment we’re living in
  - And how to adapt to it
- Epigenetic changes occur in response to a wide range of environmental factors

Kanherker et al 2014, Front Cell Dev Biol
Gene adaptations - programming

- Changes result from some genetic functions being amplified or muted
- DNA methylation most dramatic during early development
- Epigenesis “primes” or “programmes” the lifelong physiological and psychological functioning of the individual

Lister (2013), *Science*
Microbiology

The trillions of microbes that live with and in us:

- Are exchanged among us, especially between mother and child:
  - During pregnancy
  - Vaginal delivery
  - Immediate body contact
  - Colostrum and breastfeeding
- And significantly altered by environmental conditions

Johnson & Versalovic (2012), *Pediatrics*
Effects on health and development

The maternal microbiome:
- Kickstarts and shapes the infant’s immune system
- Maps metabolic pathways
- Affects health and wellbeing, including psychological and neuro-development

Flight (2014), Nature Reviews Neuroscience
Studies with long-term outcomes

• In low & middle income countries only became available fairly recently
• Birth cohort studies
• Long-term follow ups from early interventions
Birth cohort studies

Eg COHORTS (Consortium of Health-Oriented Research in Transition)

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


Showing links between early growth and adult outcomes (eg height, schooling, diabetes and cardiovascular disease risk, and birthweight of the third generation)
Follow-ups from early intervention

- **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
The first 1000 days

Pregnancy (9mo = 270 days)
+ Year 1 (12mo = 365 days)
  + Year 2 (12mo = 365 days)
  = 1000 days

A critically important developmental period takes place in the “pouch” of loving care, nurturance and protection
Prevent infection, support HIV+ children and families, by helping to:

• Prevent infection among children
• Diagnose infection as soon as possible
• Get children onto treatment as early as possible
• Ensure adherence
• Assist with disclosure and ensure protection
• Provide support to children and families with support
Link: HIV \(\rightarrow\) early child development

**HIV 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

\[\Rightarrow\text{Could be associated with higher risk of cognitive difficulties, poor school performance, lower earnings}\]
Why?

- **Biological factors**
  - Severity of mother viral load, illness
  - Inflammation, immune suppression, other infections (CMV?)
  - ARV exposure? Toxicity
  - Fetal programming

- **Social factors**
  - Lack of breastfeeding, compromised care (maternal death, poverty, depression, stress)

- **Multifactorial**
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:

  - Indicate the potential for supportive interventions
“Join up” HIV interventions

- HIV diagnosis and treatment is not only about men and women
- PMTCT is not only about preventing infection among infants
- Adolescent prevention is not only about incidence

The benefits (and harms) are joined together across the life course and through inter-generational effects
Get beyond survival ...

- Global Strategy for Women, Children’s and Adolescent’s Health 2016-2030
  (Launched 26 September 2016)
- Secretary-General- the three main objectives:
  - “First, survival, we want to end preventable deaths of women and children by 2030.
  - Second, we aim to ensure every child and adolescent thrives
  - Third, we commit to transforming the world in which women, children and adolescents live.”
Join up PMTCT and ECD interventions

“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
Unprecedented opportunities are available. If countries use them to build on the progress made and to close remaining gaps, they could catapult towards the goal of ending the AIDS epidemic by 2030. The 2030 Agenda for Sustainable Development is a vital platform for this renewed push to eliminate HIV infections among children and protect mothers’ lives—and for accelerating unifying actions to end the AIDS epidemic. The Sustainable Development Goals feature numerous opportunities for fresh, collaborative, and sustainable efforts.