Promoting Early Childhood Development Through Multi-Sectoral Intervention Packages Anchored in Nurturing Care

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Burden of risk

2004 data

- **219 million children in LMICs at risk**

REVISED 2004 data

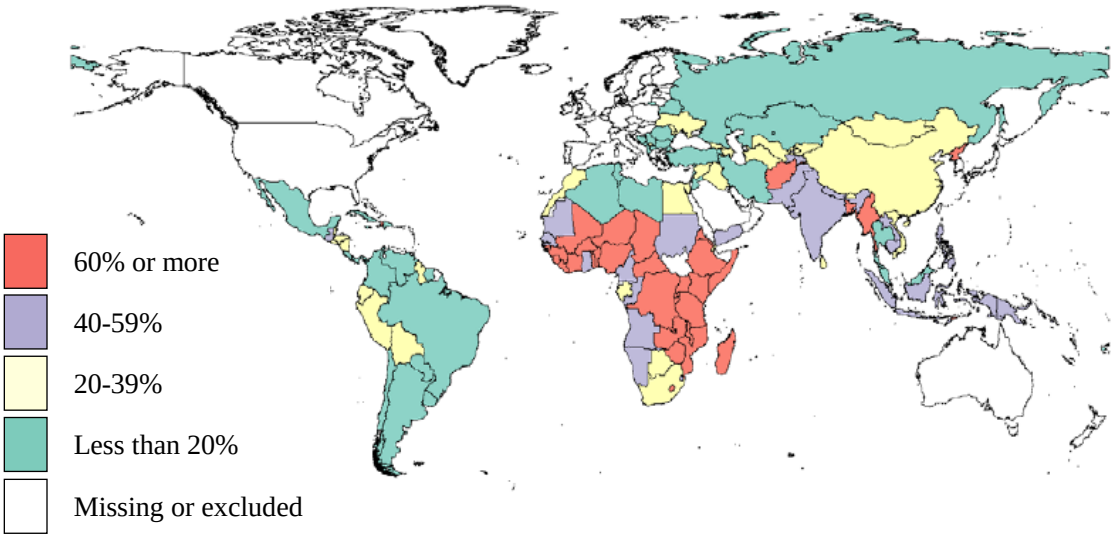
279 million children

11% Decline

2010 data

- **249.4 million children**

Risk varies significantly by low, middle and upper-middle income countries



Looking beyond risks of poverty & stunting

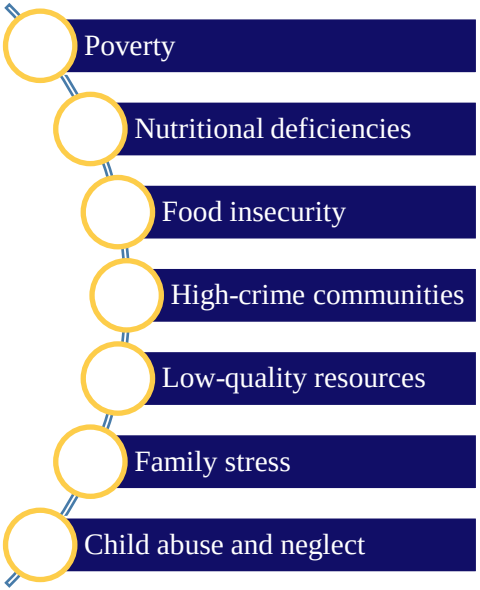
- Both low maternal schooling and child maltreatment are related to poor child outcomes
- When you add these factors, risk for poor outcomes increases dramatically

From 62.7% for stunting and extreme poverty

To 75.4% with the other risk factors added

Accumulation of adversity

- As the number of risk factors increases, the severity of impact rises
- Children in LMICs are exposed to a greater number of risks



Importance of the early years

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The Miracle of Human Development:

establishing trajectories for life-long health and wellbeing

A genetic blueprint in the embryo/fetus establishes the broad strokes of development

Environment modifies this blueprint during critical periods of development

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Parent's Pre-pregnancy Health/Wellbeing

Pregnancy Environment

Environment In infancy / childhood

Genetic Blueprint for Development

Health

Learning

Society

Earlier life events have greater and cascading effects on later development

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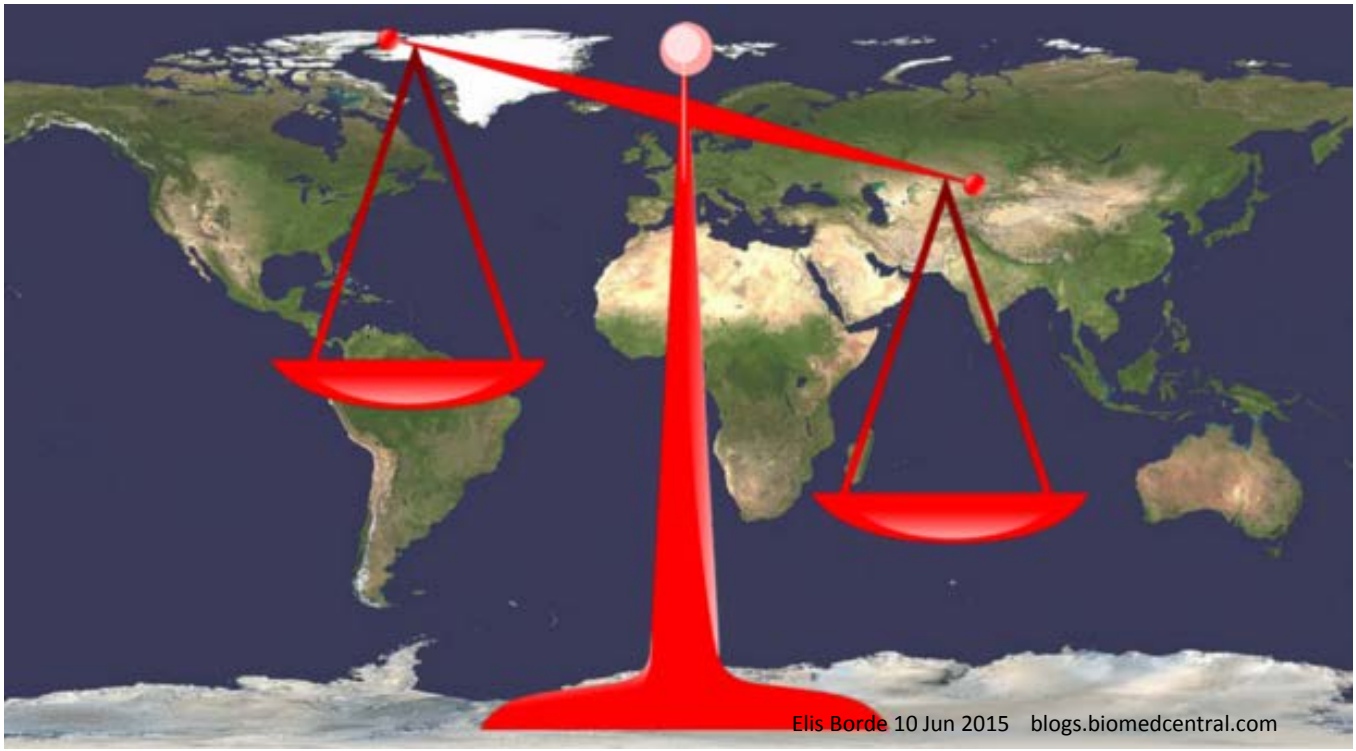

Early Environments and Human Development:
the origins of inequities in health and economic achievement

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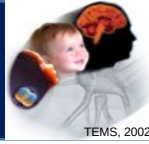

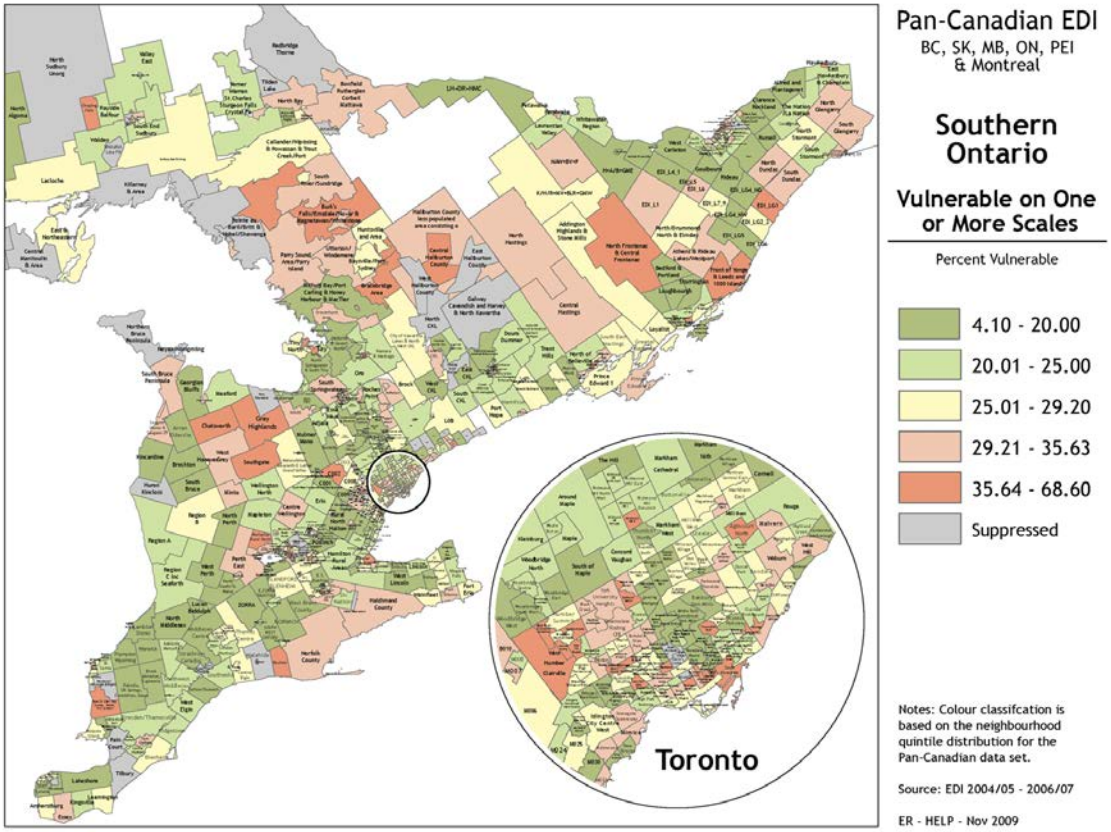

Pan-Canadian EDI

BC, SK, MB, ON, PEI & Montreal

Southern Ontario

Vulnerable on One or More Scales

Percent Vulnerable

- 4.10 - 20.00
- 20.01 - 25.00
- 25.01 - 29.20
- 29.21 - 35.63
- 35.64 - 68.60
- Suppressed

Notes: Colour classifcation is based on the neighbourhood quintile distribution for the Pan-Canadian data set.

Source: EDI 2004/05 - 2006/07

ER - HELP - Nov 2009

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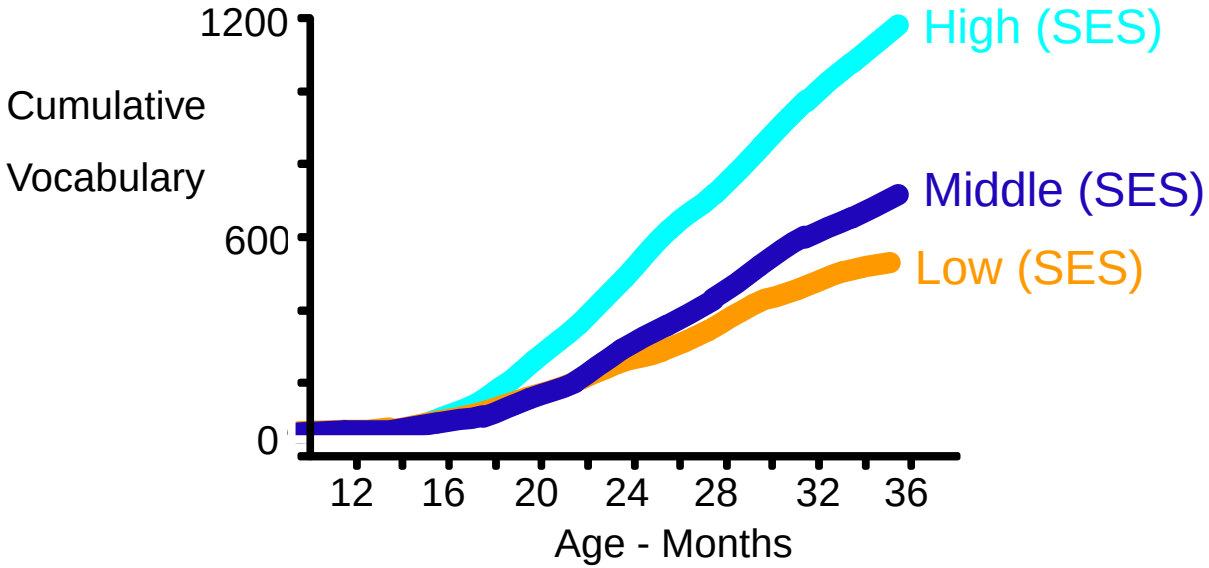
Children's vocabulary differs greatly across income groups (by 3 years old)



B. Hart & T. Risley, Meaningful Differences in Everyday Experiences of Young American Children, 1995

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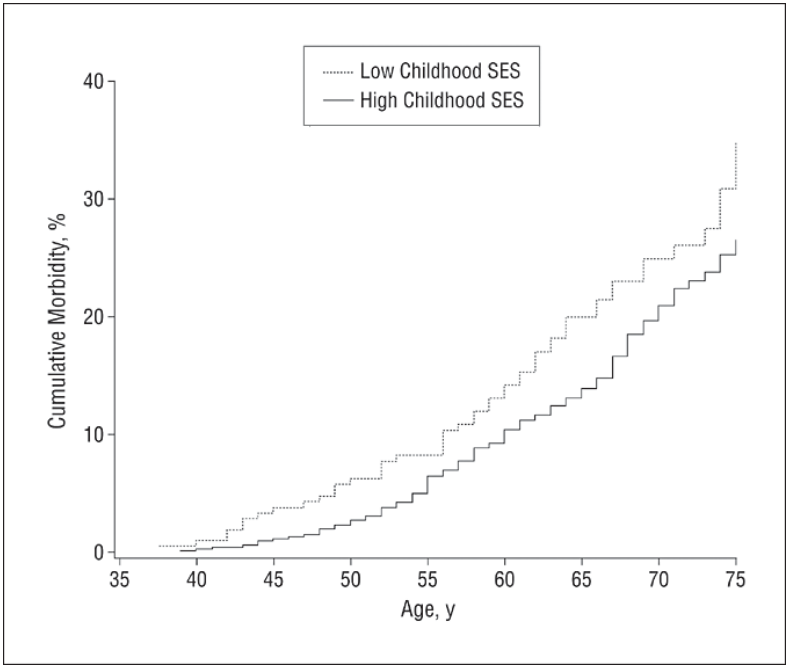
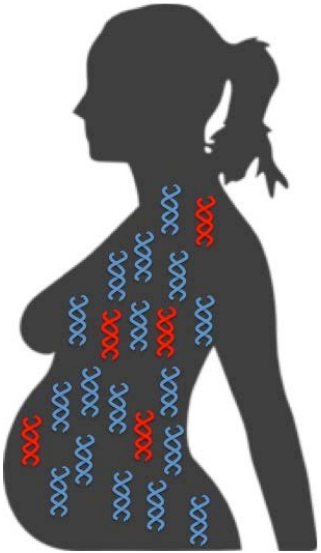


Experiences Do Get Under the Skin…

Cumulative probability of coronary heart disease in 1131 white male medical school graduates according to childhood socioeconomic status (SES)

Kittleson, M. M. et al. Arch Intern Med 2006;166:2356-2361.

The Maternal Environment and Developmental Programming



During pregnancy and infancy the maternal environment plays a critical role in establishing developmental trajectories of the child.

Maternal Exposure to stressful events during pregnancy associated with maladjusted behaviours in children at 14 years of age

Robinson et al Raine Cohort

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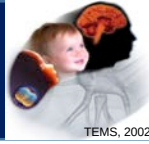

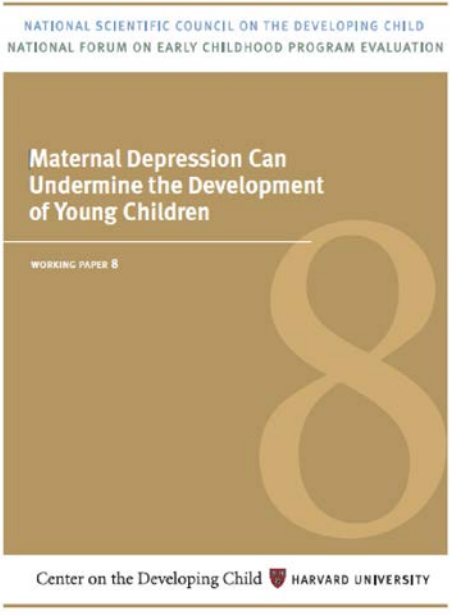

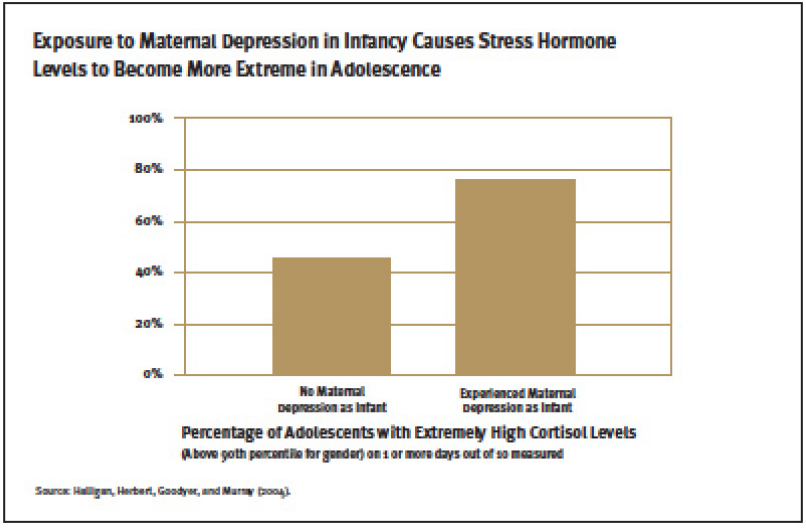

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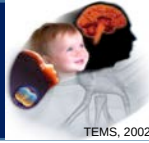
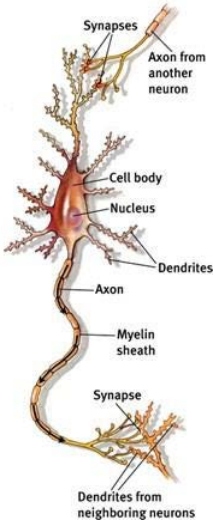
Healthy brain development needs nutrition, stimulation and protection.

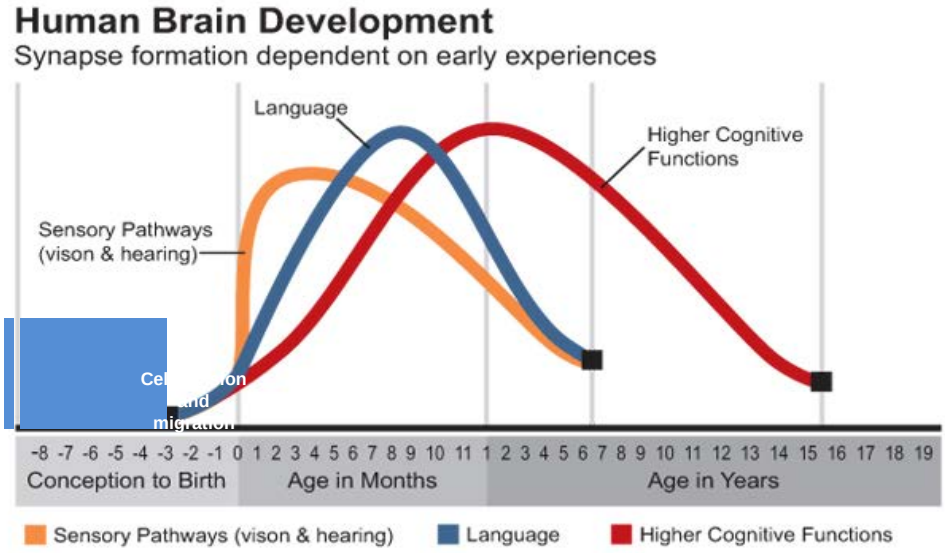
scienceofecd.com

There are sensitive times in the development of the brain.
scienceofecd.com



Sensitive periods and the developing brain





Feeling Secure & Protected

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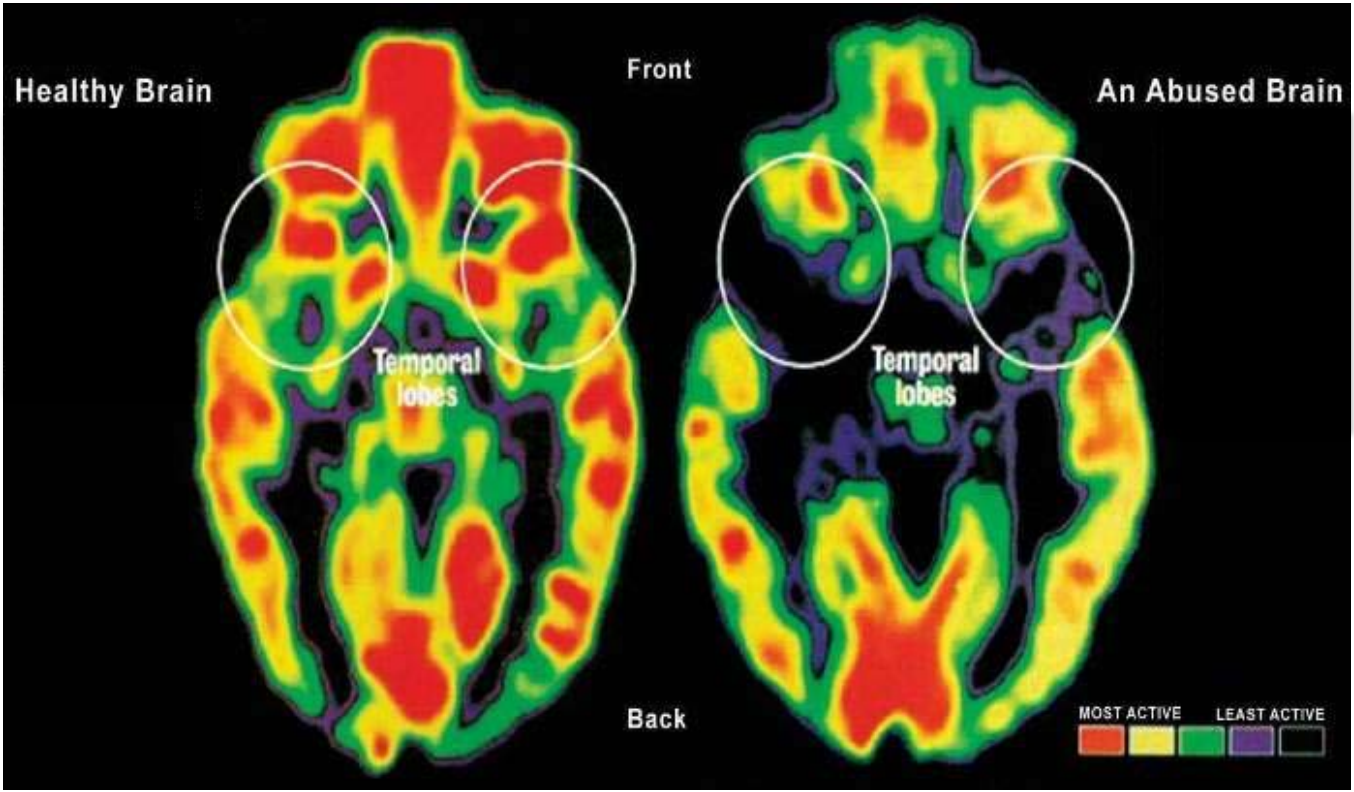

Chugani et al NeuroImage 14, 1290–1301 (2001)

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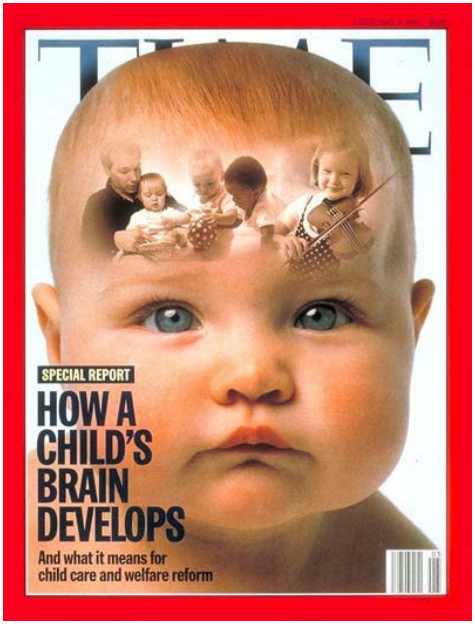


Early life is a period of high brain plasticity, where differences in cognitive, social and emotional development start to consolidate.

Poor nutrition stunts brain growth in the same way that it stunts growth of the body

Experiences impact brain development, including the number of nerve cells present and the formation of connections (synapses) between nerve cells that impact brain function including memory and learning

Neglect or abuse can lead to chronic elevations in stress hormones that are “toxic” to brain development

Gene environment interactions underlie developmental programming

Development

Variations in Genetic Sequence

Epigenetic Modification

Environment

Adult Health and Wellbeing

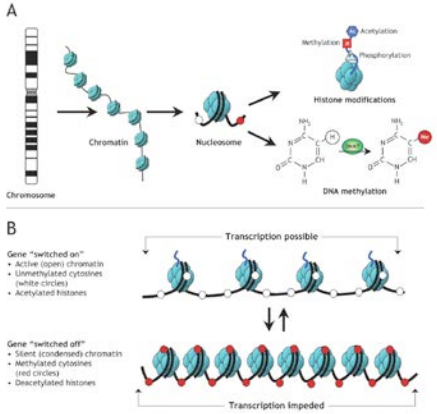
Cardiovascular disease
Obesity/diabetes
Mental health
Cognitive function
Behaviour/social function

Epigenetic mechanisms underlie developmental programming

Development

Environment

Epigenetic Modification



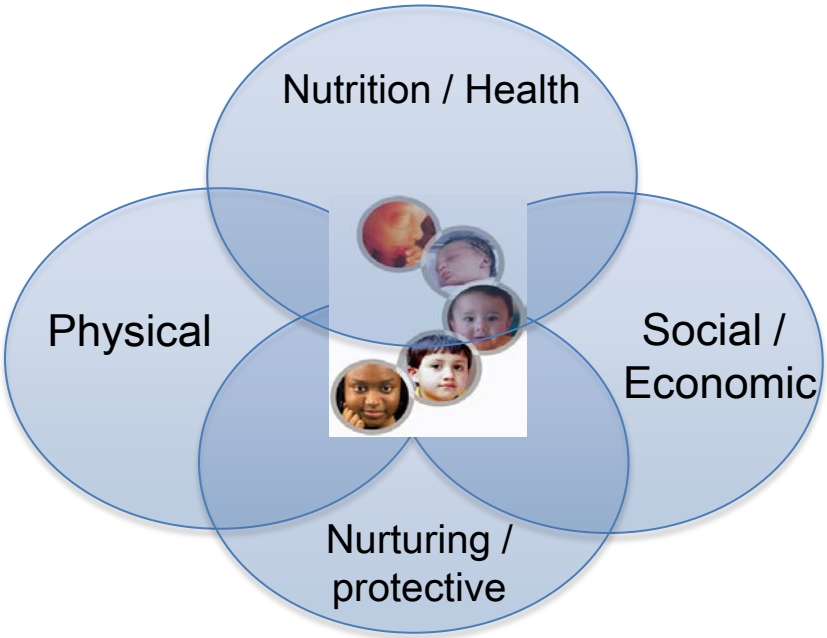
Epigenetic mechanisms mediate the impact of early-life experiences on the genome, modulating the expression of genes involved in: 1) how we cope with stress, 2) how our brain develops and functions and, 3) how we fight disease.

Multi-generational impact of early environments

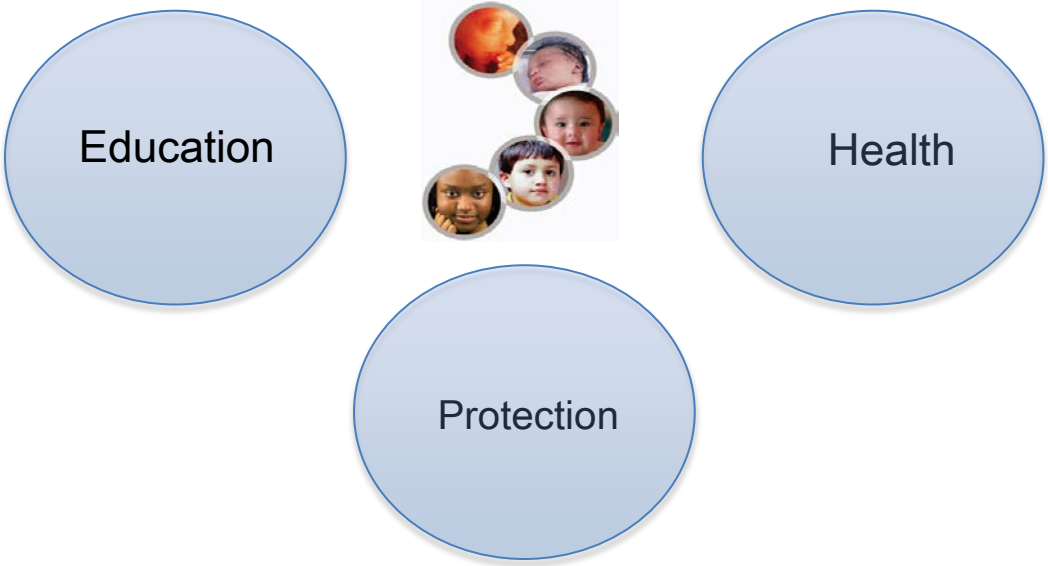
- **Health of the mother**
- Pregnancy environments impact multiple genomes.
- The pregnancy contains the genomes of the mother, the child and the grandchild.

- **Health of the father**
- Paternal pre-pregnancy health and well being impacts the health and development of infants and children.

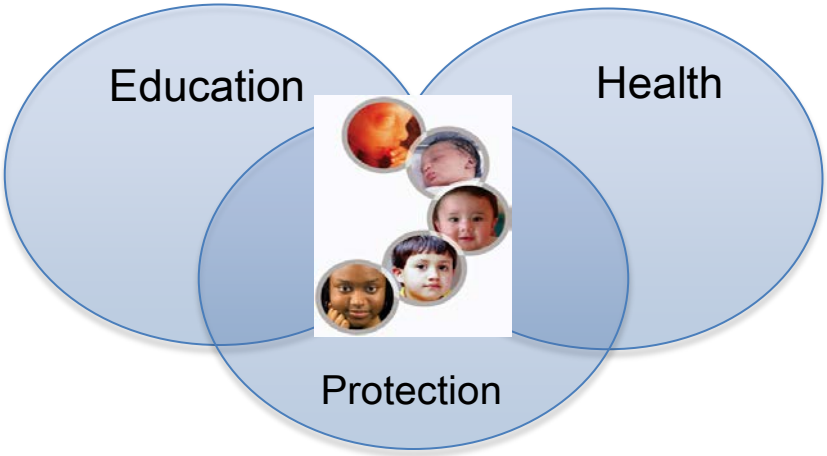
Multiple Environments Impacting Child Development



Deconstruction of Supports for Early Child Development



Multi-sectoral Approach to Holistic Chid Development



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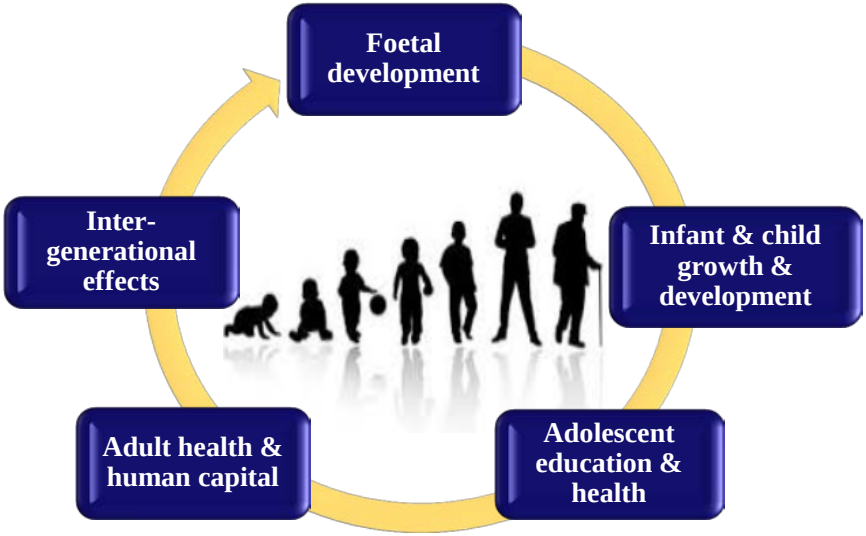
Life-course approach

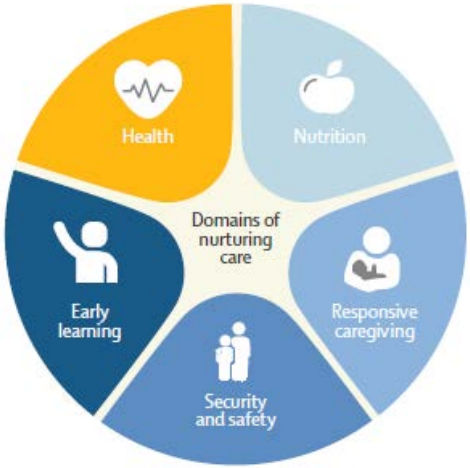


Importance of nurturing care

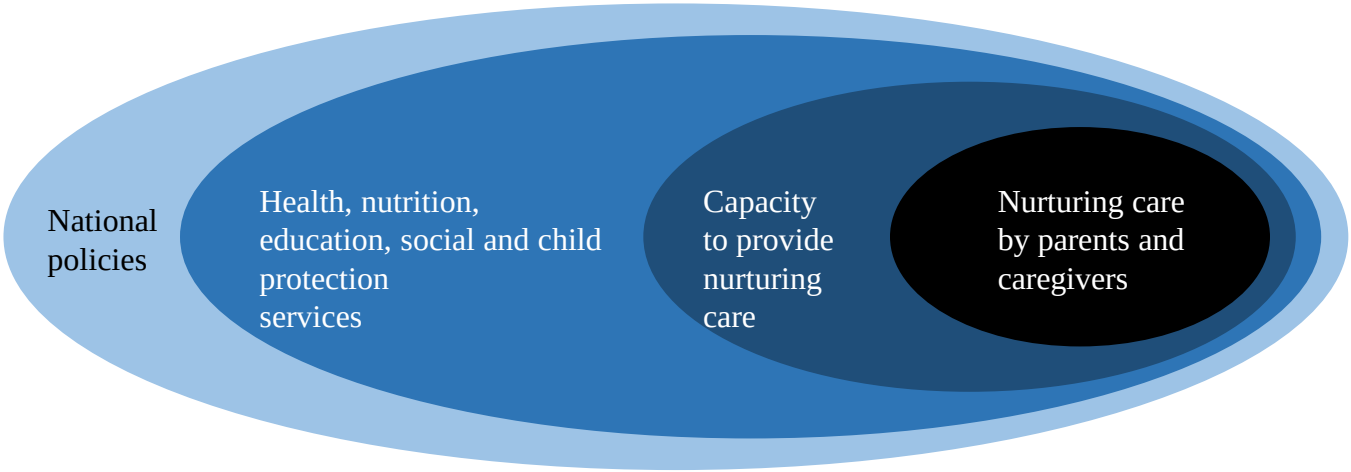
Children's early development requires nurturing care—defined as health, nutrition, security and safety, responsive caregiving, and early learning—provided by parent and family interactions, and supported by an environment that enables these interactions.

Parenting and nurturing care

- Nurturing care envelops early child development
- Comprises all essential elements for a child to grow physically, mentally and socially:
  - Nutrition
  - Health care
  - Love and security
  - Protection from danger
  - Opportunities to learn and discover the world



Nurturing care is fostered by a supportive environment – the ecological model



Evidence-based interventions for nurturing care

Review of interventions across multiple sectors

Comprehensive review of intervention studies published since 2010: RMNCH • nutrition • parenting • early childhood education • maltreatment prevention

- Evidence in each sector
- Interventions that benefit child development

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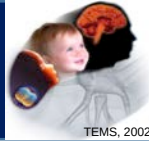

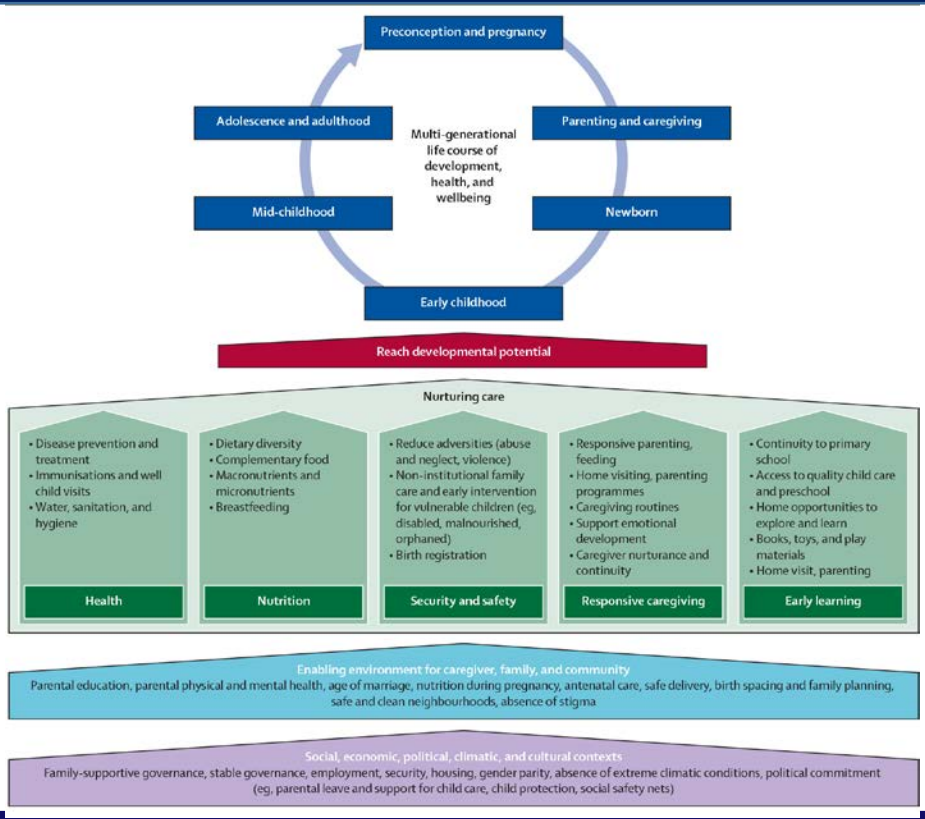

New evidence: longitudinal outcomes

- Interventions
- Birth cohort studies
  - Long-term follow ups show that growth failure in the first two years of life has extensive effects
  - Deficits and disadvantages are carried over into the subsequent generation

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Ontario Family Health Study – Ontario Birth Study / TARGet Kids

Dr. Kellie Murphy (OBS) / Jonathon Maguire, Patricia Parkin, Catherine Birken (TARGet Kids)

Pregnancy Cohort (2000 women) → Birth to Infancy to School and Beyond >7500

Integrated Data Platforms
Clinical, Physiologic, Pyschosocial, SES Phenotyping – Genomics/Genetics

Track Early Life Exposures – Monitor Child Outcomes – Define Mechanisms – Identify Children at-risk - Test Novel and Effective Interventions

↓

Policy/Practice Change
promote health, optimize potential and enhance well-being

CIHR IRSC Canadian Institutes of Health Research / Instituts de recherche en santé du Canada

1986

DEPARTMENT OF BIOTECHNOLOGY
Ministry of Science & Technology

saMRC advancinglife

World Health Organization

Applying the Lancet Roadmap
Healthy Life Trajectories - HeLTI

- In-country evidence of benefits of nurturing care
- Data sharing
- Capability for validation
- Local capacity building (mentorship and training)
- Networking to support scale-up

BILL & MELINDA GATES foundation

All Children Thriving

The cost of inaction

By 2030 non-communicable diseases will account for 50% of the global burden of disease.

WHO

"As countries prepare for a more digitalized global economy, I'm deeply concerned that our failure to tackle this challenge is condemning millions of children to lives of exclusion – lives where they won't have the brain power to succeed in school or in an increasingly digitalized workplace."

Jim Kim, President World Bank Group

The personal cost of inaction in grades and earnings lost

	Grade Deficit	Income Loss	Children
Stunted only	4.67	42.3%	106.5m (18.5%)
Poor only	0.71	5.8%	75.6m (13.1%)
Stunted and poor	6.56	32.4%	67.2m (11.7%)

Societal cost of not reducing stunting

Region	Country	GDP/capita US$	Govt health expenditure (%GDP)	Cost of inaction (%GDP)
Sub-Saharan Africa	Ethiopia	505	1.8	**7.9**
	Kenya	1245	1.8	**5.4**
	Madagascar	463	2.5	**12.7**
	Nigeria	3005	1.9	**3.0**
	Tanzania	695	2.8	**11.1**
	Uganda	572	1.9	**7.3**
South Asia	Bangladesh	1.2	1.2	**5.6**
	India	1.3	1.3	**8.3**
	Nepal	2.2	2.2	**3.4**
	Pakistan	1.0	1.0	**8.2**

Pathways to scale

1. Effective interventions
2. Delivery platforms to reach families
3. Country case studies of scale
4. Conducive policy environment
5. Affordable action

Recommendations

1. Science says “start early,” conception-3y
2. Expand political will through the SDGs
3. Create conducive policy environments
4. Adopt a multi-sectoral framework
5. Use the health sector as an entry point
6. Support system enablers

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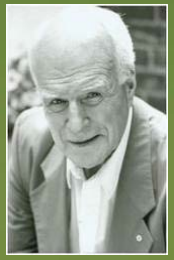
Investing in the 1st 2000 days of life to enable all children, everywhere to reach their full potential



J. Fraser Mustard

David J. Barker

Clyde Hertzman

Thank you!

obrigado ขอขอบคุณ hatur nuhun

謝謝 Спасибо Asante

Dziękuję Ci grazie நன்றி

Salamat cảm ơn bạn Дякую

dank je धन्यवाद Danke mahadsanid

merci gracias 고맙습니다

ευχαριστώ Ngiyabonga