ARACY Access Grid

Community Business Partnerships for Early Child Development (ECD)

Closing the Gap Between What We Know and What We Do

By J. Fraser Mustard
Founding Chairman
The Council for Early Child Development

February 20, 2008
Why the Gap

- Lack of understanding.
- Beliefs and culture.
- Social and economic factors.
- Cost of quality ECD programs.
- The role of the state (the child does not choose its parents).
- Professional silos (prevention vs. treatment).
“The rates and types of problems that we are currently seeing in our children and youth are unprecedented, complex problems that require innovative solutions.”

Fiona Stanley
Part 1: The Evolutionary History of Human Beings
Part 2: Developmental Neurobiology
Part 3: The Evidence about ECD
Part 4: Early Child Development and Parenting Centres – Community Business Partnerships
Part 5: Outcome Measures
Part 6: Socioeconomic Considerations – Business Community Partnerships
The Evolutionary History of Human Beings

- 200,000 Years
- 10,000 Years – Agricultural Revolution
  -- Civilization Experiments
- 3,000 to 4,000 Years – Written Language & Alphabet
- 600 Years – Books
- 50 Years – Electronic Media
Agricultural Revolution – 10,000 years ago

Transition from hunter-gatherer societies to our experiments in civilization.

Short History of Progress
Wright 2004
The Growth of the World Population and Some Major Events in the History of Technology

Exponential Knowledge and Technology Growth

1st Agricultural Revolution

Printing Press

Beginning of Industrial Revolution

21\textsuperscript{st} Century / Changes

- Exponential growth in knowledge and technology
- Population growth, demographics (aging populations), migration and refugees
- Changes in local and international economies
- Climate change and resource constraints
- Developmental neuroscience
The Search for Talent

Why It’s Getting Harder to Find – Business and Community

The Economist, October 7, 2006
Economist Magazine
The Importance of Neuroscience

- September 21, 2006 – Learning Without Learning (Epigenetics)
- October 7, 2006 – A Survey of Talent
- December 23, 2006 – A Survey of the Brain
- June 14, 2007 – RNA - Really New Advances (microRNA)
PART 2
DEVELOPMENTAL NEUROBIOLOGY
Experience-Based Brain development in the early years of life sets neurological and biological pathways that affect throughout life:

- Health
- Learning
- Behaviour
Two Neurons

Axon

RECIPIENT NEURON

Synapse

Dendrite

SIGNAL-SENDING NEURON
SENSING PATHWAYS
- Sound
- Vision
- Smell
- Touch
- Proprioception
- Taste
Vision and Hearing
Critical Periods

Eye cataracts at birth prevent normal development of vision neurons in the occipital cortex (Hubel and Wiesel)

Cochlear defects at birth and middle ear infections in infants impair hearing and language development (Rauschecker and O’Donoghue, Fiona Stanley)
Brain Pathways

- "Higher levels of brain circuits depend on precise, reliable information from lower levels in order to accomplish their function.

- Sensitive periods for development of lower level circuits ends early in life.

- High level circuits remain plastic for a longer period."

Knudsen 2004
<table>
<thead>
<tr>
<th>At Birth</th>
<th>6 Years Old</th>
<th>14 Years Old</th>
</tr>
</thead>
</table>

*Rethinking the Brain, Families and Work Institute, Rima Shore, 1997.*
Human Brain Development – Language and Cognition

Sensing Pathways (vision, hearing)

Language

Higher Cognitive Function

Early Child Development and Language

- Starts early – first 7 months
- Sets capability for mastering multiple languages
- Sets literacy and language trajectories
| Level 1: | indicates persons with very poor skills. |
| Level 2: | people can deal with material that is simple. |
| Level 3: | is considered a suitable minimum for coping with the demands of everyday life. |
| Level 4: | people who demonstrate command of higher-order processing skills. |
| Level 5: | competence in sophisticated reading tasks, managing information and critical thinking skills. |
Socioeconomic Gradients for Adult Document Literacy Scores

Mean Scores

Parents’ Education (years)

Intern’l Mean

U.S.
Canada
Australia
Sweden
Finland
Chile

OECD, 2000
Literacy Levels for the Total Population Ages 16 to 65 – USA

NALS, p. 17, 2002
Literacy Levels by Physical, Mental or Other Health Conditions – USA (Quantitative)

- Health Problems
- Mental or Emotional Problems
- Long-term Illness

NALS, p. 44, 2002
Sociocultural Gradients for Language Scores in Latin America

Parents' Education (Years)

Language Score

Argentina
Brazil
Colombia
Mexico
Cuba
Chile

Mexico

Parents' Education (Years)

Language Score
Allostasis & Allostatic Load (Stress)

Limbic HPA Pathway
Limbic HPA Pathway - Stress

Cortisol – Over Production

Behaviour, depression, diabetes, malnutrition, cardiovascular disease, memory, immune system, drug and alcohol addiction

Cortisol – Under Production

Chronic fatigue syndrome, fibromyalgia, immune system (autoimmune disorders) rheumatoid arthritis, allergies, asthma
Sensory Stimulus

Thalamus

Cortex

Amygdala

Hypothalamus PVN

PIT

CRF

ACTH

Adrenal Cortex

Hippocampus

Cortisol

LeDoux, Synaptic Self
Stress Pathway and Sensory Stimuli

Touch in the Early Period is Critical

- Rats – Mothers licking pups (High versus Low Grooming)
- Monkeys – Peer vs mother rearing
- Humans - Attachment
Epigenetics

The process by which normal gene expression is altered by experience.

Genotype vs Phenotype
Hippocampal GR(1γ) Region 16 (5’ NGFI-A RE) Methylation Timeline

Mean C-Methylation

Embryo
Day 20

Birth
Day 1

Pup
Day 6

Weaning
Day 21

Adult
Day 90

Licking Low

Licking High

M. Szyf
Serotonin Transporter Gene Experience in Early Life - Depression

Depression Risk

Age 26

S = Short Allele
L = Long Allele

No Abuse Moderate Abuse Severe Abuse

Early Childhood

Early Experience and Brain Architecture and Function

- Affects gene expression and neural pathways
- Shapes emotion, regulates temperament and social development
- Shapes perceptual and cognitive ability
- Shapes physical and mental health and behaviour in adult life
- Shapes physical activity (e.g. skiing, swimming, etc.)
- Shapes language and literacy capability
THE EVIDENCE
ABOUT
ECD and HUMAN DEVELOPMENT
Pregnancy and Infancy

- Nutrition (long chain polyunsaturated fatty acids)
- Toxic substances – tobacco, alcohol and drugs
- Sensing pathways and breastfeeding
- Infections (pre- and post-natal)
# Romanian Adoption Project

Scores at 10.5 Years

<table>
<thead>
<tr>
<th></th>
<th>CB</th>
<th>EA</th>
<th>RO</th>
</tr>
</thead>
<tbody>
<tr>
<td>IQ</td>
<td>108</td>
<td>99</td>
<td>85</td>
</tr>
<tr>
<td>Language Score</td>
<td>106</td>
<td>99</td>
<td>88</td>
</tr>
<tr>
<td>Behaviour</td>
<td>13%</td>
<td>9%</td>
<td>43%</td>
</tr>
</tbody>
</table>

CB - Canadian Born – middle class families
EA - Early Adopted – middle class families
RO - Romanian Orphanage – middle class families
Romania – BEIP Project

The cognitive outcome of children who remained in the orphanages was markedly below that of non orphanage children and children taken out of the orphanage and placed in foster care.

1958 British Birth Cohort
Age 45

- Cortisol pathway response in adult correlates with ECD.
- Children with poor ECD have dysfunctional cortisol secretion patterns at age 45.
<table>
<thead>
<tr>
<th>Adult Health</th>
<th>Adverse Early Child Development*</th>
<th>Odds - Ratios</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>General Physical</td>
<td>1</td>
<td>1.39</td>
</tr>
<tr>
<td>Circulatory</td>
<td>1</td>
<td>1.56</td>
</tr>
<tr>
<td>Mental</td>
<td>1</td>
<td>1.78</td>
</tr>
</tbody>
</table>

* Economic, family size, broken family and family dissention

EARLY CHILD DEVELOPMENT AND PARENTING CENTRES
Success by Ten
Early Child Development

- Intervene early
- Intervene often
- Intervene effectively

Ludwig and Sawhill, Brookings Institution
What Provides the Best Results?

Centre Based Programs that:

- Start Early
- Involve Parents
- Home Visiting
- Qualified Staff in Neuroscience and Development
Components of Early Childhood Development and Parenting Centres:

- ECD & care (parental and non-parental) arrangements
- Play-based learning
- Resources
- Prenatal & postnatal supports
- Nutrition programs
Early Child Development and Parenting Centres

- Offer from conception to school entry
- Provide support for parents
- Learn parenting by doing
- Provide non-parental care
- Link to and integrate with primary schools
- Detect development problems early
Recommendations to Involve The Private Sector

- Encourage private sector to give priority to community-based early child development and parenting centres
- Parental leave policies
- Establish incentives to build public-private sector partnerships
Parental Leave

Provide 18 months parental leave with income support, followed by one day weekly leave for both parents until age three to be involved in the Early Child Development & Parenting Centre.
## Barriers to Implementing ECDP Programs

1. Economics
2. Lack of understanding (government, public and professional)
3. The state as a nanny
4. No commitment to equality
## Cost to Individuals and Canadian Society of Poor Early Child Development (estimates)

<table>
<thead>
<tr>
<th>Category</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crime</td>
<td>$120 Billion/year</td>
</tr>
<tr>
<td>Mental Health, Behaviour and Drug Use</td>
<td>$100 Billion/year</td>
</tr>
<tr>
<td>Australia Substance Abuse</td>
<td>$ 35/Billion/year</td>
</tr>
</tbody>
</table>
The Brookings Institution in the US projects said that a high quality universal preschool policy would boost the size of the US economy by US$270 Billion by 2050 and by over US$2 Trillion by 2080.

K. Rudd, New Leadership, 2007
Cost of ECD-P Centres (Pregnancy to Grade 1)

Age 0 to 6 Population

Universal (2,500,000 children)

Cost $18.5 Billion (1.5% of GDP)

Present Expenditure 0.25% of GDP
Australian cost for ECD-P Centres about $12 Billion (Cdn $)
OUTCOME MEASURES
<table>
<thead>
<tr>
<th>Early Development Instrument (EDI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Physical health and well-being</td>
</tr>
<tr>
<td>• Social knowledge and competence</td>
</tr>
<tr>
<td>• Emotional health/maturity</td>
</tr>
<tr>
<td>• Language and cognitive development</td>
</tr>
<tr>
<td>• Communication skills and general knowledge</td>
</tr>
</tbody>
</table>
## Vancouver EDI Numeracy

<table>
<thead>
<tr>
<th># of Vulnerabilities</th>
<th>% Failing Grade 4</th>
<th>% Not Passing Grade 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>7.5</td>
<td>12.3</td>
</tr>
<tr>
<td>1</td>
<td>11.8</td>
<td>22.2</td>
</tr>
<tr>
<td>2-3</td>
<td>18.7</td>
<td>33.8</td>
</tr>
<tr>
<td>4-5</td>
<td>27.5</td>
<td>55.6</td>
</tr>
</tbody>
</table>

Hertzman, HELP, 2006
Decrease in the % of vulnerable children as a result of improved ECD in Western Australia

<table>
<thead>
<tr>
<th>Year</th>
<th>Floreat</th>
<th>Wembley</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>47.22%</td>
<td>47.11%</td>
</tr>
<tr>
<td>2006</td>
<td>14.3%</td>
<td>11.8%</td>
</tr>
</tbody>
</table>

AEDI
Heckman - Education

- Schools contribute little to test score gaps among children.
- Later schooling has little effect in reducing the gaps that appear early.
- Criminal rehabilitation and adult literacy programs have limited effect.
"We cannot afford to postpone investing in children until they become adults nor can we wait until they reach school - a time when it may be too late to intervene."

Heckman, J., 2001
(Nobel Prize Economics, 2000)
Rates of Return to Human Development Investment Across all Ages

Return Per $ Invested

Pre-school Programs
School
Job Training

Pre-School School Post School

Age

Carneiro, Heckman, Human Capital Policy, 2003
Public expenditures for children 0-17 years of age, Sweden 1995, by age of child
The principle of free education for school-age children is already entrenched throughout the rich world; there would be nothing incongruous about extending it further down the age range.

*The Economist*, pg 16, July 18, 1998
Canadian Council for ECD

- Private sector and community
- Educate all sectors of society
- Facilitate application of EDI and its interpretation
- Prepare and support fellows to work with all sectors of society (private and public)
Objective:

To establish ECD and Parenting Centres linked to the school system with outcome research, supported by all sectors of society, including business and government, that is universally available to all families with young children.
Council for Early Child Development

“From Early Child Development to Human Development: Capacity of our Future population depends on what we do now to support Early Child Development.”
Council for Early Child Development

Chair – Dr. Robin Williams
Vice Chair – Dr. Frieda Granot
Vice Chair – Jim Grieve
President – Dr. Clyde Hertzman
C.O.O. – John Doherty

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For more information:
http://www.councilecd.ca
A goal of ARACY and The Canadian Council for Early Child Development and Parenting is to close the gap between what we know and what we do in our societies – we know what to do.