Early Childhood Literacy and Numeracy:

Evidence to Inform Manitoba Innovation

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Manitoba Open Innovation Challenge
November 23, 2017

Human Capital and Economic Growth

- **1% increase in average literacy of the population would yield a permanent 1.5% increase in GDP per capita**
- 1.5% of Canada's GDP = $18 billion
- **1.5% of Manitoba's GDP = $577.5 million**
- **ECD** = key to improve overall literacy of the population
- Long-run impact (1960 – 1995) of investment in human capital was **3 times more important** than investment in physical capital

Source: Coulombe, S., Tremblay, J. F., & Marchand, S. (June 2004). *Literacy scores, human capital and growth across fourteen OECD countries.* Ottawa, ON: Statistics Canada.

"If we closed the education and employment achievement gap between indigenous and other Canadians, we would save more than $115 billion over 15 years while adding more than $401 billion to Canada's GDP" (Jamieson, 2012, p. 49; CSLS, 2010).

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Manitoba and Canada's Hidden Deficit: The Social Cost of Low Literacy Skills

1. **Opportunity costs** (benefits foregone): People unable to reach their full potential
2. **Remedial costs:** both social program costs (e.g., 65% of social assistance and 70% of offenders) and costs due to low literacy (e.g., workplace injury)
3. **Intergenerational costs:** Limits on parents with low literacy in helping their children achieve high literacy

Source: Maxwell and Teploca (2007)

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Manitoba and Canada's Hidden Deficit: The Economic Cost of Low Literacy Skills

1. Limits economy's ability to generate **wealth**
2. Generates undesirable levels of **social inequality** (including economic, health, educational)
3. Limits **effectiveness and efficiency** of investments in public goods and services (e.g., health, education)

Source: Murray and McCracken (2007)

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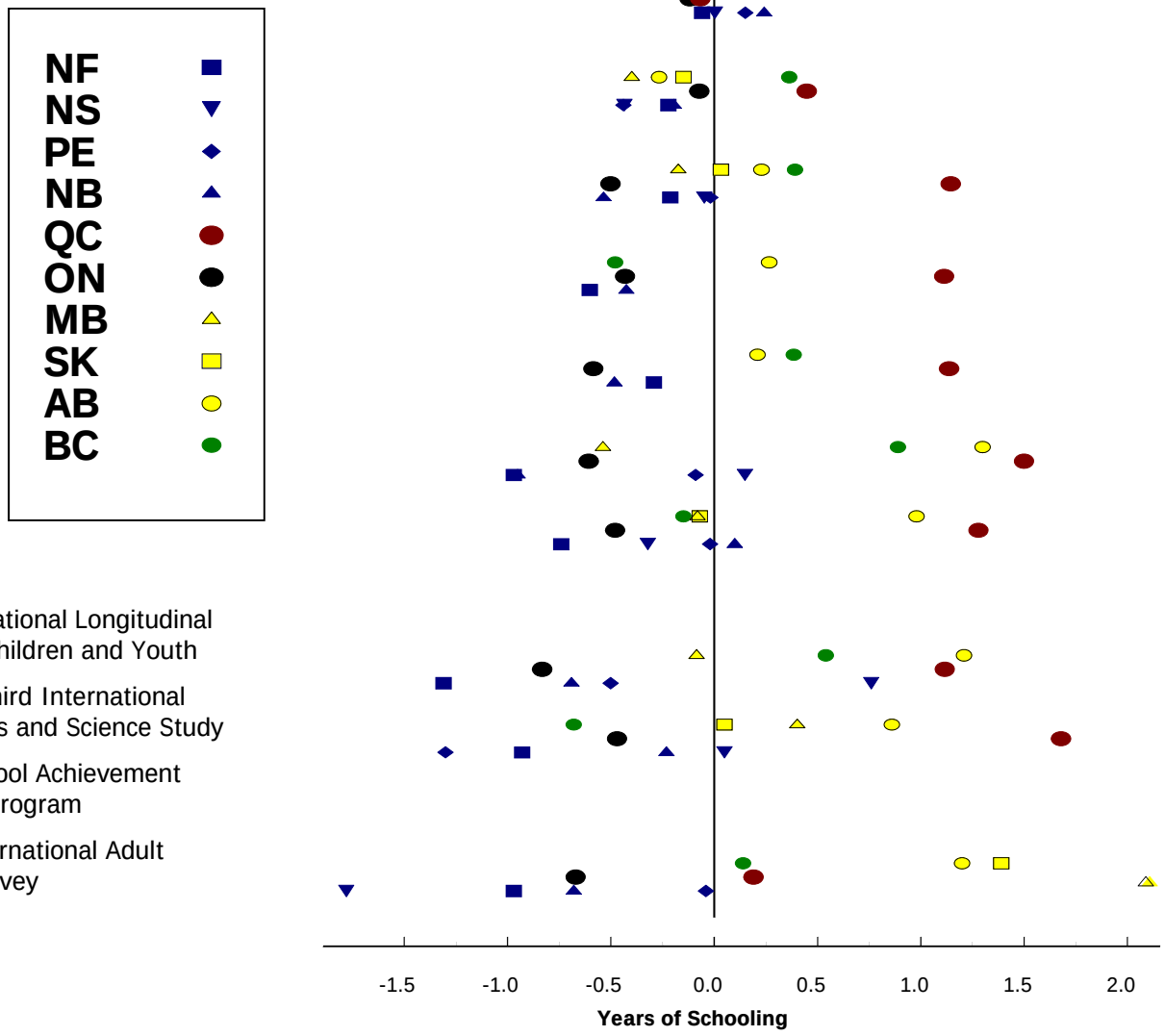
The Importance of a Lifelong Perspective:

Interprovincial Literacy and Numeracy Differences Grow Wider with Age



NLSCY - Grade 2

NLSCY - Grade 4

NLSCY - Grade 6

TIMSS - Grade 7

TIMSS - Grade 8

SAIP93 - Age 13

SAIP97 - age 13

SAIP93 - Age 16

SAIP97 - Age 16

IALS - Youth Aged 16 - 25

NLSCY = National Longitudinal Survey of Children and Youth

TIMSS = Third International Mathematics and Science Study

SAIP = School Achievement Indicators Program

IALS = International Adult Literacy Survey

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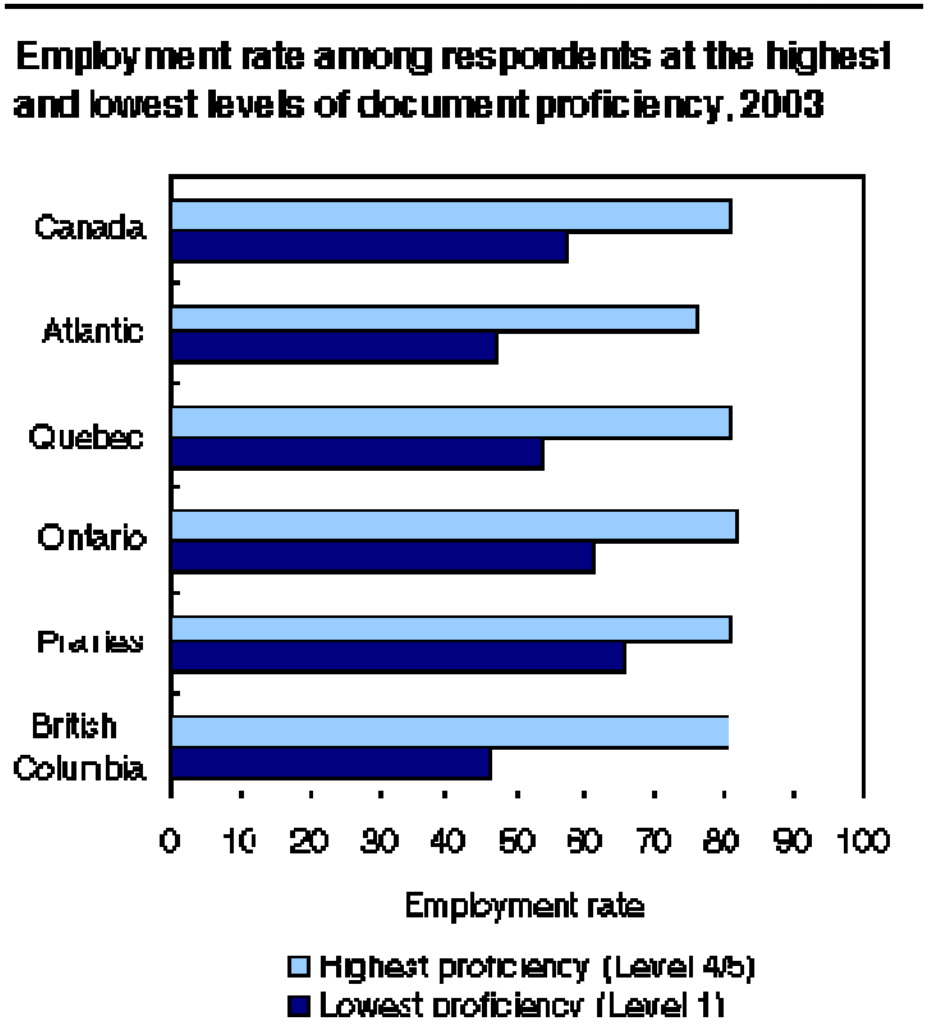
Literacy Skills and Employment in Canada

- **Lowest literacy levels had the lowest employment rates**
- About 57% (Level 1) vs. 80% (Level 4/5)
- Smallest differences in employment between lowest and highest literacy levels in the Prairies (levelling the playing field)



Source: Statistics Canada (2005) – IALSS 2003

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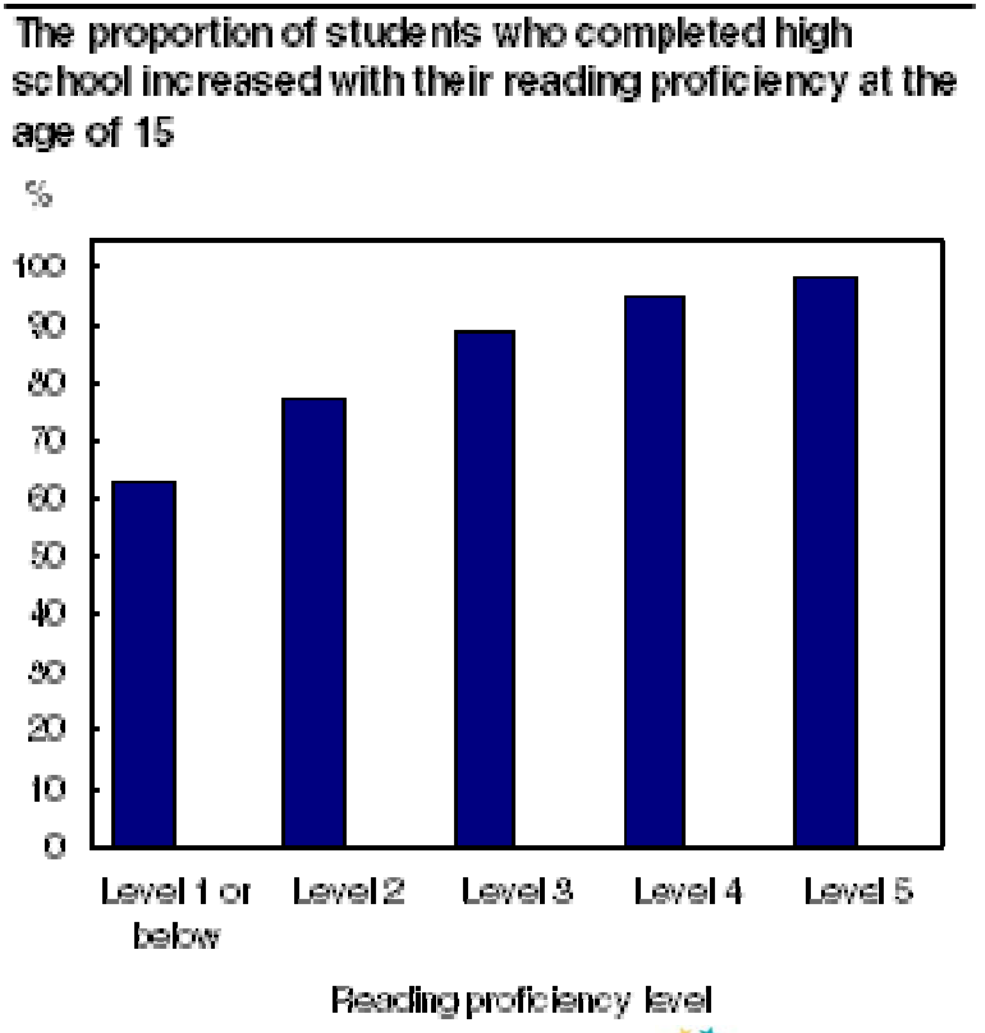
Youth Literacy and High School Completion

- **Lower youth literacy associated with later high school drop-out**
- On average, high school dropouts at <u>one full reading proficiency level below</u> high school graduates
- Only 62% of Level 1, 77% of Level 2 graduated, compared to nearly all at Level 3+
- Effect persists after controlling for gender, mother tongue, parental education, family income, location of residence, academic and social engagement
- Not necessarily deterministic: Many at Levels 1-2 graduate, whereas 2-11% at Levels 3+ do not



Source: Statistics Canada (2007) – PISA 2000 and YITS 2004

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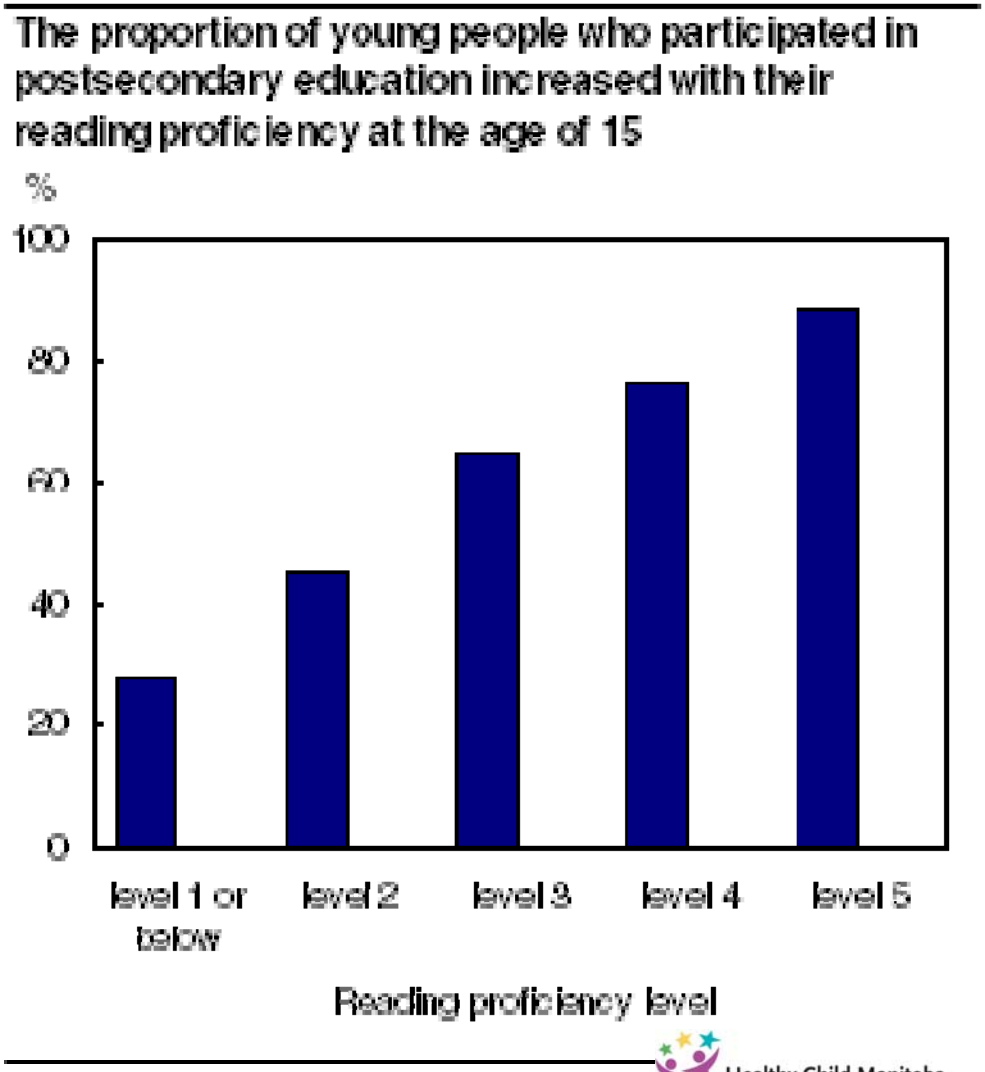
Youth Literacy and Post-Secondary Education (PSE) Completion

- **Lower youth literacy associated with lower PSE pursuit**
- On average, PSE participants at <u>one full reading proficiency level below</u> non-PSE participants
- Only 28% of Level 1 and 45% of Level 2 pursued PSE, compared to 65%, 76%, and 88% for Levels 3, 4, 5
- PSE pursuit was related to gender, parental education, family income, and mother tongue, but not location of residence
- PSE pursuit not deterministic or linear (may pursue later)



Source: Statistics Canada (2007) – PISA 2000 and YITS 2004

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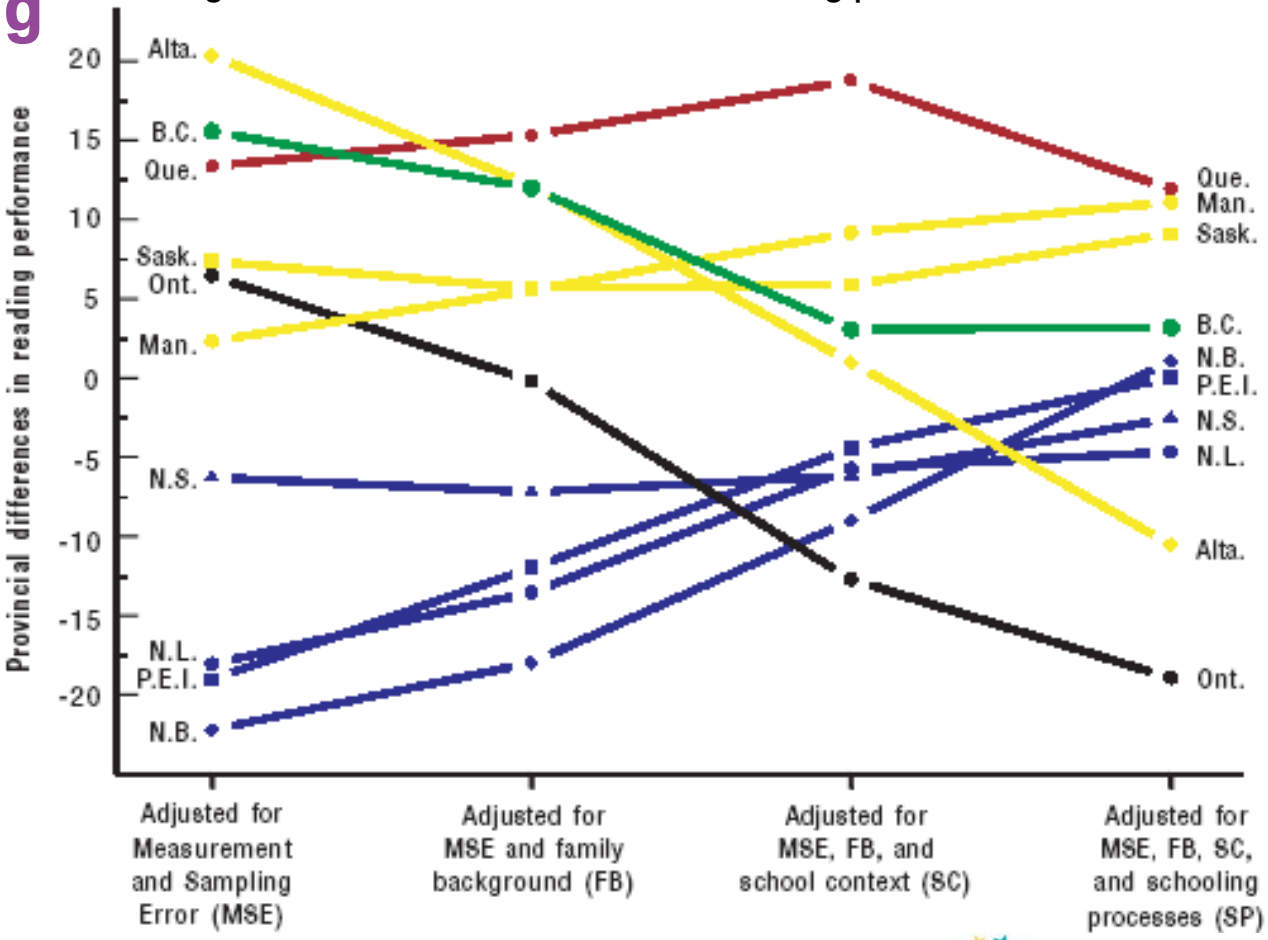
Youth Literacy in Manitoba: Levelling the Playing Field

- About 40% of differences between provinces due to family background
- About 63% of differences due to family background (e.g., SES) and school context combined
- Example: MB moves from 6th to 2nd place and AB moves from 1st to 9th place

Variation in provincial reading performance explained by family background, school context, and schooling processes



Source: Willms (2004) - PISA 2000 data

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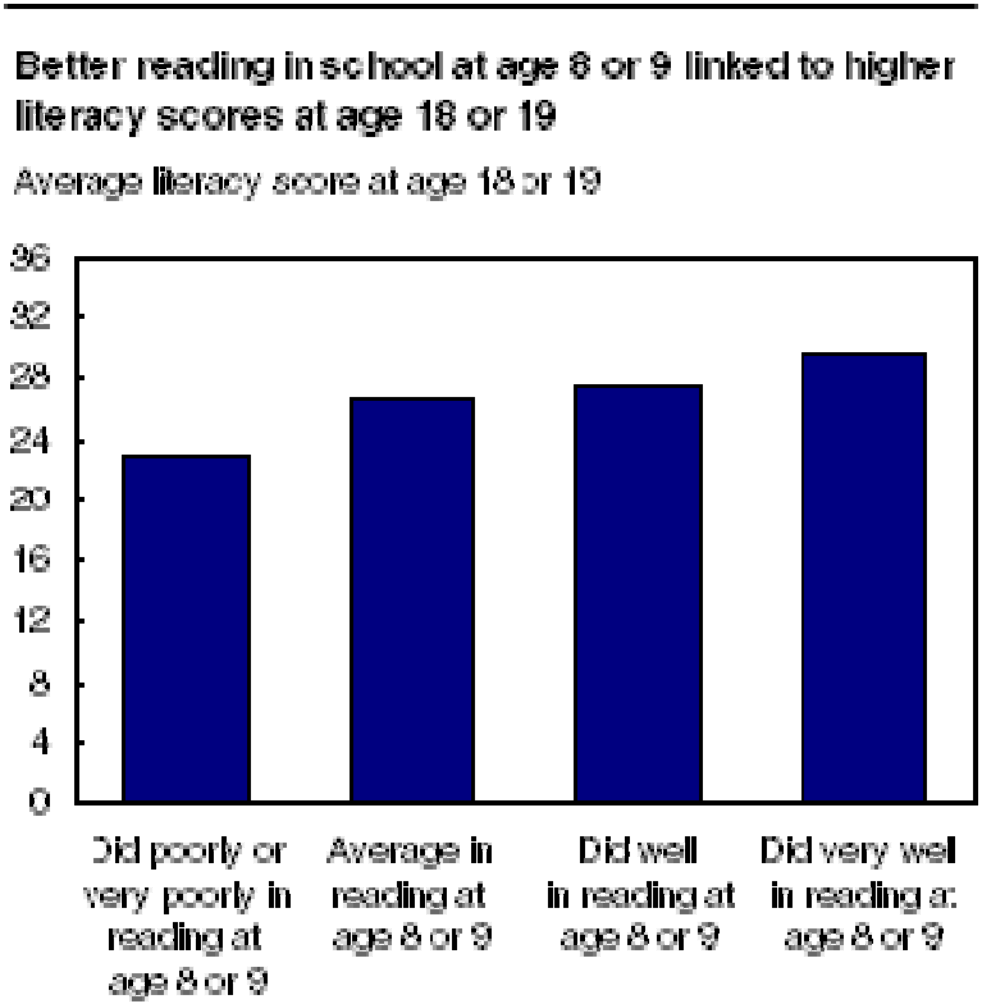
Early Reading Skills in Grade 3 and Literacy at the Transition to Adulthood

- **Literacy at age 8/9 years predicted literacy a decade later**
- Held true after controlling for sociodemographics, child behaviour, school-related factors, and parental literacy practices
- Low parental education also predicted lower later literacy
- Early hyperactivity also associated, but mediated by school-related factors (repeating elementary school grade; physical, emotional, behavioural limitations that required special help for school work; child disliking/hating school or skipping school at age 12/13 years)



Source: Statistics Canada (2006) – NLSCY 1994 - 2004

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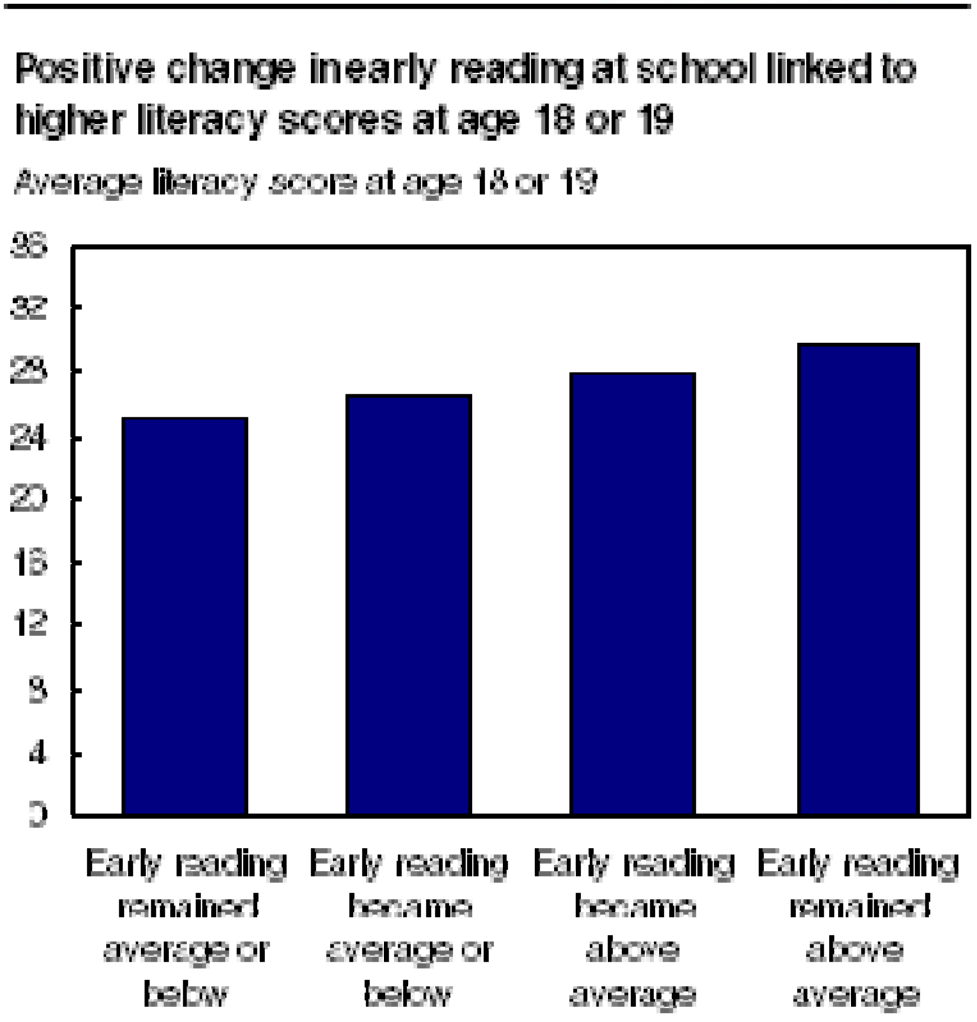
Improving Early Reading Skills and Later Literacy



Source: Statistics Canada (2006) – NLSCY 1994 - 2004

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Early Childhood and Later Literacy and Numeracy

- Youth literacy and numeracy scores in PISA are not mainly attributable to the quality of secondary school – they are the cumulative result of children's opportunities to learn at home and at school from birth to age 15
- Innovating and investing in early childhood development (ECD), from the prenatal period to school entry, is our best chance for improving the overall literacy and numeracy of the population over the long-term

Source: Willms, J.D. (2004). *Variation in literacy skills among Canadian provinces: Findings from the OECD PISA.* Ottawa: Statistics Canada.

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SHHH!

Brain Development in Progress:

By age 3 years, a young child's brain is apt to be more than TWICE AS ACTIVE as that of his or her PEDIATRICIAN

Sources:

Gopnik, Meltzoff, & Kuhl, 1999; Shore, 1997

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Investing in Early Childhood Development: The Economic Imperative

- Leading economists have shown the importance of ECD to our province and country's economic future. Knowledge is the engine of the 21st century economy. Better brains and innovative ideas fuel economic growth, create jobs, increase wealth, and secure our financial future.

"The real question is how to use the available funds wisely. The best evidence supports the policy prescription:

Invest in the very young."

James J. Heckman, PhD
2000 Nobel Laureate in Economic Sciences

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Shared Destiny:

Our Indigenous Children and the Future of Manitoba

"Manitoba cannot prosper if Aboriginal people do not prosper."

-Honourable Oscar Lathlin
(1947-2008)
Minister of Aboriginal and Northern Affairs
(2002-2008)

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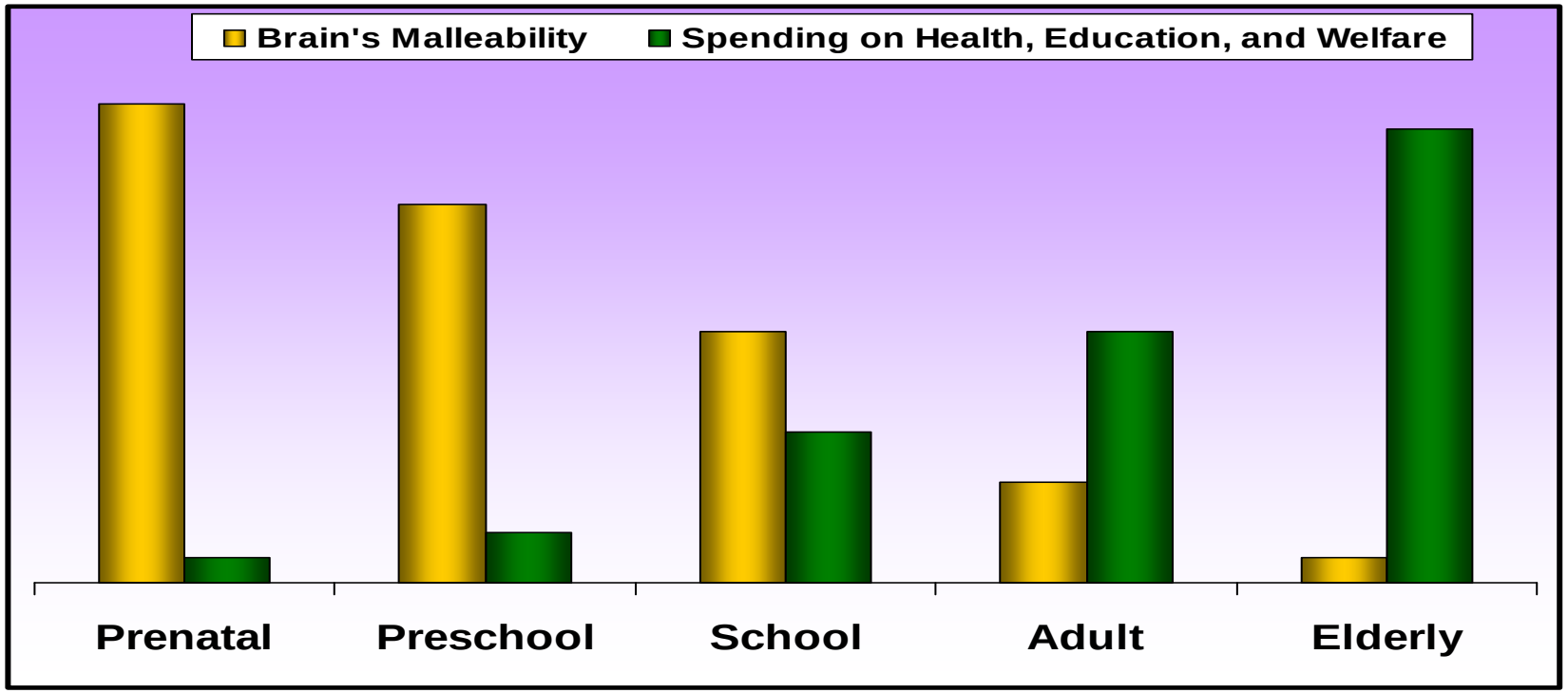
Innovation Challenge:

Addressing the Mismatch Between Opportunity and Investment



Adapted from: “How Nurture Becomes Nature: The Influence of Social Structures on Brain Development”
Bruce Perry, Baylor College of Medicine, Houston, Texas.

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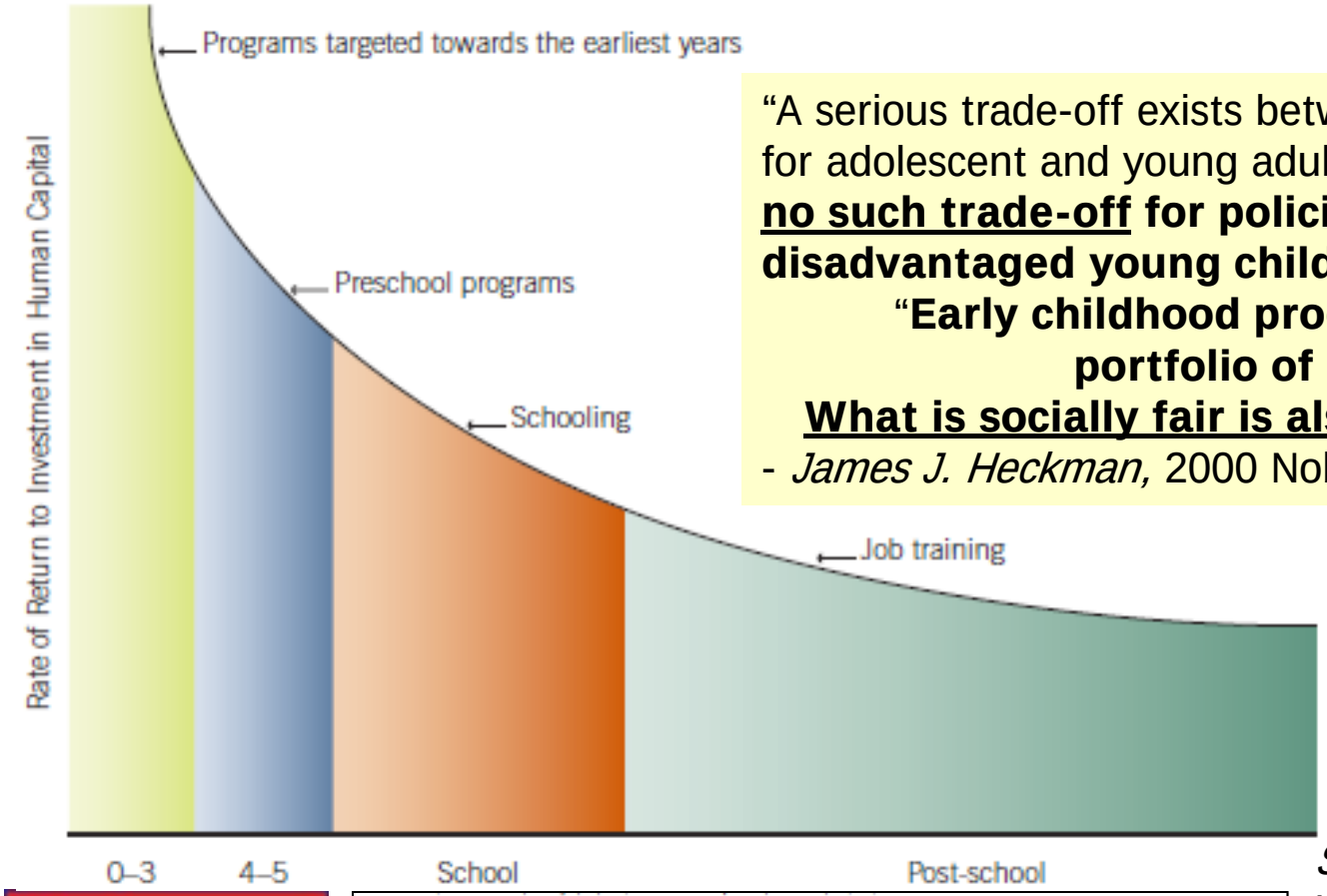
Compound Interest Model of Brain Development:



"A serious trade-off exists between **equity and efficiency** for adolescent and young adult skill policies. **There is <u>no such trade-off</u> for policies targeted toward disadvantaged young children.**"

"**Early childhood programs are <u>rare</u> among the portfolio of available social programs. <u>What is socially fair is also economically efficient</u>.**"

- *James J. Heckman,* 2000 Nobel Laureate, Economics

Sources:

Heckman (2006, 2008, 2010)

Science AAAS

PERSPECTIVE

Skill Formation and the Economics of Investing in Disadvantaged Children

James J. Heckman

This paper summarizes evidence on the effects of early environments on child, adolescent, and adult achievement. Life cycle skill formation is a dynamic process in which early inputs strongly affect the productivity of later inputs.

Early family environments are major predictors of cognitive and noncognitive abilities. Research has documented the early (by ages 4 to 6) emergence and persistence of gaps in cognitive and noncognitive skills (3, 4). Environments that do not stimulate the young and fail to cultivate these skills at early ages place children at an early disadvantage. Disadvantage arises more from lack of cognitive and noncognitive stimulation given to young children than simply from the lack of financial resources.

This is a source of concern because family environments have deteriorated. More U.S. chil-

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(1 in 4 babies provincewide~5000 per year)

2 out of every 3 Indigenous babies in Manitoba born into toxic stress

(2000 each year
3 in 4 First Nations
1 in 2 Metis, Inuit)

Families First

(similar results across Canada)

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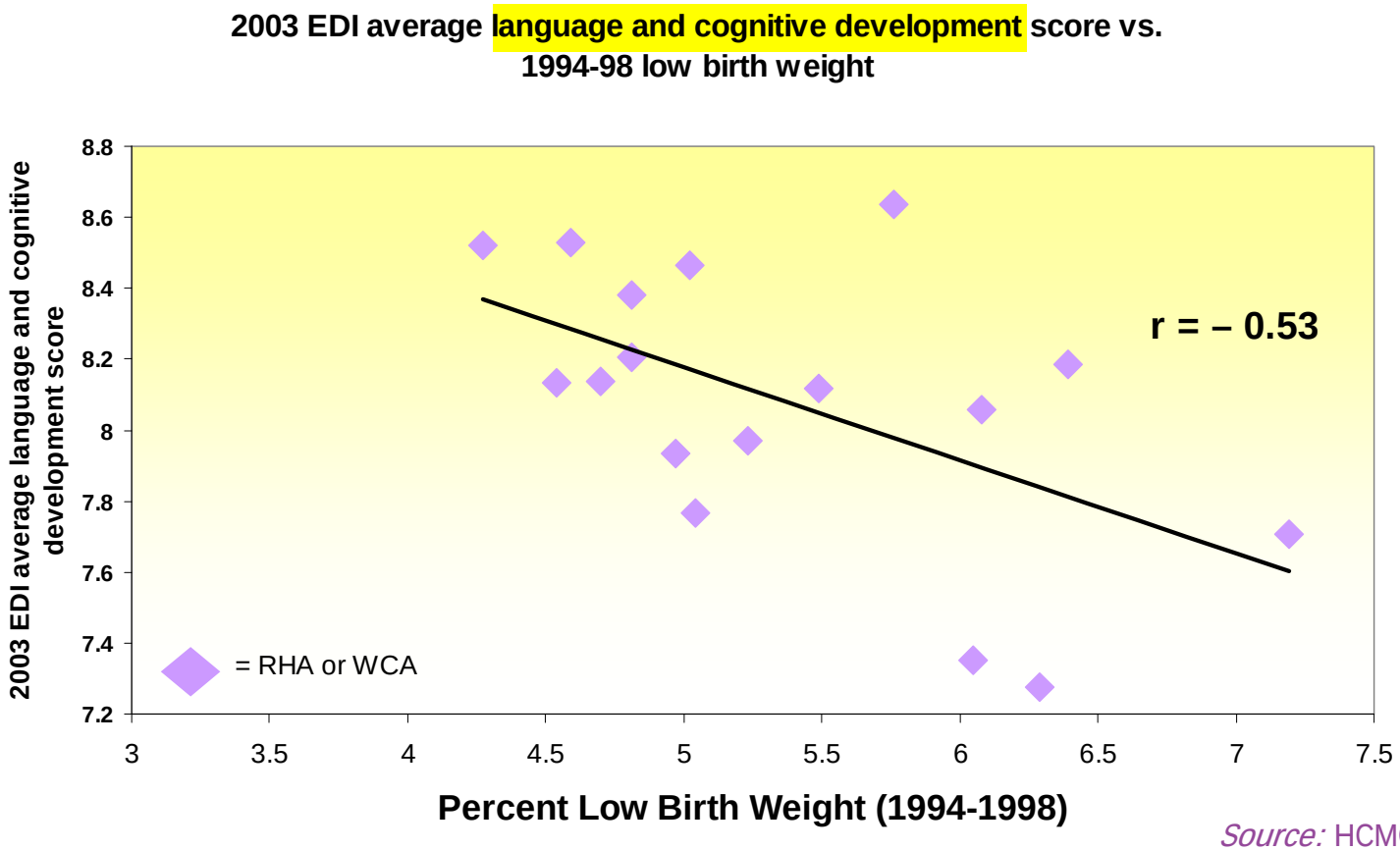
Children's Language Readiness at School Entry Begins Before Birth: LBW 1998 and EDI 2003 in MB



Source: HCMO (2003)

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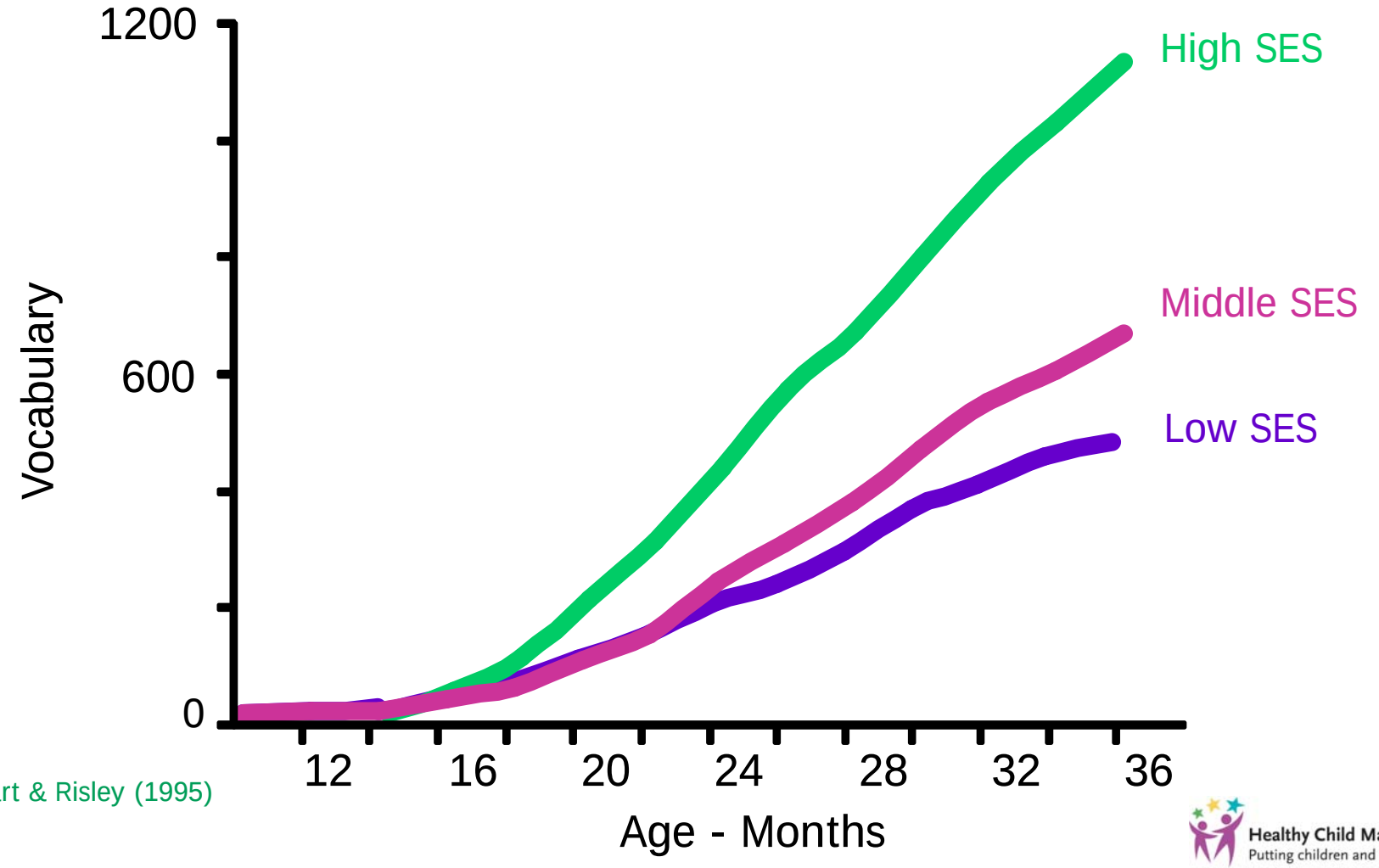
SES Differences Begin Early: Vocabulary Growth – First 3 Years



Source: Hart & Risley (1995)

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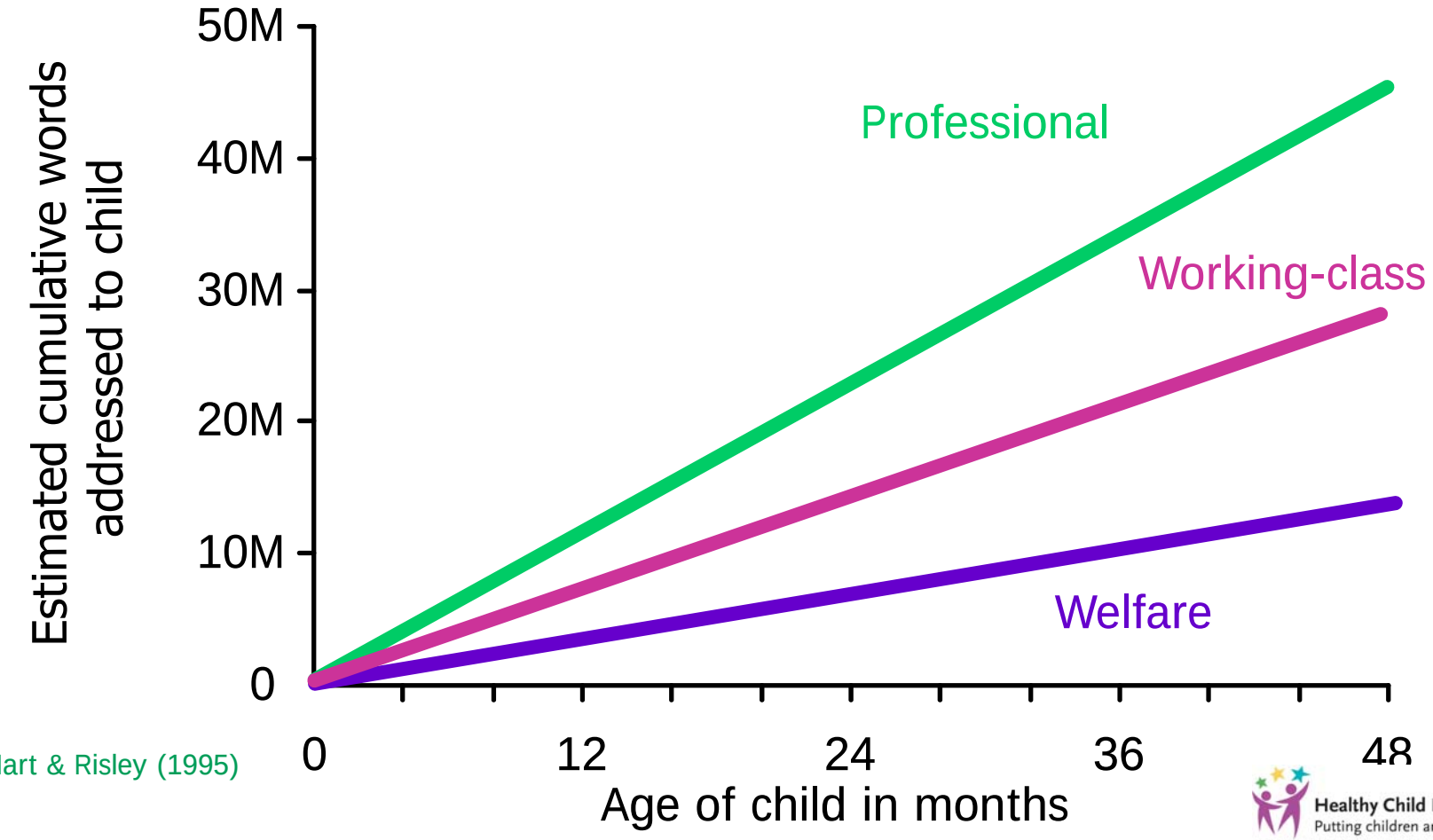
Estimated Cumulative Differences in Language Experiences by 4 Years of Age



Source: Hart & Risley (1995)

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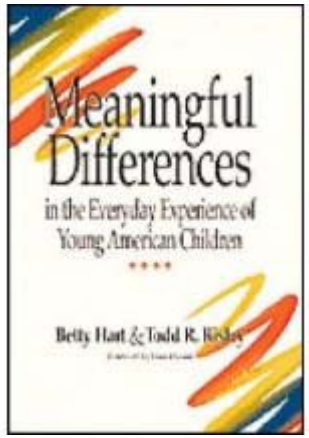
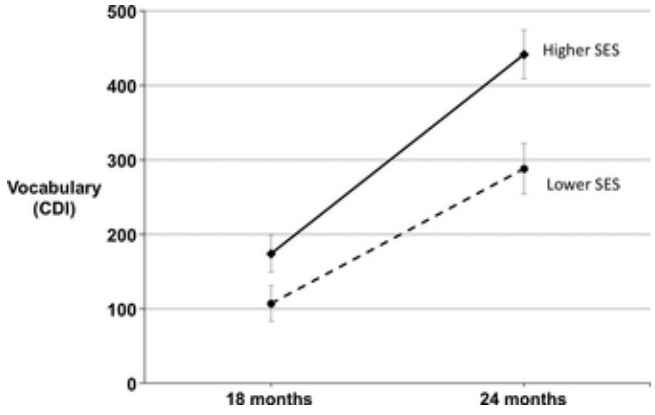
Early Childhood Development (ECD):

Language Skills Gap Emerges Very Early

(Hart & Risley, 1995; Fernald et al., 2013)



- **30-million word gap at age 3 years** between low-SES and high-SES
- **New:** first evidence of **even earlier** differences (**age 18 months**) in language and vocabulary
- **By age 24 months: 6-month gap** between low-SES and high-SES



Developmental Science

Developmental Science 16:2 (2013), pp 234–248 DOI: 10.1111/desc.12019

PAPER

SES differences in language processing skill and vocabulary are evident at 18 months

Anne Fernald, Virginia A. Marchman and Adriana Weisleder

Department of Psychology, Stanford University, USA

(March 2013 issue)

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1 in 4 Kindergarteners and

(28% or ~5000 not ready for school each year)

2 in 4 Indigenous (45%)

Kindergarteners in Manitoba

vulnerable

(similar results across Canada)

Data source: Healthy Child Manitoba Office

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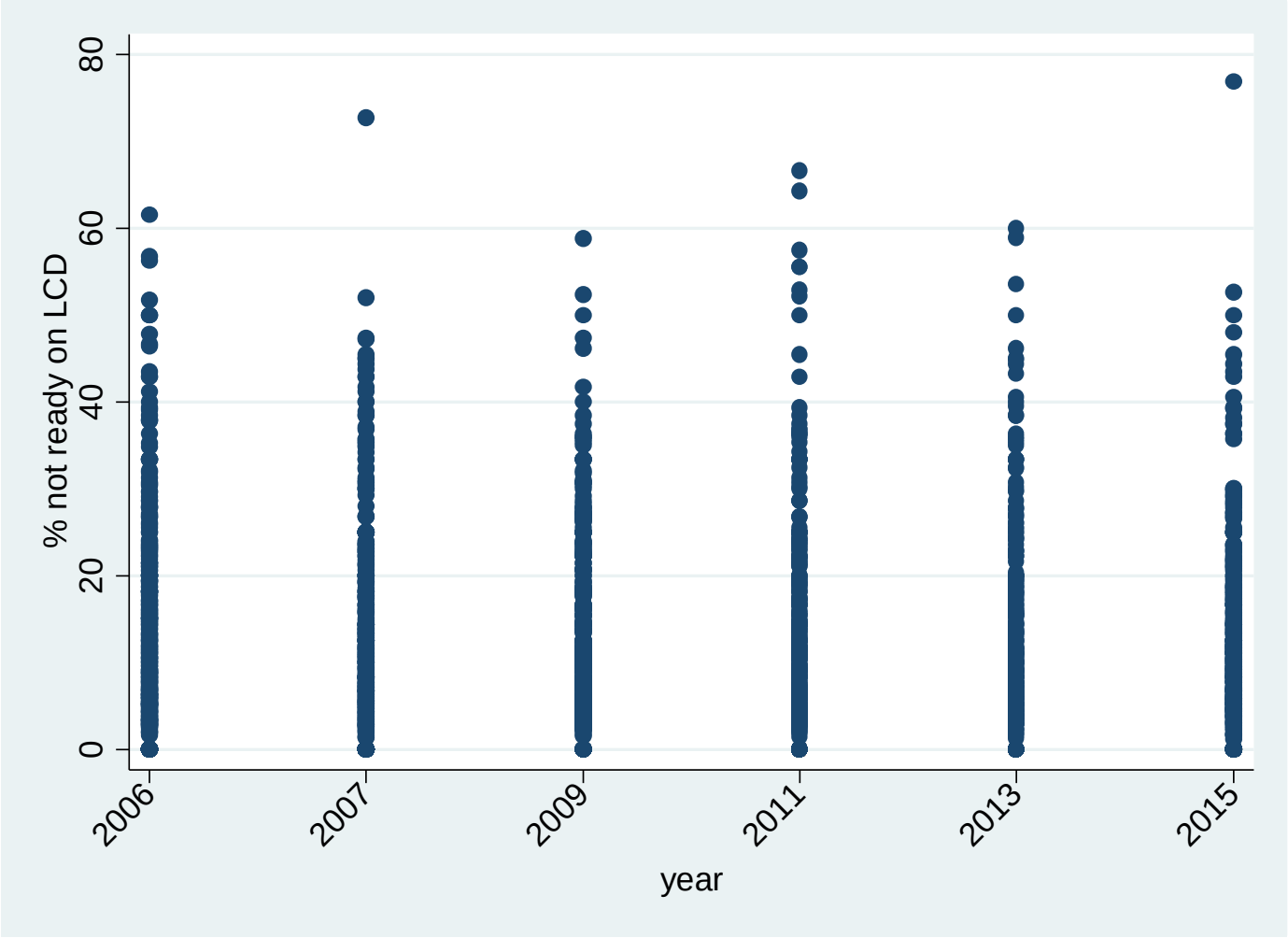
Community-Level Early Childhood Literacy and Numeracy:

Percent not ready in Language & Cognitive Development (EDI), Manitoba, Kindergarten classrooms >7 students only, 2006-2015



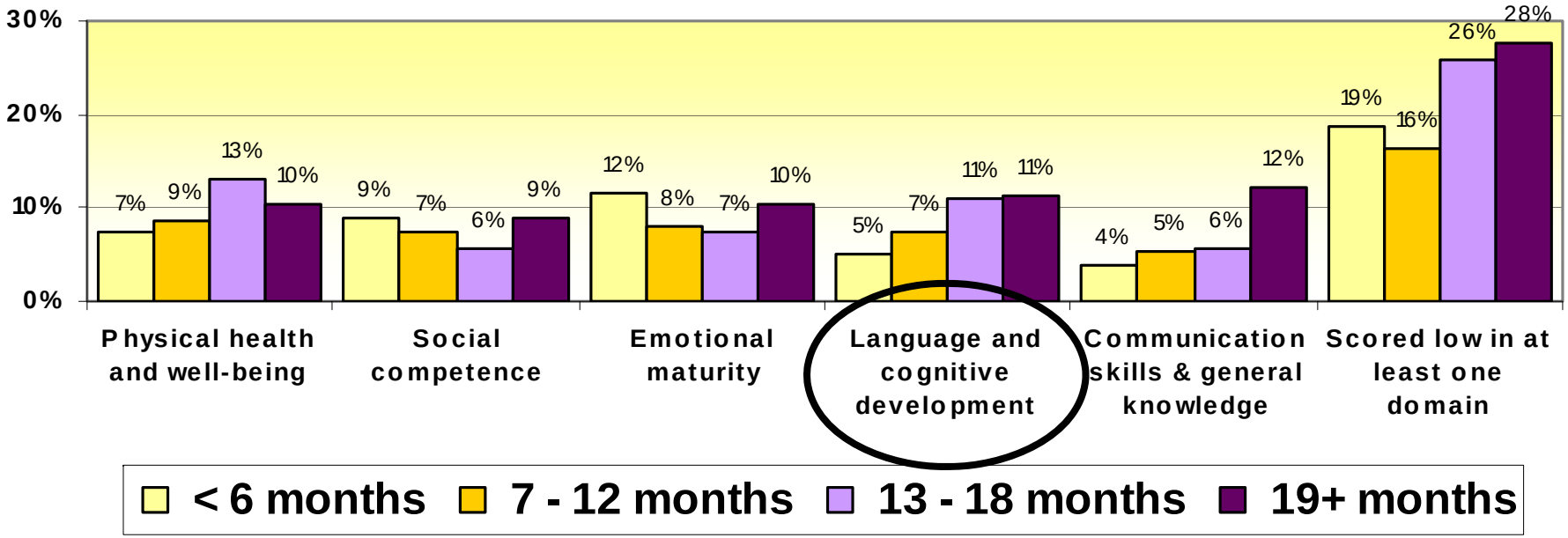
Range:

77%

0%

EARLY READING AND SCHOOL READINESS:

Child's Age When Reading with Parent Began and Percentage of MB Children Not Ready to Learn in School (age 5), 2004



Source: 2004 EDI Parent Survey and 2004 EDI results

Note: Shorter bars are better

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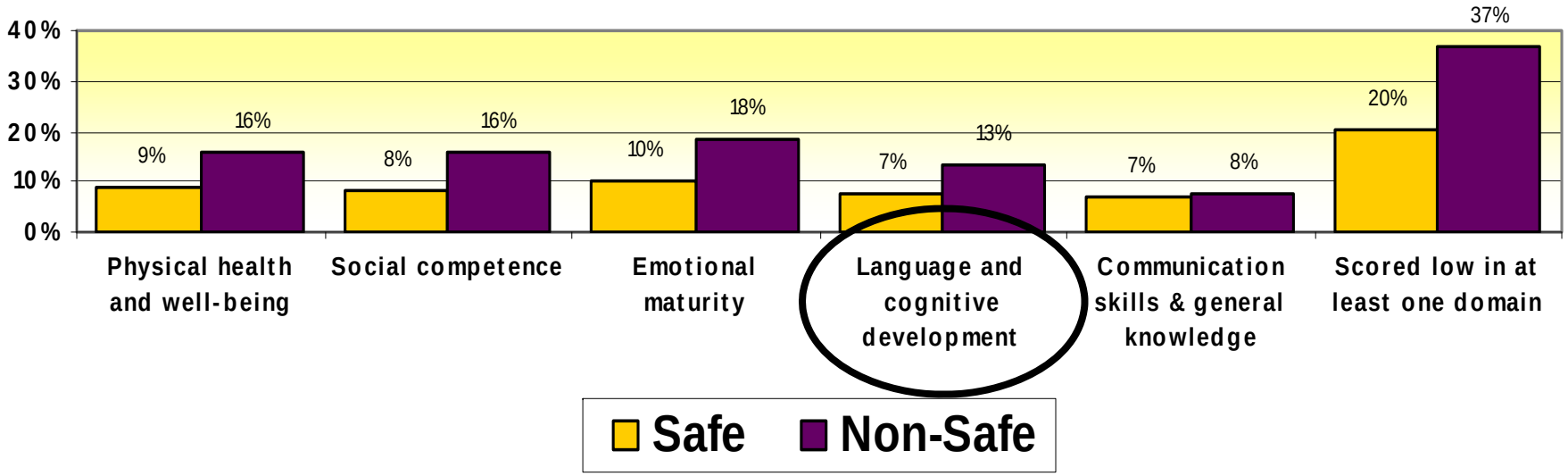
COMMUNITY MATTERS:

Neighbourhood Safety and Percentage of MB Children Not Ready to Learn in School, 2004



Source: 2004 EDI Parent Survey and 2004 EDI results

Note: Shorter bars are better

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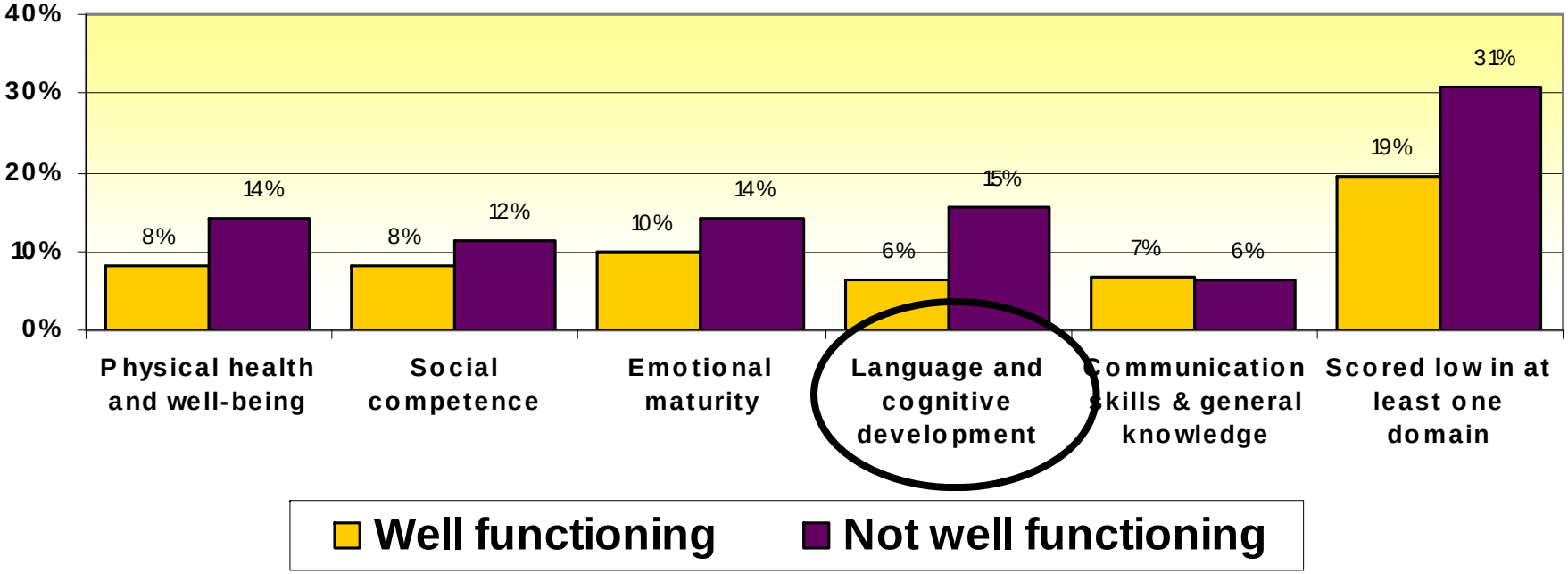
FAMILY WELL-BEING MATTERS:

Family Functioning and Percentage of MB Children Not Ready to Learn in School, 2004



Source: 2004 EDI Parent Survey and 2004 EDI results

Note: Shorter bars are better

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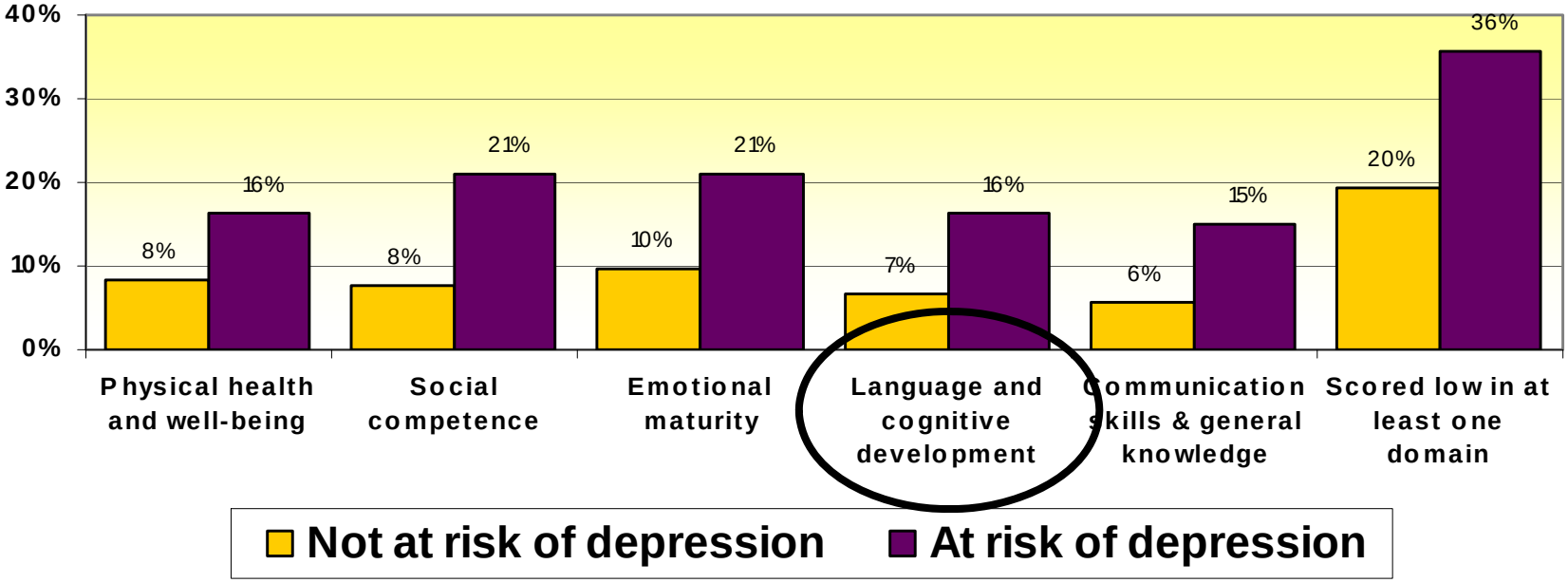
PARENT WELL-BEING MATTERS:

Parental Depression and Percentage of MB Children Not Ready to Learn in School, 2004



Source: 2004 EDI Parent Survey and 2004 EDI results

Note: Shorter bars are better

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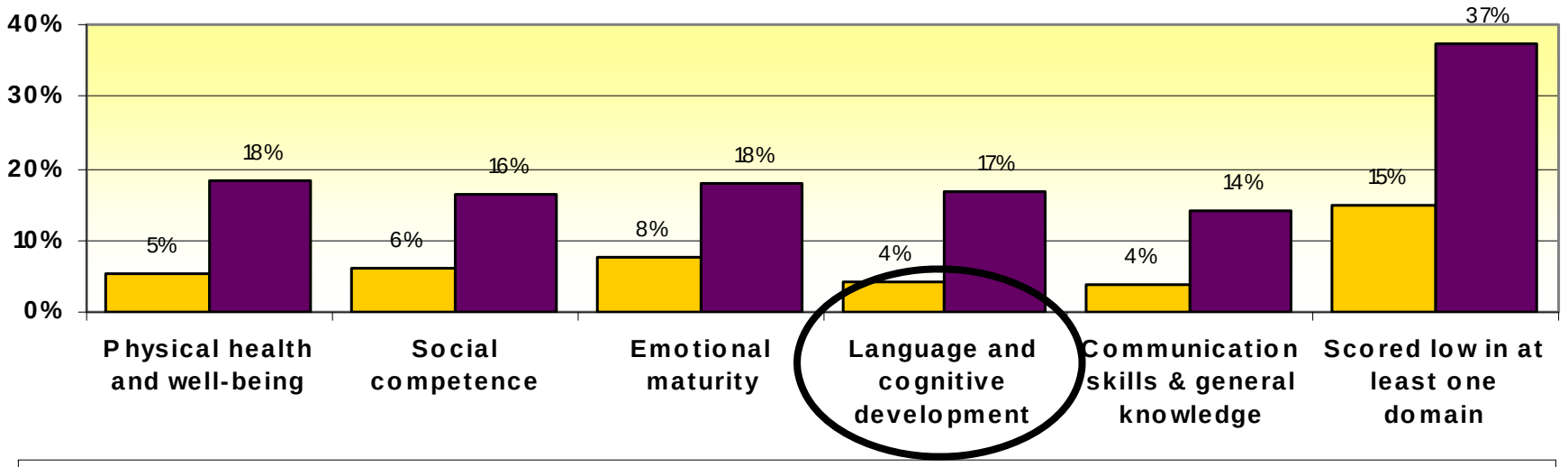
HEALTHY LIVING MATTERS:

Participation in Organized Physical Activities and Percentage of MB Children Not Ready to Learn in School, 2004



Source: 2004 EDI Parent Survey and 2004 EDI results

Note: Shorter bars are better

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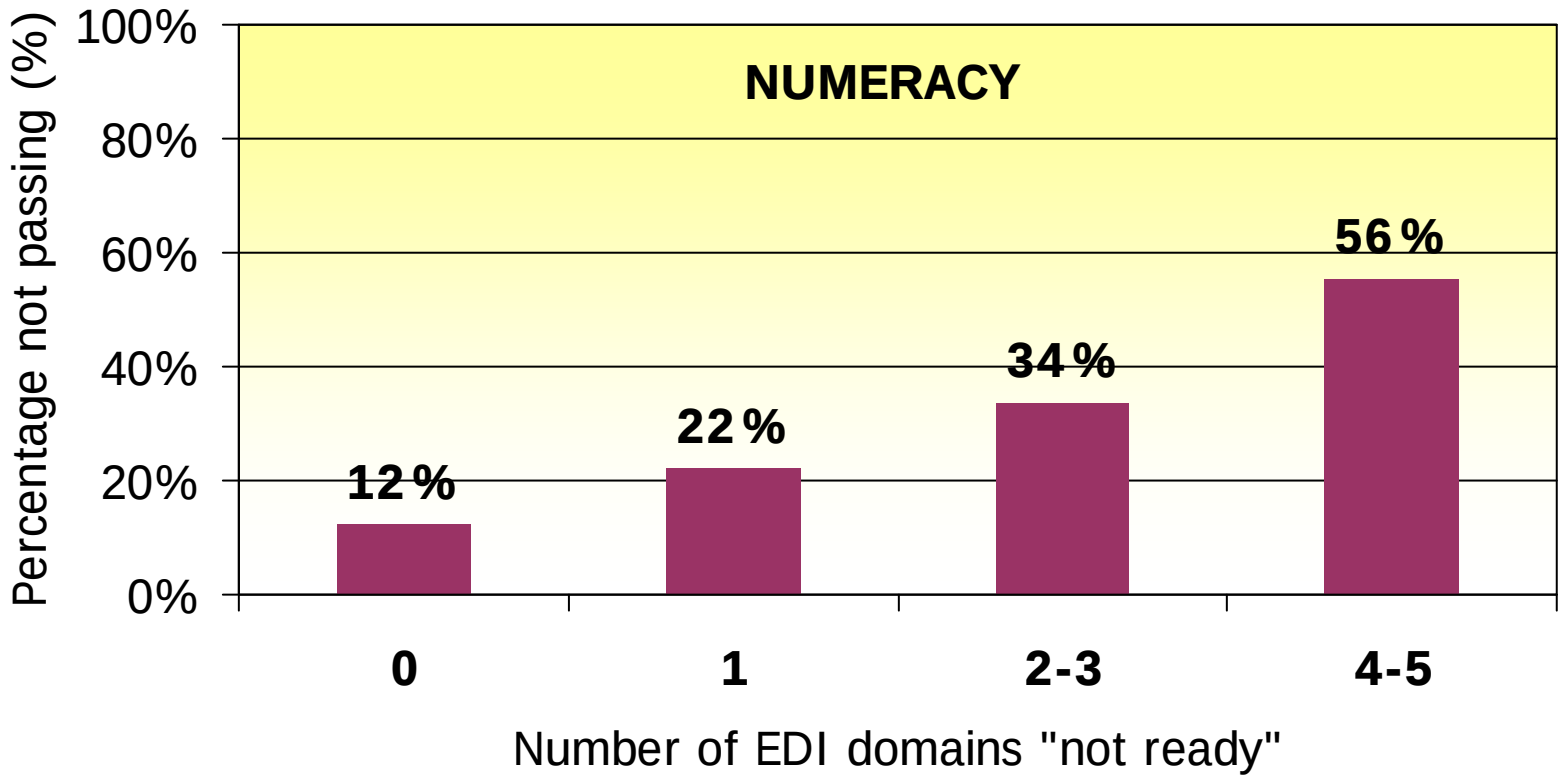
Predictive Validity of the EDI: "Not Ready" on the EDI (2000-2001) and Grade 4 Foundational Skills Assessments (FSAs) in British Columbia, 2004-2005



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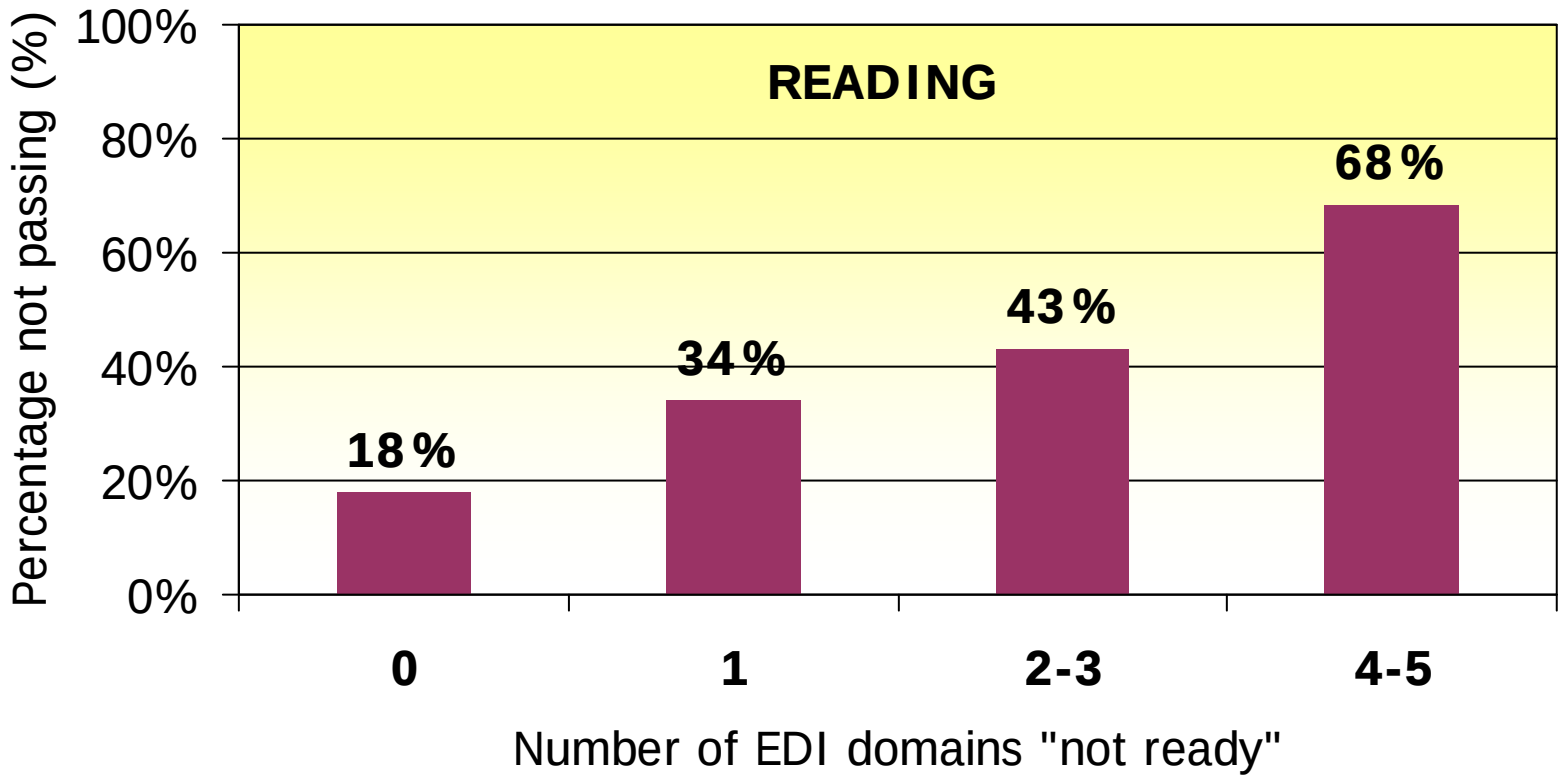

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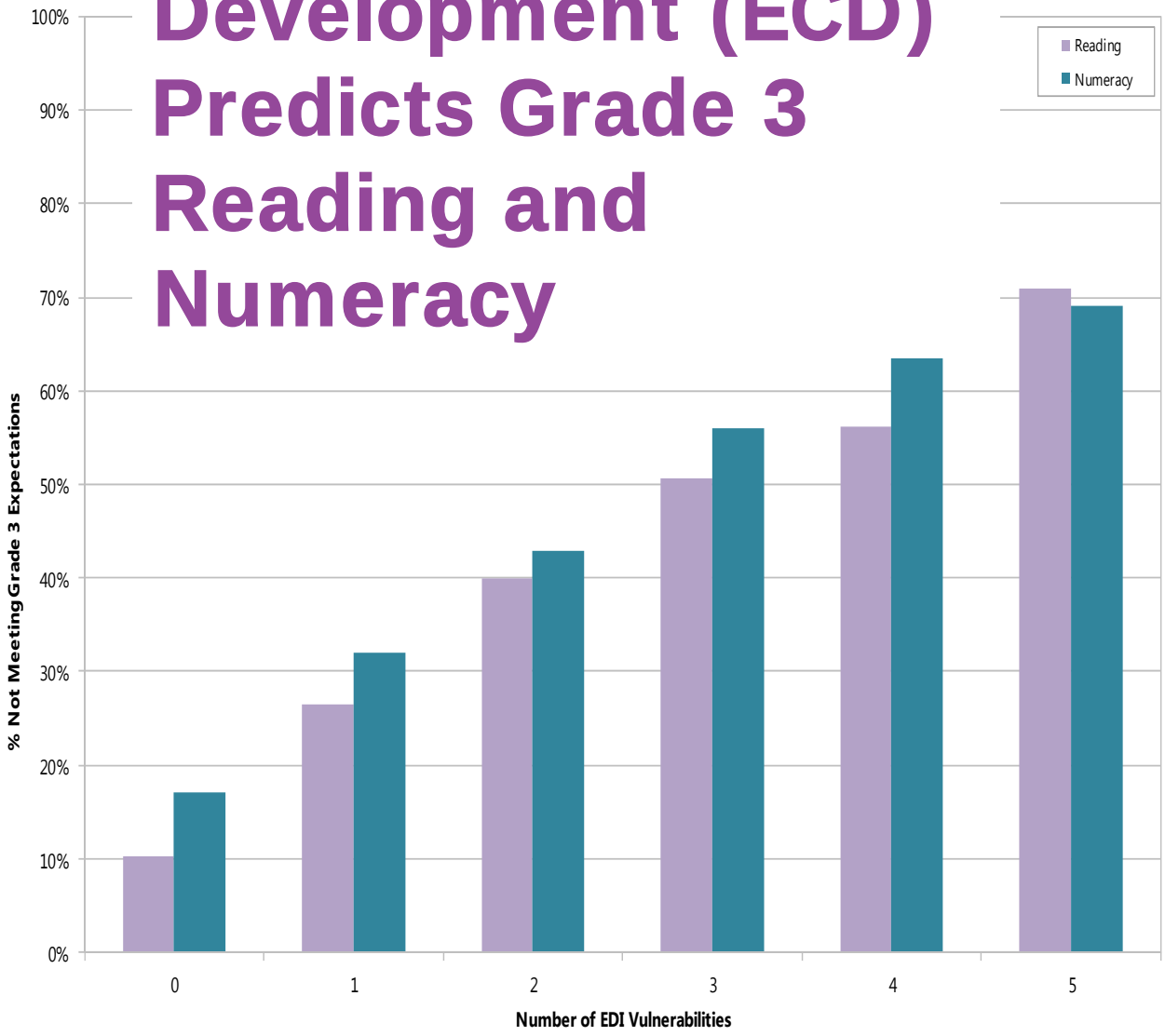
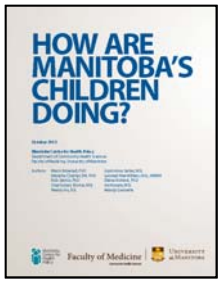
Early Childhood Development (ECD) Predicts Grade 3 Reading and Numeracy



5 Early Development Instrument (EDI) domains:

- Physical Health and Well-Being
- Social Competence
- Emotional Maturity
- Language and Cognitive Development (literacy/numeracy)
- Communication Skills and General Knowledge



Data sources: Healthy Child Manitoba Office and Manitoba Education and Training (chart from Manitoba Centre for Health Policy: Brownell et al., 2012)

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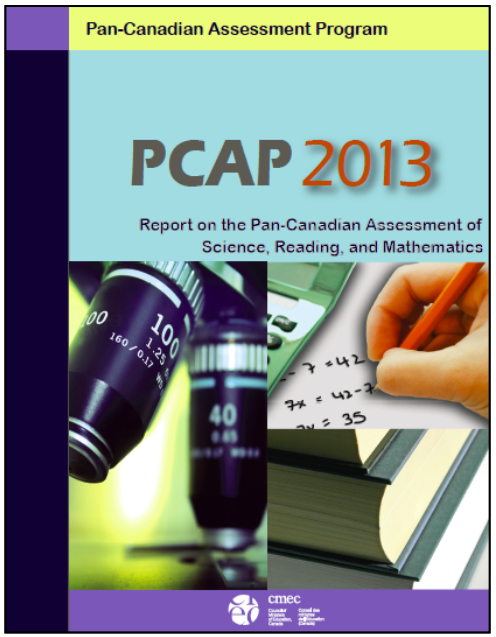
Early Childhood Development (ECD) Predicts Grade 8 Reading, Math, Science



PAST (2004)

PRESENT

FUTURE ...?

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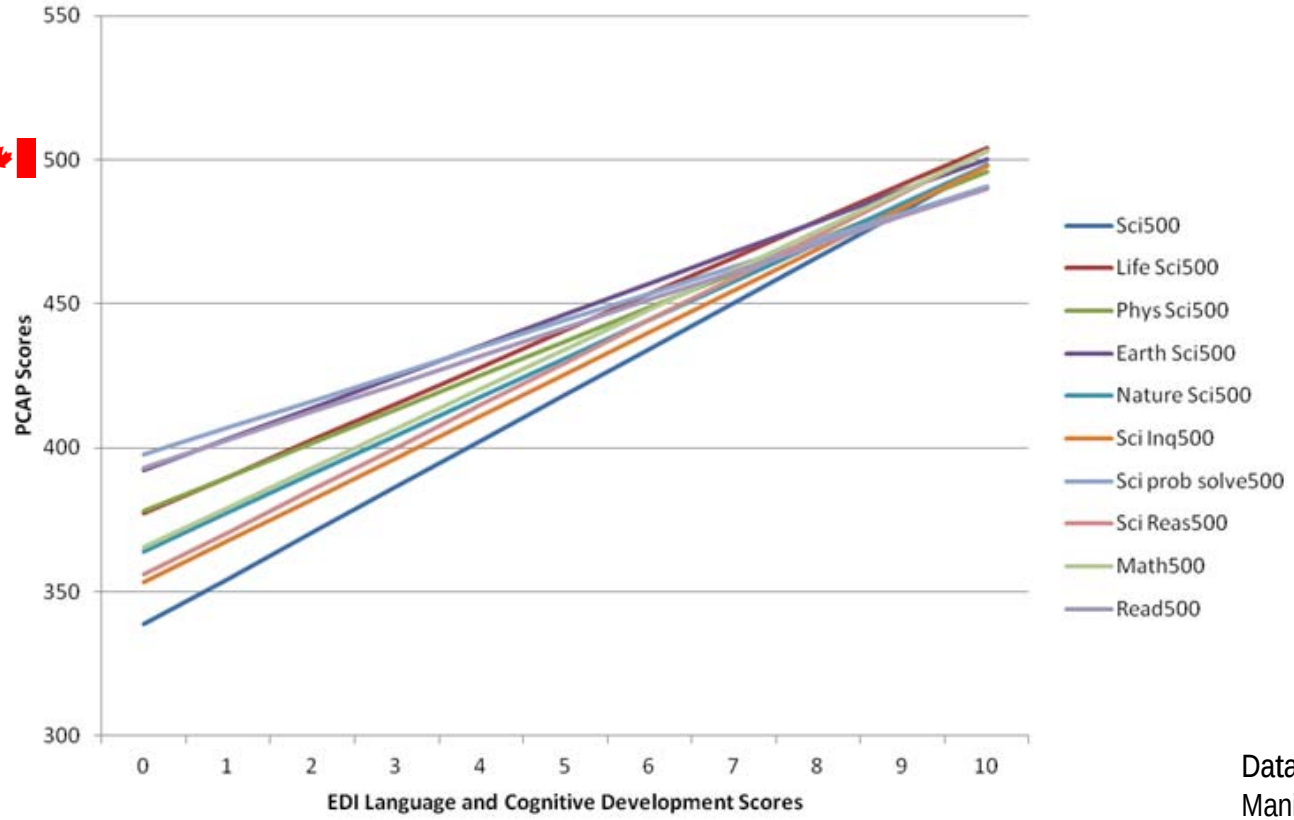
Early Development Outcomes Predict Grade 8 Outcomes:

2004/05 EDI results (age 5) and 2012/13 PCAP (age 13) results, Manitoba



Note: Children with higher EDI scores at age 5 in Kindergarten (measured in 2004/05) in the Language and Thinking Skills domain (i.e., early literacy and numeracy) were more likely to score higher on the PCAP when they were age 13 in Grade 8 (measured in 2012/13) in the related subjects of Science, Math, and Reading.

Note: EDI = Early Development Instrument, PCAP = Pan-Canadian Assessment Program

Data sources: Healthy Child Manitoba Office and Manitoba Education and Training

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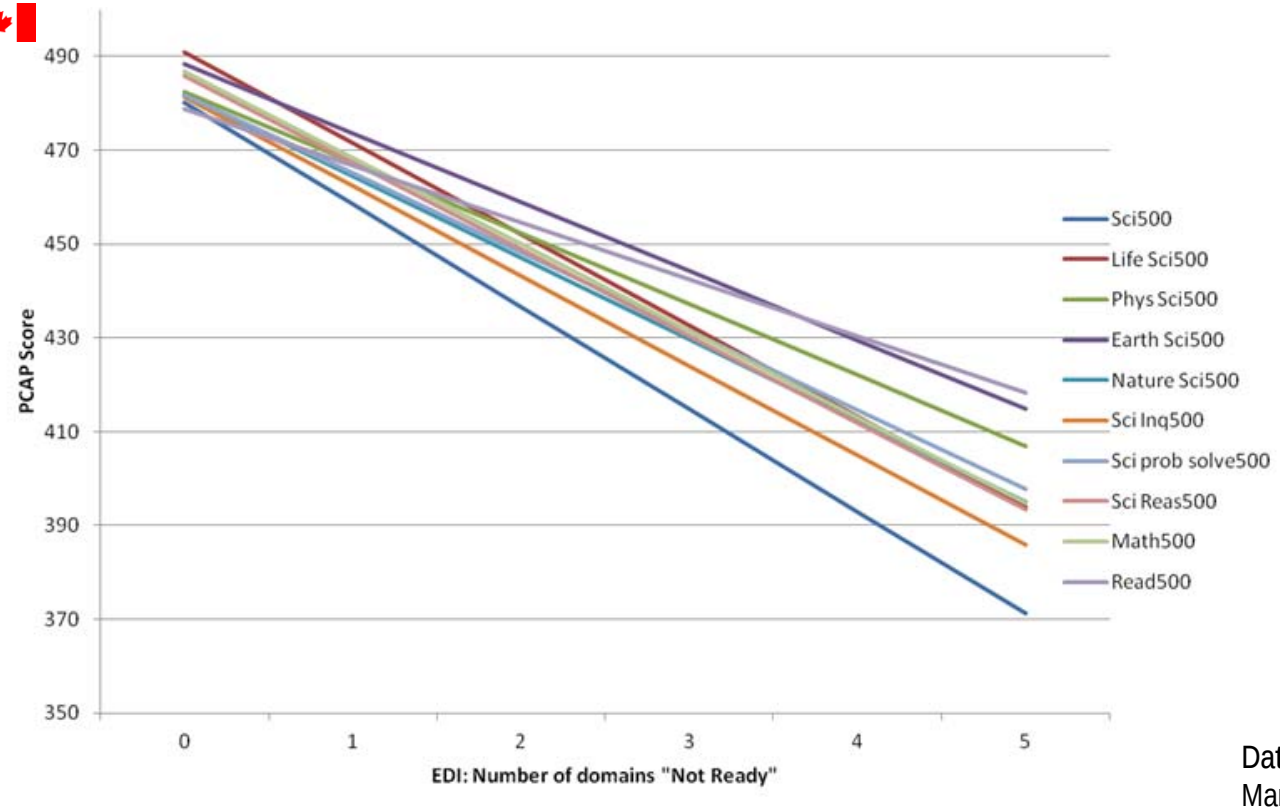
Early Development Outcomes Predict Grade 8 Outcomes:

2004/05 EDI results (age 5) and 2012/13 PCAP (age 13) results, Manitoba



Note: For Kindergarten children, the higher the number of their EDI vulnerabilities ("Not Ready" in 1 or more of the 5 EDI Domains, measured in 2004/05), the lower their PCAP scores when they were in Grade 8 (measured in 2012/13) in the related subjects of Science, Math, and Reading. More than the classic "3 Rs" is essential for later success: children also need physical, social, and emotional readiness.

Data sources: Healthy Child Manitoba Office and Manitoba Education and Training

Note: EDI = Early Development Instrument, PCAP = Pan-Canadian Assessment Program

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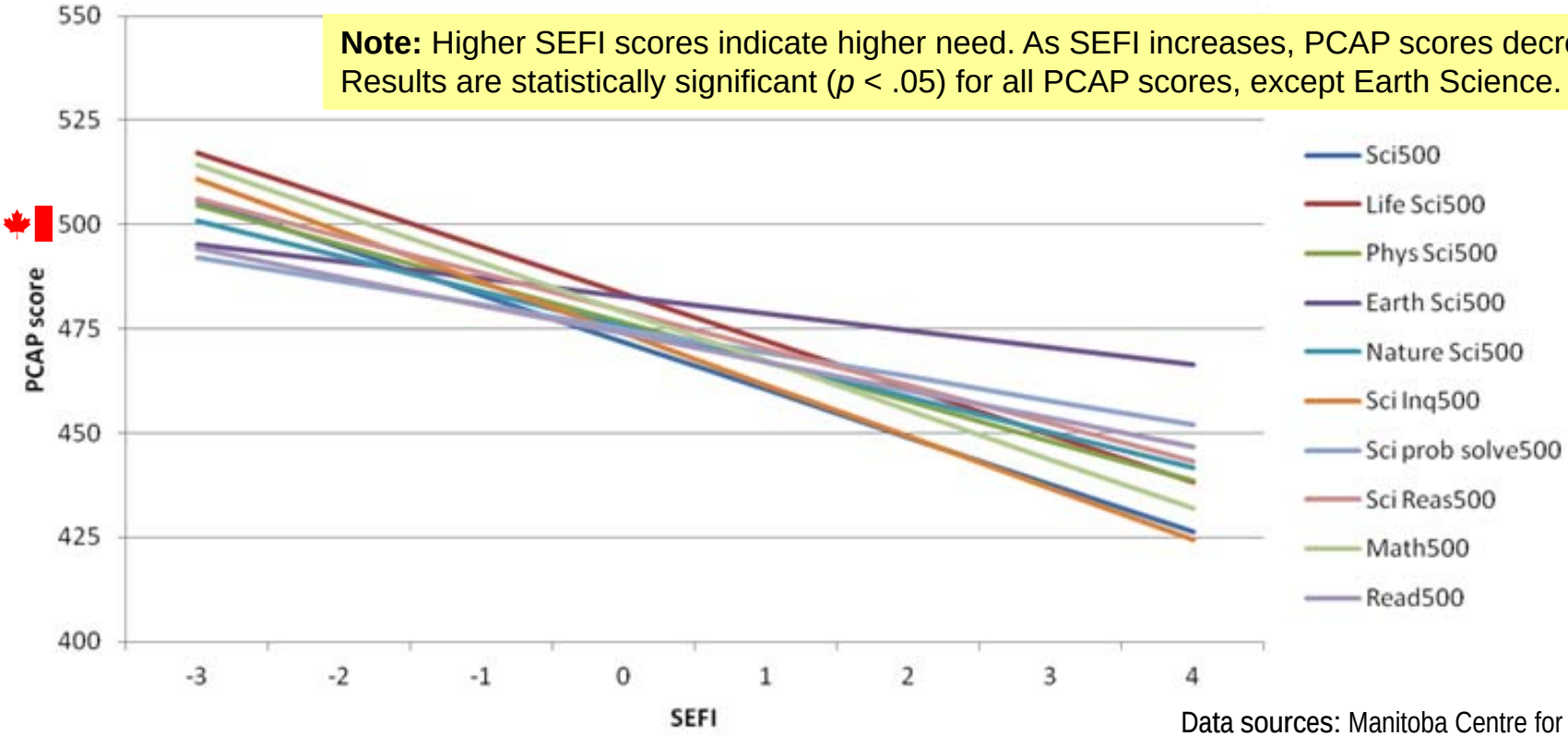
Early Socioeconomic Status Predict Grade 8 Outcomes:

2006 SEFI results (age 7) and 2012/13 PCAP (age 13) results, Manitoba

Note: Higher SEFI scores indicate higher need. As SEFI increases, PCAP scores decrease. Results are statistically significant ($p < .05$) for all PCAP scores, except Earth Science.



Data sources: Manitoba Centre for Health Policy and Manitoba Education and Training

Note: PCAP = Pan-Canadian Assessment Program, SEFI = socioeconomic factor index

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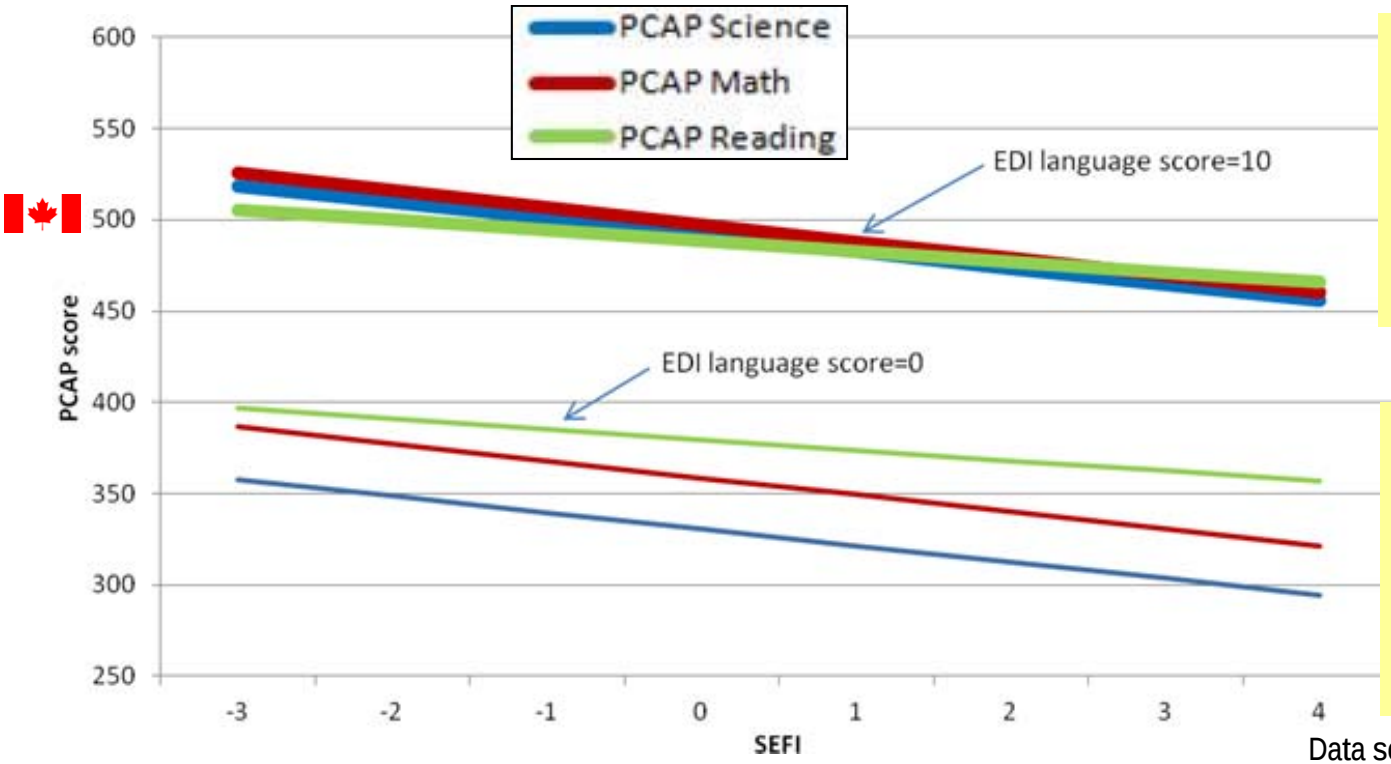
Early Development + Grade 2 SES Predict Grade 8 Outcomes:

2004/05 EDI (age 5), 2006 SEFI (age 7) and 2012/13 PCAP (age 13), Manitoba



Kindergarteners scoring the **highest** on EDI Language and Thinking Skills tend to score the highest on PCAP, but this is **reduced** by greater socioeconomic need (scores decrease as SEFI increases).

Kindergarteners scoring the **lowest** on EDI Language and Thinking Skills tend to score the lowest on PCAP, but this is **further reduced** by greater socioeconomic need (scores decrease as SEFI increases).

Data sources: Healthy Child Manitoba Office, Manitoba Centre for Health Policy, and Manitoba Education and Training

Note: EDI = Early Development Instrument, PCAP = Pan-Canadian Assessment Program, SEFI = socioeconomic factor index (higher SEFI indicates higher need).

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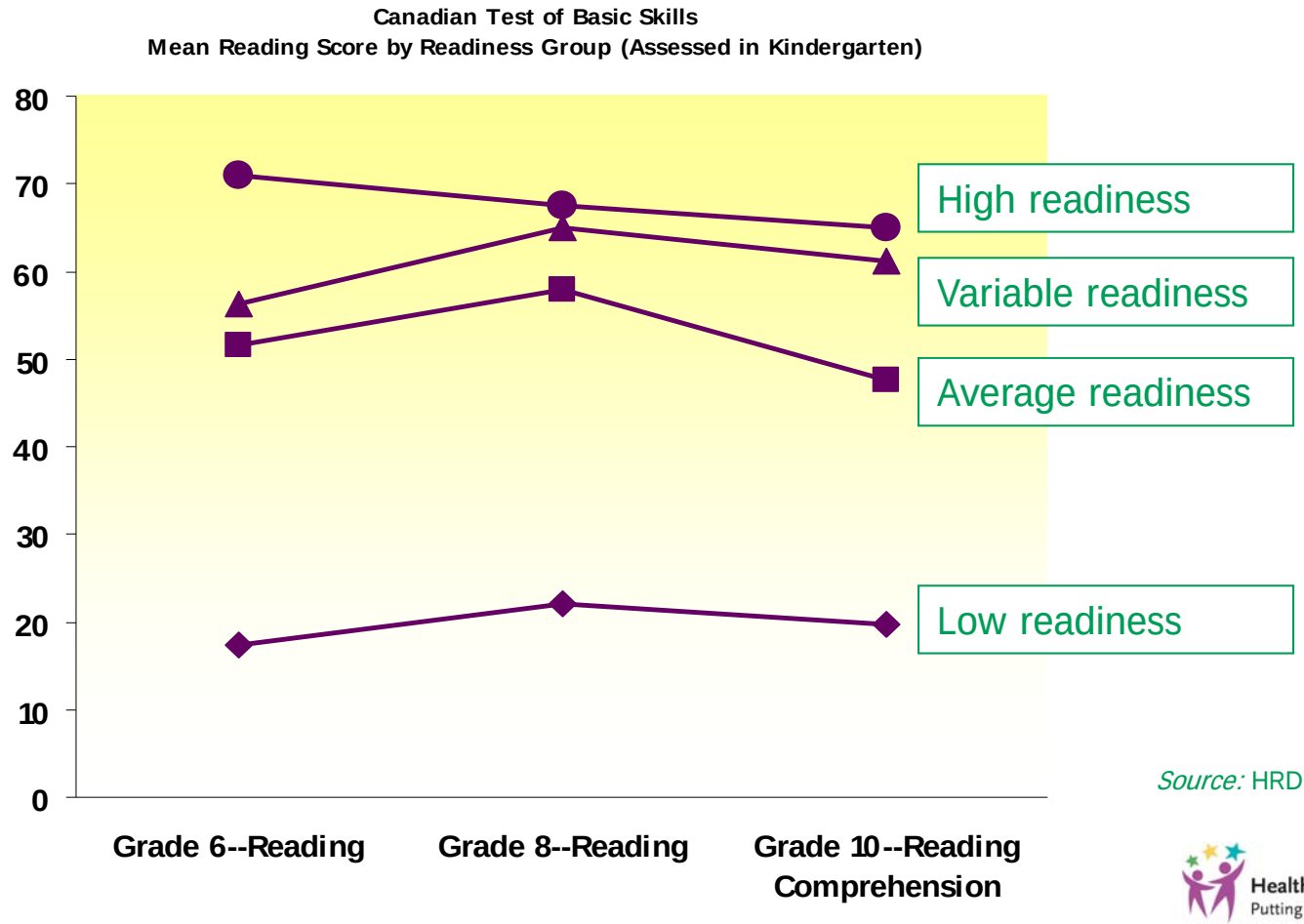
Early Differences in Readiness at School Entry Persist Through to Grade 10



Source: HRDC-ARB (2003).

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Adult Educational and Economic Outcomes of Abecedarian Project Participants: Age 30 Follow-up (Campbell et al., 2012)

- **1.7 times** more likely to graduate high school
- **4.6 times** more likely to graduate college/university (bachelor`s degree or higher: 23% vs. 6%)
- **2.65 times** more likely to be employed (full-time for at least 2/3 of past 24 months: 75% vs. 53%)
- **84% less likely** to be on income assistance (over past 89 months: <4% vs >20%); children who did not participate in the program were 6 times more likely to be on income assistance as adults

Data source: North Carolina study

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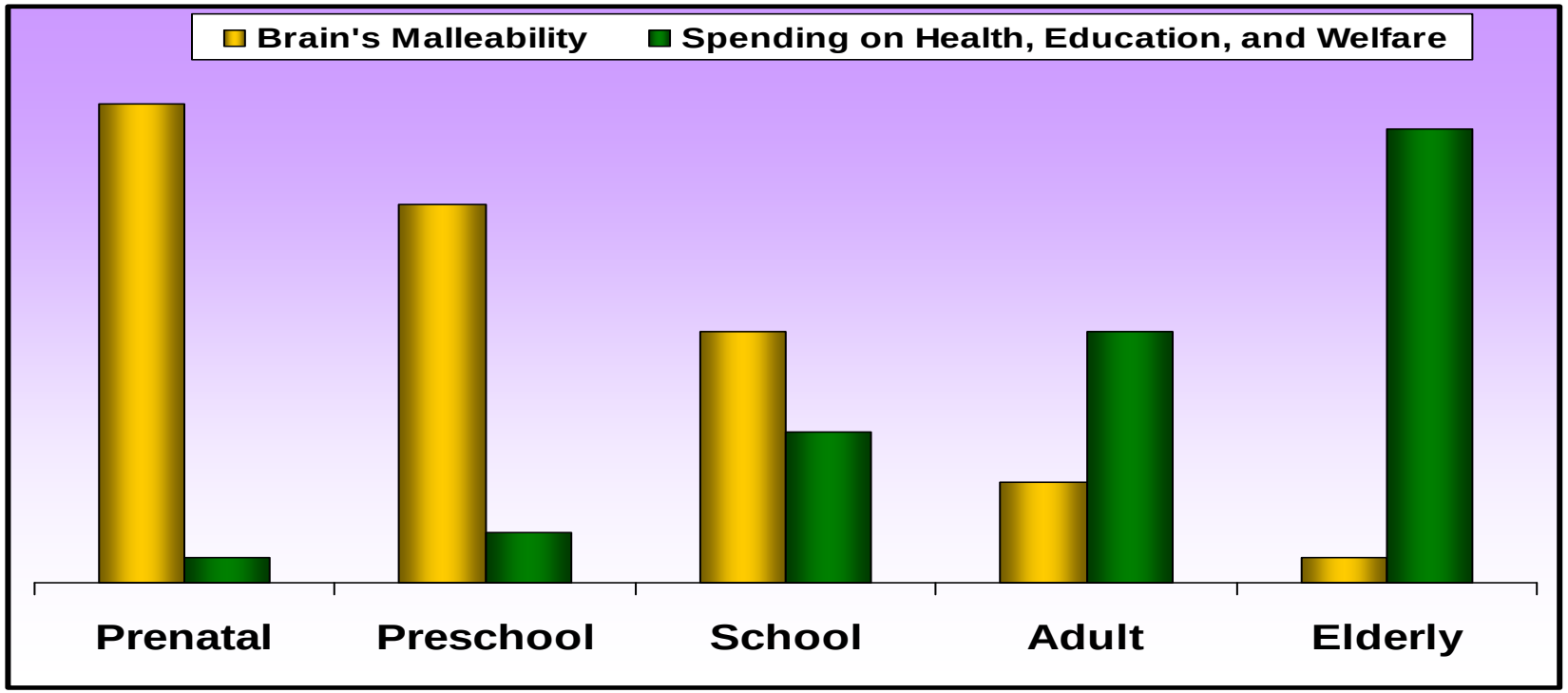
Innovation Challenge:

Addressing the Mismatch Between Opportunity and Investment



Adapted from: “How Nurture Becomes Nature: The Influence of Social Structures on Brain Development”
Bruce Perry, Baylor College of Medicine, Houston, Texas.

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Innovation Challenge:
Leaping from Red to Green

HIGH-COST, lower value (waiting until problems have already occurred):

Low-cost, HIGH VALUE (save dollars, uplift lives):

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5 IMPLICATIONS FOR INNOVATION

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