

## EARLY CHILDHOOD LEARNING

Knowledge Centre



### **BRINGING IT TOGETHER:** Merging Community-Based, Life-Course, Linked Data, and Social Indicator Approaches to Monitoring Child Development

*Proceedings from the Early Childhood Learning Knowledge Centre's  
Monitoring Committee Workshop*

Toronto, Ontario, Canada  
September 18-19, 2006

Workshop Chair: *Clyde Hertzman*  
Proceedings Editor: *Jennifer E.V. Lloyd*

# **BRINGING IT TOGETHER:**

## **Merging Community-Based, Life-Course, Linked Data, and Social Indicator Approaches to Monitoring Child Development**

### *Proceedings from the Early Childhood Learning Knowledge Centre's Monitoring Committee Workshop*

Questions about these proceedings may be directed to the Editor at [jennifer.lloyd@ubc.ca](mailto:jennifer.lloyd@ubc.ca)

This publication is available electronically on the Canadian Council on Learning's website at [www.ccl-cca.ca/childhoodlearning](http://www.ccl-cca.ca/childhoodlearning)

For additional information, please contact:  
Early Childhood Learning Knowledge Centre  
3050 Édouard-Montpetit, suite A-205  
Montréal (Qué) H3T 1J7  
Tél. : 514.343.6111 # 2541  
Fax : 514.343.6962  
[childhoodlearning@ccl-cca.ca](mailto:childhoodlearning@ccl-cca.ca)

© 2008 Canadian Council on Learning

All rights reserved. This publication can be reproduced in whole or in part with the written permission of the Canadian Council on Learning. To gain this permission, please contact: [info@ccl-cca.ca](mailto:info@ccl-cca.ca). These materials are to be used solely for non-commercial purposes.

Published in February 2008.  
Montréal, Québec

Aussi disponible en français sous le titre *Réunir les approches pour suivre le développement des enfants : Combiner la méthode des indicateurs sociaux, les évaluations populationnelles, les enquêtes longitudinales et l'appariement des données.*

The Canadian Council on Learning is an independent, not-for-profit corporation funded through an agreement with Human Resources and Social Development Canada. Its mandate is to promote and support evidence-based decisions about learning throughout all stages of life, from early childhood through to the senior years.

---

## TABLE OF CONTENTS

<b>PURPOSE OF THE WORKSHOP .....</b>	<b>4</b>
<b>FEDERAL PROVINCIAL TERRITORIAL REPORTING ON INDICATORS OF EARLY CHILDHOOD WELL-BEING.....</b>	<b>6</b>
<b>THE EARLY DEVELOPMENT INSTRUMENT (EDI).....</b>	<b>8</b>
<b>GLOSSARY OF THE SIX WORKSHOP PRESENTATIONS .....</b>	<b>10</b>
Introducing the Composite Learning Index (CLI) .....	11
Using Linked Administrative Data Sets to Study Child Outcomes .....	15
The EDI: An Indicator of Developmental Health at School Entry .....	20
Four Uses of the EDI: The Case of British Columbia .....	23
Early Child Development and Early School Achievement: A test for the EDI, Results from the Québec Longitudinal Study of Child Development.....	32
From EDI to FSA: Longitudinal Analysis with Linked Population Data .....	37
<b>DISCUSSANT'S FEEDBACK.....</b>	<b>41</b>
<b>REFERENCES.....</b>	<b>43</b>
<b>VISION AND MISSION STATEMENTS.....</b>	<b>45</b>
<b>ABOUT THE EARLY CHILDHOOD LEARNING KNOWLEDGE CENTRE .....</b>	<b>46</b>
<b>ABOUT THE ECLKC MONITORING COMMITTEE.....</b>	<b>46</b>
<b>AFFILIATIONS OF THE WORKSHOP ATTENDEES AND/OR MONITORING COMMITTEE'S MEMBERS .....</b>	<b>47</b>
<b>RELATED LINKS.....</b>	<b>48</b>

---

## PURPOSE OF THE WORKSHOP

Clyde Hertzman  
*Human Early Learning Partnership*



The purpose of this document, and the workshop that it summarises, is to highlight approaches to data collection that may be useful for monitoring early child development in Canada. As early child development (ECD) is a foundation of health, well-being, learning, and behaviour across the life course, the capacity to monitor ECD over time and by location is basic to the success of a modern society. Moreover, because we are a signatory to the United Nations Convention on the Rights of the Child, Canada is now committed to extending rights into early childhood. The Government of Canada is now a “duty bearer” with respect to providing children with the opportunities they need to develop their physical, cognitive, and social/emotional capacities in early life.

In order to fulfill this commitment, Canadian society must have an ongoing flow of high-quality information on the state of early child development, its determinants, and long-term developmental outcomes. The most desirable approach would be to create a coordinated “system of early child development statistics” that is population-based, person-specific, and longitudinal in character. Moreover, it would need to be linkable at the level of the individual, and at the level of the group, to data on the social environments encountered by the developing child from the most intimate level (the home) to the most remote (the structure of economic opportunity confronting parents and caregivers). Our workshop was meant as a step in that direction.

Four approaches to monitoring ECD were presented at the workshop. The first approach, based on the Composite Learning Index (CLI) of the Canadian Council on Learning (CCL), may be called a “social indicators” approach. Its essence is the skilful collation of routinely collected data from a wide variety of sources that, when combined, have the capacity to provide a national and regional snapshot that may be repeated over time, without loss of validity, to study trends and determinants of ECD.

The second approach, based on the work of both the Offord Centre for Child Study and the Human Early Learning Partnership, is population-based measurement using the Early Development Instrument (EDI). Its essence is the efficient collection of Kindergarten teacher reports of individual children’s development in five key domains: physical, social, emotional, language/cognitive, and communication skills. When collected on all Kindergarten children across a jurisdiction, the EDI provides detailed information at the local neighbourhood and community levels, where the key determinants of ECD, and the best opportunities for intervention, are often found.

The third approach is the longitudinal survey approach of the Québec Longitudinal Study of Child Development. Its essence is the collection of developmentally appropriate information at regular intervals from a birth (or even pre-birth) cohort that is representative of the childhood population. This approach is best for studying the individual life-

---

course determinants of development, for establishing the timing and sequencing of key developmental events, and for evaluating causal claims.

Finally, we present the “linked data” approach of both the Manitoba Centre for Health Policy and the Human Early Learning Partnership. Its essence is the creation of person-specific, population-based, longitudinal data by linking administrative records from a breadth of sources. When health care and education records from the recent past are brought together, it is possible to “instantly” create historical prospective developmental trajectories for an entire childhood population, bringing a high level of efficiency to the tracking of child development. One example of the latter is seen here in the work of Jennifer Lloyd and Clyde Hertzman, which shows how EDI data can be linked to education data.

Taken together, the four approaches presented here are the building blocks of the system of early child development statistics that Canada needs. In idealised form, the system would have the following components:

- There would be periodic, nationwide monitoring of the state of children’s development (e.g., with the EDI and other tools that operate at younger ages) in order to provide serial cross-sectional information on the development of children in the early years.
- These data would be routinely linked to health services and education data in order to create population-based developmental trajectories for Canadian children, analysable down to fine geographies.
- A series of longitudinal birth and childhood cohort studies would be conducted across the country that would be designed to assess the impact of early environments on children’s development and address causal questions about the determinants of ECD in Canada. These data, too, would be linkable to cross-sectional monitoring and to health and education data systems.
- Finally, a program of social indicators would strategically incorporate information from the above sources, plus a wide range of other social indicators relevant to children, in order to assess Canada’s progress in fulfilling its duties in early childhood.

---

# FEDERAL PROVINCIAL TERRITORIAL REPORTING ON INDICATORS OF EARLY CHILDHOOD WELL-BEING

Leanne Boyd  
*Healthy Child Manitoba*

On September 11, 2000, the federal provincial and territorial governments reached an historic agreement to improve and expand the services and programs they provide for children under 6 years of age and their families.<sup>1</sup> *The Federal/Provincial/Territorial Early Childhood Development Agreement* commits Canada's First Ministers:

- to promote early childhood development, so that, to their fullest potential, children will be physically and emotionally healthy, safe and secure, ready to learn, and socially engaged and responsible; and
- to help children reach their potential and to help families support their children within strong communities.

As part of their commitment to public reporting in *The Early Childhood Development Agreement*, governments also agreed to report annually to Canadians on their progress in enhancing early childhood development programs and services.

Under the Agreement, governments have committed to “make regular public reports on outcome indicators of child well-being using an agreed upon set of common indicators... related to the objectives established for early childhood development.” (September 2000, *First Ministers Communiqué On Early Childhood Development*).

Governments have identified a common set of 11 indicators of well-being in four key areas of action:

- promote healthy pregnancy, birth and infancy
- improvement parenting and family supports
- strengthen early childhood development, learning and care
- strengthen community supports

Under *The Early Childhood Development Agreement*, governments commit to report as follows:

## Common Indicators Of Early Childhood Well-being

The following section outlines the common set of 11 indicators being used by governments to report on young children's well-being, as committed by First Ministers in their September 2000 communiqué on early child development. The indicators presented pertain to the prenatal period through age 5 (inclusive).

---

1. The Government of Québec has stated that while sharing the same concerns as other governments on early childhood development, it does not adhere to the Federal/Provincial/Territorial Early Childhood Development Agreement. The Government of Québec is receiving its share of funding from the Government of Canada for early childhood development programs and services through the Canada Health and Social Transfer (CHST).

---

### *Physical Health and Motor Development*

- Healthy Birthweight
- Incidence of Meningococcal Group C Disease
- Incidence of Measles
- Incidence of Haemophilus Influenzae–b (Hib)
- Infant Mortality Rate
- Motor and Social Development

### *Emotional Health*

- Emotional Problem-Anxiety
- Hyperactivity-Inattention
- Physical Aggression-Conduct Problem

### *Social Knowledge and Competence*

- Personal-Social Behaviour

### *Cognitive Learning and Language Communication*

- Language

## *Additional Indicators*

Some jurisdictions, including Canada, report to their public on additional indicators of child well being, as well as family and community influences.

Governments report on some or all of the following:

- preterm birth weight
- child injury hospitalization
- child injury mortality
- prevalence and duration of breastfeeding
- parental education
- family income
- parental depression
- tobacco use during pregnancy
- family functioning
- positive parenting
- reading by adult
- neighbourhood social cohesion.

Canada also reports on measures related to: families with children living in core housing and alcohol use during pregnancy.

Annual reporting by jurisdictions began in the fall of 2002.

The above and additional information, including each jurisdiction's reports, are available at [http://www.ecd-elcc.ca/en/ecd/ecd\\_indicators.shtml](http://www.ecd-elcc.ca/en/ecd/ecd_indicators.shtml).

---

## THE EARLY DEVELOPMENT INSTRUMENT (EDI)



Magdalena Janus  
*Offord Centre for Child Studies*  
*McMaster University*

Several of the research projects presented at the workshop involved the Early Development Instrument (EDI). A 104-item questionnaire completed by teachers or early childhood educators, the EDI covers five broad developmental domains:

1. Physical health and well-being;
2. Social competence;
3. Emotional maturity;
4. Language and cognitive development; and
5. Communication skills and general knowledge.

A shorter version, designed for use in developing countries, is being tested. It will provide an opportunity to adapt items to local context.

The EDI results are reported for each of the five domains, as well as for 16 subdomains contributing to the main domains (Janus et al., 2007). Children who fall in the lowest 10th percentile of the distribution for a given domain are deemed “vulnerable” in that area; children who are “vulnerable” in more than one domain are categorised as “vulnerable” in terms of school readiness. In addition, a distribution-free index of high vulnerability, called the Multiple Challenge Index (MCI), is reported.

In Canada, the EDI data have been collected for over 400,000 children up to 2006. A normative data set was created based on 116,800 five-year-olds. Over several years, British Columbia, Manitoba, and Ontario have implemented the EDI for all Kindergarten children.

The EDI has been translated into several languages and implemented on a small or large scale in several other countries: Australia, Chile, USA, Kosovo, Jamaica, New Zealand, and the Netherlands. The EDI domains have been shown to have a robust structure in international comparisons (please refer to Table 1). It is hoped that an EDI-like, developmental, and holistic approach to measuring child development will provide a feasible and comparable methodology to keep score on children’s well-being (Janus & Offord, 2007).

**Table 1: Cronbach Alpha Internal Consistency Values for the EDI Domains in International Databases**

	Canada	Seattle, USA	Perth, Australia	Jamaica	Chile
Physical health and well-being	0.831	0.823	0.806	0.641	0.779
Social competence	0.953	0.958	0.942	0.930	0.928
Emotional maturity	0.923	0.926	0.922	0.866	0.917
Language and cognitive development	0.907	0.892	0.883	0.883	0.882
Communication and general knowledge	0.931	0.957	0.934	0.890	0.864



---

## **GLOSSARY OF THE SIX WORKSHOP PRESENTATIONS**

Introducing the Composite Learning Index (CLI) .....	11
Marc Lachance, Fernando Cartwright, Chris Boughton	
Using Linked Administrative Data Sets to Study Child Outcomes .....	15
Marni Brownell, Noralou P. Roos, Randy Fransoo	
The EDI: An Indicator of Developmental Health at School Entry .....	20
Magdalena Janus	
Four Uses of the EDI: The Case of British Columbia .....	23
Clyde Hertzman, Paul Kershaw, Lori G. Irwin, Kate Trafford, Michele Wiens	
Early Child Development and Early School Achievement: A test for the EDI, Results from the Québec Longitudinal Study of Child Development .....	32
Michel Boivin, Jean-Pascal Lemelin, Nadine Forget-Dubois, Ginette Dionne Jean Séguin, Richard E. Tremblay	
From EDI to FSA: Longitudinal Analysis with Linked Population Data .....	37
Jennifer E.V. Lloyd, Clyde Hertzman	

---

## Introducing the Composite Learning Index (CLI)

Marc Lachance  
Fernando Cartwright  
Chris Boughton  
*Canadian Council on Learning*



Learning plays a key role in the success of individual Canadians and our country as a whole. Canadians benefit from learning in many ways—through higher wages, better job prospects, improved health, and a more fulfilling life. As a country, Canada benefits through a stronger economy and greater social cohesion.

Canadians, their governments, and their employers recognise the importance of lifelong learning. Although data exist on many specific aspects of learning, until now there has been no method of measuring how well Canada is doing across the full spectrum of learning: in school, in the home, in the workplace, and in the community.

The Composite Learning Index (CLI) “connects the dots” to show the big picture of lifelong learning in Canada. The CLI is the first national learning index, not only in Canada but in the world.

The CLI combines several sources of data to generate numeric scores representing the state of lifelong learning in Canada and its many communities. A high score for a particular area means that it has learning conditions most favourable to economic and social success. Learning is not the only factor influencing this success but, in an increasingly knowledge-driven economy, it is a crucial one.

Successful learning is about cooperation and learning from best practices. The purpose of the CLI is not to pit geographic areas against each other, but to allow areas to learn from each other.

Results of the CLI are released annually to monitor the progress of lifelong learning over time.

Through drawing attention to the specific learning indicators, the CLI also provides a gateway for exploring different issues related to learning in Canada.

### *How Does the Composite Learning Index Work?*

A composite index combines a variety of statistics to produce an overall score for a particular person or area. Composite indices are used to analyse trends over time or across different regions.

The Consumer Price Index, for example, combines the costs of various items purchased by a typical household each month. When a “basket” of about 60 goods and services is combined in the Consumer Price Index, and measured over time, it offers a more complete illustration of trends in the cost of living than would the price of apples or gasoline alone. Similarly, the CLI uses a “basket” of 15 indicators to measure the state of lifelong learning in Canada. The CLI draws the link between learning conditions and social and economic well-being.

---

### *What Is Lifelong Learning?*

Learning does not only happen in the classroom. Learning is a process involving the development of knowledge, skills, and values throughout a person's life, from early childhood through adulthood. Learning is not only an intellectual process, but also something that affects all areas of life—including its emotional, spiritual, and physical aspects.

The CLI looks at learning in four major areas (pillars):

1. **Learning to Know** involves developing the foundation of skills and knowledge needed to function in the world. This includes literacy, numeracy, general knowledge, and critical thinking.
2. **Learning to Do** refers to the acquisition of applied skills. It can encompass technical and hands-on skills and knowledge, and is tied closely to occupational success.
3. **Learning to Live Together** involves developing values of respect and concern for others, fostering social and interpersonal skills and an appreciation of the diversity of Canadians. This area of learning contributes to a cohesive society.
4. **Learning to Be** refers to the learning that helps develop the whole person (mind, body, and spirit). This aspect concerns personal discovery, self-knowledge, creativity, and achieving a healthy balance in life.

### *Indicators of Learning*

The CLI combines survey data from Statistics Canada related to each of the four aforementioned areas of learning. In order to be included, the indicators must meet the following criteria: (1) pan-Canadian in scope; (2) available at a regional level; (3) collected in a way that is methodologically sound; (4) reliable; and (5) collected regularly. Geographic data from other sources are also included, in order to measure Canadians' access to different learning resources and institutions.

The indicators of each pillar of learning include:

#### **Learning to Know**

- Student skills (reading, mathematics, and problem solving)
- High-school dropout rates
- Young adults' participation in post-secondary schooling
- Post-secondary attainment among working-age Canadians

#### **Learning to Do**

- Participation in job-related training
- Availability of work training
- Access to learning institutions

#### **Learning to Live Together**

- Charitable giving
- Volunteerism

- 
- Participation in social clubs and other organisations
  - Access to community institutions, such as social clubs

### **Learning to Be**

- Exposure to media
- Exposure to sports and recreation
- Exposure to cultural events and activities (e.g., museums)
- Festivals and the performing arts
- Access to resources, such as libraries

Following the workshop's discussions and clarifications of the relationship between the CLI and the value of adding ECD-type indicators to the "basket," it was proposed to assess the feasibility of adding the EDI as an "outcome" of learning in the CLI model.

### *Causality and the EDI*

The principle underlying the statistical and conceptual model of the CLI is that learning in all four pillars is necessary to achieving a "good" society. Under this reasonable assumption, we must then derive some concept of what we mean by learning (or at least finding indicators) and what we mean by a "good" society.

In order to create the most meaningful learning index, we have to restrict our definition of "good" society to those elements that have some reasonable causal dependence on learning. With this reasoning, the EDI can be defended as an outcome, rather than a cause, given that one indication of a good society is that it produces healthy, happy children. The limitation of taking this position is that someone can make a reasonable argument that the EDI measures childhood development (i.e., how well the children have learned, thus far, to be human beings).

This is a valid point, but its corollary is that the EDI should be treated as a direct measure of learning, and thus should be used as one of the causal factors in the model, rather than an outcome. Our discussions (both within the CLI team and with the Early Childhood Learning Knowledge Centre), however, had difficulty defining indicators that are both causally downstream of early childhood development *and* have a stronger relationship with ECD than with some other learning indicator. For example, career success (and, at the macro level, average income) is dependent on ECD, but it has a stronger relationship with the more proximal indicators of postsecondary education attainment or high school literacy. Thus, because the argument for treating the EDI as an outcome is (at least) equally strong and has the benefit of being more manageable statistically, the EDI will be treated as causally dependent. In other words, we interpret the success of early childhood development to be a broad indicator of societal well-being, and we believe that successful early childhood development is dependent on successful learning on the part of the individuals and communities that make up the social context of each child.

---

### *Modelling the EDI*

Each of the four pillar scores is estimated as the linear aggregate of a set of learning indicators that has the strongest correlation with the dominant factor underlying our set of outcome variables. The four pillars are combined in turn, proportional to the strength of their respective correlation with this factor. Clearly, the single strongest influence on the weighting of the learning indicators and the values of the CLI is the choice of outcome variables. We propose that the EDI be included as one of these outcome variables.

Once the EDI is included in the set of outcome variables, the influence of the EDI on the CLI will occur in two stages. First, it will draw the common factor underlying the outcome variables towards early childhood development. Second, because the common factor has a stronger correlation with early childhood outcomes, the pillar scores and the CLI composite, which maximise the correlation between the learning indicators and this composite, will also have a stronger correlation with early childhood development. The main strengths and limitations of this approach are essentially the same as above, given that this methodological treatment mirrors the same causal logic. The methodological limitation of this choice is that the correlation between EDI and the other outcome variables (and, therefore, the impact of the EDI on the CLI) is dependent on the quality of the EDI data. Non-random missing data and the degree to which the EDI accurately measures early childhood development will have an effect on this correlation.

### *Missing Data*

The CLI is estimated using nationally available data. The EDI is available in a minority of regions, but accounts for a large proportion of the early childhood population. Given that the EDI is an outcome variable, we do not require that EDI data be available for all regions. We only require nationally-available data for indicators.

The major assumption underlying our use of the EDI, however, is that the correlations between the EDI, the other outcome variables, and the learning indicators are the same in the sample for which we have the EDI as they are for all of Canada. There are logical arguments for and against this assumption, but we do not need to rely on argumentation, given that we can test the stability of the correlation by comparing the values across subsamples of the data that we do have, given that they represent a fairly diverse group (urban/rural, east/west) and the sample size is very large. If the correlation is stable across subsamples, we are confident in its stability across Canada. The degree to which it is *not* stable gives us an idea of the validity of inferences based on the CLI, and may provide clues on how to adapt CLI methodology in the future.

There are other issues surrounding the EDI in relation to the CLI, such as integrating different ECD indicators where the EDI is not available and the larger issue of change over time when indicators change (which we consider the same issue). We suspect that we are on more solid ground there, given that those issues make use of our broader strategy of making the CLI as comparable as possible, while still making it as accurate as possible with respect to the theoretical framework.

---

## Using Linked Administrative Data Sets to Study Child Outcomes

Marni Brownell  
Noralou P. Roos  
Randy Fransoo

*Manitoba Centre for Health Policy  
University of Manitoba*



The Manitoba Centre for Health Policy (MCHP), within the Department of Community Health Sciences at the University of Manitoba, conducts research using administrative databases. Administrative databases are a collection of information that was originally gathered for purposes other than research, but are nonetheless powerful research tools. When using administrative data, linkages can be made across different data sets allowing for cross-service research. Linkages also allow us to look across several years of data, providing a useful tool for longitudinal research.

Over the last three decades, researchers at the MCHP have developed the Population Health Research Data Repository. The repository is a comprehensive collection of administrative, registry, survey, and other databases primarily comprising residents of Manitoba. It was developed to describe and explain patterns of health care and profiles of health and illness, facilitating intersectoral research in areas such as health care, education, and social services. This repository has become a global model for research using linked databases.

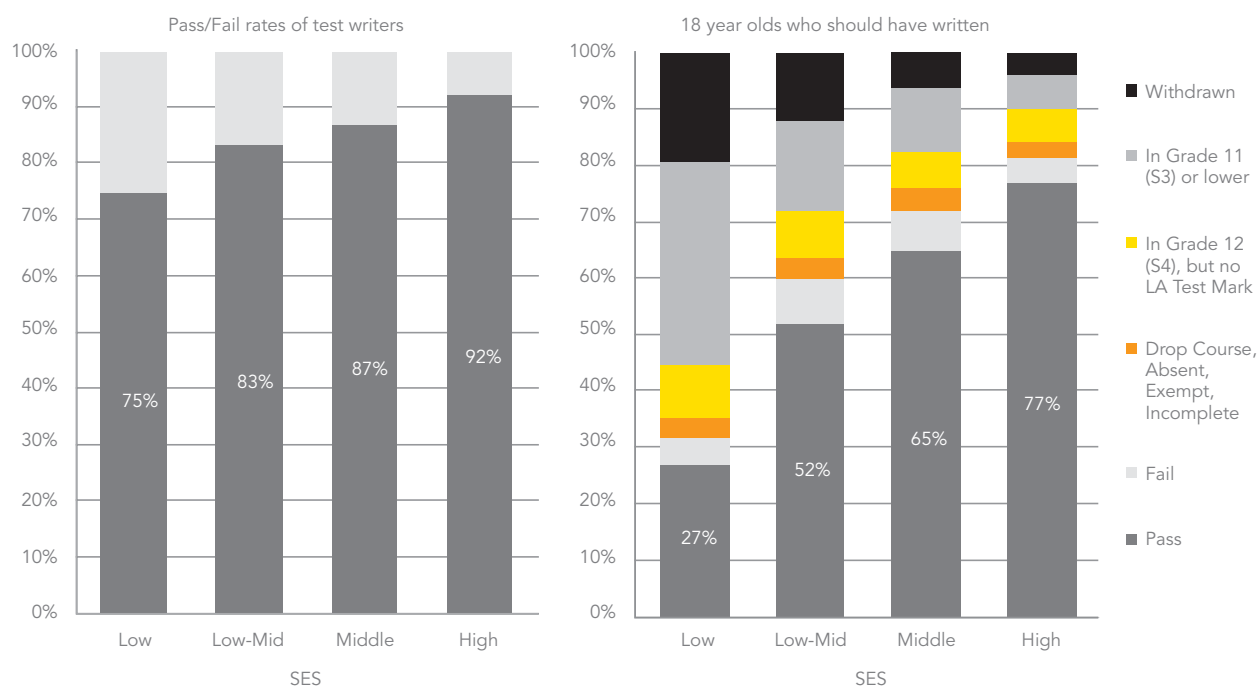
Linkages are conducted on anonymised information, respecting the highest standards of security, confidentiality, and protection of privacy (please visit <http://www.umanitoba.ca/centres/mchp/data.htm>).

In a project funded by the Canadian Population Health Initiative, data on educational performance, area-level socio-economic status (SES), and residency in Manitoba were linked together to examine educational outcomes by SES (Brownell et al., 2004; 2006; Roos et al., 2006). The figures in this piece describe aspects of that work.

Figure 1 shows the performance of Winnipeg residents on the Grade 12 Language Arts standards test, disaggregated by area-level SES. The graph on the left of Figure 1 reflects the kind of information that is available from the education data set alone; it is the type of information the schools see when they review the performance of students taking the tests: 92% of students who live in the high SES areas passed, along with 75% of those from low SES areas. This finding demonstrates a fairly shallow SES gradient in educational outcomes. The problem is this: the left-hand graph merely reports results for those who are in school, in Grade 12, and writing the standards tests.

But who *should* be writing the standards test, *but is not*? This very different story is told by the graph on the right side of Figure 1, which illustrates the more complete information that is available through data linkage—in this case, linking the education data with the Population Registry information available through the repository.

**Figure 1: Performance on Grade 12 Language Arts standards test 2001-2002, by Winnipeg SES group.**

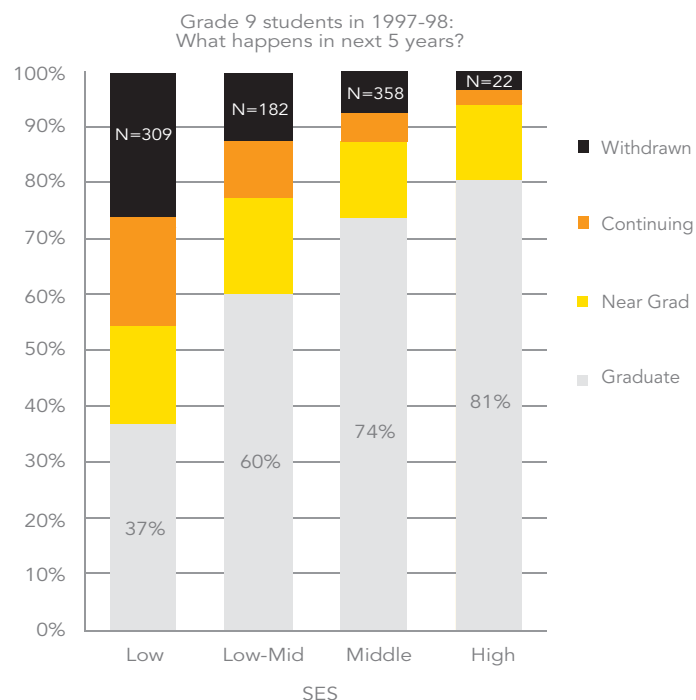


Here we identified all children born in Manitoba in 1984 who were still in Manitoba at the time of the test (84%). For those residing in Winnipeg in 2001-2002, we determined where they were in the school system (in what should have been their last year in school). The graph on the right of Figure 1 captures a very different reality: in fact, only 27% of the youth in the low SES areas who should have written the standards test passed the test that year. A very large group (almost 36%) were behind at least one year (in Grade 11 or lower), and almost 20% had withdrawn (not enrolled in school for at least 2 years). In other words, for all four SES groups, if students were in Grade 12 and writing, the great majority passed; but many of the children from low SES areas had not yet made it to Grade 12 (and many were not enrolled in school at all).

Figure 1 suggests that most of the youth from the 1984 birth cohort were still in school in 2001-2002. But what proportion of children in each SES group will graduate? To answer this question, we took all students in Grade 9 in 1997-1998 and tracked them for five years. Figure 2 shows what we found: only 37% of the students from the low SES neighbourhoods had graduated by the end of the five years. Already one in four of these students had withdrawn before completing high school. (We know these are not students who have moved out of the province, thanks again to our ability to link to the population registry.)

The picture was very different for students living in other neighbourhoods: in the high SES areas, 81% had completed high school within five years, and less than 5% had withdrawn.

**Figure 2: School completion rates by Winnipeg SES group.**



Both the Grade 12 Language Arts exam and the high school completion results demonstrate a strong socio-economic gradient in educational outcomes: students who live in lower SES neighbourhoods are less likely to pass the Grade 12 standards tests, are less likely to graduate from high school within five years of entering, are more likely to have failed a grade at some point, and are more likely to withdraw before completing high school. When do children from lower SES areas start falling behind?

To answer this question, we looked at Grade 3 standards test results for Winnipeg children. Figure 3 shows the performance of Winnipeg residents on the Grade 3 Language Arts standards test, disaggregated by area-level SES. Once again, the graph on the left of Figure 3 reflects the kind of information that is available from the education data set alone—and what the schools see when they review the performance of students taking the tests: 94% of students who live in the high SES areas passed, along with 83% of those from low SES areas. And once again, a very different story is told by the graph on the right side of Figure 3, which illustrates the more complete information available through data linkage.

**Figure 3: Performance on Grade 3 Language Arts standards test 1998-1999, by Winnipeg SES group.**



Here we identified all children born in Manitoba in 1990 who remained in Manitoba since then. Then, for those residing in Winnipeg in 1998-1999, we determined where they were in the school system (in the year they should have been in Grade 3). The graph on the right of Figure 3 captures this very different reality: in fact, only 50% of the children who live in the low SES areas who should have written the standards test that year passed. The children from the lower SES groups were not only more likely to have failed the test, but also more likely to have been absent the day of the test, exempt from the test, or to have handed in an incomplete test booklet. Importantly, the children from low SES areas were much more likely to have been held behind a grade than children from high SES areas: 14% of the children from the low SES areas were already behind at least one grade, compared to only 3% from the high SES areas. This information is generally not captured in reports on standards tests and, without it, differences in performance across SES are underestimated.

Some might argue that there is not much the educational system can do, because these differences may be present from birth. After all, we know low-income mothers and young mothers are more likely to smoke and possibly abuse alcohol and drugs during pregnancy and less likely to get prenatal care and adequate nutrition. As a result, their babies may be unhealthier from the start. We were able to look at the hospital records for the children in our study and examine two global measures of health status at birth: birth weight and Apgar scores. We found that about the same percentage of our low SES-area children were born with normal birth weights (2500-4000 grams) and high Apgar scores (8+) as children from the high SES areas.

---

Data linkages have also allowed us to investigate program enrolment by population characteristics, such as SES. We looked at an intensive one-on-one early literacy program (called Reading Recovery) that is available to some Winnipeg Grade 1 students who are experiencing difficulties learning to read. Knowing the Grades 3 and 12 outcomes in the Language Arts tests, we would assume that the highest rates of this intensive program would be found in the lowest SES areas, if this program is being offered on the basis of need. We discovered, however, that the lowest percentage of students enrolled in this program was in the low SES area (4%) whereas the highest percentage of students enrolled was in the high SES area (13%). Our discussions with educators regarding these results suggested that the need for early literacy intervention is so overwhelming in some of the schools in the low SES areas that they cannot afford to offer the resource-intensive Reading Recovery program to everyone who needs it. Out of necessity, they opt for less resource-intensive interventions that reach more children.

This research has focussed on school achievement, but the focus of policies aimed at changing the trajectories of disadvantaged children should not be limited to the school system. Our analyses and work by others (e.g., the work of the Human Early Learning Partnership described in these proceedings) reveal that, although the vast majority of children at every socio-economic level show remarkable similarities at birth, inequalities in achievement are evident early in childhood, prior to school entry. Children who are already behind their peers when they begin school will likely fall further behind and engaging them in the educational process may be difficult. This makes it imperative for governments to provide effective early childhood programs (starting in the first few years of life) to improve the experiences of children at risk.

Our research also highlights the importance of taking a population-based perspective when assessing performance across SES groups. By including not only the children present to write the tests, but also children who have fallen behind or dropped out of school, we get a truer picture of the disparities in educational outcomes. Other provinces should work towards developing similar capabilities for examining their data on educational outcomes.

---

# The EDI: An Indicator of Developmental Health at School Entry



Magdalena Janus  
Offord Centre for Child Studies  
McMaster University

The gradient nature of health inequalities in most societies is considered a key characteristic of human failure to distribute resources in an equitable way. Children's outcomes in the realm of health and behaviour seem to reliably follow the income gradients established for adult populations (Brooks-Gunn, Duncan, & Britto, 1999; Case, Lubotsky, & Paxson, 2002). As a consequence, inequalities existing for young children are perpetuated into adulthood, when it is often too late to change the disadvantageous life-course trajectory.

Attention to children's well-being and health is required at a population universal level, to address community- and society-based changes that would improve outcomes for children, and, ultimately, the whole population. Changes, however, cannot be implemented unless the target of these changes can be identified with acceptable precision, and the results of the changes measured and assessed. In this presentation, I offer a rationale for measuring children's school readiness to learn with the Early Development Instrument (EDI) as a step towards achieving such precision.

The first half of this paper is organised around four questions:

1. Why an indicator reflecting child development?
2. Why the "school entry" age bracket?
3. Why measure school readiness?
4. Why use the Early Development Instrument (EDI)?

Having addressed these questions, I summarise the properties and use of the EDI.

## *Why an Indicator Reflecting Child Development?*

Early childhood issues have been receiving increased attention in Canada and in the world over the past several years. Terms like "monitoring" and "keeping score" are being used repeatedly to indicate the need to follow the outcomes for young children, to take stock of preventions and interventions that work and those that do not, and to use this knowledge to make positive changes in influencing optimal outcomes.

Effective monitoring, however, requires accurate score-keeping. Let us consider the most frequently used indicators of children's health that appear in public media or government statistics. Infant or child mortality rates and low birth weight are the most popular, due to the relative ease with which such statistics can be collected. The next most popular indicators of the well-being of children at later stages are often school enrolment, school drop-out rate, and vaccination rates. These indicators have two characteristics in common:

---

they reflect the system's abilities to provide care (pre- and post-natal care, schooling, public health), and they are static (that is, they do not reflect children's development).

Although a wide range of research evidence tells us that children who are exposed to optimal social and physical environments have the best opportunities to grow up healthy and happy, we have not yet been able to account for the process of growing and developing in the existing indicators of children's well-being. Such an omission may be leading us to misunderstand or neglect the major factors responsible for human health. For example, through missing information on children's development, many low-level impairments contributing to general population health could be overlooked. Conversely, the knowledge that the majority of children are developmentally "on track" in the physical, socio-emotional, and cognitive areas provides grounds for confidence in the community's efforts into improving the well-being of children.

### *Why the "School Entry" Age Bracket?*

The transition between ages 5 and 7 years, between preschool- and school-age, is sometimes referred to as "the age of reason and responsibility" (Sameroff & Haith, 1996). Children's ways of thinking and behaving change in this period, as they acquire the precursors of later maturity. Rogoff et al. (1975) investigated the roles and expectations of children in 50 communities across the world. They found that these change dramatically in the period between ages 5 and 7, when children are given increased responsibility for various culture-appropriate tasks requiring trust and independence (e.g., tending animals, caring for younger children, helping in household chores). Moreover, it is in this age range that children are expected to become "teachable." Indeed, it is not a simple coincidence that, in many countries, the age range between 5 and 7 marks the period in which children begin school.

School entry is the point at which data on the majority of a population become accessible—something that is often not possible in the years after birth. At this point, the assessment has the potential to reflect the child, family, and community contributions to the children's developmental outcomes.

### *Why Measure School Readiness?*

The differences with which children reach Kindergarten do not disappear over the years of schooling. According to Entwisle and Alexander (1999), all children make gains during their education, but those who start at a lower point do not make more gains than those who start at a higher point: in other words, the relative standing at entry to Grade 1 predicts the child's relative position in later school years. Children who have access to adequate nutrition and shelter, positive stimulation, and warm and loving environments, and who are in good health will start their formal education at the point from which they can make the highest gains. Those who lack these basic necessities will, on average, remain behind. Thus it appears that differences at age 5 may be there for life.

"School readiness" is a convenient shortcut to children's developmental health at the cusp of early years and school-age development. A measurement taken at school entry is a marker for the 5 to 7 age range. The term "school readiness" can be understood as a

---

shortcut to the outcome of the transition process. Children face many transitions in their lives, but the one from home, or even preschool, to school, where they assume the full role of the student, is probably the most dramatic, and traumatic, for many children—especially in the face of serious system discontinuities between the preschool and school environments.

In this context, school readiness reflects developmental outcomes and milestones achieved during the first five years of life within the concept of early experiences.

### *Why Use the EDI?*

If a snapshot of what is broadly understood as children’s well-being is to be taken at school entry, it should ideally be taken from many perspectives and include multidimensional assessments (Love, Aber, & Brooks-Gunn, 1994). Nevertheless, the costs and benefits of overburdening children and families, as well as financial considerations, have to be taken into account, together with the focus of such measurement. An alternative option to a sample-based multi-respondent battery of assessments is to provide a community with a measure of child development status that can be easily linked with data on other aspects relevant to child development.

The EDI incorporates major developmental areas, provides data that can be aggregated to various group and geography levels, and has established its validity and reliability (Janus & Duku, 2005; Janus & Offord, 2007; Janus et al., 2007). The EDI is a tool, not a diagnostic: therefore, it allows us to highlight strengths and problem areas, and to mobilise a community for action around these areas. The EDI, however, will not target individual children. Only by association with external factors, provided by other respondents and dimensions, can the EDI actually assist in identifying solutions.

---

## Four Uses of the EDI: The Case of British Columbia

Clyde Hertzman

Paul Kershaw

Lori G. Irwin

Kate Trafford

Michele Wiens

*Human Early Learning Partnership*



In this paper we document four uses of community mapping of the Early Development Instrument (EDI) based on our population-based assessments in British Columbia, Canada:

1. Monitoring the state of ECD at the level of the population;
2. Judging resilience of communities in supporting child development;
3. Evaluating change in ECD over time; and
4. Understanding the state of ECD in special populations.

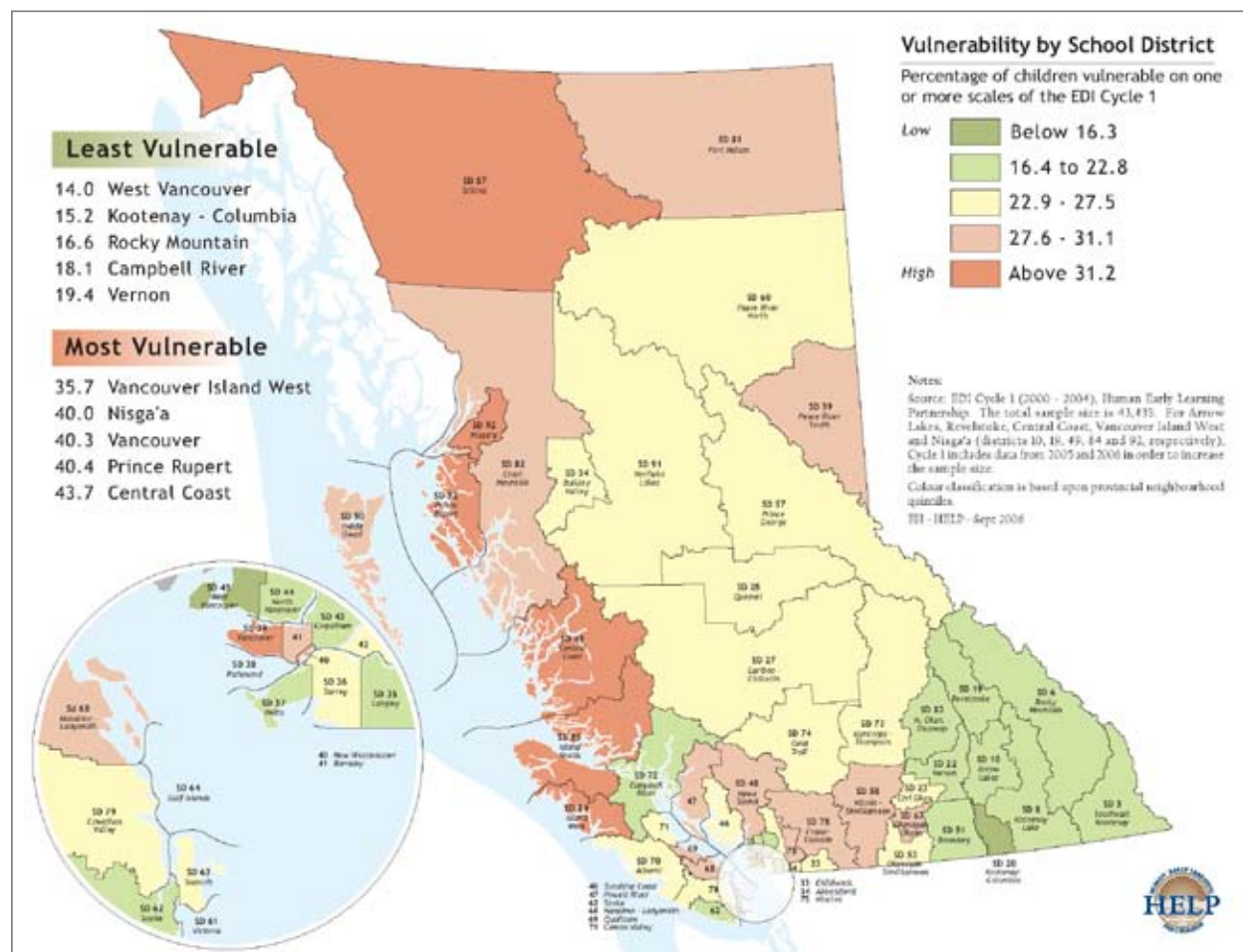
### *Monitoring the State of Early Childhood Development (ECD) at the Level of the Population*

The EDI asks Kindergarten teachers to fill out a detailed checklist about each child in their class based on five scale measures of development. The results allow us to make observations about average outcome levels and rates of vulnerability for the under-5 population in a given geographic area. The Human Early Learning Partnership (HELP) approach involves mapping child development according to the child's neighbourhood of residence, rather than by census unit, school catchment area, or school attended.

By creating neighbourhoods of 40 children or more, we ensure statistical stability and anonymity in the results. Mapping provides a visual summary of early childhood development trends in the interests of making complex social science and population health data meaningful to broad audiences. Colour maps depict information about the many intersecting environments in which families live and young children grow, including socio-economic, natural, cultural, programmatic, and policy environments as they interact in and across neighbourhood, community, regional, and provincial geographies. In this regard, maps invite observers to contemplate a broad understanding of early development that transcends the boundaries of any single policy envelope—for example, education, health, child care, welfare, or justice—to see how the interrelations between all of these areas influence children before they reach age 6.

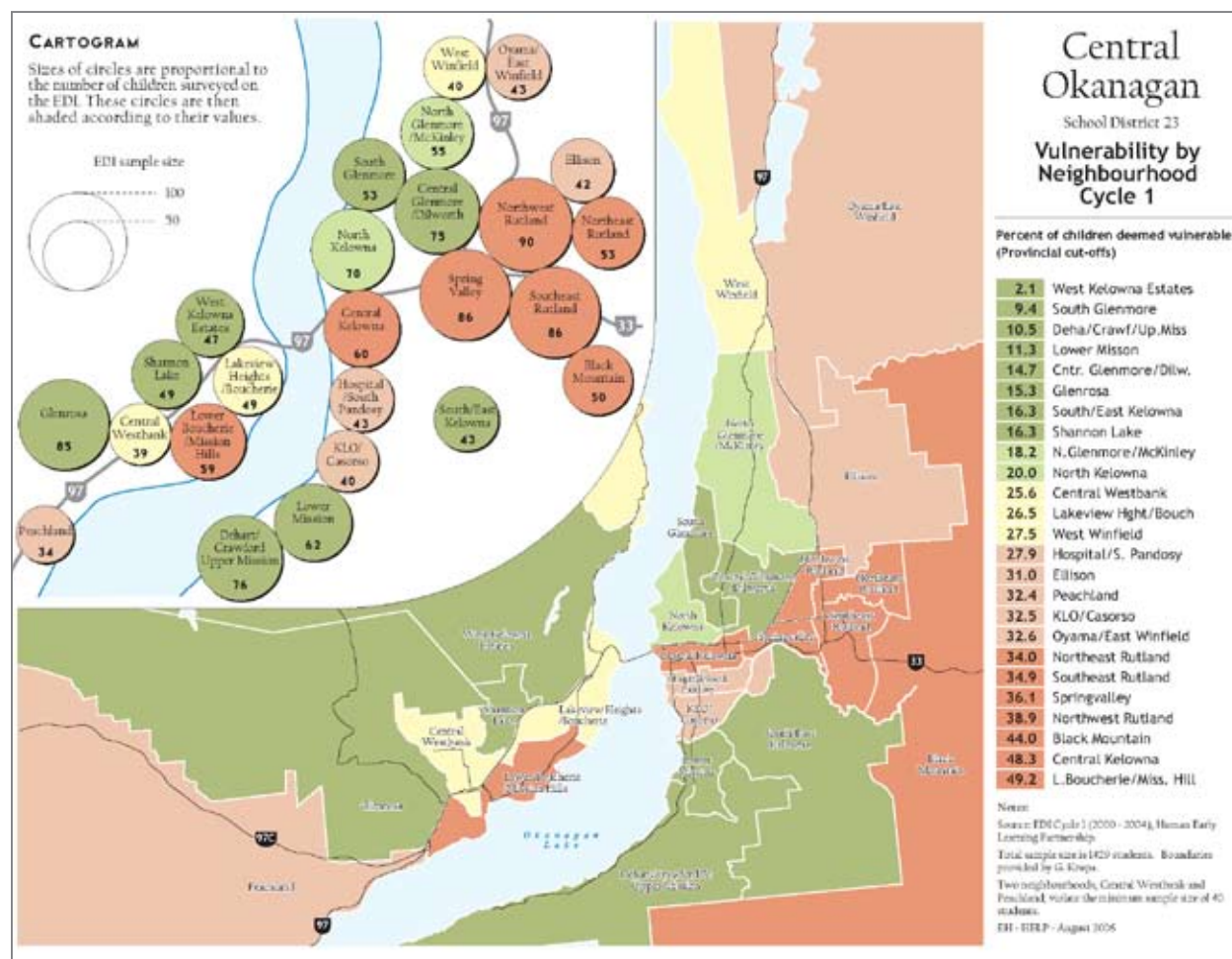
The provincial maps display the proportion of vulnerable children in the 59 geographic school districts of residence, as measured by each of the five scales of the EDI (see Figure 1). EDI evaluations are completed by the Kindergarten teacher where the children go to school, but are accounted for in the school district where they live. The reason for this is that children spend their first five years of life in families and communities that influence their development. Given that the primary focus of the EDI work is to reflect on the quality of those early experiences, mapping children according to where they live best serves this purpose.

**Figure 1: Vulnerability by school district.**



Most of the determinants of early child development are found at the level of the family and neighbourhood. Moreover, family types differ by neighbourhood, as does the level of access to quality programs and services. Therefore the most important population aggregation of the EDI is at the neighbourhood level. The literature on the effects of neighbourhoods on child development most frequently relies on data that are reported using census boundaries or other administrative units of analysis (Burton & Jarrett, 2000). The convenience of census or other survey boundaries comes with costs, however, including the fact that census boundaries often do not match local perceptions of neighbourhood divisions. In response, HELP has worked closely with communities to benefit from local knowledge in determining neighbourhood boundaries that more accurately reflect the experience of a diverse range of people who reside in the area (see Figure 2). Local ECD coalition representatives were invited to draw lines on maps of their area to signal the presence of perceived divides in their community. Although some local coalitions opted to maintain the census or another existing boundary system, others opted for dramatically different breakdowns than those employed for survey data collection.

Figure 2: Central Okanagan.



### Judging Resilience of Communities in Supporting Child Development

Starting with roughly 100 census variables, we produced “best fit” models for the five EDI scales, as well as “one or more vulnerability” models that depict the relationship between SES and vulnerability rates across the 469 BC neighbourhoods. In each case, seven or fewer census variables entered the model. The following fractions of neighbourhood variation in EDI vulnerability were accounted for by these “best fit” models:

Table 1: Fractions of Neighbourhood Variation in EDI Vulnerability Accounted for by “Best Fit” Models.

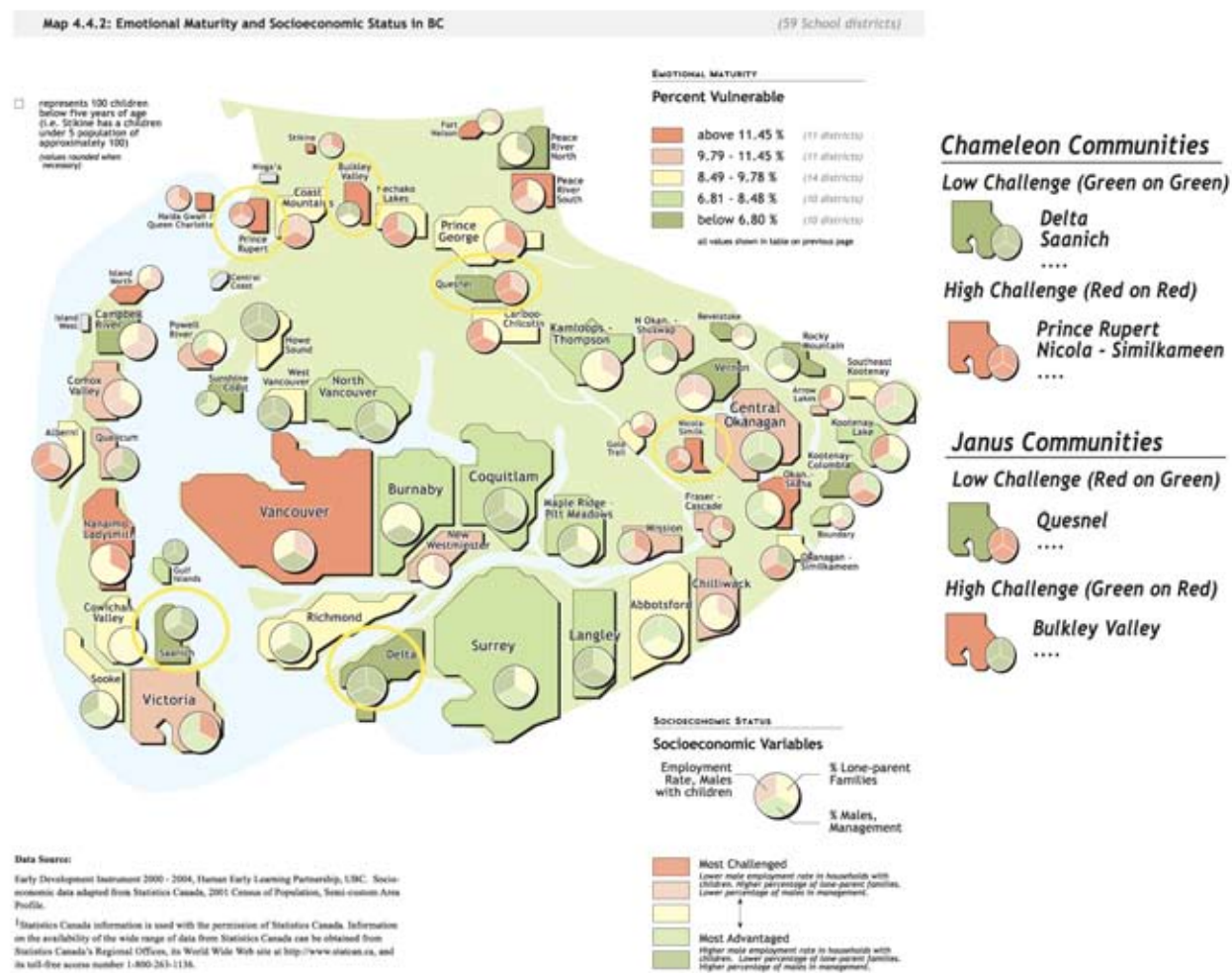
EDI Domain	Proportion of Variance Explained
Physical health and well-being	33.8%
Social competence	20.9%
Emotional maturity	23.4%
Language and cognitive development	27.2%
Communication skills and general knowledge	46.9%
One or more EDI vulnerabilities	42.7%

---

The relationship between SES and child development can be read directly from maps with SES pie charts (see Figures 3 and 4). Chameleon communities (those that take on the colour of their SES variables) show the relationship most directly. A green pie on green background shows communities that are relatively privileged in terms of the selected socio-economic characteristics and also enjoy less childhood vulnerability. (This pattern is what we would expect to find.) Red-on-red patterns illustrate a similar story about the relationship between SES and vulnerability, although in the opposite direction. Communities that struggle with more disadvantaged social and economic circumstances typically suffer higher rates of vulnerability.

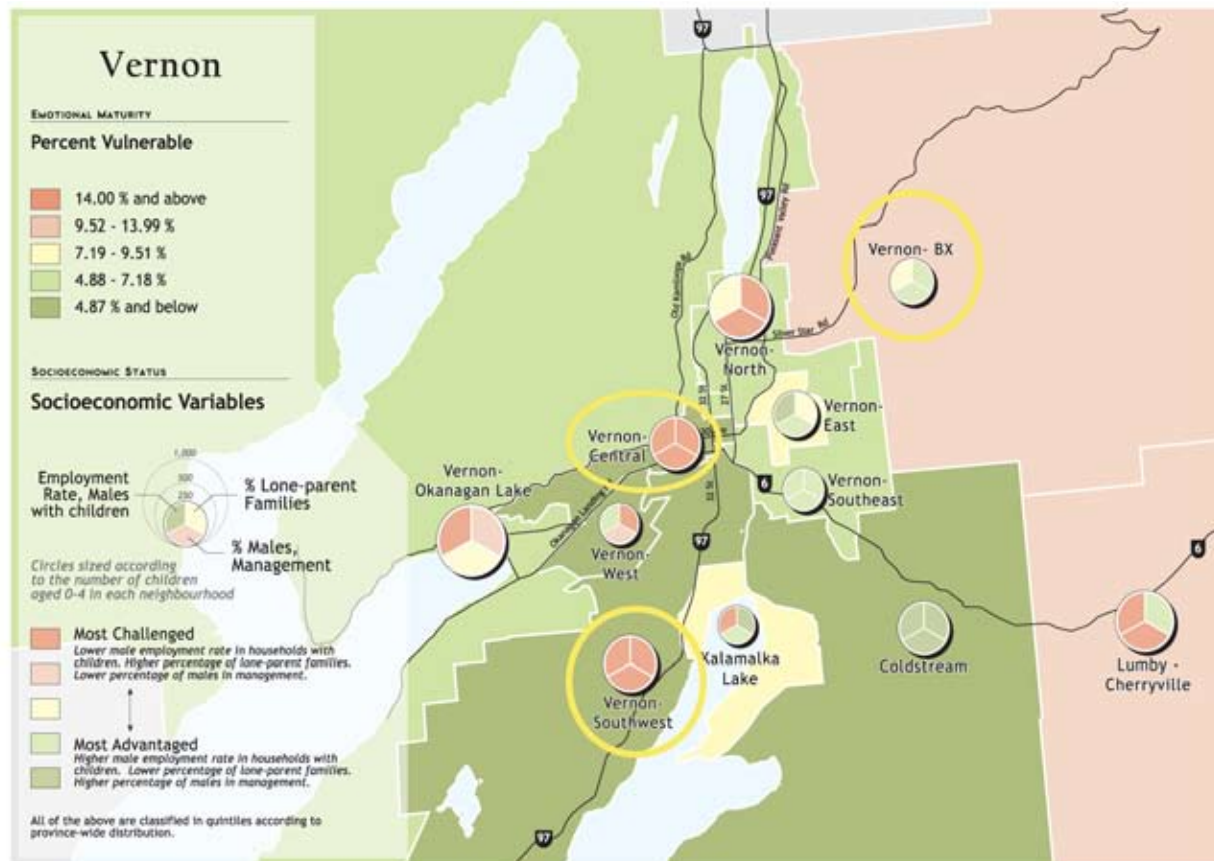
For policy and community development purposes, some of the most interesting communities are those that are the opposite of chameleon: these communities stand out because their EDI vulnerability colours are distinctly different from their SES pie charts. In such communities, children's development is less influenced by socio-economic characteristics than we would predict. The colour contrast can be good news or bad news. For example, some school districts have a pie chart that is entirely red, yet their physical vulnerability is relatively low and is portrayed as dark green. These areas on the map are good-news stories, because they represent communities that are overcoming socio-economic circumstances that would generally result in higher rates of vulnerability among Kindergarten children. Policy-makers will want to pay particular attention to these kinds of communities to learn what is allowing citizens in these districts to protect children from negative SES influences. Does it have something to do with the community resources and assets that citizens enjoy, the level of trust in the community, the level of collective socialisation or cohesion, or something else entirely?

Figure 3: Emotional maturity and socio-economic status in BC.



**Data Source:**  
 Early Development Instrument 2000 - 2004, Home Early Learning Partnership, UBC. Socio-economic data adapted from Statistics Canada, 2001 Census of Population, Social Issues Area Profile.  
 † Statistics Canada information is used with the permission of Statistics Canada. Information on the availability of the wide range of data from Statistics Canada can be obtained from Statistics Canada's Regional Offices, its World Wide Web site at <http://www.statcan.ca>, and its toll-free access number 1-800-263-1136.

**Figure 4: Emotional maturity and socio-economic status in Vernon.**



### Evaluating Change in ECD over Time

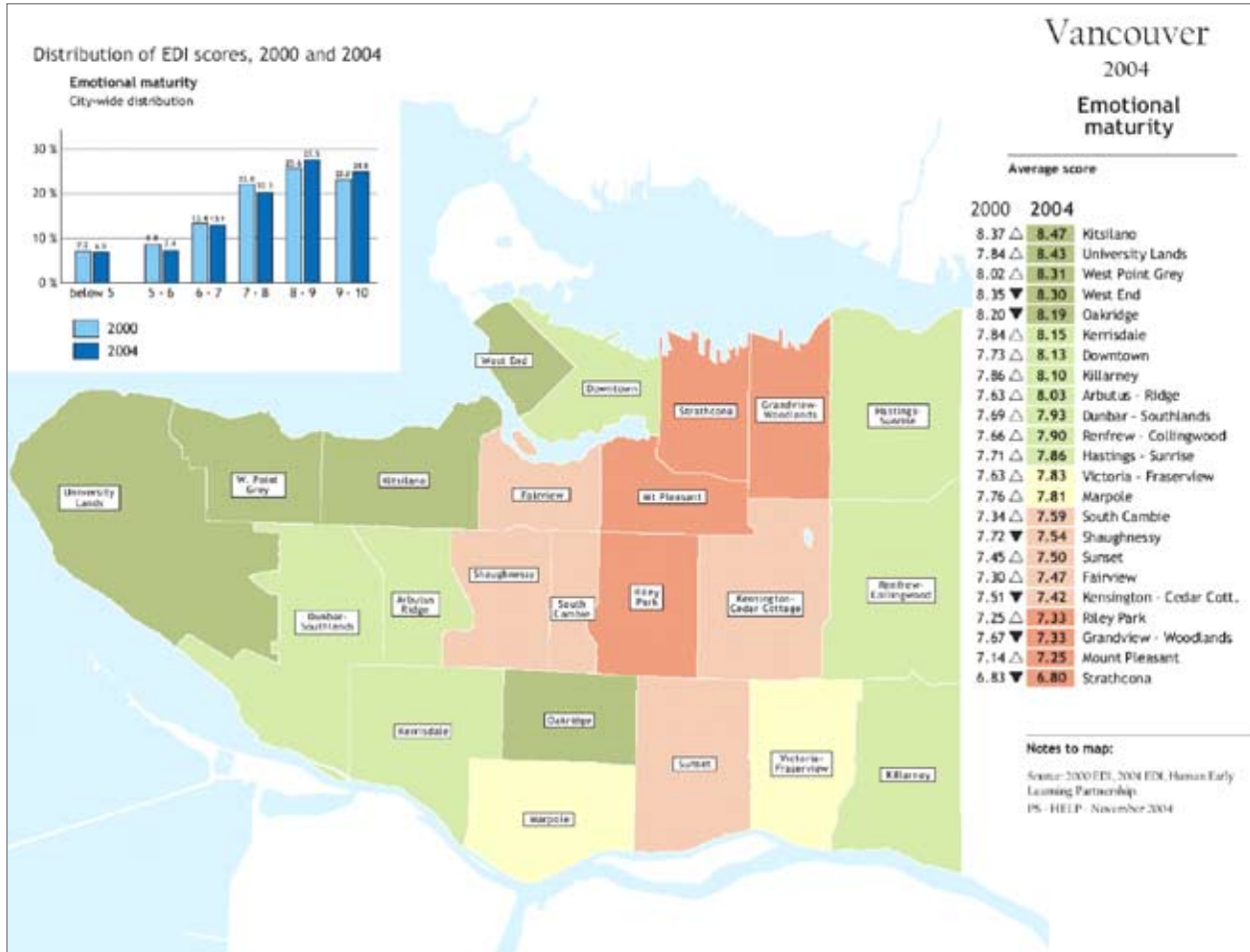
By the end of the 2006-2007 school year, we will have completed EDI on all BC school districts at least twice, once between 2000 and 2004 and a second time between 2004 and 2007. In order to make reliable inferences about child development over time, these data are being examined in several ways, using the scores that individual children receive for each scale, average neighbourhood scores, and neighbourhood vulnerability rates.

Our criteria for evidence of positive change over time are:

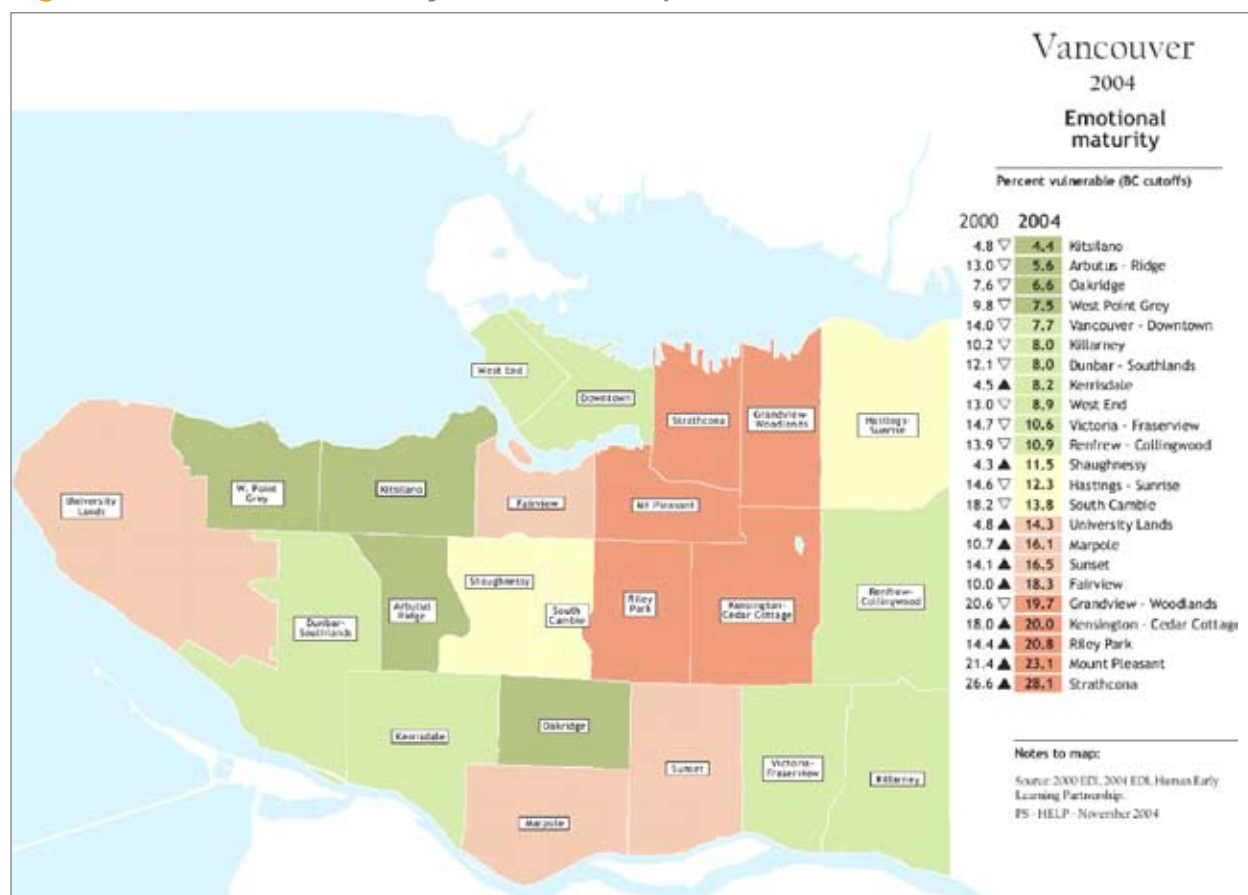
- An upward shift in the distribution of individual scores across the entire district;
- Increasing average scores across neighbourhoods;
- Decreasing inequality in average scores across neighbourhoods;
- Decreasing proportions of vulnerable children across neighbourhoods; and
- Decreasing inequality in the proportion of vulnerable children across neighbourhoods.

Conversely, the reverse will signal clear evidence of negative change. Figures 5 and 6 illustrate these principles using the Vancouver School District as a visual example.

Figure 5: Emotional maturity in Vancouver (average score).



**Figure 6: Emotional maturity in Vancouver (percent vulnerable).**



### Understanding the State of ECD in Special Populations

As of February 2005, the Human Early Learning Partnership had completed EDI evaluations on more than 3,500 Aboriginal children around the province. These represent a complete sample of those in public Kindergarten, but lower coverage of those in exclusively Aboriginal schools.

Nonetheless, our sample represents at least 80% of Aboriginal Kindergarten-children in British Columbia. In 51 geographic school districts, there were sufficient numbers of Aboriginal children to report average EDI scores and vulnerability rates without compromising confidentiality. The level of vulnerability on any EDI-scale category among Aboriginal children ranges from 19.2% to 80.0% (see Figure 7). This range of vulnerability is very wide, stretching from better-than-average vulnerability (less than 24% is better than average) to high. Rather than emphasizing how Aboriginal children are doing on average compared to the broader population, our work directs attention to the range of vulnerability between the Aboriginal children in each district. It shows that the range of vulnerability for Aboriginal children across communities is huge, and largely overlaps the range for the population as a whole. This, in turn, emphasizes the relevance of the question “Why are some communities better places for Aboriginal children to grow up in than others?”



---

# Early Child Development and Early School Achievement: A test for the EDI, Results from the Québec Longitudinal Study of Child Development

Michel Boivin  
Jean-Pascal Lemelin  
Nadine Forget-Dubois  
Ginette Dionne  
Jean Séguin  
Richard E. Tremblay  
*Groupe de recherche sur l'inadaptation psychosociale chez l'enfant (GRIP) /  
Research unit on children's psychosocial maladjustment  
Université Laval  
Université de Montréal*



## *The Early Childhood Development Monitoring Context*

There are operational constraints on the choice of ECD indicators in a Canada-wide monitoring context:

- ECD indicators must be suitable to a population-based assessment, with territorial/community components. This precludes the use of extensive batteries. It might also preclude the use of direct assessments of ECD unless they are short and easy to administer.
- ECD indicators must also be suitable to repeated assessments of the same communities (i.e., they must be reliably sensitive to community differences and change).
- ECD indicators should reflect the multidimensional nature of ECD (i.e., cognitive, language, motor, socio-emotional skills, and knowledge components).
- Finally, the validity of ECD indicators should be based on their predictive accuracy with respect to short-, medium-, and long-term outcomes. In that sense, early school achievement may be seen as an ecologically valid outcome.

---

### *What Should Be the Unit of Measurement: The Community, the Family, or the Individual Child?*

The answer to this depends on the question asked, but we believe that much can be gained by having an ECD indicator assessed at the child level. The rationale is as follows:

- The environment is multilayered and some environmental influences on the child are likely to be indirect influences: community-level or more distal environmental factors (e.g., the quality of the neighbourhood) are likely to affect children through their effects on more proximal environmental factors (e.g., the quality of parenting). These influences may affect children of the same family differently. Thus, in addition to interfamily differences, intrafamily differences are likely and should be monitored.
- Bio-psycho-social processes (e.g., gene x environment interactions; that is, the impact of a given environment on the child varying as a function of his/her genotype) are likely involved in ECD, and these processes operate at the individual level.
- Changes in communities are ambiguous. Communities change by attrition. People move in and out of communities. It is important to keep track of these changes to understand changes in communities.
- Higher level (i.e., community-level) descriptors can be reliably construed on lower level (i.e., child-level) data.
- Hence, the individual child is a good level to start with.

### *Child-level Indicators of ECD: What Is out There?*

ECD indicators can be categorised in two groups. The first group includes direct assessments of cognitive and language skills. Direct assessments can be further grouped in two subcategories. The first subcategory comprises inventories, which consist of short, multidimensional assessments of cognitive school readiness (e.g., Metropolitan Readiness Test or the Lollipop test, Chew & Morris, 1984; Scarpati & Silver, 1999). The second subcategory includes more general assessments (proxies), such as IQ tests and verbal proficiency measures (Blair, 2001; La Paro & Pianta, 2000). The potential problem with these general assessments is that they do not reflect the multifactorial nature of school readiness.

The second group includes indirect measures (e.g., ratings by parents, teachers, and, where age appropriate, children). Among these are ad hoc ratings (proxies such as aggression) and more multidimensional ratings such as the EDI—the focus of our attention here.

### *The Québec Longitudinal Study of Child Development (QLSCD)*

We have examined a number of questions relating to the predictive validity of the EDI within the QLSCD. The QLSCD is an ongoing prospective longitudinal study of children, beginning at 5 months of age. The sample is representative of all single-infant births in 1998 in the province of Québec.

---

The main goals of the QLSCD are to describe and understand the developmental trajectories of emotional, cognitive, behavioural, and school adjustment during early and middle childhood. The QLSCD includes multivariate assessments of child developmental outcomes measured longitudinally, as well as extended and detailed multilevel assessments of environmental factors (e.g., SES, parents' behaviours). The QLSCD also shares features with two other major longitudinal studies, including a sample of twins (Québec Newborn Twin Study) and the National Longitudinal Study of Children and Youth (NLSCY).

Several ECD measures have been used in the QLSCD, beginning at the age of 42 months. These include the Block Design subtest of the Wechsler Preschool and Primary Scale of Intelligence–Revised (WPPSI-R), the Peabody Picture Vocabulary Test (PPVT), the Visually Cued Recall test (VCR), the Number Knowledge test (NKT), the Lollipop test, the EDI, and teacher ratings of school achievement (Grades 1 to 3).

**Question 1: How well can we predict early school achievement from late-preschool information?**

In an initial predictive trial, we chose a “shotgun” approach: our aim was to achieve the best prediction of early (teacher assessed) school achievement from Kindergarten assessments. Thus we used a variety of information collected in Kindergarten to predict school achievement in Grade 1: the Block Design, the PPVT, the VCR, the NKT, the Lollipop test, the EDI, and parent ratings of social behaviour.

A regression analysis showed that 54% of the variance in school performance could be predicted from this entire set of predictors. Significant predictions could be obtained from 41 months on. Once Kindergarten information was taken into account, however, measures taken earlier did not add to the prediction of early school achievement. Thus, early school achievement is fairly well predicted from Kindergarten data.

**Question 2: How well does the EDI predict early school achievement?**

We entered all EDI subscales as predictors in a second regression analysis. The EDI alone predicted 37% of the variance in early school achievement, which amounts to 69% of the predictive power of the shotgun approach.

The following scales had a significant contribution to the prediction: physical readiness for school day ( $\beta = .07$ ), approaches to learning ( $\beta = .13$ ), readiness to explore new things ( $\beta = -.09$ ), hyperactivity/inattention ( $\beta = -.09$ ), basic numeracy skills ( $\beta = .19$ ), advanced literacy skills ( $\beta = .12$ ), communication and general knowledge ( $\beta = .27$ ).

We also compared the EDI to the Lollipop test, a direct, multidimensional assessment of cognitive school readiness. The Lollipop test predicted 34% of the variance in early school achievement, with significant contributions from all of its four subtests: colours and shapes ( $\beta = .12$ ), spatial recognition ( $\beta = .09$ ), numbers ( $\beta = .14$ ), and letters ( $\beta = .44$ ).

We then compared the predictive validity of the EDI to an extensive cognitive battery composed of the following assessments: the Block Design, the PPVT, the VCR, and the NKT. A third regression analysis showed that this battery predicted 35% of the variance in early school achievement, with a significant contribution from all four tests: PPVT

---

( $\beta = .21$ ), block design ( $\beta = .16$ ), NKT ( $\beta = .36$ ), and memory task ( $\beta = .09$ ).

Finally, we compared the predictive validity of the EDI to that of the cognitive battery plus the Lollipop test. A fourth regression analysis showed that the combination of the cognitive battery and the Lollipop test explained 45% of the variance in early school achievement, with a significant contribution from all of these measures except for the spatial recognition subtest of the Lollipop: PPVT ( $\beta = .15$ ), block design ( $\beta = .13$ ), NKT ( $\beta = .21$ ), memory task ( $\beta = .08$ ), colours and shapes ( $\beta = .08$ ), numbers ( $\beta = .06$ ), and letters ( $\beta = .31$ ).

Thus, with respect to predicting early school achievement, the EDI performed very well when compared to an extensive battery of direct measures of ECD.

**Question 3: How much does the EDI add to the prediction of early school achievement by a direct measure?**

Here our aim was to examine the amount of explained variance in early school achievement that could be added by the EDI after taking into account the prediction from a direct assessment of school readiness (i.e., the Lollipop test). We performed a hierarchical regression analysis in which the subtests of the Lollipop were entered simultaneously in a first step and the subscales of the EDI were entered simultaneously in a second step. Overall, 46% of the variance in early school achievement was accounted for by the two measures. The EDI added 12% of the variance after the Lollipop was considered. However, three of the four subtests of the Lollipop still significantly contributed to the prediction. Specifically, the results suggest that a significant part of the Letters subtest remains unaccounted for by the EDI ( $\beta$  of the Letters subtest only drops from .41 to .29).

We also did the reverse; that is, we examined the amount of explained variance in early school achievement that could be added by the Lollipop test after taking into account the prediction from the EDI. Results were similar. The Lollipop added 10% of the variance after the EDI was considered. All EDI subscales found earlier to contribute significantly to the prediction (see Question 2) were still significant contributors after the Lollipop was entered in the regression analysis, except for the hyperactivity/inattention scale. Thus, redundancy is only moderate and important aspects of literacy in Kindergarten may not be well covered when only one of these two measures is used.

We also examined the association between the EDI and language skills (specifically, receptive vocabulary). A regression analysis was conducted in which the PPVT was the dependent variable and the EDI subscales the independent variables: 20% of the variance in receptive vocabulary could be predicted from the EDI. The two following scales had a significant contribution to the prediction: basic numeracy skills ( $\beta = .13$ ) and communication and general knowledge ( $\beta = .35$ ).

Thus, much could be gained with respect to predicting early school achievement by adding information about literacy skills to the EDI.

---

#### **Question 4: How well does the EDI account for the association between the early socio-demographic risk factors and school achievement?**

Early socio-demographic risk factors were associated to later school difficulties. In our study, these risk factors accounted for 13% of the variance in early school achievement, with a significant contribution from the following risk factors: mother's low education level, father's low education level, young motherhood, SES, and gender (in particular, boys did less well in school).

We looked at the contribution of the EDI to the prediction of early school achievement, after taking into account the early socio-demographic risk factors. The EDI accounted for an additional 39% of the variance in early school achievement. It also accounted for SES and gender contributions to early school achievement, but not for mother's and father's low education levels, nor for young motherhood. In other words the EDI only partly accounted for the contribution of these early socio-demographic risk factors to early school adjustment. It is not clear at this point what mediates this unaccounted-for prediction by early socio-demographic risk factors. However, in this regard, the Lollipop did less well than the EDI (i.e., it only accounted for the gender contribution).

#### **Preliminary Conclusions**

The EDI is a useful tool for the prediction of early school achievement; however, some questions remain. First, does the EDI predict later school achievement as well as early school achievement? Does the EDI predict more general school adjustment indicators (e.g., peer relations)? Are there specific family factors and practices accounting for cognitive aspects of school readiness? These questions will be examined in a near future as the QLSCD unfolds.

Not all dimensions of the EDI had a significant unique contribution to the prediction of early school achievement. In the context of a Canada-wide monitoring initiative, the EDI could be reduced accordingly. This proposition, however, may be premature, because such an operation would have to take into account the medium- to long-term predictive accuracy of the EDI, as well as the predictive validity of some of the EDI subscales with respect to social-emotional outcomes. It should, however, be possible to derive a short form of the EDI with similar predictive validity.

Some aspects that appear to be central to successful school transition (e.g., literacy skills) may need further and more detailed assessment. Accordingly, it might be useful to complement the EDI with appropriate measures.

The EDI is designed for the late-preschool period, as a cumulative outcome measure of ECD since birth. The state of ECD in Kindergarten, however, may be predicted from an earlier period. To this end, we should work towards the creation of an EDI version for the toddler period.

---

## From EDI to FSA: Longitudinal Analysis with Linked Population Data

Jennifer E.V. Lloyd  
Clyde Hertzman  
*Human Early Learning Partnership*



The Human Early Learning Partnership's Child & Youth Developmental Trajectories Research Unit (CYDTRU) has been exploring changes in British Columbian children's development over time via the individual-level linkage of two population data sets: the Early Development Instrument (EDI), a measure of school readiness administered in students' Kindergarten year, and the British Columbia Ministry of Education's Foundation Skills Assessment (FSA), a Grade 4 measure of academic skills.

By linking these two data sets at the individual level, it is possible to compute a C-to-B Ratio (CBR) for each neighbourhood in British Columbia, Canada. The CBR is a simple index of change created by HELP to describe the changing development of British Columbian children, at the neighbourhood level, across Kindergarten and Grade 4.

### *More about the Population Data Sets*

#### *The Kindergarten Data: The Early Development Instrument (EDI)*

In the spring of the Kindergarten year, British Columbia teachers or early childhood educators complete the EDI on behalf of all of the students in their classrooms. The EDI combines several areas that have been identified as relevant to children's school readiness: physical health and well-being, social competence, approaches to learning, emotional maturity, language development, cognitive development, communication skills, and general knowledge (Doherty, 1997; Janus et al., 2007; Kagan, 1992; Keating & Hertzman, 1999).

#### *The Grade 4 Data: The Foundation Skills Assessment (FSA)*

The FSA is designed to measure the reading comprehension, numeracy, and writing skills of 4th- and 7th-grade students throughout British Columbia. The FSA is administered in public and funded independent schools across the province in late April/early May of each year. Approximately 40,000 students per grade level write the FSA each year.

### *Linking the EDI to the FSA*

The linkage rate between individual children's EDI and FSA records is very high across the available school years:

- 89% for the 1999/2000 EDI administration:
  - 3782 out of 4267 EDI records were linked to FSA numeracy scores four years later;
  - 3783 out of 4267 EDI records were linked to FSA reading comprehension scores four years later;

- 87% for the 2000/2001 EDI administration:
  - 3173 out of 3643 EDI records were linked to FSA numeracy scores four years later; and
  - 3172 out of 3643 EDI records were linked to FSA reading comprehension scores four years later.

### *What Is Meant by EDI and FSA “Vulnerability”*

The computation of the C-to-B Ratio for a given neighbourhood requires first identifying the neighbourhood’s individual children as being either “vulnerable” or “not vulnerable,” not only on the EDI but also on the FSA. Here, a child is “vulnerable” on the EDI if any of his or her domain scores (social, emotional, physical, language, or communication) falls below the domain-specific, provincial cut-off score—a fixed score corresponding to the bottom 10% of the provincial distribution of domain-specific, Cycle 1 EDI data.<sup>2</sup> Conversely, a child is identified as “not vulnerable” on the EDI if none of his or her domain scores falls below the domain-specific cut-off score. It is this omnibus (across domain) “ever risk” flag that is used in the calculation of the C-to-B Ratios here.

A child’s FSA “vulnerability” in a given domain (reading comprehension or numeracy) is due to his or her score being “below provincial expectations” (a label assigned to the child’s domain score by the Ministry itself) or the child’s not completing the test. All other scores are identified as “not vulnerable”. It should be noted that we have chosen slightly different language to describe children’s FSA “vulnerability” or “non vulnerability,” so as to preserve the rather more academic nature of the Ministry’s assessment, “not passed” and “passed,” respectively.

### *Four EDI-to-FSA “Pathways”*

Using the aforementioned criteria for flagging a given child’s EDI and FSA performances as being vulnerable or not vulnerable to risk, it is possible to classify pathways from, or deflections between, Kindergarten to Grade 4 in four ways. As Table 1 describes, children who are not vulnerable on the EDI and who also passed the FSA can be thought of as following Pathway A (a positive trajectory over time). Even more promising are children who follow Pathway C: vulnerable on the EDI and nonetheless passed the FSA four years later (a positive deflection).

In contrast, children who are vulnerable on the EDI and do not pass the FSA are thought to follow Pathway D (a negative trajectory over time). Arguably, the least promising of the four patterns is Pathway B, which describes those children who are not vulnerable on the EDI, yet do not pass the FSA four years later (a negative deflection).

---

2. For the specific rationale for the 10% vulnerability cut-off, please see Janus et al. (2007).

**Table 1: Four EDI-to-FSA Pathways.**

		FSA (Grade 4)	
		Passed	Did Not Pass
EDI (Kindergarten)	Not Vulnerable	Pathway A (+)	Pathway B (-)
	Vulnerable	Pathway C (+)	Pathway D (-)

Note. (+) = a “positive” trajectory or deflection, (-) = a “negative” trajectory or deflection

### The C-to-B Ratio (CBR)

By identifying individual children as following Pathways A, B, C, or D, a unique C-to-B Ratio can be calculated for each of the nearly 60 neighbourhoods across British Columbia in which longitudinal analysis is currently possible (EDI years 1999/2000 and 2000/2001).

In essence representing the ratio of positive to negative pathways/deflections for a given neighbourhood, the C-to-B Ratio is calculated as follows:

$$\text{CBR} = [C / (C + D)] / [B / (A + B)]$$

where:

- **A** = Count of children “not vulnerable” on EDI at Kindergarten who “passed” the FSA in Grade 4 (a positive trajectory);
- **B** = “Not vulnerable” on EDI, yet “did not pass” FSA (a negative deflection);
- **C** = “Vulnerable” on EDI, yet “passed” the FSA (a positive deflection); and
- **D** = “Vulnerable” on EDI and “did not pass” FSA (a negative trajectory).

### Results

As described in Table 2, the average CBR for reading comprehension (4.94) is lower than that for the numeracy subtest (6.75). More noteworthy is that the range of respective reading comprehension and numeracy CBRs varies widely across the relevant British Columbia neighbourhoods: from 2.87 to 23.36 (numeracy) and from 1.45 to 25.88 (reading comprehension).

**Table 2: C-to-B Ratio: Descriptive Statistics.**

	Mean	SD	Median	Minimum	Maximum
Numeracy	6.75	4.10	5.40	2.87	23.36
Reading	4.94	4.33	3.57	1.45	25.88

---

CYDTRU's subsequent analyses have revealed that, as would perhaps be expected, higher CBRs (relatively high ratio of positive to negative deflections) are generally found in neighbourhoods with the lowest risk of vulnerability and those that are the richest economically, whereas the lowest CBRs (relatively low ratio of positive to negative deflections) are found in neighbourhoods with the highest risk of vulnerability and those that are the poorest.

Various neighbourhoods, however, show higher or lower CBRs than would otherwise be expected given their respective rates of vulnerability and their socio-economic status. Therefore, in order to better understand the variation in neighbourhood-level CBR scores across British Columbia, it is necessary, as a future step, to explore to a fuller degree the socio-economic determinants of the variation. Such research is currently underway at the Human Early Learning Partnership.

---

## DISCUSSANT'S FEEDBACK

Ray Peters  
Queen's University



This is the first face-to-face working meeting for the Monitoring Committee of the newly formed Early Childhood Learning Knowledge Centre (ECLKC). ECLKC has three other committees: the Directing Committee, the Scientific Committee, and the Knowledge Exchange Committee. ECLKC is one of five Knowledge Centres established at the end of 2005 by the Canadian Council on Learning (CCL).

One of the first projects undertaken by CCL, even before the five knowledge centres were operating, was to begin the development of the Composite Learning Index (CLI). This index is designed to provide a single numerical index of the state of learning in Canada, from its youngest to its oldest citizens. It is intended to be the lifelong-learning analogue of the Gross National Product (GNP).

One of the first tasks of ECLKC was to review the various early learning measures of the CLI. These measures were meant to reflect the state of early childhood learning (ages birth to 6 years) in Canada at any particular point in time. CCL's intent was to collect all the relevant measures of lifelong learning available which reflected or predicted adult productivity and well-being. CCL announced its intent to release the first CLI in April of 2006.

After several discussions in late 2005 and early 2006, the initial membership of ECLKC Directing Committee decided to inform CCL that in the opinion of ECLKC, the measures of early childhood learning to be included in the CLI were inadequate and should not be included in the first iteration of the CLI. CCL subsequently deleted these measures from the first CLI released in 2006.

In agreeing to eliminate the early child measures for the first version of the CLI, however, CCL also issued a challenge to ECLKC to work towards identifying specific measures of early learning that could be incorporated into future versions of the CLI. Responding to this challenge has become the defining issue for the Monitoring Committee, and this workshop was organised to begin to address it. In particular, the workshop was designed to: (1) hear from the Monitoring Committee members actively involved in research involving indicators of early childhood learning; and (2) discuss with several members of CCL the purpose and methods used in the first application of the CLI, in order to better understand how the Monitoring Committee could contribute to the next version.

I commented that measuring early childhood *learning* was essentially measuring early childhood *development* (ECD), and that the measures of ECD presented in these meetings were good candidates for consideration for inclusion in the CLI; however, I also expressed my opinion that to attempt to capture lifelong learning in a single number was incredibly ambitious, if not naïve. Even to attempt to reflect ECD in a single index flies in the face of current attempts to identify and quantify the various domains of ECD, such as those reflected in the Janus/Offord Early Development Instrument (EDI), now being employed widely in

---

many provinces, and Doug Willms' Early Years Evaluation (EYE). These domains include physical, social, emotional, language, and cognitive development among others.

I suggested that we consider using such measures as the EDI as an index of ECD or early childhood learning at age 5, rather than the current CLI strategy of one index for all learning across such a wide age span. I believe that it is important to have the discussion of such a possibility with CCL now, because, if there were *either* no interest in such an approach on the part of the other members of the Monitoring Committee or a definite opposition to considering such an approach on the part of those developing the CLI, then the task of the Monitoring Committee would be quite different in the future. (Ensuing discussion seemed to indicate an interest in discussing such an approach from both Monitoring Committee and CCL members).

I emphasized the need to identify or, in some cases develop, pan-Canadian indicators of ECD, building on the work in Manitoba, British Columbia, and Québec on province-wide implementation of the EDI and linking it to other administrative data sets in health and social services. I bemoan the lack of progress in many Canadian jurisdictions in linking child-level data sets, and I emphasize this as an important task for the Monitoring Committee: not to preach to the converted, but to encourage and support provincial and territorial governments to learn from the work of, for example, Manitoba and BC (as presented at this workshop's meetings by Marni Brownell, Clyde Hertzman, and Jennifer Lloyd). Can (or should) the Monitoring Committee make this a public information campaign?

Another concern I raised was the current divide between EDI and EYE proponents in Canada. This is confusing for many at the upper policy levels, and is an important issue for many researchers attempting to convince governments to measure ECD in a consistent and ongoing way. Is the resolution of this issue a task for the Monitoring Committee?

I closed by thanking those who organised the meetings so well, especially Jane Bertrand and Jennifer Lloyd, thanked the three CCL representatives for their active participation, and applauded the spirit of cooperation and mutual problem-solving that characterised the two-day event.

---

## REFERENCES

- Blair, C. (2001). The early identification of risk for grade retention among African American children at risk for school difficulty. *Applied Developmental Science, 5*, 37-50.
- Boyle, M. H., & Lipman, E. L. (2002). Do places matter? Socio-economic disadvantage and child problem behaviour in Canada. *Journal of Consulting and Clinical Psychology, 70*(2), 378-389.
- Brooks-Gunn, J., Duncan, G. J., & Britto, P. R. (1999). Are socio-economic gradients for children similar to those for adults? Achievement and health of children in the United States. In D. Keating & C. Hertzman (Eds.), *Developmental Health and the Wealth of Nations: Social, biological, and educational dynamics* (pp. 94-124). New York: Guilford Press.
- Brooks-Gunn, J., Duncan, G. J., Klebanov, P. K., & Sealand, N. (1993). Do neighborhoods influence child and adolescent development? *American Journal of Sociology, 99*(2), 353-395.
- Brownell M. D., Roos, N., Fransoo, R., Guèvremont, A., MacWilliam, L., Derksen, S., Dik N., Bogdanovic, B., & Sirski, M. (2004). *How do educational outcomes vary with socio-economic status? Key findings from the Manitoba Child Health Atlas 2004*. Winnipeg, Manitoba: Manitoba Centre for Health Policy.
- Brownell M. D., Roos, N. P., Fransoo, R., Roos, L. L., Guèvremont, A., MacWilliam, L., Yallop, L., & Levin, B. (2006). Is the class half empty? A population-based perspective on socio-economic status and educational outcomes. *IRPP Choices, 12*(5), 1-30.
- Burton, L. M., & Jarrett, R. L. (2000). In the mix, yet on the margins: The place of families in urban neighborhood and child development research. *Journal of Marriage and the Family, 62*(4), 1114-1135.
- Case, A., Lubotsky, D., & Paxson, C. (2002). Economic status and health in childhood: The origins of the gradient. *The American Economic Review, 92*(5), 1308-1334.
- Chen, E., Matthews, K. A., & Boyce, W. T. (2002). Socio-economic differences in children's health: How and why do these relationships change with age? *Psychological Bulletin, 128*(2), 295-329.
- Chew, A. L., & Morris, J. D. (1984). Validation of the Lollipop Test: A diagnostic screening test of school readiness. *Educational and Psychological Measurement, 44*(4), 987-991.
- Cicchetti, D., & Walker, E. F. (Eds.). (2007). *Neurodevelopmental mechanisms in psychopathology*. New York: Cambridge University Press.
- Doherty, G. (1997). *Zero to six: The basis for school readiness*. (Report #R-97-8E), Ottawa, Ontario: Human Resources Development Canada.
- Entwisle, D. R., & Alexander, K. L. (1999). Early schooling and social stratification. In R. C. Pianta & M. J. Cox (Eds.), *The transition to Kindergarten* (pp. 13-38). Baltimore, MD: Brookes Publishing.
- Hertzman, C. (1999). Population health and human development. In D. Keating & C. Hertzman (Eds.), *Developmental Health and the Wealth of Nations: Social, biological, and educational dynamics* (pp. 21-40). New York: Guilford Press.

- 
- Hertzman, C. (2000). The case for an early childhood development strategy. *Isuma: Canadian Journal of Policy Research*, 1(2), 11-18.
- Hertzman, C., McLean, S. A., Kohen, D., Dunn, J., & Evans, T. (2002). Early development in Vancouver: Report of the Community Asset Mapping Project (CAMP). Vancouver, British Columbia: Human Early Learning Partnership.
- Hertzman, C., Power, C., Matthews, S., & Manor, O. (2001). Using an interactive framework of society and lifecourse to explain self-rated health in early adulthood. *Social Science and Medicine*, 53(12), 1575-1585.
- Janus, M., Brinkman, S., Duku, E. K., Hertzman, C., Santos, R., Sayers, M., Schroeder, J., & Walsh, C. (2007). *The Early Development Instrument: A population-based measure for communities. A handbook on development, properties, and use*. Hamilton, Ontario: Offord Centre for Child Studies.
- Janus, M., & Duku, E. K. (2005). *Normative data for the Early Development Instrument*. Retrieved August 9, 2007, from the Offord Centre Web site: <http://www.offordcentre.com/readiness>
- Janus, M., & Offord, D. (2007). Development and psychometric properties of the Early Development Instrument (EDI): A measure of children's school readiness. *Canadian Journal of Behavioural Science*, 39(1), 1-22.
- Kagan, S. L. (1992). Readiness past, present, and future: Shaping the agenda. *Young Children*, 48(1), 48-53.
- Keating, P., & Hertzman, C. (1999). *Developmental health and the wealth of nations: Social, biological, and educational dynamics*. New York: Guilford Press.
- La Paro, K. M., & Pianta, R. C. (2000). Predicting children's competence in the early school years: A meta-analytic review. *Review of Educational Research*, 70(4), 443-484.
- Love, J. M., Aber, J. L., & Brooks-Gunn, J. (1994). *Strategies for assessing community progress toward achieving the First National Educational Goal*. Princeton, NJ: Mathematica Policy Research, Inc.
- Rogoff, B., Sellers, M. J., Pirota, S., Fox, N., & White, S. H. (1975). Age of assignment of roles and responsibilities to children: A cross-cultural survey. *Human Development*, 18(5), 353-369.
- Roos, N. P., Brownell, M., Guèvremont, A., Fransoo, R., Levin, B., MacWilliam, L., & Roos, L. (2006). The true story: A population-based perspective on school performance and educational testing. *Canadian Journal of Education*, 29(3), 1-22.
- Sameroff, A. J., & Haith, M. M. (1996). Interpreting developmental transitions. In A. J. Sameroff & M. M. Haith (Eds.), *The five to seven year shift: The age of reason and responsibility* (pp. 3-30). Chicago, IL: University of Chicago Press.
- Scarpati, S., & Silver, P. G. (1999). Readiness for academic achievement in preschool children. In E. V. Nuttall, I. Romero, & J. Kalesnik (Eds.), *Assessing and screening preschoolers: Psychological and educational dimensions*, 2<sup>nd</sup> ed. (pp. 262-280). Boston, MA: Allyn & Bacon.

---

## VISION AND MISSION STATEMENTS

### *Vision*

The vision of the ECLKC Monitoring Committee is a coordinated system of early child development statistics for Canada that charts whether or not we are making progress in fulfilling our commitment to help young children thrive.

### *Mission*

The Monitoring Committee's mission is to promote discussion and consensus building among key stakeholders in Canadian society in order to create a high quality coordinated system of early child development statistics.

---

## **ABOUT THE EARLY CHILDHOOD LEARNING KNOWLEDGE CENTRE**

The Early Childhood Learning Knowledge Centre (ECLKC) is one of five knowledge centres created and funded by the Canadian Council on Learning (CCL).

ECLKC is comprised of a national consortium led by the Université de Montréal's Centre of Excellence for Early Childhood Development (CEECD).

Three committees carry out ECLKC's work and activities:

- A Scientific Committee;
- A Monitoring and Reporting Committee; and
- A Knowledge Exchange Committee.

The Centre also relies on a Directing Committee and an Advisory Committee, both comprised of experts from various organisations from across Canada.

ECLKC's mission is to enhance the knowledge of parents, service providers, service planners, and policy-makers in early childhood learning. In the long term, this knowledge will improve the quality of early childhood environments and optimize the learning conditions and school-entry preparation of young children.

ECLKC's work involves: (1) gathering and transferring leading scientific knowledge on the conditions that foster early childhood learning and development from conception to age five; (2) identifying research that should be carried out in order to improve scientific knowledge on the conditions that foster early childhood learning; and (3) determining the best ways to monitor the progress of early childhood learning outcomes.

## **ABOUT THE ECLKC MONITORING COMMITTEE**

ECLKC's Monitoring Committee, comprised of many of the scholars who attended the workshop, works to identify existing early learning indicators and recommend indicators that should be developed.

---

## AFFILIATIONS OF THE WORKSHOP ATTENDEES AND/OR MONITORING COMMITTEE'S MEMBERS

Jane Bertrand  
*University of Toronto*

Anne Biscaro  
*Niagara Region Health Department*

Michel Boivin  
*Université Laval*

Chris Boughton  
*Canadian Council on Learning*

Leanne Boyd  
*Healthy Child Manitoba*

Marni Brownell  
*Manitoba Centre for Health Policy  
University of Manitoba*

René Carbonneau  
*Université de Montréal*

Fernando Cartwright  
*Canadian Council on Learning*

Carol Crill-Russell  
*Invest in Kids*

John Doherty  
*Council for Early Childhood Development*

Claire Gascon-Giard  
*Early Childhood Learning Knowledge Centre*

David Hay  
*Canadian Policy Research Network*

Clyde Hertzman  
*Human Early Learning Partnership*

Magdalena Janus  
*Offord Centre for Child Studies  
McMaster University*

Dafna Kohen  
*Statistics Canada*

Marc Lachance  
*Canadian Council on Learning*

John LeBlanc  
*Dalhousie University*

Jennifer E.V. Lloyd  
*Human Early Learning Partnership*

Nathalie Moragues  
*Early Childhood Learning Knowledge Centre*

Ray Peters  
*Queen's University*

Stuart Shanker  
*Council for Early Child Development*

Richard E. Tremblay  
*Research unit on children's psychosocial  
maladjustment, Université de Montréal*

Robin Williams  
*Niagara Region Health Department*

---

## RELATED LINKS

Canadian Council on Learning

[www.ccl-cca.ca](http://www.ccl-cca.ca)

Canadian Policy Research Networks

[www.cprn.com/](http://www.cprn.com/)

Composite Learning Index

[www.ccl-cca.ca/CCL/Reports/CLI2007](http://www.ccl-cca.ca/CCL/Reports/CLI2007)

Convention on the Rights of the Child

[www.unicef.org/crc/](http://www.unicef.org/crc/)

Early Childhood Learning Knowledge Centre

[www.ccl-cca.ca/CCL/AboutCCL/KnowledgeCentres/EarlyChildhoodLearning](http://www.ccl-cca.ca/CCL/AboutCCL/KnowledgeCentres/EarlyChildhoodLearning)

Early Development Instrument

[www.offordcentre.com/readiness/EDI\\_viewonly.html](http://www.offordcentre.com/readiness/EDI_viewonly.html)

Groupe de recherche sur l'inadaptation psychosociale chez l'enfant (GRIP)  
Research unit on children's psychosocial maladjustment

[www.gripinfo.ca/](http://www.gripinfo.ca/)

Human Early Learning Partnership

[www.earlylearning.ubc.ca](http://www.earlylearning.ubc.ca)

Manitoba Centre for Health Policy

[www.umanitoba.ca/centres/mchp/reports/child\\_inequalities/index.shtml](http://www.umanitoba.ca/centres/mchp/reports/child_inequalities/index.shtml)

World Health Organization

[www.who.int/en/](http://www.who.int/en/)