

## TOP 10 TOPICS:

- LANGUAGE
- MEMORY
- SOCIAL SKILLS
- HEALTH
- GENETICS
- AND MUCH MORE...

# 10 X 10 100 REASONS TO CELEBRATE ECD RESEARCH IN CANADA

BY MICHEL BOIVIN AND RICHARD E. TREMBLAY

Once again, for the tenth consecutive year, we present our annual Top Ten compilation of early childhood development research in Canada. As always, the selection is eclectic and reflects the breadth and wide-ranging nature of ECD research. The complex, transactional and bio-social nature of early development is the common thread running through this compilation of reviews, meta-analyses and original articles.

A solid group of reviews and empirical articles deals with various aspects of **early social-emotional and cognitive development**. For instance, one review paper proposes an integrative framework for describing how cognitive and social factors interact in the early development of social skills, placing special emphasis on the role of executive function and mother-child joint attention in the pro-

cess. Another review looks at the multidimensional character of language development in the first year of life and documents how this process starts *in utero*. Another study challenges the view that older children have better memory than younger children, and thus that memory grows with age.

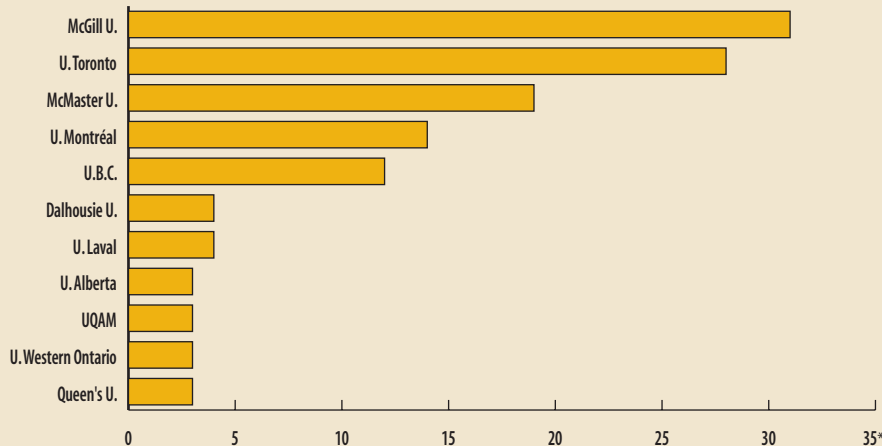
**Gene-environment research** is usually well represented in our Top Ten, and this year

is no exception. A review paper discusses the epigenetic mechanisms underlying the possible biological embedding, through parenting and home environment, of poverty effects on early child development. An empirical paper reveals a complex pattern of genes by environment interactions predicting mood disorder and suicide attempts: several genes that regulate the neurotransmitter serotonin seem to be involved, but each presents a unique pattern of association with mental health outcomes.

As usual, **clinical and epidemiological research**, often with an international scope, is strongly represented in our Top Ten. One study presents results showing that children with bipolar parents are more likely to develop psychiatric disorders, including ADHD. Infant nutrition and breastfeeding is another hot topic. One randomized clinical trial shows how a simple hydrolyzed formula may prevent at-risk children from developing autoantibodies associated with diabetes. Another international study looks at mother-to-child transmission of HIV through breastfeeding, finding that even mothers who were HIV-negative (but who later seroconverted) carry a significant risk of transmitting HIV to their infant. The power of meta-analyses is shown in a review paper concluding that overweight and obese women who become pregnant have an increased risk for premature delivery. One international report presents national and regional statistics on young child deaths and stresses the importance of these statistics for planning ECD policies and programs. These findings all point to the importance and challenges of the early identification and prevention of health problems.

Over the past decade, our annual Top Ten compilation of ECD research in Canada has highlighted a total of 100 scientific papers. The graph to the left illustrates where world-class ECD research is produced in Canada. The 11 institutions listed account for 85% of the Top Ten publications, showing that top ECD research is present in all regions of Canada.

## TOP 100 PAPERS (2001-2010)



\* Number of papers with at least one author from a Canadian institution.

Only shown in this graph, those with at least three publications in the top 100 (2001-2010).

**TABLE 1 – MOST CITED PAPER EACH YEAR FROM 2001 TO 2010**

Year	Authors	Journal	Number of Citations*	
			Average	Total
2001	Liu <i>et al.</i>	<i>Nature Neuroscience</i>	36	394
2002	Castellanos <i>et al.</i>	<i>JAMA</i>	48	475
2003	Sears <i>et al.</i>	<i>New England Journal of Medicine</i>	41	371
2004	Weaver <i>et al.</i>	<i>Nature Neuroscience</i>	128	1023
2005	Gluckman <i>et al.</i>	<i>Lancet</i>	72	507
2006	Shaw <i>et al.</i>	<i>Nature</i>	44	265
2007	Alwan <i>et al.</i>	<i>New England Journal of Medicine</i>	23	114
2008	Hutchison <i>et al.</i>	<i>New England Journal of Medicine</i>	25	101
2009	McGowan <i>et al.</i>	<i>Nature Neuroscience</i>	77	231
2010	Black <i>et al.</i>	<i>Lancet</i>	53	105

\*Timespan: From publication date to July 3, 2011

A sample of 100 papers published in the top journals over the past decade clearly gives us a good idea of where world-class excellence in ECD research stands in Canada. It also provides a strong corpus of selected research for a more fine-grained analysis of our choices over the years, and thus provides a unique standpoint for analyzing trends in ECD research in Canada.

**MOST CITED TOP TEN ARTICLES 2001-2010**

The tenth anniversary of our yearly *Bulletin* is an excellent opportunity to take a closer look at the actual scientific impact of these publications. Using Institute of Scientific Information (ISI) statistics, we selected each year's most cited Top Ten paper from 2001 to 2010 (see Table 1). The mean annual number of citations ranges from 23 to 128, indicating that our Top Ten papers have had quite a significant impact in their fields of knowledge.

**EPIGENETICS AND ECD**

New findings on epigenetic processes have clearly attracted the attention of the scientific community in recent years. The two most cited papers, both published in *Nature Neuroscience*, are from the same research team at McGill University and deal with epigenetic mechanisms of the stress response. By far, the most cited paper is the 2004 article on epigenetic programming by maternal behaviour<sup>1</sup> (128 citations/year), followed by a more recent paper, published in 2009, on the role of child

abuse in the epigenetic regulation of the stress system<sup>2</sup> (77 citations/year). A third paper from the same journal, published in 2000, linked maternal care, hippocampal synaptogenesis and cognitive development<sup>3</sup> (36 citations/year). By and large, these three papers speak to the crucial role and biological embedding of early social experience in development.

**CLINICAL AND EPIDEMIOLOGICAL RESEARCH**

Our 2001-2010 selection of clinical and epidemiological research was also well referenced. A 2005 paper reporting on selective head cooling to treat neonatal encephalopathy<sup>4</sup> made quite a significant impact on the field (72 citations/year). So did papers on brain volume abnormalities associated with ADHD<sup>5</sup> (2002; 48 citations/year), the long-term follow-

up of childhood asthma<sup>6</sup> (2003; 41 citations/year), the use of selective serotonin-reuptake inhibitors in pregnancy and the risk of birth defects<sup>7</sup> (2007; 23 citations/year), hypothermia therapy after traumatic brain injury in children<sup>8</sup> (2008; 25 citations/year), and an international overview of causes of child mortality in 2008<sup>9</sup> (2010; 53 citations/year).

Basic knowledge on early childhood development is perhaps the poor relation of the lot, with only one paper on intellectual abilities and cortical development<sup>10</sup> (2006; 44 citations/year) making it to the Top Ten.

These statistics on the annual rate of citations for our Top Ten selections are quite impressive and indicate that Canadian researchers are at the forefront of the international effort to build basic and applied ECD knowledge. Clearly, there is much cause for celebration. 🐼

References:

- Weaver ICG, Cervoni N, Champagne FA, D'Alessio AC, Sharma S, Seckl JR, Dymov S, Szyf M, Meaney MJ. Epigenetic programming by maternal behavior. *Nature Neuroscience* 2004;7(8):847-854.
- McGowan PO, Sasaki A, D'Alessio AC, Dymov S, Labonté B, Szyf M, Turecki G, Meaney MJ. Epigenetic regulation of the glucocorticoid receptor in human brain associates with childhood abuse. *Nature Neuroscience* 2009;12(3):342-348.
- Liu D, Diorio J, Day JC, Francis DD, Meaney MJ. Maternal care, hippocampal synaptogenesis and cognitive development in rats. *Nature Neuroscience* 2000;3(8):799-806.
- Gluckman PD, Wyatt JS, Azzopardi D, Ballard R, Edwards AD, Ferriero DM, Polin RA, Robertson CM, Thoresen M, Whitelaw A, Gunn AJ. Selective head cooling with mild systemic hypothermia after neonatal encephalopathy: Multicentre randomised trial. *Lancet* 2005;365(9460):663-670.
- Castellanos FX, Lee PP, Sharp W, Jeffries NO, Greenstein DK, Clasen LS, Blumenthal JD, James RS, Ebens CL, Walter JM, Zijdenbos A, Evans AC, Giedd JN, Rapoport JL. Developmental trajectories of brain volume abnormalities in children and adolescents with attention-deficit/hyperactivity disorder. *JAMA-Journal of the American Medical Association* 2002;288(14):1740-1748.
- Sears MR, Greene JM, Willan AR, Wiecek EM, Taylor DR, Flannery EM, Cowan JO, Herbison GP, Silva PA, Poulton RA. Longitudinal, population based, cohort study of childhood asthma followed to adulthood. *New England Journal of Medicine* 2003;349(15):1414-1422.
- Alwan S, Reefhuis J, Rasmussen SA, Olney RS, Friedman JM. Use of selective serotonin-reuptake inhibitors in pregnancy and the risk of birth defects. *New England Journal of Medicine* 2007;356(26):2684-2692.
- Hutchison JS, Ward RE, Lacroix J, Hebert PC, Barnes MA, Bohn DJ, Dirks PB, Doucette S, Fergusson D, Gottesman R, Joffe AR, Kirpalani HM, Meyer PG, Morris KP, Moher D, Singh RN, Skippen PW. Hypothermia therapy after traumatic brain injury in children. *New England Journal of Medicine* 2008;358(23):2447-2456.
- Black RE, Cousens S, Johnson HL, Lawn JE, Rudan I, Bassani DG, Jha P, Campbell H, Walker CF, Cibulskis R, Eisele T, Liu L, Mathers C. Global, regional, and national causes of child mortality in 2008: A systematic analysis. *Lancet* 2010;375(9730):1969-1987.
- Shaw P, Greenstein D, Lerch J, Clasen L, Lenroot R, Gogtay N, Evans A, Rapoport J, Giedd J. Intellectual ability and cortical development in children and adolescents. *Nature* 2006;440(7084):676-679.

# SOCIAL SKILLS DEVELOPMENT: PUTTING THE PUZZLE TOGETHER

**Social skills form the basis of human interactions. The development and maintenance of social skills depend on a myriad of interconnected factors in individuals and their environment.**

**"T**here are a very large number of factors that will contribute to a child's social competence and ability to interact with his or her social environment; we need to be taking into account as many of those factors as possible," says Miriam H. Beauchamp, a neuropsychologist and researcher at the Sainte-Justine Hospital Research Centre and assistant professor in the Department of Psychology at the Université de Montréal.

Dr. Beauchamp is co-author of a paper that brings together, in an integrated framework, the multitude of factors that influence the emergence and expression of social skills: internal and external factors, brain development and integrity, and cognitive functions, comprising attention-executive, communications and socio-emotional skills.

Internal factors refer to components of an individual's self, such as temperament, personality, or even physical attributes. External factors refer to components of an individual's environment, such as family environment, socioeconomic status and culture. Brain development and integrity refer to the neural underpinnings of social skills, which can be disrupted by genetic disorders, developmental anomalies or brain injuries.

Executive function is an umbrella term for the skills that allow us to plan, organize, and reach goals. This includes attention control, which refers to the processes involved in self-monitoring, response inhibition, and self-regulation. *"We have often made a big distinction between cognitive development and social development, but the two interact: if you don't have the skills to inhibit inappropriate behaviours or to communicate adequately, then that will have an impact on the way you socialize,"* says Dr. Beauchamp. Examples might be a child who cannot wait for his or her turn while playing a game, or an impulsive child who is unable to inhibit verbally or physically aggressive reactions.



## FROM BABY'S FIRST SMILE

Manifestations of social skills begin early, from baby's very first smile. *"This comes from watching their mother smile at them, and it is one of the first cues in understanding and recognizing social emotions,"* says Dr. Beauchamp. One of the next milestones in social communication is joint attention, when baby can focus on something and realize that a second person is looking at the same thing: baby looks at a toy, then looks at Mommy, who is looking at the toy, and gets a reaction from her.

Socio-emotional skills include the perception and processing of socio-emotional cues, from basic aspects of face and emotion perception to complex cognitive processes that involve understanding mental states. A sense of intended actions or goals is apparent from early infancy; by about eight years of age, children have a sense that others may have feelings or thoughts different from their own.

Sophie Parent, director of the School of Psychoeducation at the Université de Montréal,

*"Manifestations of social skills begin early, from baby's very first smile."*

says this paper brings together all the pieces in a very large and complex puzzle, providing a deeper understanding of how social skills develop.

*"This model can help in developing preventive interventions, or in planning interventions in the early stages when problems appear,"* she notes. It can help people working with very young children to understand the milestones or indicators of normal social skills development — and to recognize when something is not right. *"It also offers clinicians a broader range of avenues to explore when problems arise,"* says Parent. 🦋

BY EVE KRAKOW

# LANGUAGE FROM THE BEGINNING



*“The language journey actually begins in the womb.”*

**Even before they’ve uttered a single word, babies are picking up the skills they need to learn language. In fact, the process begins *in utero*.**

**W**hile at the University of British Columbia (UBC), Judit Gervain (who is now working in Paris) collaborated with Italian researcher Jacques Mehler to put together a comprehensive review of language development in the first year of life. Their work reflects the complex, multidimensional nature of the language development process. Forget nature versus nurture. Both are essential for language, and biological and environmental processes must work together to make it possible.

## TALK TO YOUR PREGNANT BELLY

The language journey actually begins in the womb. At birth, infants can already *“distinguish between languages that have a different rhythm,”* says Gervain. *“At around four to five months, they can identify and recognize their first name. Between that time and their first birthday, infants start to pick out more and more of the very frequent word forms. ... It’s around*

*their first birthday that they start to produce some of these word forms. They may have an intended meaning, but it might be quite different from the actual meaning.”*

In addition, *“some of the cries of newborn infants actually reflect the unique melody of their native language. Later, babies use this knowledge to help them identify correct word order and certain grammatical structures, such as the beginning and end of a sentence. Lots of simple things they extract from speech then help them to learn more complicated grammar,”* says Gervain. *“This is known as bootstrapping.”*

Until recently, behavioural research was the cornerstone of infant language studies. It was through this research that experts learned that by about seven to eight months of age, infants can recognize the basic word order of their native language (e.g. verb-object in English; object-verb in Japanese). They seem to learn this by identifying the position of very frequent words. In English, for instance, words

like “he, she, it, this, that, there” often come at the beginning of sentences.

More recently, near infra-red spectroscopy or optical topography, a safe way to image babies’ brains, has allowed for further bridging of the gap between mind, brain and behaviour. For instance, says Gervain, it has helped researchers to determine that infants can recognize simple patterns in speech, such as repetition (e.g. ma-ma, yum-yum, bow-wow).

## PUTTING IT TOGETHER

Putting all this research together means that it can eventually be used to help identify potential delays or problems in language development even before babies utter their first word.

*“Is the organization there at birth that you expect?”* asks Janet Werker, another language expert from UBC. *“Are the biases there at birth that you expect? Is the ability to pick up regularity (patterns) there? Are babies learning the sound system of their native language? Do they have appropriate speech-sound discrimination, with preference for sounds used in their native language?”* Answering these questions can not only help to identify problems but also pinpoint exactly where difficulties lie, allowing for the development of targeted preventive and treatment strategies.

Such testing is particularly important for preemies, infants with brain injuries, or infants with a hearing impairment. As the research progresses, it could provide real solutions for such common and pervasive problems as learning disabilities and speech delay. 🐾

**BY ALISON PALKHIVALA**

# YOUNG CHILDREN MAY REMEMBER MORE THAN WE THINK

**Can young children remember things as well as older children? A new study questions long-standing assumptions on memory development.**

**T**raditionally, it has been thought that older children are better at remembering things because the part of the brain involved in metamemory is more developed. Metamemory refers to awareness, monitoring and regulation of the contents of memory.

A new study suggests that while neural maturation is a factor, the main constraint for young children is that they don't yet have enough general knowledge to create rich representations, or mental pictures, of their experience. Because young children see the world in broad terms (e.g. cheese and apples are both foods, whereas older children will distinguish between dairy and fruit), their representations are poorer. Researchers found that when these representations are equal in quality, young children remember just as much as older children.

It began with an experiment in which children were presented with a series of pictures of toys, animals and vehicles, shown in rooms of houses on posterboards. The children were given two tasks: a recognition task, where they were shown the original items and new items, and asked which items they had previously seen; and a source monitoring task, where they were asked questions to determine how much they had encoded (remembered) about each situation.

As expected, older children recognized more of the pictures. Yet when it came to the items that children said they didn't remember seeing, younger children remembered more of the contextual attributes (e.g. room location or colour of posterboard) than older children.

*"This goes against the traditional view of memory development,"* says Stanka A. Fitneva, a researcher in the Department of Psychology at Queen's University, and one of the study's authors. *"The classical account is that children will claim to know something that they don't know. We found the opposite: they claimed not to know, when in fact they did know."*

The researchers hypothesized that young children do this because of the structure of

their representations. *"They remember the context, but have not integrated the context with the item,"* Fitneva explains. This was confirmed in another experiment that showed that for younger children, remembering just one or two attributes was generally not sufficient for them to remember the item itself, as compared to older children.

Researchers also examined the issue of suggestibility — the notion that children may internalize something that has been suggested and then think that it is true or has actually happened. Children were given an illustrated story of a trip to the zoo, and then asked questions about items that had appeared (or not) in the story. Children were also asked to mark if they remembered an item, or didn't exactly remember the item but thought it had been there. *"Remember/know judgments indicate an ability to monitor the contents of memory, i.e. metamemory,"* Fitneva explains.

To assess children's representations of the items in the story, children were presented with three items and asked which one didn't belong. This told researchers how similar (close together) or distinct (far apart) children perceived the items to be. *"What we found was that when younger and older children's representations of the items were similar, their remember/know accuracy was the same,"* Fitneva points out.

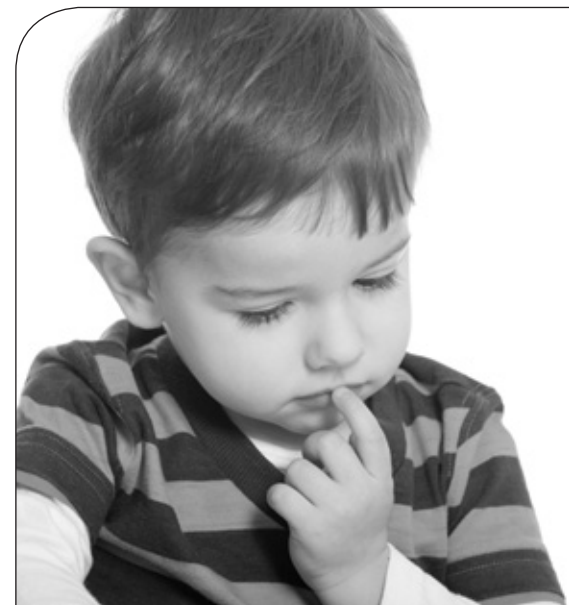
Nicholas Bala, a law professor at Queen's University specializing in child witness issues, says these findings offer promising avenues for training investigators, police officers and social workers who interview children. *"This research suggests that there are ways children can be questioned that will enhance their reliability."*

Usually, child witnesses are testifying about situations of physical or sexual abuse (either as victim or witness). *"Often, the defence strategy is not 'you're lying,' but 'you must have been influenced by suggestions from the person who questioned you,'"* says Bala. *"This new work qualifies issues of suggestibility and makes clear that children can be very reliable witnesses."*

From a learning perspective, Fitneva sees this paper as empowering. *"For as long as research on memory has existed, the importance of neurological development has been stressed. But if memory is controlled by biological processes, there's little we can do about it,"* she says. *"We argue that no: we can do a lot to improve how children learn and remember."* ✎

BY EVE KRAKOW

*"The classical account is that children will claim to know something that they don't know. We found the opposite: they claimed not to know, when in fact they did know."*



# A HEALTHY ENVIRONMENT MEANS HEALTHY CHILDREN



*“The effects of poverty on child development are mediated by both parenting and the home environment.”*

**Good parenting is crucial to raising happy, healthy children. But what makes a good parent? It turns out that the society in which we live plays an important role in how well we care for our little ones, which in turn directly affects their brain development, resulting in measurable effects on their health and intellect.**

**D**r. Michael Meaney of McGill University, an expert on the psychobiological impact of parenting, collaborated with experts in neuroscience and society from the University of Pennsylvania to produce a review paper on how socioeconomic status affects brain development early in life.

## **IMPORTANCE OF PARENTING AND THE PARENTING ENVIRONMENT**

*“Parenting and family function occur within a context,” says Dr. Meaney. “Punitive, or even abusive parenting, most often occurs in a context of parents who are themselves carrying a mental health burden. That mental health burden is often associated with the conditions of their life, and the most prevailing and profound condition that alters parenting is poverty.”*

Two bodies of science support this notion. The first is child development research showing that the effects of poverty on child development are mediated by both parenting and the home environment. The second source of evidence comes from evolutionary biology, studies which reveal that the quality of the prevailing environment, defined by availability of resources and threat of predation, can alter parental signals to their offspring in a way that changes the behaviour of that offspring. These are universal biological mechanisms, affecting not only humans but also plants, insects, reptiles, and birds.

## **IMPLICATIONS FOR PUBLIC POLICY**

These findings have important implications for public policy. *“There is indeed a biological basis for the link between society, family function*

*and child development,” says Dr. Meaney. “This would strongly endorse the ongoing discussion in Canada about creating a minimum level of income for every family. People will, quite rightly, question whether throwing money into families really changes their circumstances... And the evidence now is yes, it will... This also supports movements towards high quality daycare.”*

According to Dr. Marni Brownell, an expert in the social determinants of health at the University of Manitoba, *“We’ve known for years that there’s a socioeconomic gradient in health, and the lower your socioeconomic status, the poorer your health outcomes. That gradient occurs in kids, not just in health but also in school performance and emotional and social development. What’s important about this research is it provides that link between socioeconomic status and mental health and between socioeconomic status and school achievement. And that link is that the environment alters brain development.”*

*“What this research helps to do is provide some specifics on which poverty reduction strategies may work best and why they work,” says Dr. Brownell. For instance, a Manitoba-based initiative that provides income supplements for poor pregnant women has reduced the risk for low birth weight and prematurity in infants. “This research suggests that perhaps these children will also have better longer-term outcomes because the supplement reduced stress in the mother during pregnancy and provided better nutrition, and those things actually have an impact on brain development.”* 🦋

**BY ALISON PALKHIVALA**

# UNRAVELLING SUICIDE AND DEPRESSION

The relationship between genes, experiences, and behaviours in childhood and the risk of developing mood disorders or attempting suicide later in life is complex and multidimensional. Dr. Jelena Brezo and colleagues from McGill, Université de Montreal, Université Laval and UQAM have conducted some of the foundational research that could eventually lead to a better understanding of how these processes interact.

**“W**e focused on genes that regulate serotonin, a master neurotransmitter,” says Dr. Brezo, who is currently at City of Hope Comprehensive Cancer Center in California. “We looked at whether inter-individual differences in these genes increase risk for suicide attempts and mood disorders directly or indirectly by acting as moderators of environmental stressors, such as childhood physical or sexual abuse, such that selected genetic differences lead to psychiatric disorders only in some and not all abused individuals.”

“We also explored the mediating mechanisms by which serotonin-related genes may influence psychiatric risk, suspecting that this may be through gene effects on the development of personality, so that highly anxious children may be at a higher risk for mood disorders and those that are impulsive-aggressive at a higher risk for attempted suicide in later life.”

The investigators tested 1,255 French-speaking residents of Quebec, the province with the highest suicide rate in Canada. Participants were kindergarten age when they were first recruited into the study in 1986-1987. During the 22 years they were followed, they were evaluated repeatedly with regard to their home life, experience of physical or sexual abuse, social behaviour, symptoms of anxiety and mood disorder (e.g. depression, bipolar disorder), and suicide attempts. They also underwent genetic testing.

## KEY FINDINGS

The results were complex, but basically boil down to the following:

1. One gene (HTR2A) affected the risk of both making a suicide attempt and develop-

ing a mood disorder, but by different mechanisms: it had a direct impact on the risk for mood disorders, but its effect on suicidality was influenced by participants' histories of physical or sexual abuse.

2. Another gene (TPH1) directly affected suicide attempt risk.

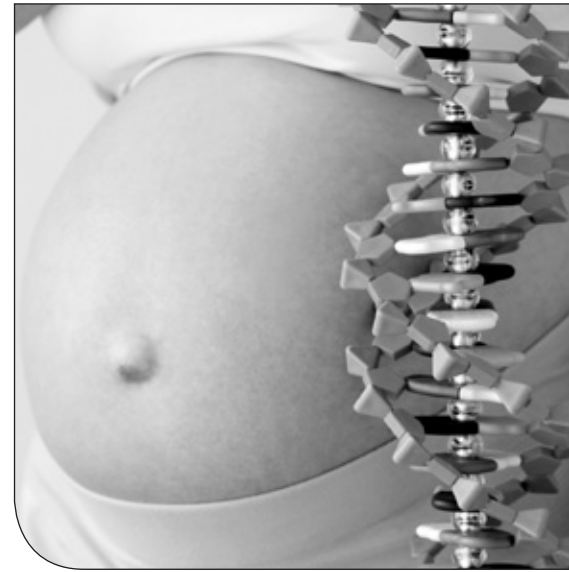
3. Three other genes had an impact only on the risk of developing a mood disorder. One (HTR5A) appeared to affect the risk directly, while the other two (HTR1A and SLC6A4) were influenced by whether the participants had experienced physical abuse as a child.

4. Unexpectedly, anxiousness in childhood did not appear to influence the genetic link with mood disorders, and childhood disruptiveness did not influence the genetic link with suicide attempts.

## FUTURE POSSIBILITIES

“Once gene-environment interactions like the ones identified in this study in relation to psychiatric disorders are better characterized, we could identify individuals who may be especially sensitive to the adverse effects of environmental stressors,” says Dr. Brezo. This type of research can also “help us to identify early behavioural markers of future risk for suicidality and other psychiatric problems.”

According to Dr. Johanne Renaud, an expert on suicide and depression in youth from the Douglas Institute, identifying those who are most vulnerable to mood disorders and suicidality early in life means early interventions can be used to “prevent the negative processes that begin during adolescence and young adulthood, such as school drop-outs, substance abuse, disrupted social functioning, or even suicide.”



*“Individual genetic mapping will perhaps allow us to better target early signs of mental illness.”*

*“In the future, individual genetic mapping will perhaps allow us to better target early signs of mental illness and related behaviours by determining the best personalized treatment options (whether by psychotherapy or by pharmacotherapy), depending on the patient’s genome,” says Dr. Renaud. 🦋*

BY ALISON PALKHIVALA

# BETTER DATA ON CHILD DEATHS COULD SAVE MORE LIVES

**Up-to-date information on the causes of child deaths is crucial in guiding global efforts to improve child survival.**

**A**lthough child mortality has been declining worldwide as a result of socioeconomic development and intervention programs, every year some 8.8 million children still die before their fifth birthday. A report with new estimates for 2008 (most recent data available) of the major causes of child deaths by region and by country will hopefully help to focus national programs and donor assistance.

Worldwide, the leading causes of death in children younger than five years are infectious diseases: chiefly pneumonia, diarrhea, and malaria. Some 41% of deaths occurred in the neonatal period, i.e. in infants less than four

weeks old. The greatest single causes in this age group were preterm birth complications, birth asphyxia, neonatal sepsis (generalized infections of the newborn), and pneumonia.

Diego G. Bassani, an epidemiologist at the Hospital for Sick Children in Toronto and one of the study's authors, explains that calculating the number and causes of child deaths is a huge challenge because in many developing countries, children die without having any contact with a health facility or health professional. For this latest study, however, the two largest countries, China and India, contributed real data collected through national surveys.

According to the 2008 estimates, some 49% of child deaths occurred in five countries: India, Nigeria, Democratic Republic of the Congo, Pakistan and China. Dr. Bassani sees this concentration of numbers as a huge window of opportunity. *"If you work with the governments of those countries, you can have a very large impact on the global numbers of child deaths."*

Dr. Bassani says the report can also improve the way aid is provided to countries and help direct national programs. He gives the example of India, where the government may face heavy lobbying from pharmaceutical companies, because even a cheap vaccine represents an enormous opportunity for profit once multiplied by the 27 million children born each year. *"Because of this, the government tends to be extremely careful about how it flags a disease as a priority. It wants to work with the best evidence possible."*

Michael Kramer, scientific director of the Institute of Human Development, Child and Youth Health, says the report shows a huge potential for saving lives. *"Many of these deaths are preventable, without a lot of high-tech interventions... Breastfeeding can prevent many cases of pneumonia and diarrhea; pneumonia can be treated with antibiotics; diarrhea can be treated with rehydration solutions; mosquito nets can reduce malaria risk."*

Preventing neonatal deaths is more difficult, because of the technical expertise and health infrastructure required (to resuscitate an asphyxiated baby or to perform a C-section, for example). Yet Dr. Kramer says there are promising avenues, such as a project in India where women are being given financial incentives to give birth in health centres.

Most of all, however, Dr. Kramer stresses the importance of improving data collection methods, perhaps through the use of intensive surveys in representative regions. He also points out that stillbirths are not included in the current numbers. *"Better counting is essential to get a handle on stillbirths and neonatal deaths and to understand how big the problem really is,"* he notes. 🦋

**BY EVE KRAKOW**



*"Every year some 8.8 million children still die before their fifth birthday."*

Ref.: Black RE, Cousens S, Johnson HL, Lawn JE, Rudan I, Bassani DG, Jha P, Campbell H, Walker CF, Cibulskis R, Eisele T, Liu L, Mathers C. Global, regional, and national causes of child mortality in 2008: A systematic analysis. *Lancet* 2010;375(9730):1969-1987.

# HEALTHY WEIGHT, HEALTHY BABIES

**Many mothers-to-be are aware that being overweight or obese is bad for their health, but they may not know that it can also threaten the health of their unborn child. Research led by Dr. Sarah D. McDonald from McMaster University has shown that overweight and obese women who become pregnant have an increased risk for premature delivery.**

**D**r. McDonald and colleagues analyzed data from 84 studies involving over a million women. They explored the relationship between the mother's body weight immediately before becoming pregnant and her risk of preterm birth, defined as birth before 37 weeks' gestation (the normal gestation period for humans is 40 weeks) and/or having a child with a low birth weight.

*"Overweight and obesity are now the most common conditions complicating pregnancy in most developed countries, including Canada, and they are creeping up in some developing countries," says Dr. McDonald. "Prematurity and low birth weight are the two factors that are most predictive of death or illness in infants and illness right through childhood."*

## OVERWEIGHT INCREASES RISK OF PRETERM BIRTH

Overweight or obese women face about a 30% increased risk of their labour being medically induced prematurely. Induction is often performed because continuing the pregnancy is risky for the mother's or baby's health. The heavier the woman, the greater her risk of having labour induced earlier than 37 weeks. Similarly, the heavier the woman, the higher her risk of delivering earlier than 32 weeks, meaning the baby would be severely preterm and at higher risk for illness, disability and even death. Thus, if women can decrease their weight somewhat, even if it's not down to the normal range, they may be able to have healthier babies.

The studies evaluated by Dr. McDonald came from both the developed and developing worlds, and there were some interesting



*"Overweight and obesity are now the most common conditions complicating pregnancy."*

differences between the two. *"When we looked at low birth weight in the developed world, we found that women were not protected from having a low birth weight baby by being overweight or obese," says Dr. McDonald. "But in developing countries there was about a 40% decrease in the risk of having a low birth weight baby."*

It's not clear why this is so. Dr. McDonald speculates that *"it may be that in the developed and the developing world, being overweight and obese mean different things. So, in the developing world it might mean you can afford to eat all you need and more. In the developed world, however, it may mean you're stuck eating more low-cost, calorie-dense, nutritionally-poor 'junk food'."*

## CALL TO CURB OBESITY

The findings provide yet more incentive to combat obesity at a personal and societal

level. *"In Canada now, the obesity rate among women of reproductive age is as high as 25% depending on the area and the province," says Dr. B. Anthony Armson, an expert in maternal obesity at Dalhousie University. "Overweight and obesity in our society can start in utero, so we need to intervene somewhere. Pregnancy is a very important time to start to make some behavioural adjustments and changes in lifestyle because pregnant women are very receptive to trying to do the best for themselves and their babies. These women need to be seen by a nutritionist, and they should be educated about what is the appropriate weight gain during pregnancy for someone who is already overweight. It's a nine-month window of opportunity to try to bring about some change."* 🍏🍏

**BY ALISON PALKHIVALA**

# SIMPLE PLAN, BIG PAYOFF

**Could preventing type 1 diabetes be as simple as switching baby formula? Hans-Michael Dosch, MD, PhD, from the Hospital for Sick Children, and colleagues all over the world are trying to find out.**

In type 1 diabetes, the body's immune system produces proteins, known as autoantibodies, which are part of the autoimmune attack on the insulin-producing beta-cells in the pancreas. Without insulin, the body tissues cannot absorb sugar for its energy needs.

*"Type 1 diabetes changes the lives of children and their families dramatically,"* says Dr. Céline Huot, a paediatric endocrinologist at CHU Sainte-Justine. It means a special diet, multiple daily injections of insulin (or a pump), and special accommodations at school and daycare.

## REGULAR VS. HYDROLYZED FORMULA

After well over a decade of research in patients and animal models, Dr. Dosch and his colleagues crystallized a curious observation: there appears to be a critical window early in life during which dietary exposure to non-human proteins (like those found in cow milk) can trigger the gradual development of autoimmunity to insulin-producing beta cells among genetically diabetes-prone individuals. As a prelude for a massive clinical trial now running on three continents (TRIGR.org), the international team conducted a pilot study with 240 infants at high risk for developing type 1 diabetes, based on their family history and genetic profile.

The investigators randomly assigned the babies to receive one of two types of formula: a regular cow's milk-based formula or a special formula in which the proteins had been hydrolyzed, i.e. broken down into very small molecules unable to provoke an immune response. Parents were instructed to use the formula they had been assigned whenever breast milk was unavailable during the first six to eight months of the babies' lives. The children were

monitored to see whether they developed autoantibodies associated with diabetes, a sign they might later develop the disease.

These children are now about 10 years old, and remarkably, those who received the hydrolyzed formula were 46% less likely to develop one or more autoantibodies associated with diabetes development. *"No intervention or therapeutic effort, and there are many, has ever been able to touch these autoimmune signs,"* says Dr. Dosch.

## CAUTIOUS OPTIMISM

Lowering rates of type 1 diabetes even a little would be an astounding achievement. Currently, over 300,000 Canadians live with the condition, and about 10,000 are newly diagnosed annually. Diabetes and complications from diabetes, which include damage to the kidneys, eyes, nerves, and blood vessels, cost the Canadian economy more than \$17.4 billion every year.

Dr. Huot says that while these findings are encouraging, *"we have to be cautious. Documenting that you have high levels of autoantibodies will not necessarily translate into diabetes."*

The much larger TRIGR trial, when completed, will provide a clearer picture of just how beneficial this special diet may be for high-risk infants. *"It would be a very easy ... way of preventing or postponing a condition,"* says Dr. Huot. *"But what is not available in regular practice is the genetic screening that these families have undergone to identify those babies at high risk for type 1 diabetes."* So to date, it remains unclear which babies might benefit from the special formula. 🦋

BY ALISON PALKHIVALA



*"Type 1 diabetes changes the lives of children and their families dramatically."*

# LEGACY OF BIPOLARITY FOR PRESCHOOLERS

**People affected by bipolar disorder experience abnormal mood swings, which can fluctuate from periods of extreme overexcitement (mania) to periods of extreme sadness (depression), sometimes interspersed with periods of stability.**

**T**oronto researchers involved in the Pittsburgh Bipolar Offspring Study (BIOS) wanted to examine the development of psychiatric problems in children aged two to five whose parents have bipolar disorder. Does their parents' bipolarity have an impact on their development? Are they at greater risk of developing the disorder?

To find out, the researchers assessed 121 children of bipolar parents, using various diagnostic tests for a number of psychiatric disorders, such as attention-deficit hyperactivity disorder (ADHD), oppositional disorder, and anxiety. They were particularly interested in exploring mood disorders, such as mania and depression, in order to detect potential precursory signs of bipolar disorder in the children. These results were then compared with those of 102 children who came from comparable backgrounds but whose parents did not have bipolar disorder.

The results of these studies showed that children with bipolar parents, particularly those over four years old, were twice as likely to develop two or more psychiatric disorders. They were also eight times more likely to develop ADHD.

Children of bipolar parents displayed more symptoms of mania and depression than the other children; however, these symptoms were not yet strong enough to establish a mood disorder diagnosis (except for three of the 121 children assessed).

Dr. Benjamin Goldstein, a psychiatrist, one of the authors of the current study, and a scientist at the Sunnybrook Research Institute in Toronto, explains. "A factor that adds to the challenge of accurate diagnoses in pre-pubertal children is that these children have more limited means of expressing symptoms of mania. They don't have credit cards to max-out, and they don't



*have cars they can drive recklessly. There are also biases that can interfere with seeing symptoms as such. If one feels that happiness in childhood is always normal, and that pathological euphoria cannot exist in childhood, then that effectively guarantees that mania will not be viewed as such."* It is therefore possible that these factors can lead to misdiagnosis of children.

Dr. Daphne Korczak, a child psychiatrist at the Hospital for Sick Children and assistant professor at the University of Toronto, says that "this exciting study of the preschool children of bipolar parents provides valuable information for both the primary care and specialist physician in clinic. It underscores the importance of understanding parental psychopathology when evaluating psychological and behavioural presentations of young children, and highlights the need to keep an open mind in the interpretation of ADHD-type symptoms in this population."

The advantage of early detection of ADHD and other developmental issues in these very young children is the possibility of earlier intervention. "Even in the absence of any pro-

*"Children of bipolar parents displayed more symptoms of mania and depression than the other children."*

*blems among their children, my general advice to parents with bipolar disorder is that whatever is healthy for other children is likely especially important for their children. That includes avoiding excessive stress, having regular sleep-wake times, balanced nutrition, and regular physical activity,"* says Dr. Goldstein. 🐾

**BY BLANDINE JARDON**

# MOTHER TO CHILD TRANSMISSION OF HIV THROUGH BREASTFEEDING

**When a mother is HIV-positive, what are the risks of her transmitting the virus to her infant through breastfeeding? What would be the best scenario of intervention to lower this infection risk? Is there a special timing?**

To answer these questions, researchers in the ZVITAMBO\* program enrolled more than 14,000 post-partum women and their children to examine the transmission of HIV through breastfeeding among women who seroconverted (i.e. who developed in their blood detectable antibodies directed against HIV) at different times (before and after birth).

Surprisingly, researchers found that during the first year of life, infants born to mothers who were HIV-negative at delivery but who subsequently seroconverted had an infection rate through breastfeeding that was about

three times greater than the rate for infants born to HIV-positive mothers (23.6% vs 8.5% respectively), indicating a high rate of HIV transmission during maternal primary infection. Among the women who seroconverted after delivery and who had a short seroconversion interval, 62% transmitted HIV to their infants in the first three months after infection; approximately eight times the rate for baseline positive women. What is worrying is that many such mothers will test negative for HIV when tested with an antibody-based test, as the window period\*\* for diagnostic tests can be several weeks long.

*“Currently, there is a large global effort to develop point-of-care tests for HIV and other developing world pathogens,”* notes Dr. Brian J. Ward, professor of infectious diseases at McGill University in Montreal and a co-author of the study. *“At the moment, several rapid tests are in use in different countries. Others are rapidly approaching various markets. However, there is no ideal test in any market yet.”* Unfortunately, it is unlikely that any of these point-of-care tests will be able to identify breastfeeding women who are newly infected by HIV.

As a result, the prevention of primary infection in pregnant and breastfeeding women will continue to be critically important to reducing the rate of infant HIV infection. 🦋

**BY BLANDINE JARDON**

\*ZVITAMBO: Zimbabwe Vitamin A for Mothers and Babies Project.

\*\*Window period: the time from infection until a test can detect any change.

Ref.: Humphrey JH, Marinda E, Mutasa K, Moulton LH, Iliff PJ, Ntozini R, Chidawanyika H, Nathoo KJ, Tavengwa N, Jenkins A, Piwoz EG, Van De Perre P, Ward BJ. Mother to child transmission of HIV among Zimbabwean women who seroconverted postnatally: Prospective cohort study. *British Medical Journal* 2010;341.



## BULLETIN

This bulletin is a publication of the Centre of Excellence for Early Childhood Development (CEECD) and the Strategic Knowledge Cluster on Early Child Development (SKC-ECD). Several funding agencies financially support the CEECD and the SKC-ECD, among which are the Canadian Social Sciences and Humanities Research Council (SSHRC) and private foundations. The views expressed herein do not necessarily represent the official policies of these agencies.

To read about the most up-to-date scientific knowledge on early childhood development, visit [www.child-encyclopedia.com](http://www.child-encyclopedia.com)

**Editors:**

Nathalie Moragues, Kristell Le Martret, Richard E. Tremblay and Michel Boivin

**Managing Editor:**

Claire Gascon Giard

**Collaborators:**

Blandine Jardon, Eve Krakow, Alison Palkhivala

**Scientific Proofreading:**

Anthony Armson, Nicholas Bala, Diego G. Bassani, Miriam H. Beauchamp, Jelena Brezo, Marni Brownell, Hans-Michael Dosch, Stanka A. Fitneva, Judit Gervain, Benjamin Goldstein, Céline Huot, Michael Kramer, Daphne Korczak, Michael Meaney, Sarah McDonald, Sophie Parent, Johanne Renaud, Brian J. Ward, Janet Werker

**Copy Editor:**

Lana Crossman

**Layout:**

Guyline Couture

**Printing:**

SIUM

Centre of Excellence for Early Childhood Development  
Strategic Knowledge Cluster on Early Child Development  
GRIP-Université de Montréal  
P.O. Box 6128, Downtown Station  
Montreal, Quebec H3C 3J7

Telephone:

(514) 343-6111, extension 2525

Fax:

(514) 343-6962

E-mail:

[cedje-ceecd@umontreal.ca](mailto:cedje-ceecd@umontreal.ca)

Websites:

[www.excellence-earlychildhood.ca](http://www.excellence-earlychildhood.ca)

[www.skc-ecd.ca](http://www.skc-ecd.ca)

ISSN 1499-6219

ISSN 1499-6227