

SHARING THE BRAIN STORY

AFWI's Knowledge-Mobilization Strategy:
Transforming research, policy, and practice in Alberta

AFWI'S KNOWLEDGE MOBILIZATION STRATEGY:

Transforming Research, Policy, and Practice in Alberta. (2013).
Calgary, AB, Canada: Norlien Foundation.

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Published October 2013.

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Purpose of Report

This report summarizes the Norlien Foundation's broad knowledge-mobilization efforts in early brain and biological development, mental health, and addiction during the period 2010-2012.

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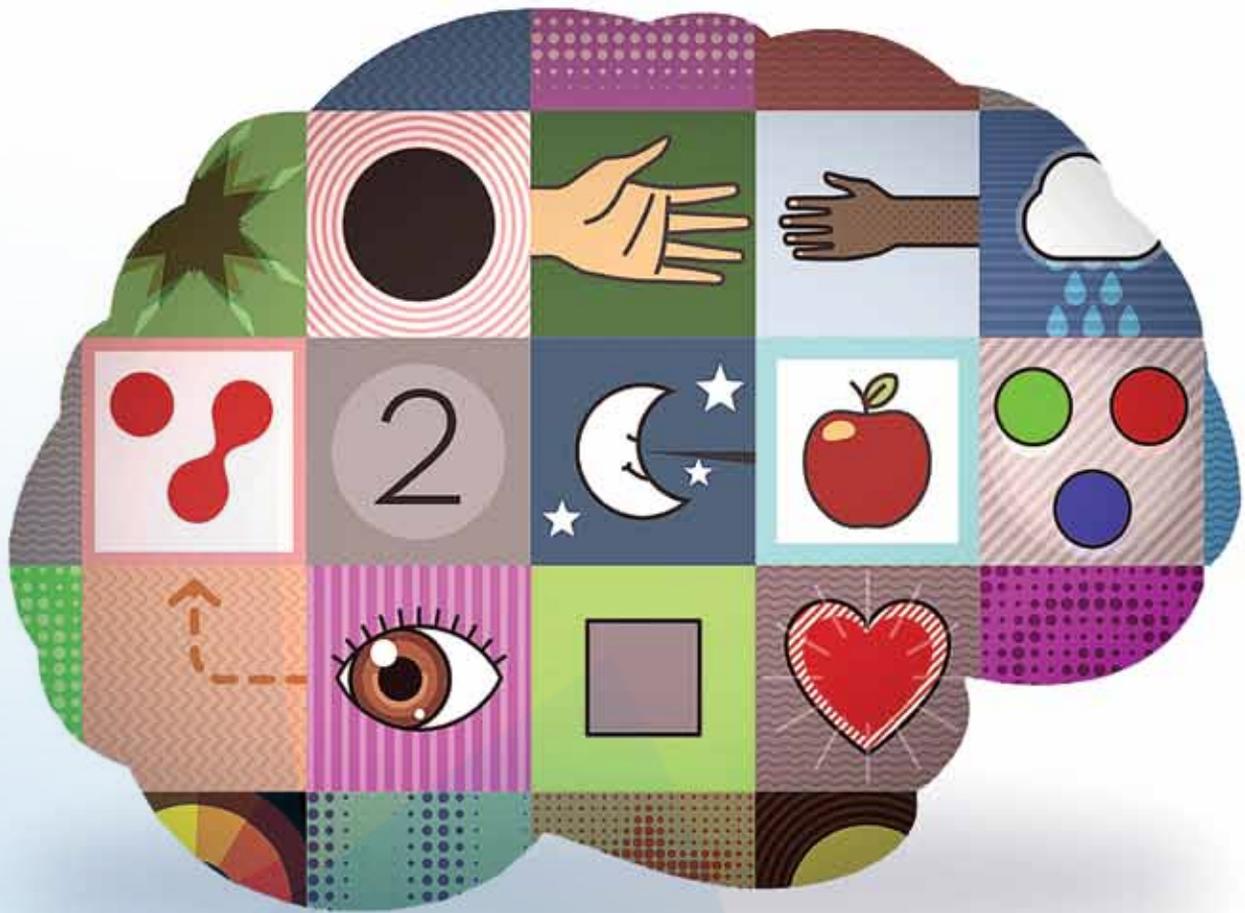
INTRODUCTION

A little over three years ago, the Alberta Family Wellness Initiative (AFWI) embarked upon an ambitious and unprecedented undertaking. Our goal was nothing less than to mobilize knowledge about early brain and biological development and recovery from addiction to bring about change in policy and practice for the benefit of Alberta and its families – in short, to bridge the gap between what we know and what we do as a society. At the time, we didn't know how far we could go with this transformative goal, but we knew we were going in the right direction. This area had lagged behind all others in the sphere of human health and well-being in terms of application of scientific knowledge to policy and practice. Our model was simple: we engaged 200 change leaders in Alberta's health and human services sectors – including education, social services, and justice – and exposed them to the expertise of some of the brightest minds in North America and abroad in the fields of early brain and child development, addiction, and system change. We brought our Alberta participants back each year to hear the most up-to-date science in these fields; discuss its implications for research, policy, and practice; and work together to translate that knowledge so it can be brought to bear on policy and practice in Alberta. The results to date have been promising for the broad-scale transformational change that we had aspired to at the outset. What we have accomplished together in three short years demonstrates what is possible with vision, collaboration, and commitment. Now we are embarking on the next phase of our initiative, which will leverage these accomplishments into communities of purpose and transform our knowledge into positive outcomes for Alberta's children, families, and communities. This report provides a brief summary of where we have been and where we are going with this initiative.

Nancy Mannix, JD

Chair and Patron, Norlien Foundation

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- 1 Early childhood matters, enormously.
 - 2 The foundation for healthy development depends on stable, responsive relationships with adult caregivers in a safe, supportive environment.
 - 3 These factors depend upon the capacities of parents, caregivers, and communities.
 - 4 Every policy domain that affects how people live plays a role in the healthy development of children.



THE AFWI MODEL:

Bridging the gap between what we know and what we do

Compelling evidence from a wide range of scientific disciplines tells us that early experiences, combined with gene-environment interaction, lay the foundation – for good or ill – for brain development and nearly all aspects of human development throughout life. The challenge is to fully integrate this knowledge to better inform policy and practice. The Alberta Family Wellness Initiative (AFWI) works as a catalyst to bring this about – to bridge the gap between what we know from science and what we do in policy and practice.

To further this work, the AFWI developed a unique model for knowledge-mobilization that recognizes the need for an interdisciplinary approach to bring about a transformation in policy and practice. A critical aspect of this initiative is to provide the multi-disciplinary science, policy, and practice communities with a common language and framework of understanding based on the latest scientific knowledge about the effects of early childhood experiences on lifelong health and well-being.

In 2010, the AFWI partnered with the Government of Alberta and Alberta Health Services (AHS) to launch twin three-year strategies, one in early brain and biological development and the other in recovery from addiction. Together, these strategies were designed to drive evidence-based change in policy and practice for the benefit of Alberta and its families. The science told us these were two aspects of the same story – the story of brain development. By approaching this most fundamental narrative from both angles, we ultimately were able to engage a much wider, more multi-disciplinary policy, practice, and research community than through traditionally shared knowledge. Many people from the Norlien Foundation and stakeholder groups were involved in the planning, design, and implementation of these strategies to make this happen. Within its first year in action, the AFWI’s “meta-strategy” was making an impact.

Engagement is key

The key ingredient of the AFWI model is engagement. From the start, the initiative engaged a critical mass of change leaders from the broad range of disciplines, agencies, and government departments in Alberta that touch on issues related to early child development, mental health, and addiction. Their expertise extends from health practice, policy, and research to education, social services, and justice. Together they represent the broad reach of early childhood development and addiction across society. Participants were selected for their unique capacity to influence research agendas, cross-ministerial collaboration, policy development, decision-making, professional development, training, program design, and practice. Their employers agreed to support the initiative by incorporating their AFWI activities into the participants’ job responsibilities.

The AFWI held three annual Early Brain & Biological Development (EBBD) Symposia and three Recovery from Addiction (RFA) Symposia, respectively, in the spring and fall of each year from 2010 through 2012 at The Banff Centre in Banff National Park. Each of the two Symposium series engaged roughly 100 participants, who were invited back each year to build upon their experience and learnings. At the Symposia, these change leaders were exposed to the most current knowledge available in early brain and child development, addiction, and organizational change, delivered by leading researchers in their fields from across North America and beyond. Following the expert presentations, participants met in facilitated multi-disciplinary cohort groups to discuss the implications of the knowledge for policy and practice in Alberta.

At the start of the initiative in 2010, participants were organized into small cross-disciplinary teams of about six to eight people. Each group selected a particular challenge or area of interest to work on over the course of the three-year initiative, such as integration of services across the continuum of care, research priorities, or training and development for clinicians and professionals. The teams met during each five-day Symposium, set individual and group action goals, and put their learnings to work in real-life settings in their own spheres of influence. Between Symposia, they continued to communicate with fellow team members and had opportunities to engage in additional mid-year learning activities to enhance their skills. In the process, they created new collaborative networks. Also, during the time between Symposia, the AFWI followed up with phone interviews to find out how participants were progressing toward achieving the goals they had set and what they needed in order to facilitate change. Data provided through these follow-up interviews helped to determine whether the strategies were achieving desired results and to address issues or barriers participants might be facing.

Over 80 per cent of the participants remained engaged throughout the three-year initiative. They have stayed connected and have expanded their networks, bringing change and innovation, vertically and horizontally, throughout the system in Alberta, and beyond.

“Childhood maltreatment is a very well established risk factor for both mental health conditions and for addiction in young people and adults. I think by understanding a little bit more about the biology that is underlying the effect of maltreatment on psychopathology, we will be able to understand how to help young people that have suffered from traumatic experiences early in life by modifying biological processes related to it.” **Andrea Danese, MD, PhD**

THE NEXT PHASE

Following the conclusion of the Alberta Family Wellness Initiative's (AFWI) three-year knowledge-mobilization strategies for Early Brain & Biological Development and Recovery from Addiction, the AFWI is advancing to the next phase with a strategy that will unfold over the next two years. This initiative will engage a new cohort of change leaders who will be linked with mentors who participated in the initial phase. Participants in the new strategy will focus on sharing the up-to-date story of brain development throughout the policy and practice communities, as well as with the general public, in order to translate the most current knowledge into positive outcomes for children and families. This next phase will be launched at a Symposium titled **Accelerating Innovation: Telling the Brain Story to Inspire Action**, scheduled for October 27 through November 1, 2013, at the Shaw Conference Centre in Edmonton.

The objectives

The key objective of this next phase is to create positive change in outcomes for children and families by mobilizing knowledge about the intergenerational impact of addiction and toxic stress on the developing brain. During the Symposium and the subsequent two years the focus will be on:

- Mobilizing and linking the science of brain development with mental health and addiction.
- Developing a shared understanding of the intergenerational effects of stress and addiction at different ages and stages of development and the implications related to policy, practice, and research.
- Fostering "communities of purpose" that will be able to apply and communicate the knowledge to develop innovative and integrated approaches for prevention, intervention, and treatment for mental health and addiction issues across the lifespan.

"Early experiences influence virtually all aspects of a monkey's behaviour and biology. Not only do they influence how its behaviour develops and how it learns to regulate its emotions, but it also influences development at the level of stress hormones, metabolism, various neurotransmitters, the structure and function of the brain, and gene expression. That is, early experiences can change the way genes work." **Stephen Suomi, PhD**



“Early brain development represents more than a simple unfolding of a genetic blueprint – it represents a complex dance of genetic and environmental events that interact to adapt the brain to fit a particular environmental context. Your brain is sculpted by a lifetime of experiences, especially in the first few years of life.” **Bryan Kolb, PhD**

FRAMING A CORE STORY OF BRAIN DEVELOPMENT

Ultimately, research, policy, and practice depend upon public awareness, perception, and support. But while scientific knowledge about early childhood development, child mental health, and addiction has advanced dramatically in recent years, very little of this knowledge has percolated into public discourse. The public still has foggy, often misguided, notions of how the brain develops; what, if anything, can be done to promote healthy development; and who is responsible for doing it. Likewise, under-developed notions about the nature of addiction and what causes it restrict how the public and policy makers think about what can be done to address the problem and who is responsible for doing it.

The National Scientific Council on the Developing Child, based at the Center on the Developing Child at Harvard University, has partnered with the FrameWorks Institute to produce a series of working papers that translate the science into a core story of early brain and child development in lay language (see Resources, p.36). The Norlien Foundation partnered with the Harvard Center to bring that core story to Alberta. The Foundation engaged FrameWorks to research attitudes and beliefs among Albertans on the issues of early child development, child mental health, and addiction and to develop messaging that effectively distills the complex science into key points that expand public understanding and invigorate public discussion in Alberta. FrameWorks uses research from the social and cognitive sciences to reframe scientific information for non-scientists.

FrameWorks researchers shared the results of their Alberta research at the EBBD and RFA Symposia. They also provided participants with workshops on framing the scientific knowledge into a narrative about early child development and addiction using familiar metaphors with the demonstrated potential to improve public insight and provide a common framework of knowledge capable of informing policy and program decisions. This core story has proven powerful in uniting people both within and across fields. It forces us as a society to take responsibility for the environments and experiences that shape children's outcomes. And it challenges us as adults to put in place better protective barriers between children and the negative experiences they may encounter. This narrative continues to evolve as problems of communicating key concepts about addiction and child development are detected and corrected through rigorous research.

The Core Story of Early Child Development and Addiction

What actually develops? It all begins with **brain architecture**. The early years matter because early experiences affect the architecture of the maturing brain. The quality of that architecture establishes the foundation for all of the development and behaviour that follow. Getting things right the first time is easier than trying to fix them later. The brain's architecture is composed of social, emotional, and cognitive strands that get woven together, strongly or weakly, to support subsequent development. What affects one, affects all.

How does it work? The process by which the brain gets built is much like the **serve and return** of a tennis game. Serve and return happens when young children instinctively reach out for interaction, through babbling, facial expressions, gestures, and cries, and adults respond by getting in sync and returning the same kinds of sounds and gestures. Serve and return works best with adults who are familiar to the child. If adults do not respond, the child's learning process is interrupted and incomplete. Young children need many of these interactions per day, since they are literally the building blocks of brain architecture.

Early learning is foundational to everything that follows. Children learn very early to pay attention by developing the **air traffic control system** in their brains. As a child learns to regulate the flow of his or her attention and to focus on tasks, he or she creates mental priorities. This mechanism – called **executive function** – needs to be geared up as early as possible. This can be done through programs that give children opportunities to practise recognizing roles and sequences and joining in on cue, such as in play-acting or taking turns. This mental flexibility makes it easier to learn new information and use skills in new and complex situations throughout life. Facilitating executive function skills requires parents and society as a whole to create, sustain, and support opportunities for children to use these skills, so that each successive phase of learning and development builds on a solid base.

What matters most, genes or environment?

Experiences and environments count as much as genes and can even influence how genes work. Our genes have instructions on them that tell our bodies how to work. However, the environment has to authorize the instructions for them to be carried out. Positive experiences are **environmental signatures** that authorize instructions for positive outcomes. Negative experiences, like exposure to violence or abuse, authorize instructions for negative outcomes. Because environmental signatures on a person's genes can last a lifetime, society needs to ensure that genes get positive environmental signatures early on.

What derails development? Stress is the bad guy in the story of child development, but we have a lot to say as a society about the power of the stress our children are exposed to. A **positive stress response** happens in situations like the first day with a new caregiver or receiving an immunization. It's a normal part of healthy development and is characterized by short increases in heart rate and hormone levels. **Tolerable stress** activates the body's alert systems to a greater degree as a result of more severe, longer-lasting difficulties, such as the loss of a loved one or a frightening injury. If the stress is time-limited and buffered by supportive relationships with adults who help the child adapt, the brain and body recover from what might otherwise be damaging effects. A **toxic stress response** occurs when a child experiences strong, frequent, and/or prolonged adversity – such as physical or emotional abuse, chronic neglect, mental illness or addiction in a caregiver, exposure to violence, and/or chronic family economic hardship – without adequate adult support. Prolonged activation of the stress-response systems can disrupt the development of brain architecture and other organ systems, and increase the risk for stress-related disease and cognitive impairment well into adulthood. Toxic stress literally gets built into the brain and the body. Society can work to prevent toxic stress responses in young children by reducing their exposure to extreme environments and by providing buffering relationships at school and in the community.

How can we prevent negative outcomes? For many children, the consequences of early adversity may be many years in the future – or, if a child is fortunate enough to land in a strong community, may not be triggered at all. Early negative experiences affect later development in the same way that faultlines sometime result in full-blown earthquakes. **Brain faultlines** appear across all segments of society, and, like faultlines in the earth, they can form in a number of ways. In some cases, they appear as the brain develops, or they can develop over time as people experience stress without supportive relationships. Also, people may have been born with brain faultlines. Just because there is a faultline doesn't mean there will be an earthquake. Brain faultlines are triggered by factors and experiences that turn them into earthquakes, which can do a huge amount of damage. There are things we can do to help prevent faultlines from developing, and to minimize the chances that existing faultlines will turn into earthquakes. There are also things we can do once traumas or addictions have happened to prevent damage from happening again.

What can we do to protect children from harm?

To prevent toxic stress and avoid triggering brain faultlines, society needs to focus on the child's ability to function at home and in the community. Promoting children's mental health is like using a sugar packet to level a table. The table can't function properly if it is on a slanted floor or if one of its legs is uneven. Similarly, children can't function fully if the environment in which they grow is unstable. This affects their mental health and undermines their development. The table can't level itself: we have to step in and provide assistance to steady the table's base. Putting a child

in a violent or extremely unsupportive environment or uprooting the child from his or her home is like placing a table on uneven ground. When we intervene, by stabilizing the child's environment and helping him or her level out, the child's mental health is supported and he or she can get back in sync with their environment. Whether it's by providing appropriate and timely interventions in situations of parental addiction or depression, or by making better-trained mental health professionals more available in very early care programs, interventions can help children achieve the levelness they need to grow a strong foundation for later development.

How can we tap Alberta ingenuity to shape better environments for our children?

We can measure the **effectiveness factors** that account for the difference between programs that work and those that don't work to support healthy development. Without these effectiveness factors in place, children could spend many hours in a program and not show many positive outcomes. When we isolate the effectiveness factors, we can evaluate what a good program is and focus on making the good programs available to more people. Doing this, however, requires us to subject children's programs to scientific rigour, so that we can know what the effectiveness factors are.

A young girl with long, straight, dark brown hair is looking intently at a chess game. She is wearing a red top. The background is a brightly lit room with large windows, and other people are visible in the background, some holding up phones. The image has a teal overlay on the bottom left and bottom right corners.

“It is a myth that destiny is in our genes. Exciting new studies reveal that most human traits and most diseases come not just from genetics and not just from environmental experience, but from a convergence of the two – a mixing of the two into what are called gene-environment interactions. It is this differential expression of the genetic code that turns out to be what really does guide our fate, our ability, and our potential as human beings.” **W. Thomas Boyce, MD**



“The neurobiology of addiction has profound implications for everything from treatment to recovery to vulnerability, but the critical part here is that anyone who tries to argue that addiction is a moral problem or a choice problem is missing the key point: it’s a brain disease. The brain has changed and you have to get your brain back to deal with addiction.” **George F. Koob, PhD**

WHAT WE KNOW AND WHY IT MATTERS

Findings from neuroscience, developmental psychology, molecular biology, and economics leave no room for doubt: early childhood matters significantly. Adverse early life experiences – such as abuse, neglect, and growing up with caregivers who have mental health and addiction issues – affect the developing brain, resulting in increased risk for physical and mental disorders, addiction, and learning deficits later in life.

Everyone in society has a stake in this issue. The healthy development of all children provides a solid foundation for economic productivity, responsible citizenship, strong communities, and successful parenting of the next generation.

How Brains Get Built

The complex dance of genes and environment

Brains are built over time, starting before birth and continuing through infancy, childhood, adolescence, and young adulthood. Early brain development involves a complex dance of genetic and environmental factors that interact to influence the architecture of the maturing brain and how it will function throughout the lifespan – controlling cognition, emotion, and physical and mental health. Genes provide the basic blueprint, but experiences shape the processes that establish either a sturdy or weak foundation for all the learning and behaviour that follow. Early life experiences don't actually change the structure of the genes; they change the action of regulatory proteins that bind to DNA and turn genes on or off. Through this process, called epigenetic change, experiences leave lasting chemical "signatures" on genes and change the way they work. There is also evidence that epigenetic changes can be passed from one generation to the next.

Different parts of the brain develop at different rates

The sensory systems for vision and hearing form largely before birth and are fine-tuned during the first six months of life. Language capacities develop later in the first year. The pre-frontal cortex, which controls planning, higher-order decision-making, and emotion regulation, matures later in the teen and early adult years.

The brain starts with a large number of neurons, and over the first three years a large number of connections form between them – more connections than the brain will have at any other time of life. The connections that get used strengthen and stay; those that are not used get pruned away. If a child is read to, talked to, and reasoned with, he or she is using the brain circuits needed for reading, comprehension, and reasoning. Those circuits will be strengthened and stay in place. A child who is left on his or her own for extended periods of time, watching television for example, will not use the same circuits and those circuits will not be strengthened.

The capacity of the brain to change structure, function, or organization of neurons in response to experience is called brain plasticity. This ability persists throughout the lifetime, but specific types of plasticity are age dependent. In the case of the pre-frontal cortex, which matures over an extended period of time, there is a long window of plasticity providing a greater opportunity to affect processes under its control positively or negatively.

Serve and return sets the stage

Scientists now recognize that early positive interaction between a child and one or more caregivers is important for healthy development. Human infants come into the world as social beings ready to attach and to interact with those around them. Within a month they will seek out the eyes of another as a key medium for interaction and communication. By six weeks they are able to perceive others' emotions and produce emotional signals of their own, leading to a back-and-forth, ever-evolving interaction with a parent or other caregivers. This serve-and-return reciprocity, similar to hitting a ball back and forth in a game of tennis, sets the stage for learning of all kinds that takes place in early childhood, including language learning, cognitive learning, and emotional regulation. These interactions are important for developing competencies that help children do well in school, achieve to their full potential, and thrive in many other domains of development, including social and emotional.

What Can Go Wrong?

Stress is a key factor in early brain development. There are different grades of stress, which differ in their effects on the brain. Positive stress occurs in response to a challenging situation, such as receiving a vaccination or meeting a new caregiver. Positive stress is moderate, short-lived, and important for healthy brain development and building stress-coping competencies for adulthood. Tolerable stress, such as the death of a parent, is more severe, but if it occurs in the context of supportive adult relationships, it does not cause long-lasting damage to the brain and body.

Toxic stress is entirely different. Toxic stress is intense, long-lasting, and uncontrollable, and occurs in the absence of supportive relationships. For children, it can occur as a result of abuse, neglect, or living with a parent who is unable to provide appropriate care due to mental illness or addiction. Early toxic stress embeds itself in our biological systems and manifests itself in adulthood in any number of chronic conditions and disorders, from cardiovascular disease and diabetes to addiction and mental illness.

Contrary to popular belief, very young children can experience significant impairments in their mental health. The characteristics associated with mental health problems in the very young are often different from those seen in older children and adults with psychological difficulties and might include anxiety, depression, self-regulation disorders, social withdrawal, and self-destructive behaviour. These problems require attention to prevent them from developing into worse problems later. When children grow up under conditions of high adversity, they also fall behind in developmental milestones. The more severe the toxic stress they experience, the more likely they are to fall behind, cognitively, emotionally, and socially.

One of the best predictors of resilience in children is at least one safe, secure adult relationship, which can buffer against toxic stress. Buffering can come from family members or from other caring adults who play a significant role in a child's life.

How toxic stress “gets under the skin”

Scientists are starting to understand the biological pathways that underpin brain development and how stress “gets under the skin” to affect brain and body. Stress produces a shift in the body’s biological systems to prepare for “fight or flight” in response to a perceived threat in the environment. These biological changes include increased blood glucose utilization, increased blood pressure, suppression of the immune system, vigilance, and arousal. As a short-term response, these changes prime a person to perform optimally and are essential to survival. But repeated activation of this system, especially in response to chronic toxic stress, results in a wear-and-tear effect on the body called allostatic load. Exposure to chronically elevated stress hormones can alter gene expression, affect a child’s developing brain architecture, and increase vulnerability to both physical and mental illness and substance use later in life.

How does this happen? The stress system is directed by a neuropeptide called corticotrophin-releasing factor (CRF), which activates glucocorticoids, including cortisol, via the hypothalamic-pituitary-adrenal (HPA) axis. Glucocorticoids are steroid hormones that act in response to perceived threat by suppressing unnecessary systems, including the immune system, so as to direct energy to the immediate needs of fight or flight. Normally, when glucocorticoids are released in response to stress, they cross the blood-brain barrier and interact with glucocorticoid receptors in the brain to shut off the release of more glucocorticoids. Human and animal studies indicate that early life stress can trigger an epigenetic mechanism that silences the expression of the glucocorticoid receptor gene, decreasing the number of receptors. This makes the stress-response system resistant to being shut down, so the hormones continue to circulate in the body and brain, keeping blood pressure high and the immune system down and leading ultimately to cell injury and inflammation. This fits with the increased prevalence of inflammatory diseases such as asthma and autoimmune diseases in individuals who experienced early life adversity. Persistent inflammation has also been linked to the development of major depression.

Two major cohort studies – the New Zealand Dunedin Multidisciplinary Health and Development Study and the British Environmental Risk (E-Risk) Longitudinal Twin Study – found a significant correlation between maltreatment in childhood and elevated inflammation in later years. These effects start to surface as early as age 12.

The dose effect

There is no evidence of a unique relationship between particular early risk factors and outcomes. However, the number of different early risk factors that a child experiences produces a cumulative risk. Various studies confirm this so-called “dose effect.” One of the largest, the Adverse Childhood Experiences (ACE) study (a collaboration between the Centers for Disease Control and Prevention and Kaiser Permanente in San Diego, CA), analyzed the relationship between a wide array of adverse childhood experiences (ACEs) and health and behavioural outcomes later in life in 17,000 members of the Kaiser Health Plan. Subjects were given a score of one for each of nine ACEs:

1. Recurrent physical abuse
2. Recurrent emotional abuse
3. Contact sexual abuse
4. An alcohol and/or drug abuser in the household
5. An incarcerated household member
6. Someone who is chronically depressed, mentally ill, institutionalized, or suicidal
7. Mother is treated violently
8. One or no parents
9. Emotional or physical neglect

The study found that the number of ACEs has a graded relationship to many common medical and public health problems, from smoking and lung disease, alcohol abuse, and HIV risk to attempted suicide, teen sexual behaviour, depression, and liver disease. ACEs appear to affect multiple biological systems and brain functions, leading to multiple problems in health and social domains.

The Dunedin study, which followed subjects from birth, measured a set of ACEs constituting childhood maltreatment, such as physical and sexual abuse and harsh discipline, and found a similar dose effect of adversity in children.

Early development and addiction

The effect of early toxic stress on brain development is a significant risk factor for addiction. Addiction is recognized now as a chronic, relapsing brain disease with an underlying neurobiological process. While addiction involves many interdependent causal factors, adverse early childhood experiences can alter brain architecture, including areas responsible for mood regulation and stress responses, in ways that may prime a person to become vulnerable to addiction. Addiction includes both substance-related addiction, such as abuse of alcohol or drugs, and process addiction, involving problematic use of sex, gambling, food, or other behaviours. A person can have multiple addictions at the same time to varying degrees of severity.

Most adults with addiction first started engaging in risky behaviours, including substance use, during their teenage years. This is a time during which the pre-frontal cortex is undergoing change and is not yet fully mature. Due to the extended time period over which the pre-frontal lobes develop, exposure to addictive substances and behaviours during the period of plasticity can alter brain architecture in atypical ways and increase the likelihood of developing an addiction later in life.

The neurobiology of addiction

Under normal developmental conditions, a person has a robust reward system and a quiescent stress system. When a person becomes addicted, the brain is changed dramatically and the condition is reversed. Three key neurobiological elements involved in the addiction process are: decreases in reward function, sensitization of brain stress systems, and disruption of pre-frontal executive function, leading to a definition of addiction as a reward-deficit, stress-surfeit, executive-function disorder.

Initial drug-seeking behaviour is moderated by the basal ganglia, a collection of brain nuclei that are responsible for, among other things, motivation and perception of reward. This structure contains most of the brain's dopamine, a neurotransmitter that plays a major role in reward-motivated behaviour. It orients us toward stimuli in the environment that are important for survival and produces positive reinforcement – via a burst of dopamine that feels good – when we find them. While a natural reinforcer produces a 20-30% release of dopamine, crack cocaine produces a 400% increase. Alcohol and opioids act in an equally powerful way on the nucleus accumbens, a component of the basal ganglia, to release neuropeptides called endorphins that also activate the reward system. As excessive release of these neuropeptides occurs, the brain adjusts: there is a reduction in dopamine activity and a change in endorphin receptors that blunts the effect of any natural release of endorphins. This is a reward-deficit disorder.

Meanwhile, there is also a stress-surfeit disorder occurring as a result of sensitization of CRF, which directs the body's stress system. In alcoholism and in chronic stress disorders, the stress system in the brain becomes supersensitive, meaning that more CRF is released in response to stress than normal, and lower amounts of stress are required to produce CRF release, thereby activating cortisol, which increases anxiety and depresses mood. Individuals in this condition are more likely to seek out ways to cope with stress by self-medicating

with substances or behaviours that reduce anxiety and improve mood. In animal studies, rats under these circumstances will take two to three times as much alcohol in a bar-pressing task and will work harder for it. In fact, all drugs of abuse have been shown to increase and sensitize CRF levels in the amygdala.

The frontal cortex of the brain, responsible for executive function, is also under investigation in the field of addiction. This is the system responsible for decision-making and self-regulation. The pre-frontal cortex keeps the reward system in the nucleus accumbens and the stress system in the amygdala under control and is compromised in the addiction process. In animals, it appears that this system is very sensitive to binge cocaine use and binge alcohol use.

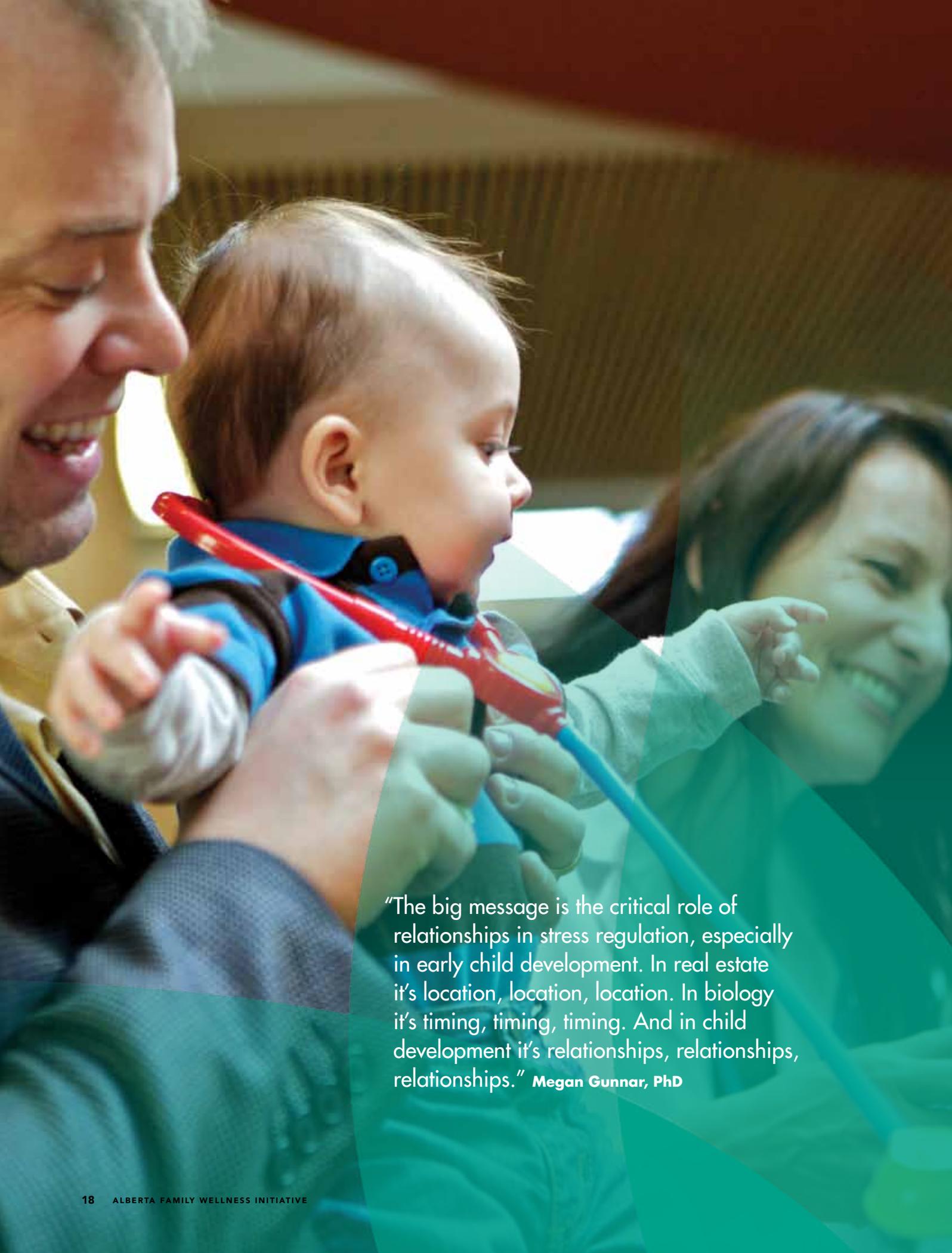
Parental depression, substance abuse, and intergenerational transmission

Early toxic stress compromises not only children's cognitive and emotional development but also their ability as adults to care for the next generation. Chronic stress impacts key biological systems, including reward and stress-regulatory systems. These systems are also central to capacities required to care for another, such as self-control, emotional regulation, distress tolerance, decision-making, anticipation of consequences, and capacity to maintain executive-control functions in stressful situations.

Studies show consistent differences between parents and non-parents in perceptual sensitivity and neural-reward and stress systems during the first months after a baby is born. Mothers show an enhanced sensitivity to sound compared to non-mothers and an activation of the brain's reward circuits at the sight of their own happy infants. Mothers also respond differently than non-mothers to high-distress baby cries with activation in regions of the brain involved in planning motor response.

This does not happen with insecurely attached or addicted parents. These parents experience decreased reward activation in response to their baby's positive emotions and less sensitivity and more stress in response to their baby's cries. As a result of the addictive process, they habitually turn to their substance or behaviour of abuse to relieve the stress, raising the potential for neglect or abuse of the child. In the case of parental depression, the infant may be perceived to be bothersome. There may be feelings of guilt, resentment, and ambivalence toward the baby. Early deprivation or neglect in the parent's own childhood may cause a heightened reaction to stress and an increased risk for abuse of the child. This begins a new cycle of early adversity for the next generation.

“The state of the science on neuroscience and developmental neuroscience has evolved to a point where we can start to make reasonable claims about the impact of early experiences on later addictive behaviours. That really is a crucial message for practitioners and policy makers alike.” Cameron Wild, PhD



“The big message is the critical role of relationships in stress regulation, especially in early child development. In real estate it’s location, location, location. In biology it’s timing, timing, timing. And in child development it’s relationships, relationships, relationships.” **Megan Gunnar, PhD**

Toward Evidence-Based Solutions

Increased understanding of how environment and genetics interact to influence the neurobiological and neurobehavioural underpinnings of early child development and addiction has led to innovative, more effective approaches to prevention, intervention, and treatment.

Improving air traffic control

There is increasing evidence that the pre-frontal cortex of the brain, which is responsible for “air traffic control” functioning such as self-regulation, planning, working memory, and decision-making, is profoundly affected by toxic stress. Children living in high-stress environments can be seen falling behind in this area as early as two years of age. It is also known that the pre-frontal cortex remains plastic over a longer period of time than other parts of the brain and may lend itself to retraining. This knowledge has led to the development of interventions and strategies that have improved outcomes for children and adults, including children with behavioural inhibition and children in foster care, adopted children, and others who have experienced abuse, neglect, and trauma. Interventions ranging from mindfulness training for parents with depression or addiction to computer programs and classroom-management strategies have shown that executive functioning skills can be taught and improved. Research has shown that high-quality instruction can foster executive functioning skills, making a case for upgrading preschool education. At the very least, it is possible to provide a preschool environment with high-level instructional supports to minimize losses and maximize gains for children at risk because of early deficits.

Treating parental depression

Depression and its effects on parenting is an area that particularly offers promise for intervention due to its prevalence, high cost to society, and the availability of a variety of interventions that have shown encouraging results. In fact, depression is the most treatable of major mental illnesses. The evidence suggests there are important opportunities to strengthen parenting while treating depression and, in doing so, strengthen outcomes for children.

There are many different treatment strategies and choices for depression, including cognitive behavioural therapy, interpersonal therapy, mindfulness techniques, and medication. A meta-analysis of randomized controlled depression-prevention trials in adults suggests that approximately 22% of major depressive episodes can be prevented. Promising intervention strategies for depressed parents include treatment, providing help with parenting, using an approach involving at least two generations, and in some cases directly involving children in the treatment process. Depression prevention can be an outcome of other interventions in broader systems that help parents become more effective, such as job retraining for unemployment. Broader preventive interventions that support families, such as home visitation, should be easily accessible.

Interventions that focus on parental mindfulness have been shown to be effective with depressed mothers. Work with the mother as parent must be combined with parent-child work to address the mother's perceptions about the baby and her understanding of what the baby is conveying to her. In the case of addiction, some programs that use this approach, specifically focused on increasing a mother's mindfulness of her experience as a parent and the needs of the child, have shown effectiveness in decreasing substance use comparable to, and sometimes better than, standard drug treatment. Most important, integration of services for adults as parents with services for their children offers the opportunity to impact multiple generations and especially the parenting by those children when they are adults.

Involved fathers make a difference

Research shows that early father involvement helps children adapt to difficult life situations, and that children of involved fathers tend to have fewer behavioural problems and do better in school. The benefits extend to the men in terms of better health and longevity and more satisfying romantic relationships. Women married to involved fathers tend to experience lower levels of postnatal parenting stress and depression and are more responsive to their children. All of these changes tend to lower children's risk of being abused and/or neglected.

These observations led to the development of a research and intervention program called Supporting Father Involvement (SFI), the first randomized, controlled clinical trial focused on father involvement in low- and middle-income families. SFI is based on the idea that in order to help the family, it is essential to start with where the family started – the couple relationship. The study, conducted in California, compared three groups: a control group that received an information session, and two groups – fathers only and couples only – that participated in a 16-week intervention consisting of interactive sessions dealing with co-parenting and relationship issues.

The results showed the fathers' groups helped men become more involved in children's care while children's problem behaviours remained stable. The couples' groups also helped fathers get more involved and kept children's behaviours stable while reducing parenting stress, depression, and anxiety. The control group remained the same or worsened, and their children's behaviour problems increased. Strengthening the co-parenting relationship is what makes the difference, the researchers point out.

The SFI study is now being replicated at pilot sites in Alberta.

An evidence-based approach to addiction

A research-based understanding of epigenetics, developmental neuroscience, and behavioural neuroscience is shifting the way society supports individuals and families coping with addiction. Behaviour and imaging studies show distinct changes in structure and function in the brains of addicted individuals. This suggests new avenues for identifying vulnerability to addiction, new options for choice and timing of interventions, and new ways to monitor treatment progress.

Some of the advances discussed at the RFA Symposia included the integration of mental health treatment with addiction treatment, therapy for multiple addictions, use of trauma-informed therapy, gender-sensitive therapy, family-centred care, adoption of a chronic disease management model of care, and more attention to performance measurement and management.

A chronic disease management model for addiction

Traditionally, addiction has been treated as an acute condition, with clients stabilized and released after a brief episode of treatment, only to return when the condition worsens or relapses. Since addiction has been recognized as a chronic disease rather than a failure of personal will, a chronic disease management model is gradually being seen as the most appropriate and effective approach to addiction treatment.

Recent advances in the management of chronic diseases such as diabetes, hypertension, and chronic obstructive pulmonary disease (COPD) have been used to help reduce wait times, decrease use of healthcare resources, and improve overall patient health. Key concepts of this approach are screening and early detection in the entire population, use of interdisciplinary healthcare teams to provide services and long-term monitoring and follow-up, education of patients in self-care practices, and establishment of a long-term case management system with primary care physicians co-ordinating patient care. Studies of the success rates of Physician Health Programs (PHP), which use a holistic, family-centred, chronic care management approach to addiction, show excellent outcomes for substance abuse problems. The success of the PHP model indicates that it is possible to improve addiction treatment outcomes by adopting the chronic care approach and strengthening linkages across the continuum of care. Alberta's Addiction and Mental Health Strategy embraces the chronic disease management model for addiction.

The family as client

At policy and program levels, we need to think about families, not individuals, to have the greatest impact. Addiction is a family affair. Chronic toxic stress and adverse childhood experiences that affect the neurobiology of people within the family system reach back generations and become ingrained. Growing up in a household with an addicted parent who is unable to provide appropriate care can negatively affect the architecture of a child's developing brain and his or her own capacity to care for another as an adult. Not only can the resulting epigenetic changes in the brain be passed on to the next generation, but the child also doesn't experience the secure attachment in his or her early years or learn the appropriate parenting behaviours that underpin his or her ability to parent effectively as an adult. Yet addiction treatment programs are most often designed to focus only on the individual. A paradigm shift is required in both policy and practice to recognize and treat the family as client. When we focus on the family and their recovery, the likelihood of the addicted person receiving help, staying in treatment, and continuing in recovery substantially increases, while the potential for intergenerational transmission decreases. The Alberta government has taken an important step in this direction by adopting a family-based, more comprehensive approach to prevention and treatment in its Addiction and Mental Health Strategy.

“Parents tend to rely on what their family did or else do completely the opposite and so often there’s no room for scientific evidence on parenting. But the science should have some value to them. No matter what their history is, no matter what kind of background they came from, parenting skills are learnable; they’re accessible; they’re evidence-based and professionals can teach them.” **Amelia Arria, PhD**



“Wrapping a child in bubble wrap is the worst thing we can do to help them develop into competent, stress-resilient adults. You have to have experiences that challenge you if you’re going to be competent as an adult. It’s the toxic stressors that we worry about.”

Megan Gunnar, PhD

Aboriginal community mobilization

In the case of Aboriginal communities, a whole community can be mobilized to tackle the problem of addiction through a defined multi-step cultural and spiritual process based on a common history of trauma. The Wellbriety Movement is an example of such a process and may offer solutions for some of Alberta's Aboriginal communities.

Wellbriety recognizes the interconnectedness of everyone and of everything in the spiritual and physical worlds by involving not only those in recovery but also their families, friends, and the whole community in the healing process. It trains community facilitators to lead a process that includes community-wide acknowledgement of unresolved grief and the building of infrastructure to support healing, such as 12-step groups for men and for women, groups for children of alcoholics, and Sons of Tradition and Daughters of Tradition prevention programs for youth. The system illustrates how change happens not from the top down but from these small circles that expand and change the community as a whole.

Providing caregiver and community supports

The science tells us that one or more stable, supportive relationships with adults in a child's life can be a powerful buffer against toxic stress. Policies that support parents and caregivers in this all-important role should be a number-one priority in both prevention and treatment initiatives.

Resources that familiarize parents with the core story of early brain and child development should be provided to them at the earliest opportunity, prenatally or shortly after their baby's birth. Information programs are effective to a degree, but more is needed to address the severe adversity that some children endure in their homes and communities. Screening should be in place for early detection of parent-child attachment problems, including parental depression and addiction. Treatment plans ideally will engage the whole family and include interventions aimed at strengthening parent-child attachment.

Ensuring that needed caregiver and community supports are in place requires co-ordinated cross-sector, cross-ministry, and cross-agency initiatives – including a broad range of government policies and programs, as well as private-sector initiatives. This collaborative approach is already underway in Alberta. The provincial government's Addiction and Mental Health Strategy is a fully integrated model for change.

Early screening in a primary care setting

Opportunities for prevention and early intervention are most evident at the primary care level. Many issues remain to be addressed to ensure that physicians and other professionals in primary care are prepared to carry out this responsibility, as well as provide referrals to specialized care and follow-up in a chronic disease management model for addiction treatment. These issues range from fee structures and training to knowledge of all available addiction services and how to access them.

There is growing evidence that early detection of problem drinking short of addiction can save the healthcare system considerable expense. Because heavy drinking affects blood pressure and blood glucose control, alcohol-use screening and counselling have the potential to improve clinical management of hypertension and diabetes. This would involve adopting an SBIRT (screening, brief intervention, and referral to treatment) approach for patients in primary care settings. Under the SBIRT model, all patients automatically undergo a quick screening to assess their alcohol use. Patients deemed at risk of developing serious problems receive a brief intervention to raise their awareness of potential negative consequences of their alcohol use and motivate them to reduce their alcohol consumption. Patients who show symptoms of

alcohol dependence receive referrals to specialty care. To make this system work, primary care practitioners need a reliable, up-to-date directory of addiction and mental health services in the community, including non-AHS services, and clinical pathways that support linkage and access to them.

Some primary care practices in southern Alberta are piloting use of a questionnaire designed for the ACE study to screen for adverse childhood experiences. Use of the ACE questionnaire in the U.S. has proven useful in getting patients to discuss how early childhood adversity may have influenced their lives and to determine whether further intervention or treatment is required.

Improved continuity of care

Currently, there are many gaps in the continuity of care for addiction. The pathway from detox through intervention, follow-up, self-management, and ongoing monitoring is convoluted. Services must be integrated and linkages must be established between and among primary care physicians and practitioners working in the wide range of treatment programs and community supports so that the patient's pathway is clear and no patient falls through the cracks. Links between clinicians and disciplines outside the healthcare system – such as justice, corrections, education, and child and family services – are needed to facilitate early intervention and ensure continuity of care from multiple entry points. Work is underway in Alberta's Addiction and Mental Health Strategic Clinical Network (AMH-SCN) to develop and evaluate a clinical pathway for alcohol use disorders ranging from potentially harmful drinking through to addiction.

Process improvement for addiction treatment

Business process improvement is a systematic approach to help optimize an organization's underlying operational processes in order to achieve greater efficiency and improve results. This approach has been used successfully in many industries and is now being applied to health care to improve access and retention to care. The Network for the Improvement of Addiction Treatment (NIATx) was created specifically to help improve business processes for addiction treatment services.

NIATx has identified four key areas in which addiction treatment agencies could greatly improve their business processes: (1) reduce the delay between first contact and obtaining treatment; (2) reduce the number of people not showing up for appointments (no-shows); (3) increase admissions; and (4) increase continuity rates between different levels of treatment. Their research shows that changing from scheduled appointments to walk-in appointments is a highly effective change an organization can make to reduce no-shows, increase admissions, and reduce the delay to obtaining treatment. Organizations have also successfully increased their continuity rates by enrolling patients in outpatient programs while they are still in residential treatment, and scheduling joint sessions between residential and outpatient programs. The AMH-SCN's Access Improvement Measure (AIM) is a business process redesign tool that helps family practices, specialty clinics, and Alberta Health Services programs streamline a patient's journey through care.

Embedding performance measurement into the system

The measure of a system's effectiveness is not just the quantity of programs available but also their quality. Participants heard a telling statistic that while numerous treatments have been tested and found effective for children and adolescents with mental health problems, less than five per cent of the care provided to children in North America with mental health problems is guided by evidence-based practices. It is likely not a stretch to raise similar concerns about programs for individuals and families affected by addiction or mental illness. When introducing any new program, it is essential not only to ensure it is evidence-based but also to build in a mechanism to monitor results.

With massive changes taking place in the province's addiction and mental health system and the broader human services system, mechanisms must also be in place to track system performance. Effective performance management requires specifying measurable goals, a strategy for achieving those goals, and a small set of performance indicators for monitoring progress. It is important to collect only the measures that can provide critical information that can be used to achieve the desired outcomes. Too many performance indicators can burden staff with collection of data that has no practical use. It is also important not to waste time waiting to measure outcomes. Systems that show better performance during treatment tend to have better outcomes, so a more sensible logic model involves the use of outcome proxies or indicators that can be measured during treatment, such as symptom relief, and that may suggest treatment is leading to a good outcome or that treatment is not working and a change of approach is required. Putting procedures in place to receive fast feedback in order to take corrective action requires a culture and mindset that see failure as a learning opportunity. Alberta has done considerable groundwork in this area and now needs to streamline its goals and indicators for effective performance management as it integrates mental health and addiction into the larger healthcare system.

Above all, invest in the early years

A core element of the Alberta Family Wellness Initiative (AFWI) strategy and Alberta's Addiction and Mental Health Strategy is the importance of investment in the early years. Due to the high level of brain plasticity during early childhood, the return on investment in early intervention is significant in terms of prevention. There are also considerable returns on investment to be gained in evidence-based treatment programs for adults with addiction, not only for the potential to improve the lives of addicted individuals but also to improve the quality of the environments in which their children are raised.

“One lesson we have learned about the neurology of addiction is that detoxification isn't treatment; it's detoxification. The brain is organized in a way that withdrawal is in a different part of the brain than the attachment to drugs. So, even in the brain, you can chemically change the withdrawal centre with detox, but it doesn't change the addiction.” **Mark S. Gold, MD**



“I think Albertans are beginning to get very focused in this area and are recognizing that the health and welfare of our children translates into the health and welfare of our community for a long time.” **Pat Levitt, PhD**

AFWI STRATEGY ACHIEVES MAJOR IMPACT

Within the first year of the Alberta Family Wellness Initiative (AFWI) strategy, the Government of Alberta produced two major policy documents incorporating key learnings from the AFWI Symposia. *Let's Talk About the Early Years*, a report by Alberta's Chief Medical Officer of Health, incorporated elements of the core story of early child development and addiction and many key concepts from EBBD 2010, such as the far-reaching effects of toxic stress on brain architecture and function, the importance of the serve-and-return interaction that builds the brain through secure attachments between parent and infant, and the gene-environment interaction that influences development from pre-birth and underscores the need to invest more wisely in the early years.

The second document, *Creating Connections: Alberta's Addiction and Mental Health Strategy*, was published in 2011 and strongly reflects learnings from the 2010 EBBD and RFA Symposia. Many Symposia participants played a part in building the Strategy. The FrameWorks Institute was also engaged in the development of *Creating Connections* to ensure that the language of the Strategy was congruent with some of the discussions taking place at the Symposia. The Strategy adopts a family-based, comprehensive approach to prevention and treatment that features enhanced prenatal and at-birth screening, ongoing parenting support, a continuum-of-care model, chronic disease management for addiction, and improved access to quality addiction and mental health services within the primary healthcare environment – key concepts discussed at the Symposia. The Strategy is now being implemented throughout the system in Alberta.

Other early results linked to concepts discussed at the EBBD and RFA Symposia include:

- Use of a common language – including concepts such as toxic stress and brain architecture – has helped professionals from health, education, justice, and other service areas to work together, for example in the development of the Addiction and Mental Health Strategic Clinical Network (AMH-SCN) being rolled out within Alberta Health Services.



“It doesn’t just happen that we become parents. It’s built into our biology. Something happens when you have a baby that activates components of the reward circuitry in your brain. This has important implications for how we think about working with depressed or addicted adults who are also parents.”

Linda Mayes, MD

- The AMH-SCN has selected three main projects for initial focus: clinical pathways for depression; clinical pathway development for alcohol use disorders; and AIM (Access Improvement Measure), a business process redesign tool. The aim is to fill gaps across tiers of care and across the lifespan to address issues of intergenerational transmission of addiction and depression.
- Videos on the AFWI website have been used as a resource to help mental health and other health professionals understand addiction risk factors, treatment, and models of care.
- The AFWI website received more than 28,000 hits from Alberta over the two years following its launch in September 2011.
- A new professional development curriculum for addiction and mental health workers – Provincial Concurrent Capable Learning Series (PCCLS) – incorporates concepts of long-term chronic disease management, integrated care, and family involvement, particularly for individuals with concurrent disorders.
- Information from the Symposia has spread to the business sector, where some employers are looking at the chronic disease management model of addiction treatment with respect to employees.
- Alberta's corrections system is shifting to a trauma-informed chronic care model of treatment for inmates with addiction. A universal screening tool for mental illness and addiction has been instituted. For those who screen positive, treatment starts in the facility with links to community services on their release.
- Work has begun with an EBBD presenter/expert on a Parenting After Separation pilot course.
- Workforce development learning modules have been created from EBBD Symposia videos to be used for staff to earn social work credit.
- Collaboration is underway between Alberta's Health, Human Services, and Education departments at the deputy minister level on a cross-ministerial early childhood development strategy.

At the national level, the Association of Faculties of Medicine of Canada and the Norlien Foundation have partnered to develop a suite of e-learning tools on early brain and biological development and addiction for undergraduate medical education. These include a series of 13 podcasts on brain development and addiction based on lectures from the EBBD and RFA Symposia, an online primer on the biopsychosocial approach to addiction, and several interactive virtual patient cases designed to highlight intergenerational issues related to addiction.

"You've created something over three years that is really distinctive. It's hard to find this kind of linkage between science, policy, and practice anywhere. You have a special opportunity now."

James Radner, MPhil

Impact spreads throughout the system

In a recent survey, participants cited specific outcomes within their own practices and workplaces, as well as in a broader context, including:

Research

- Many reported that their own research focus and agenda were influenced by their AFWI experience and that they have observed a rising number of research projects across disciplines focused on child development and the early years.
- A large number noted broader networks and increased opportunities for collaborative research across and within disciplines, including more involvement of clinicians in research, increased engagement from partners, and more connections with other researchers
- A significant number reported increased sharing and mobilization of knowledge (e.g., research findings, core story, and chronic disease model for addiction) with colleagues, students, public policy makers, family and youth judges, and patients through workshops, presentations, formal education, and in clinical practice.
- Many reported increased networking opportunities, nationally and internationally, including development of an addiction research network.
- A multi-stage research protocol investigating the impact of ACEs on health outcomes was developed through collaboration between AHS, the University of Calgary, and primary care networks (PCN). The project is intended to result in the development of a treatment strategy for at-risk Albertans in primary care settings.

Policy

- A large number of participants noted increased knowledge about addiction and early brain research, and increased use of research and learnings in policy development.
- Nearly one-third noted that policies are being updated and reviewed based on Symposia learnings.
- Many reported increased cross-discipline collaborations and strategic partnerships, including alliances with researchers and service providers, within ministries and across provincial and federal governments; many observed that collaboration across disciplines, services, and zones is becoming an expectation.
- A significant number observed that learnings, particularly related to early brain research, trauma, and the chronic disease model for addiction treatment, are influencing policy development of Alberta's Addiction and Mental Health Strategy and the beginnings of an early child development strategy for the province.

Practice

- Nearly half of the respondents in this area reported using research to inform their practice (e.g., chronic disease model and trauma-informed approach for addiction treatment; a more family-centred approach; and more integration of services for addiction and mental health).
- Close to a quarter of respondents reported integration of assessment tools, such as the ACE questionnaire and other screening tools for children and adolescents, into their practice.
- Many reported more knowledge exchange with other practitioners and cross-sector linkages.
- Some have used Symposia resources, in the form of information sheets for patients and parents, in their practice.
- A number have observed changes to practice in the broader environment, including integration of measurement and evaluation; introduction of screening tools; and increased focus on prevention, trauma-informed care, and integration of the core story of early brain development and addiction.

Professional development

- Several respondents reported knowledge mobilization with colleagues and students through lunch-and-learn series, telehealth education programs, and Provincial Court judicial conferences.
- Some have developed workshops, presentations, and conferences based on Symposia learnings.
- About one-third reported increased staff and student training opportunities, such as gender-based and trauma-informed training.
- Some have become involved in workshops and training to bring elements of the Wellbriety process to interested First Nations communities.

Institution-based education

- One-third of the respondents reported changes to curricula, including updates to early childhood development programs; changes to content in social work and health sciences programs; changes to medical education, particularly regarding addiction; increased student engagement regarding addiction within an MBA program; and greater use of research to support teaching. For example, one participant who teaches in an MBA program integrated information on addiction treatment and prevention into lectures in light of increasing focus on social responsibility in such programs.
- A large number reported observing learnings incorporated into education, including development of new undergraduate and integrated undergraduate/graduate courses in nursing, curriculum development in social work and pharmacy, and development of a proposal for a neuroscience course for early childhood practitioners.
- Some reported involvement in changes to education, such as integration of the chronic disease model into the curriculum, integration of learnings into lectures, and exam questions based on core story material.
- Some noted increased opportunities for collaboration, such as a partnership between the University of Calgary and Child and Family Services to develop a Social Pediatrics rotation for all pediatric residents at the University of Calgary.

Culture

- Significantly, fully half of respondents indicated that they had observed or experienced changes in attitudes and increased understanding and awareness of the AFWI's scientific content. For example, they noted more use of developmental screening in Primary Care Clinics, use of a common language, recognition of the chronic disease model for addiction treatment, better informed practice, better informed staff, and recognition of early childhood development as a priority.
- Almost as many reported being better informed or observing a better-informed environment across and within disciplines, as evidenced by attitude changes in the workplace regarding addiction and the significance of early brain development, and increased compassion regarding addiction.
- A Family and Youth Court judge says judges have become much more aware of the impacts of toxic stress on the developing brain and that this awareness appears to be making its way into their decisions and has heightened awareness of the issue amongst the litigants and counsel who appear before them.
- In the broader cultural environment, nearly one-quarter of respondents reported growing numbers of networks and collaborations between research, policy, and practice, within community organizations and schools, and between Alberta Health Services, ministries, and community partners.

Most significant impact of all

Across the board, respondents reported that the language of the core story of early brain development is entering common usage and the AFWI learnings are becoming common knowledge. This is perhaps the most significant impact of the AFWI strategy on research, policy, and practice in Alberta. A common language and a common understanding are the foundation for the next step: to translate our collective knowledge into positive outcomes for children and families throughout the province.

“Addiction is a developmental brain disease and we need to think about it from a developmental perspective, and that will have a number of implications for what we do from policy, research, and service delivery points of view.... Every addiction program should have a child development and family process-oriented clinician inside the treatment program to help the addiction treatment system better think about and negotiate these issues of child development and family process.” **Thomas J. McMahon, PhD**

WHAT NEXT?

How can we mobilize to move the leading-edge science that we now know into practice?

Taking the core story to the people

The public in general needs to understand the core story of early brain development so as to support effective and efficient community programs and services. The Alberta Family Wellness Initiative (AFWI) participants have carried the message back to their colleagues and have begun to incorporate it into their professional responsibilities. The Government of Alberta continued the dialogue with the publication of *Let's Talk About the Early Years*. Primary care practitioners are well positioned to further disseminate this information to the public. Appropriate training curricula are already being put in place in Alberta, for example in schools of nursing, to provide the necessary skills and knowledge to perform this role.

In order to continue the momentum already achieved, it is important to move the core story into the public square. A positive step in this direction was the publication of an entire issue of AHS' *Apple* magazine in fall 2012 devoted to early childhood and brain development. Approximately 135,000 copies of the magazine were distributed at locations around Alberta and through the Norlien Foundation, with an estimated readership of nearly 475,000. Core story messaging is also being embedded in AHS' Prenatal/Postnatal and Early Childhood (PEaCh) resources for expectant parents and parents of children 0-5 years old. Other Alberta-based vehicles for conveying the core story are the popular *Science in Seconds* video series (<http://albertafamilywellness.org/families-individuals>) and Health Unlimited Television (HUTV). The latter, in partnership with AHS and Health Link Alberta, provides general health and wellness programs for over 200 medical waiting room screens in 55 locations throughout Alberta, from Fort McMurray to Cardston, reaching nearly 700,000 viewers per month. HUTV has produced several vignettes from AFWI materials in addition to airing *Science in Seconds* videos.

Shift to prevention

The vehicle for achieving the ultimate goal of healthy children, families, and communities will be a gradual shift in emphasis and resources upstream to health promotion and prevention. Alberta has a distance to go toward that future, but momentum is gaining in the province's system transformation. AHS' population and public health programs around maternal child health – including surveillance; screening and early identification; well child clinics; preconception, prenatal, postnatal, and early childhood programs – have a clear focus on promotion and prevention. A new social policy framework has been drafted, and implementation of Alberta's new Addiction and Mental Health Strategy is well underway. These and other high-level policy developments provide a picture of a system developing in the desired direction.

Toward a new model for change

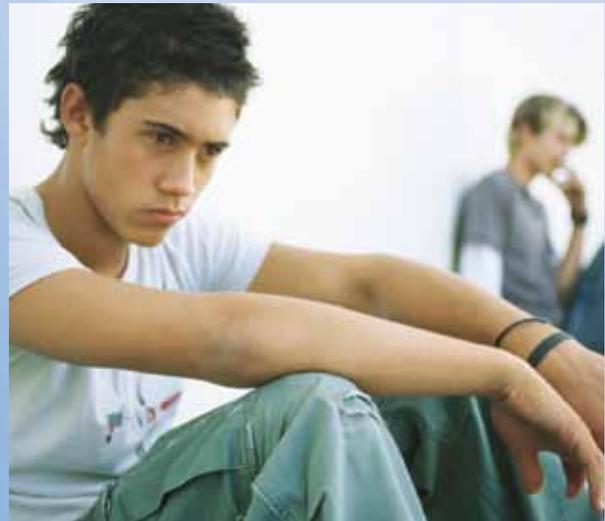
The framework guiding early childhood policy and practice to date has been based on the theory that an enriched language environment, parental education, and better nutrition are the bases for a healthy growth trajectory. The hypothesis behind the toxic stress core story is that enrichment efforts are limited by toxic stress in the early years that leads to impaired health and development. Today's science suggests that new protective interventions can counter early childhood adversity and restore a healthy developmental trajectory. This theory has been formulated by the Frontiers of Innovation (FOI) group initiative in an integrated science-based logic model that could inform more effective early childhood policies and programs.

FOI focuses on the work of a community of more than 400 researchers, practitioners, policy makers, philanthropists, and experts in systems change from across North America. The goal of FOI is to bring about substantially greater positive impacts for vulnerable young children whose needs or the needs of their caregivers are not being fully met by existing policies and programs. Major support for the FOI initiative has been provided by the Norlien Foundation, along with several other major North American investors, led by the Bezos Family Foundation.

FOI connects practitioners, policy makers, and researchers into ideas-to-action groups and identifies pockets of activity – small innovating community-level programs and larger innovating jurisdictions – where a focused resource push could result in faster change. Alberta is one of those jurisdictions and two Alberta sites are included in the group of innovating sites.

The work that has been done in Alberta, led by the Norlien Foundation and the provincial government, has laid the groundwork for innovation here. This effort has systematically developed social capital through a shared language and knowledge base, shared understanding of a science-based core story, multi-level engagement, and nurturing of cross-boundary relationships. Alberta has also set up the connections, both within its own system and with other innovating jurisdictions across North America, to sustain positive change and innovation. From front-line clinics to the provincial policy-making level, Alberta now has a community of purpose focusing collectively on unmet needs and sharing knowledge and aspirations for improved outcomes for early child development and for individuals and families affected by addiction. This is not an end point but a springboard to new ways for turning what we know into what we do to shape the world we leave behind for future generations of Albertans.

The Symposium titled Accelerating Innovation: Telling the Brain Story to Inspire Action, scheduled for October 27 through November 1, 2013, will kick off the next phase.



“One area of concern is the intergenerational transmission of trauma. If a caregiver is affected by being on an emotional roller coaster, how does that affect his or her ability to parent effectively? We need to look at how to better support these at-risk parents in terms of policy, treatment, and future research.” **Ruth Lanius, MD, PhD, FRCPC**

RESOURCES

The summary reports of each of the EBBD and RFA Symposia, and videos of the Symposia presentations in their entirety, are available for download from the Alberta Family Wellness Initiative (AFWI) website. The website (<http://www.albertafamilywellness.org/>) offers access to a wide range of resources on early brain and biological development, child mental health, and addiction geared specifically to researchers, healthcare professionals, front-line professionals, policy makers, and the general public. These include document and video libraries, learning modules, event listings, and information updates via e-mail, as well as video summaries of Symposia highlights, a collection of current Working Papers from the National Scientific Council on the Developing Child, and reports from the FrameWorks Institute on how the general public in Alberta thinks about early childhood development, children's mental health, and addiction. The website is now being referenced as a resource in professional education and professional development curricula and is a continuing source of current information for all stakeholders.

National Scientific Council on the Developing Child Working Papers

Available from: http://developingchild.harvard.edu/resources/reports_and_working_papers/

Working Paper 1. Young Children Develop in an Environment of Relationships. (2004).

Working Paper 2. Children's Emotional Development is Built into the Architecture of Their Brains. (2004).

Working Paper 3. Excessive Stress Disrupts the Architecture of the Developing Brain. (2005).

Working Paper 4. Early Exposure to Toxic Substances Damages Brain Architecture. (2006).

Working Paper 5. The Timing and Quality of Early Experiences Combine to Shape Brain Architecture. (2007).

Working Paper 6. Mental Health Problems in Early Childhood Can Impair Learning and Behavior for Life. (2008).

Working Paper 7. Workforce Development, Welfare Reform, and Development of Young Children. (2008).

Working Paper 8. Maternal Depression Can Undermine the Development of Young Children. (2009).

Working Paper 9. Persistent Fear and Anxiety Can Affect Young Children's Learning and Development. (2010).

Working Paper 10. Early Experiences Can Alter Gene Expression and Affect Long-Term Development. (2010).

Working Paper 11. Building the Brain's "Air Traffic Control" System: How Early Experiences Shape the Development of Executive Function. (2011).

Working Paper 12. The Science of Neglect: The Persistent Absence of Responsive Care Disrupts the Developing Brain. (2012).

PARTICIPANT QUOTES

"I am now involved in an ACE-based research project as well as a number of other projects informed by the EBBD/RFA Symposia. The ability to speak with government, ministries, other researchers and clinicians due to the common language and information base is invaluable."

"The judges in my group (Family and Youth) have become much more aware of the impacts of toxic stress on the developing brain. This awareness appears to be making its way into our decisions and has heightened awareness of the issue amongst the litigants and counsel who appear before us."

"The language of the core story is everywhere!"

"There is a growing critical mass of researchers, across many disciplines, who are all focused on child health. I believe Calgary is really being put on the academic map as a place to study child development."

"The conversation has certainly changed in the province. The awareness and uptake of early brain development is now a regular focus of conversation across a number of areas that I am involved with."

"I use the science and core story in practice and find the staff are picking up the same messages."

"I use the information in Judicial Dispute Resolution meetings on a regular basis and I believe that the majority of my colleagues do as well."

"I have ensured that, when training medical students or junior residents, I expose them to the ideas relayed in the EBBD symposium."

"I am greatly surprised at the number of requests for workshops and speaking engagements I have received since incorporating the core story into my presentations."

"I am much more likely to reach out to another professional group if I am looking for support or information as the connections have been formed through our time together."

EBBD AND RFA SYMPOSIUM FACULTY

The following scientists and experts have served as Faculty Presenters at the Alberta Family Wellness Initiative's Early Brain & Biological Development and Recovery from Addiction Symposia from 2010 to 2012.

Robert Anda, MD, PhD, Centers for Disease Control and Prevention; Co-Principal Investigator, (with Vincent Felitti), Adverse Childhood Experiences (ACE) Study

Amelia Arria, PhD, Director, Center on Young Adult Health and Development, School of Public Health, University of Maryland

Susan Nall Bales, MA, Founder and President, FrameWorks Institute

William Beardslee, MD, Director, Baer Prevention Initiatives; Chairman Emeritus, Department of Psychiatry, Children's Hospital Boston; Gardner Monks Professor of Child Psychiatry, Harvard Medical School

Claudia Black, MSW, PhD, Addiction and codependency clinician, author, and trainer

W. Thomas Boyce, MD, Professor of Pediatrics and the Sunny Hill Health Centre/BC Leadership Chair in Child Development, College for Interdisciplinary Studies and Faculty of Medicine, University of British Columbia

Jacob Burack, PhD, Professor of School Psychology and Human Development, Department of Educational and Counselling Psychology, McGill University

Judy Cameron, PhD, Professor of Psychiatry and Director of Science Outreach, University of Pittsburgh; Affiliate Senior Scientist, Oregon National Primate Research Center

Patrick Carnes, PhD, Executive Director, Gentle Path Program, Pine Grove Behavioral Health Center

André Corriveau, MD, MBA, FRCPC, Chief Medical Officer of Health, Government of Alberta

Stephanie Covington, PhD, LCSW, Co-founder, Center for Gender and Justice, Institute for Relational Development

Don Coyhis, President and Founder, White Bison, Inc.

Michelle Craig, MLP, R.SLP, CCC-SLP, Manager, Early Childhood, Health Promotion, Disease and Injury Prevention, Alberta Health Services

Andrea Danese, MD, PhD, Clinical Lecturer/Assistant Professor in Child and Adolescent Psychiatry, Institute of Psychiatry, King's College London

Philip Davies, PhD, Executive Director, Oxford Evidentia, U.K.

Maureen Devolin, MA, Manager, Sexual and Reproductive Health, Health Promotion, Disease and Injury Prevention, Alberta Health Services

Marcus Earle, PhD, LMFT, CSAT, Clinical Director, Psychological Counseling Services Ltd.

Vincent Felitti, Clinical Professor of Medicine, University of California; Co-Principal Investigator (with Robert Anda), Adverse Childhood Experiences (ACE) Study

Philip Fisher, PhD, Professor of Clinical Psychology, University of Oregon; Senior Scientist, Oregon Social Learning Center

Nathaniel Foote, MBA, JD, Managing Director, TruePoint; Senior Fellow, Center on the Developing Child, Harvard University

Nathan A. Fox, PhD, Distinguished University Professor, Department of Human Development, University of Maryland College Park

Richard Frank, PhD, Margaret T. Morris Professor of Health Economics, Department of Health Care Policy, Harvard Medical School

Brenda Garrett, RN, MC, LPC, CSAT, Senior Team Leader, Psychological Counseling Services Ltd.

Mark S. Gold, MD, Donald Disney Eminent Scholar, Distinguished Professor and Chair of Psychiatry, University of Florida

Megan Gunnar, PhD, Regents Professor, Distinguished McKnight University Professor of Child Development, and Director of the Institute of Child Development, University of Minnesota

David Gustafson, PhD, Faculty member, Industrial and Systems Engineering Department, and Director, Center for Health Enhancement Systems Studies (CHESS), University of Wisconsin – Madison; National Program Director, Network for the Improvement of Addiction Treatment (NIATx)

Charlene Hellson, BA, Co-ordinator, Honouring Life: Aboriginal Youth & Communities Empowerment Strategy, Alberta Health Services

Heather Henderson, PhD, Associate Professor, Department of Psychology, and Director, Social Development Laboratory, University of Miami

Keray Henke, MA, Senior Advisor, Alberta Education, Government of Alberta

Matthew Hill, PhD, Assistant Professor, Departments of Cell Biology/Anatomy and Psychiatry and the Hotchkiss Brain Institute, University of Calgary

Michael Kaufmann, MD, CCFP, FCFP, Medical Director, Physician Health Program and Professionals Health Program, Ontario Medical Association

Nathaniel Kendall-Taylor, PhD, Director of Research, FrameWorks Institute

Margaret King, Assistant Deputy Minister, Community and Population Health, Alberta Health and Wellness, Government of Alberta

Marsha Kline-Pruett, PhD, MSL, Maconda Brown O'Connor Professor, Smith College School for Social Work

Bryan Kolb, PhD, FRSC, Professor of Psychology and Neuroscience, Canadian Centre for Behavioural Neuroscience, University of Lethbridge

George F. Koob, PhD, Professor and Chair of the Committee on the Neurobiology of Addictive Disorders, Scripps Research Institute

Ruth Lanius, MD, PhD, FRCPC, Professor of Psychiatry, London Health Sciences Centre, University of Western Ontario

Pat Levitt, PhD, Provost Professor of Neuroscience, Psychiatry, Psychology and Pharmacy and Chair, Department of Cell and Neurobiology, Keck School of Medicine; Director, Zilkha Neurogenetic Institute, University of Southern California

Richard Lewanczuk, MD, Chief of Chronic Disease Management and Senior Medical Director for Primary Care, Community and Rural Health, Alberta Health Services

Harriet MacMillan, MD, FRCPC, Dan Orford Chair in Child Studies and Professor, Departments of Psychiatry, Behavioural Neurosciences, and Pediatrics, McMaster University

Glenda M. MacQueen, MD, PhD, FRCPC, Vice Dean, Faculty of Medicine, and Professor, Department of Psychiatry, University of Calgary

Jacques Magnan, PhD, Chief Executive Officer, Alberta Innovates – Health Solutions

Dianne Maier, MD, FRCPC, CCFP, Program and Medical Director, Physicians and Family Health Support Program, Alberta Medical Association

John March, MD, PhD, Professor of Psychiatry and Behavioral Science, Duke University Medical Center; Director, Neurosciences Medicine, Duke Clinical Research Institute

Shannon Marchand, Assistant Deputy Minister, Social Policy Framework, Ministry of Human Services, Government of Alberta

Linda Mayes, MD, Arnold Gesell Professor of Child Psychiatry, Pediatrics, and Psychology, Yale Child Study Center, Yale University

A. Thomas McLellan, PhD, Chief Executive Officer and Co-founder, Treatment Research Institute; Professor of Psychiatry, University of Pennsylvania

Thomas McMahon, PhD, Associate Professor, Departments of Psychiatry and Child Study, Yale University School of Medicine

Michael Meaney, PhD, James McGill Professor, Departments of Psychiatry, and Neurology and Neurosurgery, and Director, Program for the Study of Behaviour, Genes and Environment, McGill University

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Tom Mosgaller, MSc, Director of Change Management, Network for the Improvement of Addiction Treatment (NIATx), University of Wisconsin – Madison

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Charles Nelson, PhD, Professor of Pediatrics and Neuroscience, Harvard Medical School; Richard David Scott Chair in Pediatric Developmental Medicine Research, Children's Hospital Boston, DMC Laboratories of Cognitive Neuroscience

David O'Brien, BA, CMA, Senior Vice President, Primary and Community Care, Alberta Health Services

Garrett O'Connor, MD, President, Betty Ford Institute

Steven Ornstein, MD, Professor, Department of Family Medicine and Graduate Studies, Medical University of South Carolina; Founder and Director, Practice Partner Research Network (PPRNet)

Deborah A. Phillips, PhD, Professor of Psychology and Associated Faculty, Public Policy Institute, Georgetown University

Lora Pillipow, BA, Executive Director, Social Policy Framework Project Team, and Executive Director, Strategic Initiatives, Ministry of Human Services, Government of Alberta

Kyle Pruett, MD, Clinical Professor of Child Psychiatry and Nursing, Yale University

Catherine Pryce, RN, MN, Vice President, Addiction and Mental Health Strategic Clinical Network, Alberta Health Services

James Radner, BA, MPhil, PMD, Senior Fellow, Harvard Center on the Developing Child, and Assistant Professor, School of Public Policy & Governance, University of Toronto

Jack Shonkoff, MD, Julius B. Richmond FAMRI Professor of Child Health and Development, Harvard School of Public Health and Harvard Graduate School of Education; Professor of Pediatrics, Harvard Medical School and Children's Hospital Boston; Founding Director, Center on the Developing Child, Harvard University

Stephen Suomi, PhD, Chief, Laboratory of Comparative Ethology, Eunice Kennedy Shriver National Institute of Child Health and Human Development, National Institutes of Health

Wayne Spychka, Director, Addiction and Mental Health, Ministry of Health, Government of Alberta

Patricia Van Horn, JD, PhD, Associate Clinical Professor, Department of Psychiatry, University of California, San Francisco; Director of the Division of Infant, Child and Adolescent Psychiatry, Interim Director of Child and Adolescent Services, and Associate Director of the UCSF Child Trauma Research Program, San Francisco General Hospital

John Weisz, PhD, ABPP, Professor of Psychology, Harvard Faculty of Arts and Sciences and Harvard Medical School; President and CEO, Judge Baker Children's Center

Cameron Wild, PhD, Professor, School of Public Health and Director, Addiction and Mental Health Research Laboratory, University of Alberta



“Once you understand the multiple addiction part, and you start understanding the neuro-connections part, you are moving to a whole different model of treatment.... You can’t do it in 30 days; it’s a three- to five-year process to change those neuro-pathways.... Treatment is just a door-opener. You need to be thinking in terms of the long-term trajectory and looking for who is doing that long-term work and doing it well, or ask what needs to be built in order to have that bridge so people can have that sustained recovery.” **Patrick Carnes, PhD, CAS**



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