

# The first 5 years: Starting early

Early Childhood Series

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## Acronyms

NT	Northern Territory
COAG	Council of Australian Governments
NAPLAN	National Assessment Program for Literacy and Numeracy
AEDI	Australian Early Development Index
WHO	World Health Organization
USA	United States of America
UK	United Kingdom

## Executive summary

Investing in the early years is now understood to be one of the most effective strategies available to governments for reducing inter-generational disadvantage, building human capability and creating a fairer society.

The evidence of the benefits of investing in early childhood development derive from four converging areas of recent research.

- New methods in brain science and epigenetics showing how children's experiences in their family, community and early learning environments influences early brain development and establishes the foundation for their future health, learning and behaviour.
- Longitudinal studies showing the extent to which adult health, wellbeing and capability have their origins in family and community environments of early child rearing.
- Intervention studies demonstrating the effectiveness and long-term (adult) benefits of evidence-based preventive strategies and programs for children in their early years.
- Economic studies of proven early childhood interventions documenting the high return on investment of preventive strategies and programs delivered early in the life-course.

The Council of Australian Governments' National Reform Agenda to close the life outcomes gap between Indigenous and non-Indigenous Australians and the *Investing in the Early Years—A National Early Childhood Development Strategy* are two important policy initiatives drawing on this evidence. These policy initiatives, together with the level of new funding now available through a range of national partnership agreements, provide an unprecedented opportunity for making the transformational changes needed to improve early childhood development outcomes in the NT.

Recent breakthroughs in scientific understanding of how genes and the environment interact in shaping overall human development have resulted in the study of the developmental origins of adult health and disease as one of the fastest growing 'cutting-edge' areas of medical research. Other advances in neuroscience have also shown that the quality of early brain development is much more important for children's longer-term developmental outcomes than previously realised.

Evidence from animal studies and new functional brain imaging methods with humans show that the brain is a self-organising system in which the neural circuits of the brain are progressively 'hard-wired' by their repeated activation through the child's experiences and behaviour. While genes provide a 'blueprint' for the sequence in which different anatomical structures of the brain will emerge, the actual way in which they connect, and hence how they function, is also shaped by experience. In other words, it is a matter of both nature and nurture.

Many of these environmental influences begin even before birth. A range of commonly occurring antenatal health and lifestyle factors are now known to affect the unborn child's growth and early brain development. These include poor maternal nutrition, smoking, alcohol use, exposure to chronic or traumatic stress as well as maternal illnesses such as antenatal depression and gestational diabetes. Each of these antenatal risks is associated with a higher likelihood of adverse cognitive, behavioural and health outcomes in childhood, as well as longer-term susceptibility to a range of adverse adult physical and mental health conditions.

The hierarchical sequence in which brain structures develop before and after birth—from the development of relatively simple circuitry for sensory-motor and reflexive responses necessary for basic survival to the elaborate circuitry underpinning more complex processes such as those involved in self-regulation of attention and higher cognitive functioning—is significantly impacted by the nature of the child's early experiences with her or his caregivers.

Each new stage of brain growth and skill development is underpinned by the quality of the neural circuitry established in preceding stages. This is why it is important that parents, families and communities are assisted to understand how responsive caring and stimulation helps children establish a sturdy foundation for their long-term health, learning and wellbeing.

Brain research has identified sensitive stages of child development when specialised brain regions are especially receptive to particular developmental opportunities in their environment of child rearing. These sensitive periods are important windows of opportunity where appropriate developmental stimulation can boost children's development and readiness for school learning.

There is strong evidence for the long-term benefits of early learning programs which help children to focus their attention, persist with tasks and be receptive to the kinds of instruction and activities they are likely to encounter in the more structured learning environments of primary school.

Programs enabling good health care and adequate nutrition before and after birth are fundamental to improvements in childhood developmental outcomes. Access to regular child primary health care, use of evidence-based protocols such as the *Healthy Under 5 Kids* program is essential for development. These programs can provide a base for evidence-based parenting support and family counselling and can enable the early detection and treatment of developmental and health problems that are often much more difficult to manage if they become entrenched.

Life-course development research has identified key developmental processes and environmental circumstances that are strongly associated with adverse (or better) developmental outcomes. This research has enabled more effective targeting of policies and services as well as the design of better programs for families, schools and communities to improve child health and development.

There are a number of evidence-based early child development and parenting programs now available which should be considered for application in the NT. The Nurse Home Visiting Program is one such program having the strongest evidence of efficacy and effectiveness in producing significant improvements in early child development and educational outcomes, as well as increased longer-term employment and social and emotional benefits. A version of this program adapted for use with Indigenous families is currently being trialed in the Alice Springs area.

These and other programs such as the WHO Care for Child Development family counseling program typically seek to aid parents' understanding of their children's health care and developmental needs, strengthen attachment and responsive interaction, and teach ways to encourage desirable behaviour and non-coercive ways of managing misbehaviour.

Longitudinal studies of representative population samples consistently show the strong link between socioeconomic disadvantage in early life and the overall population burden of adult chronic disease, social and emotional problems, poor educational outcomes and unemployment. The implication of this for the NT is that systematic efforts to improve children's developmental outcomes will continue to be thwarted without more effective investment to ensure the universal availability of basic human services in housing, environmental health, primary health care, family support, child care and early education.

The research evidence summarised in this paper has four clear messages for community leaders and decision makers seeking to improve the health, capability and wellbeing of NT children.

- The most cost-effective means of reducing the proportion of children failing to realise their developmental potential for educational success and improved life opportunities is through community and government investment to strengthen early childhood development.
- The earlier in life that prevention and intervention can begin, the greater the opportunity for shifting children's developmental pathways in a positive direction. Later interventions, although important, are considerably less effective if good early foundations are lacking.
- Significant reductions in many of the chronic diseases responsible for the reduced life expectancy of the Indigenous population could be achieved by decreasing the number and severity of adverse experiences that threaten the wellbeing and development of young children, as well as by strengthening the protective relationships that help to mitigate the harmful effects of toxic stress.
- Current health promotion and disease prevention policies which are now predominantly focused on adults would be more effective if greater evidence-based investments were made to strengthen the foundations of health in the prenatal and early childhood period.





# 1. Introduction

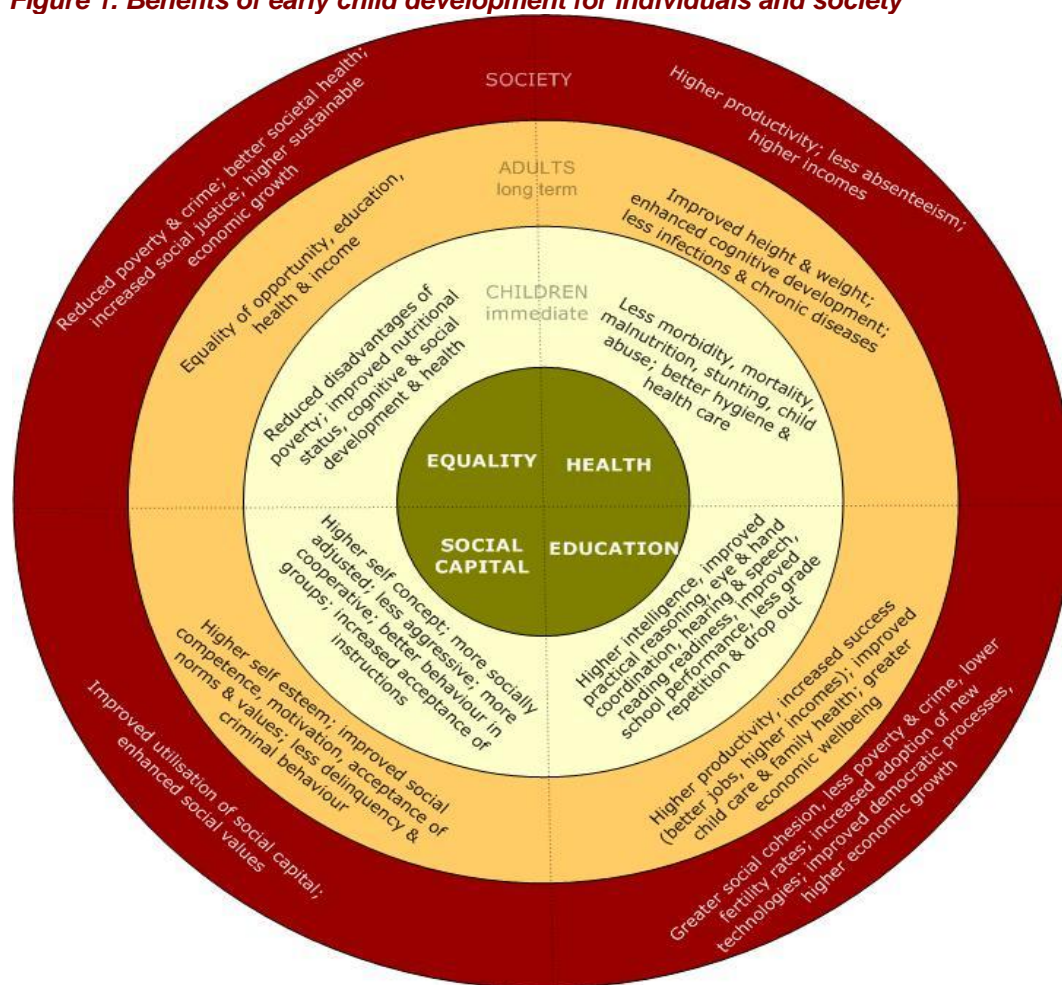
## 1.1 Why the early years are so important

The value of investing to ensure all children get the best start in life is increasingly evident to governments around the world.<sup>1</sup> The need for such investment in Australia was recognised by the Council of Australian Governments with its endorsement of *Investing in the Early Years—A National Early Childhood Development Strategy*.<sup>2</sup> This national initiative is supported by the accumulating body of evidence showing that investing to support and strengthen all aspects of early childhood development brings long-term benefits to children over the course of their lives and to the whole community (refer Figure 1). Investing in early childhood development is now recognised as one of the most effective strategies for breaking the intergenerational cycle of disadvantage and creating a fairer society.<sup>3,4</sup>

Understanding and responding to problems facing Australian children, including children and young people growing up in the NT today, is vital to ensuring a better future for all Territorians. Sharing and integrating the new knowledge about how children's health, safety and development can be optimised in the early years is an essential step towards closing the gap between what is known about early years development and the choices which can be made by governments, communities and families to ensure that all children get the best possible start in life.<sup>5,6</sup>

The Council of Australian Governments' 2006 National Reform Agenda includes an agreement for a focus on early child development as a priority area of reform for Australia's future health (for the prevention of chronic diseases in adulthood), capability and economic prosperity (improved education, skills and productivity). This reform initiative recognises that, for Australia to be competitive in the knowledge-intensive global economy of the 21<sup>st</sup> century, it is vital that governments and the nation take account of the current evidence showing the many long-term benefits of investment in early childhood.<sup>7</sup>

**Figure 1. Benefits of early child development for individuals and society<sup>7</sup>**





## 2. Why invest in early childhood development?

“When we invest wisely in children and families, the next generation will pay that back through a lifetime of productivity and responsible citizenship. When we fail to provide children with what they need to build a strong foundation for healthy and productive lives, we put our future prosperity and security at risk.” (US National Scientific Council on the Developing Child, 2007) <sup>8</sup>

A number of major national and international reports have recently been published bringing together the research evidence that underpins arguments for investment in the early years of life. <sup>9 10</sup> In summary, this evidence indicates that investing resources to support children in their early years brings long-term benefits to children and to the whole community. In these reports four converging strands of evidence emerge:

- Recent advances in brain science and the behavioural and social sciences have brought new understandings of how healthy child development happens, how it can be derailed and what societies can do to keep it on track. This research has helped to explain how children’s early life experiences shape the basic architecture of the developing brain and why this has important implications for health and human capability over the life-course. <sup>11</sup>
- Ecologically-based, longitudinal studies conclusively demonstrate the long-term effects of children’s family, community and early learning environments for their health and wellbeing later in life. These studies show that children’s socioeconomic and physical environments of childrearing and their relationships (e.g. with parents, families and other caregivers) all matter a great deal for their healthy development and education outcomes. <sup>12</sup>
- New developments in prevention science have enabled the effective implementation and scaling up of evidence-based programs to achieve population-level improvements in children’s developmental outcomes. <sup>13</sup>
- Economic studies of the costs and benefits of the systematic implementation of proven early childhood programs with families, schools and communities have quantified the longer-term economic and social benefits of such early childhood programs. These have demonstrated the need for a more effective balance between ‘up-stream’ preventive and early intervention services as opposed to the ‘down-stream’ costs of treatment or remediation later in the life-course. <sup>14 15</sup>

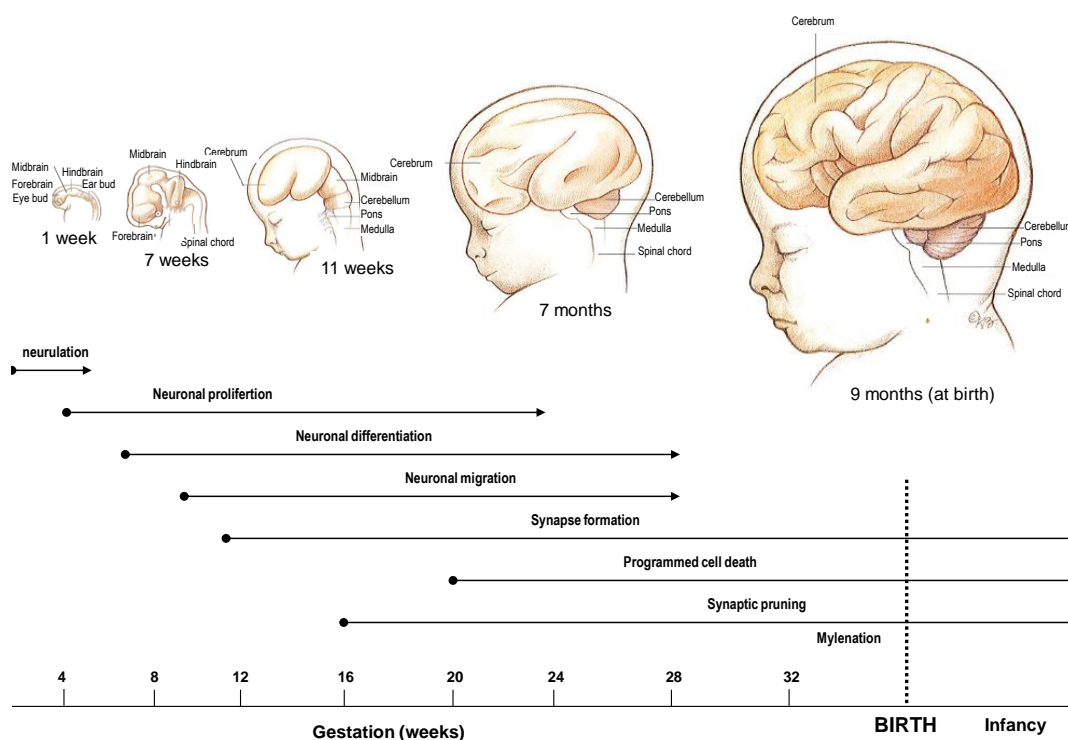
### 2.1 New scientific understandings of healthy development

The availability of new methods of brain imaging such as functional magnetic resonance imaging has enabled detailed mapping of the neural circuitry or ‘wiring’ of the brain. Research discoveries in the new science of epigenetics have also brought dramatic new insights into the molecular and genetic processes through which the child’s early experiences play a critical role in shaping the nature and quality of the brain’s developing architecture and function. <sup>16</sup>

### 2.2 Brain development before birth

Around one-quarter of our overall brain development occurs before birth. The future brain and nervous system first become apparent at around 3 to 4 weeks of development (Figure 2). <sup>6</sup> At this early stage, new brain cells (neurones) are forming at a rate of more than 250 000 per minute. This rapid neuronal growth continues throughout the pregnancy so that by the time of birth the number of neurones is well over a billion. <sup>17</sup> From about the eighth week of development, neurones also begin to become more specialised and start sending out multiple branches to form an intricate pattern of connections with other neurones in different regions of the brain. <sup>17</sup> The development of the child’s brain during gestation is particularly sensitive to the mother’s health, nutrition and environmental circumstances.

**Figure 2. Stages of brain development before birth**



Source: Perspectives from Developmental Neuroscience, pp 113-150, In O'Connell, Boat and Warner, (Eds) *Prevention of Mental Disorders and Substance Abuse Among Children, Youth, and Young Adults: Research Advances and Promising Interventions*, 2009.<sup>6</sup>

## 2.3 Smoking, alcohol and drug use in pregnancy

### **Smoking and foetal development:**

The use of alcohol and other drug use during pregnancy has long been known to be detrimental to an unborn child's development. More recently, large-scale population studies have confirmed that maternal smoking during pregnancy is a very important risk factor for infant survival, Sudden Infant Death Syndrome, for infant and child respiratory health, as well as its impact on infant and longer-term sleeping patterns, intellectual development and behaviour—particularly disruptive behaviour disorders and attention difficulties.<sup>18 19</sup>

### **Alcohol and foetal development:**

There is conclusive evidence showing that maternal alcohol consumption has significant effects on the foetal brain development and children's subsequent cognitive and behavioural outcomes. The extent of the symptoms of Foetal Alcohol Syndrome and Foetal Alcohol Spectrum Disorders depends on the timing and frequency of maternal drinking, the amount of alcohol consumed and the stage of foetal development at the time of consumption. Though the severity of the damage depends on all these factors, no safe threshold of alcohol use has been found, and the medical recommendation is that no alcohol be consumed during pregnancy. Even small amounts can cause brain damage that can affect the child for life.<sup>20 21</sup>

Foetal Alcohol Syndrome and Foetal Alcohol Spectrum Disorders are now understood to be some of the most frequent causes of intellectual impairment. Children, adolescents and adults with Foetal Alcohol Syndrome and Foetal Alcohol Spectrum Disorders have poor judgement, poor social perception, a lack of impulse control and the inability to predict the consequences of their behaviour and thus have a greatly increased likelihood of finding themselves in trouble with the law. USA and Canadian studies indicate that adults with Foetal Alcohol Spectrum Disorders are a much larger proportion of the prison population than of the general population. The disability of prisoners with Foetal Alcohol Spectrum Disorders also means that, they are generally less likely to benefit either from rehabilitation or deterrent offered by incarceration.<sup>22 23</sup>

These are all compelling reasons for ensuring that maternal health and family support services take a proactive approach in providing preventive counselling on the risks of alcohol in pregnancy and that more strenuous efforts be made to improve community understanding of the national guidelines on alcohol use during pregnancy.<sup>24</sup>

### **Maternal stress:**

High levels of stress experienced by the mother also affect the unborn child's brain development. Where a mother is exposed to high levels of stress during pregnancy (caused by inadequate housing, food insecurity, or family violence) her child is much more likely to experience later emotional or cognitive problems, including attention deficit-hyperactivity disorders, as well as anxiety and language delay. This effect has been shown to be separated from the effects of maternal postnatal depression and anxiety.<sup>25 26</sup>

Where pregnant women are exposed to very intense or multiple stresses this can result in over-production of the stress hormone cortisol. The unborn child's exposure to high levels of this hormone in the womb has been shown to not only slow the rate at which new neurones are produced but also to selectively influence the way in which the brain's stress response system develops, predisposing the child to higher levels of impulsivity and emotional overreaction.<sup>26</sup>

### **Antenatal depression:**

Between 7 and 20% of pregnant women experience antenatal depression which is as common as the wider known condition, postnatal depression. It is also less well recognised due to the symptoms of depression developing gradually and because symptoms such as fatigue are also common during most pregnancies.<sup>26</sup>

Perinatal depression has been shown to be associated with infants and children having increased likelihood of problems in many aspects of cognitive and behavioural functioning and increased susceptibility to the later development of depression and other disorders. These problems range from affective and interpersonal functioning to brain and neuroendocrine (hormonal) abnormalities.<sup>27</sup>

## **2.4 Brain development during infancy and early childhood**

A child's brain grows from around one-quarter the size of the adult brain at birth to two thirds the size of the adult brain by age three. Over this period there is a phenomenal surge in the formation of new neurones (brain cells) and their branching out to form connections with other neurones (synapses). Around 700 new synapses are estimated to be formed every second during this period of maximum growth and development of skills.<sup>17</sup>

By age 3 years the human brain has more neurones and synapses than it will have at any other stage in life. Then two other processes brain development become more active. First, the pathways between brain cells which make up the brain circuits associated with specific brain functions tend to be strengthened and retained as they are activated by the child's experience and behaviour. At the same time the neuronal connections which are infrequently activated are selectively eliminated or 'pruned' in a 'use it or lose it' manner. So, from the age of 3 years the overall number of neurones in the brain and their synaptic connections progressively declines (see Figure 3 below). This interaction of the child's biology with their conditions and experiences of child rearing – particularly before age 5 years - literally shapes the brain circuitry which forms the foundation for all subsequent health, behaviour and learning.<sup>17</sup>

**Figure 3. Brain development from infancy to adolescence**



Source: Illustration from AEDI Results Guide (2010) <sup>28</sup>

## **2.5 Brains are built in a ‘bottom-up’ sequential process**

Brain development begins with the simplest circuits vital for survival being built first, then moving on to more complex circuits such as those that underpin adaptive (intelligent) functioning. Every new skill the child develops is built upon the skills that came before. Sensory pathways, like those for basic vision and hearing, are the first to develop, followed by early language skills and then more complex cognitive functions such as reasoning.

While genes determine the order in which new brain cells develop, branch out and connect to different areas of the brain, the child’s experience of its environment also plays a key role in how this process unfolds and whether specific brain circuits become strong or weak.

## **2.6 Attachment, early interaction and the brain**

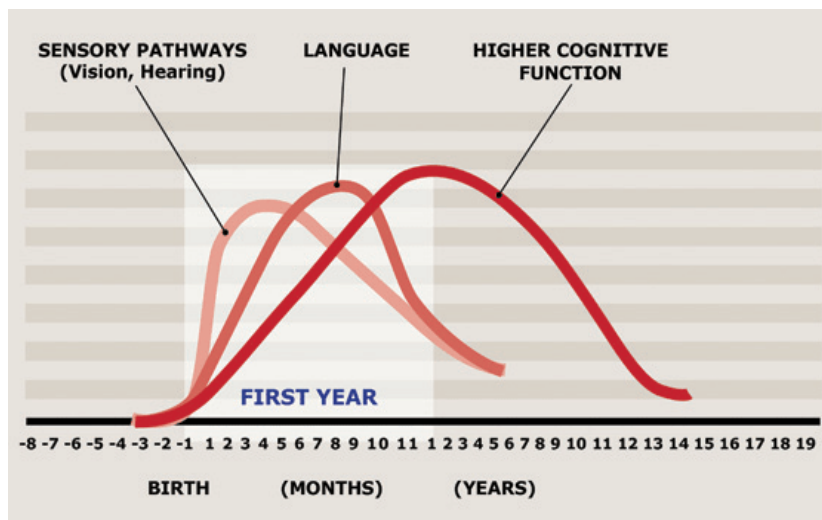
One of the most important early ingredients in this developmental process is the ‘two-way’ reciprocal relationship of emotional engagement between children and their parents or other caregivers. From early infancy children develop in an environment of relationships and naturally reach out for interaction through babbling, facial expressions and gestures. Parents and other adults typically respond with the same kind of vocalising and gesturing back at them. As these relationships extend into other child care settings, children develop best when the caring adults around them respond in warm, individualised and stimulating ways. <sup>29 30</sup>

In contrast, when the environment is impoverished, neglectful, unpredictable or abusive, the brain’s architecture does not form as expected, which can have long-term effects such as impairments in learning, behaviour and health<sup>17</sup>. There is now a growing body of research showing that the prompt, contingent and appropriate responsiveness by the child’s mother or other primary caregiver has important consequences for the child’s sense of emotional security and long-term benefits for the child’s developing brain. These benefits range from better cognitive and psychosocial development to protection from chronic disease and early mortality. <sup>29 30</sup>

## 2.7 Sensitive periods of development

Neuroscience and experimental psychology have described sensitive periods for the development of different brain functions (e.g. binocular vision, emotional control, language and a various cognitive abilities) and their brain circuits (see Figure 4). The neural connections in the areas of the brain associated with these functions proliferate at different times. During these critical periods the 'use it or lose it' process of synaptic pruning is especially important. Where the child's environment provides the right kind of stimulation at the right time, the child's development is optimised and it is much easier for the child to acquire certain skills. For example, by the first year, the parts of the brain that recognise the difference between different vocal sounds are becoming specialised to the language(s) the baby hears in its family of child-rearing. At the same time it is beginning to lose the ability to recognise important sound distinctions that occur in other languages.<sup>16</sup>

**Figure 4. Sensitive periods for synapse formation**



Source: Shonkoff J, Phillips D (Eds) 2000<sup>17</sup>

Because the brain prunes away the circuits that are not used, those that are used become stronger and increasingly difficult to alter over time. This reduction in plasticity, or ability of the brain to grow and change in response to its environmental circumstances, means that the early childhood years offer the ideal time to provide the experiences that shape healthy brain circuits. It also means that it is easier and more effective to influence a baby's developing brain architecture than it is to rewire parts of its circuitry later in childhood or adolescence. In other words, we can 'pay now' by ensuring positive conditions for healthy development, or 'pay more later' in the form of costly educational remediation, health care, mental health services and increased rates of incarceration.<sup>17</sup>

"Early experiences determine whether a child's developing brain architecture provides a strong or weak foundation for all future learning, behaviour and health."

Center on the Developing Child at Harvard University, 2007<sup>8</sup>

## 2.8 Stress and the child's developing brain

Recent international research shows that adults who have had traumatic stress in their lives as children show earlier signs of ageing and premature death<sup>32</sup>, more depression and higher risks for attempted and completed suicide<sup>33</sup>, more cardiovascular disease<sup>34</sup>, as well as increased risks for substance abuse<sup>33,35</sup>, insulin resistance and type II diabetes.<sup>36</sup> Further, there is robust evidence that specific prolonged stresses, such as abuse as a child, raises the risks of depression, suicide, substance abuse, and reduces the body's immune response and resistance to infections.<sup>36-38</sup>

When children are exposed to intense or overly frequent stressors, stress hormones are produced at high levels and these affect the developing brain significantly through the rate at which new neurones are produced and how they connect up with each other. Children with continuing high levels of stress hormones, such as adrenaline and cortisol, have an increased risk of developing longer-term dysfunction of their self-regulatory 'stress response' system.<sup>37</sup>



One such atypical stress response is where an individual develops an autonomic nervous system 'overreaction' pattern. These children characteristically overrespond to frustration or external provocation (e.g. increased heart rate, raised blood pressure or heightened aggressive reactions). This pattern of overarousal can be evident from an early age and is now known to be a major risk factor in later behavioural and mental health problems as well as adult cardiovascular disease.

Another common pattern of stress response dysregulation is where the body's arousal to stress becomes unusually prolonged, e.g. the stress response has difficulty 'switching off'. These individuals show a pattern of response to stress where blood cortisol levels take much longer to return to their normal 'resting' levels after the source of a stress has subsided. Individuals with this stress response pattern with chronically elevated levels of cortisol are at significantly higher risk of obesity and type II diabetes—in addition to the generally better known risk factors of diet and exercise.<sup>36 37</sup>

Shonkoff and Phillips (2000) have summarised the recent research on the effects of different levels of stress on the body's stress regulatory systems and the way in which this can have immediate and longer-term effects on how the child's nervous, endocrine and immune systems will develop and function. Some of these effects are described schematically in Table 1 below.

**Table 1. The impact of different levels of stress**

	<i>Positive stress</i>	<i>Tolerable stress</i>	<i>Toxic stress</i>
<b>Characteristics</b>	Moderate, short-lived stress responses, lead to brief increases in heart rate or mild changes in stress hormone levels.	More traumatic or chronic unpredictable stresses can produce bio-physiological responses that may disrupt the structure and longer-term functioning of the brain circuits that regulate emotion. However where such stresses are buffered by supportive relationships this usually facilitates adaptive coping.	Traumatic and chronic unpredictable stresses result in a strong and prolonged activation of the body's stress management systems in the absence of the buffering protection of adult support.
<b>Precipitants</b>	Precipitants include such challenges as meeting new people, dealing with frustration, getting an immunisation, or adult limit setting.	Examples of precipitants of this level of stress could include death or serious illness of a loved one, a frightening injury, parent divorce, a natural disaster, terrorism or homelessness.	Examples of precipitants include extreme poverty, physical or emotional abuse, chronic neglect, severe maternal depression, substance abuse or family violence.
<b>Impact on health outcomes</b>	This level of stress is an important and necessary aspect of healthy development. It is much better managed by the individual when it occurs in the context of stable and supportive relationships.	Generally occurs within a time-limited period, which gives the brain an opportunity to recover from potentially damaging effects.	'Toxic' levels of stress disrupt the structure and functioning of the brain's stress management systems. This is evident in prolonged 'fight-flight' autonomic overactivity and responding at relatively lower thresholds.  This pattern of chronic stress overresponsiveness significantly increases the risk of stress-related adult physical illness, mental health and behavioural disorders.

Source: Shonkoff J, Phillips D, 2000<sup>17</sup>

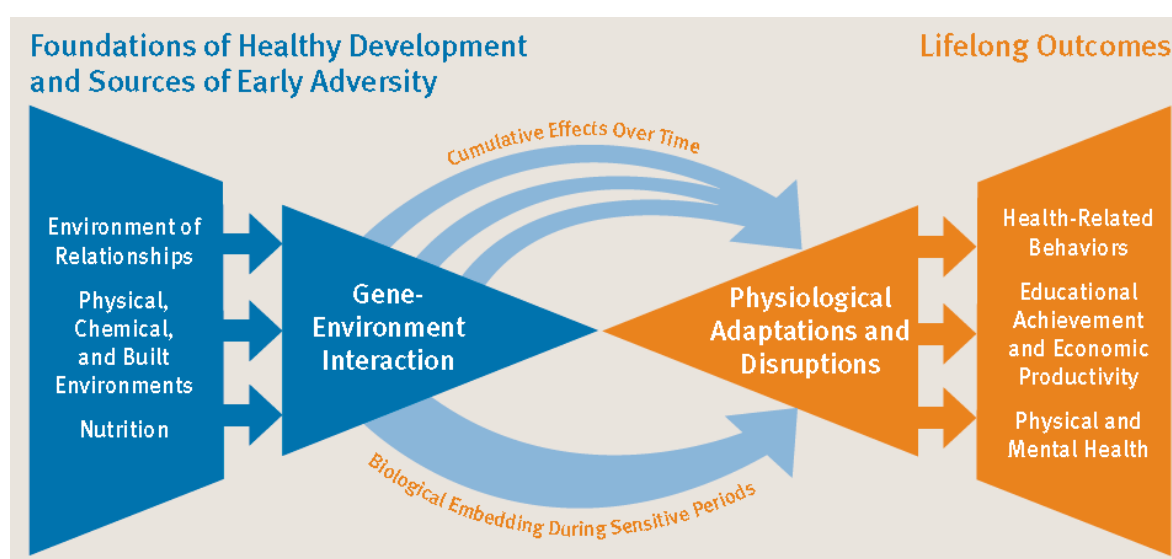


## 2.9 Life-course developmental research

Life-course developmental research has its early origins in observational, experimental and clinical studies of the psychological and physical development of infants and children, particularly over the latter half of the twentieth century.<sup>38</sup> More recently, life-course developmental research has expanded to include studies of the entire life span and has had a greater focus on the ecological or contextual influences on the social, economic and cultural aspects of people's lives. There is also expanding scientific interest in epidemiological studies showing how early life environmental exposures (such as infections, nutrition, or stress) are associated with increased adult susceptibility to chronic diseases such as diabetes, cardiovascular disease, and mental health problems.<sup>39</sup> Since the completion of the mapping of the human genome in 2003, there has also been a rapid growth of laboratory and population-based epigenetic studies investigating how genes and environmentally-based experiences influence the way in which genes are expressed.<sup>39</sup> The epigenetic study of the environmental and early-life origins of adult health and disease is now one of the most rapidly expanding areas of medical science.<sup>40</sup>

In light of the growing understandings of the developmental origins of health and disease, Shonkoff (2010) has proposed that future policy and services for children should be informed by what he terms the 'new biodevelopmental framework'. This would involve policy and services being targeted more effectively to take account of how genetic and environmental factors interact to influence the long-term health and wellbeing of individuals.<sup>41</sup> The key elements of this developmental model, which help to explain the biological basis of disadvantage, are summarised in Figure 5 below.

**Figure 5. How early experiences get into the body**



Source: Shonkoff, 2010<sup>41</sup>

There is now a growing number of longitudinal studies following up large samples of children from very early in their lives (i.e. birth or prenatally) through to adulthood which provide information that can further explain these bio-developmental processes and how they can be modified. These studies include the Avon Longitudinal Study of Parents and Children<sup>42</sup>, the Millennium Cohort Study<sup>43</sup>, the Dunedin Study<sup>44</sup>, the Raine Study (WA Pregnancy Cohort Study)<sup>45</sup> and the USA National Children's Study, which in 2009 began enrolling pregnant women in a study of 100,000 children from birth to age 21 years.<sup>46</sup>

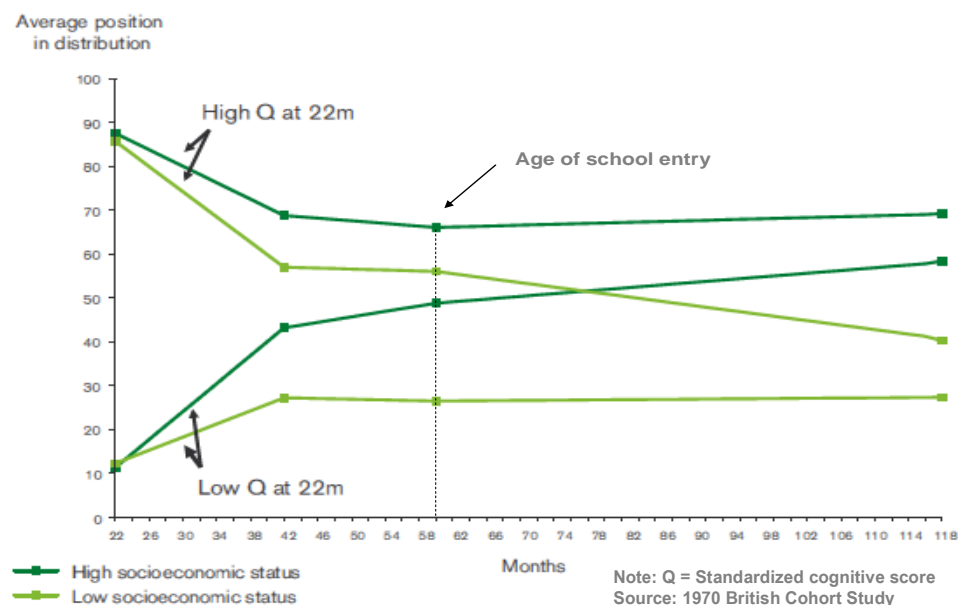
The Longitudinal Study of Australian Children commenced in 2004 with two cohorts of 5,000 infants aged 0-1 years and another 5,000 children aged 4-5 years<sup>47</sup>. The Longitudinal Study of Indigenous Children commenced in 2008 with a cohort of around 2,000 Australian families with Indigenous children aged 6 to 18 months and 3½ - 4½ years. It is following these families annually to develop a better understanding of the way in which Indigenous children's early social, economic and cultural environments contribute to their longer-term adjustment and wellbeing.<sup>48</sup>

A consistent finding from longitudinal studies around the world is the extent to which socioeconomic gradients, particularly in the formative early years of life, matter a great deal in accounting for the overall population burden of adult physical and mental health disorders, psychosocial problems and educational outcomes.<sup>3</sup>

In resource-rich countries such as the UK, Canada and Australia, social gradients (differential outcomes based on an individual's social position) are evident by school entry in a range of human development domains: physical, social and emotional, language and cognitive development. Such early disparities tend to increase over time.

Data on some 14 000 children in the 1970 British Birth Cohort Study has highlighted the extent to which early social gradients can influence children's functional ability later in childhood – and how these can be modified. Waldfogel found that children who had low cognitive scores at age 22 months, but who grew up in families of high socioeconomic position, improved their relative scores as they approached the age of 10 (Figure 6 below). Conversely children with high cognitive ability at age 22 months, but who were raised in low socioeconomic families, had worse cognitive function at age 10 than the children with low cognitive ability at age 22 months who were raised in high socioeconomic families.<sup>49</sup>

**Figure 6. Social position at age 22 months and cognitive development to age 10 years: 1970 British Birth Cohort Study**



Source: Waldfogel, 2004<sup>48</sup>

Similar findings from a range of other longitudinal studies suggest that to have an impact on longer-term educational and health inequalities, it is necessary to address the social gradient in children's opportunities for positive early developmental experiences. Later interventions, although important, are considerably less effective where good early foundations are lacking.<sup>49</sup>

### 3. Prevention science and effective interventions

Life-course development research has been valuable in identifying environmental risk and protective factors that can inform more effective targeting of policies and services, as well as the design of programs for families, schools and communities to improve child health and development. It has also provided a wealth of information about the benefits of early childhood programs for children and society. While this evidence is mostly from the evaluation of targeted programs, it also includes findings from longitudinal studies showing the benefits of universal and selectively targeted preschool parenting programs in Australia<sup>51-53</sup>, the USA<sup>54</sup> and Europe<sup>55</sup> and of universal preschool in the UK<sup>56</sup> and the USA.<sup>57</sup>

#### 3.1 Quality early childhood programs

Although early childhood programs vary, most offer combinations of quality maternal, child and family health services, early childhood education and care, and parent support services. They aim to strengthen the capacities of caregivers and communities to promote the health and development of young children.

The more effective programs tend to be those that work directly with children and also with parents to improve engagement with their children, and to foster skills and confidence in parenting. Outcomes are generally better when services are well-coordinated within a community and where there is good continuity of care for the child and their parent or caregiver.<sup>58</sup>

The quality of the workforce, their training and support are vitally important for early childhood services to achieve good outcomes for children. It has also been found to be useful to structure programs around key transition points such as pregnancy and birth, from home to early childhood education and care, and the transition to school. These are times when parents face new challenges and situations, but also when they are more receptive to support and information relevant to the developmental needs of their children.<sup>11</sup>

#### 3.2 Improving health and nutrition

Ensuring access to primary health care services (including mental health care when needed) is one of the most effective policies for reducing perinatal and early childhood health impairments. Home visiting programs, ensuring regular primary health care for pregnant mothers and children, are an important way of monitoring maternal health, social support needs and the adequacy of infant and childhood growth and other aspects of development.<sup>59</sup> They are valuable in identifying and initiating early intervention for maternal and child concerns that could lead to more serious problems later.

These programs also encourage the parent or caregiver to undertake activities in the home that can enhance their children's development. Such activities include ways of engaging attention, playing, storytelling and using picture books to stimulate the child's imagination and language development.<sup>59</sup>

Over and above the cost-benefit studies of maternal and child primary health care which demonstrate significant returns, there is growing evidence of the benefits on Supplemental Food Programs for Women, Infants and Children in the USA and several developing countries. For example, low income mothers who participate in the Supplemental Food Program for Women, Infants and Children in the USA are less likely to have pre-term or low birth weight babies—situations which are associated with lower educational achievement, lower probability of employment and lower earnings as an adult.<sup>60</sup>

Similarly, the WHO Infant and Childhood Nutritional Counselling Program<sup>61</sup> and home micronutrient supplementation (e.g. iron, folate and vitamin C) programs have been shown to be effective in reducing rates of growth retardation (stunting), wasting and childhood anaemia—all of which can adversely affect the developing brain.<sup>62 63</sup> Of particular relevance to the NT are international studies showing that the benefits of nutritional counselling and supplementation in communities with high proportions of undernourished and stunted children are significantly enhanced when families are also counselled by Indigenous health workers on care, interaction and activities that stimulate child development.<sup>63 64</sup>

### 3.3 Improving capability and confidence in parenting

Most families adapt successfully to the challenges of preparing for the birth of an infant, and then caring for a new child. However, this transition can be a challenging time, particularly for parents having their first child or where parents are themselves very young, or where parents are socially isolated or are experiencing serious adversity or disadvantage. In such circumstances there is strong evidence that home visiting services can provide the critical support needed and have positive and substantial effects on a variety of childhood and adult outcomes.<sup>13</sup>

However, not all home visiting programs have proven to be equally effective. The programs found to be more effective are those provided by well-trained and adequately supervised professional staff who implement a range of defined services guided by clear goals, and who are successful in engaging families for the duration of the program. The home visiting program with the strongest evidence is the Nurse Family Partnership Program, which provides home visits usually starting in the second trimester before birth. This program involves weekly visits immediately following the birth and a total of around fifty home visits by the time the child is aged two.<sup>59</sup>

Of particular relevance to the NT are the findings from a recent large-scale randomised control trial of the universal implementation of an evidence-based parenting program (Triple-P) in 18 US counties with population sizes between 50,000 and 175,000.<sup>54</sup> The introduction of the program was found to have been associated with significant and large effect-size reductions for three independently measured population indicators: substantiated child maltreatment, child out-of-home placements, and child maltreatment injuries within these counties where the program was delivered in comparison of counties not receiving the program.

### 3.4 Family supports to reduce sources of toxic stress

Those families in greatest need of support (e.g. parents with mental health, drug and alcohol misuse, parents experiencing family violence, or parents at risk for child abuse) can benefit from more focused services targeted to some of the sources of their stress. For example, parents at high risk for child abuse have been found to benefit from individualised coaching to increase their awareness and responsiveness to specific child behaviours, to learn to use praise and non-coercive discipline strategies, and to learn to stimulate their child's development of language and other skills.<sup>51 54</sup>

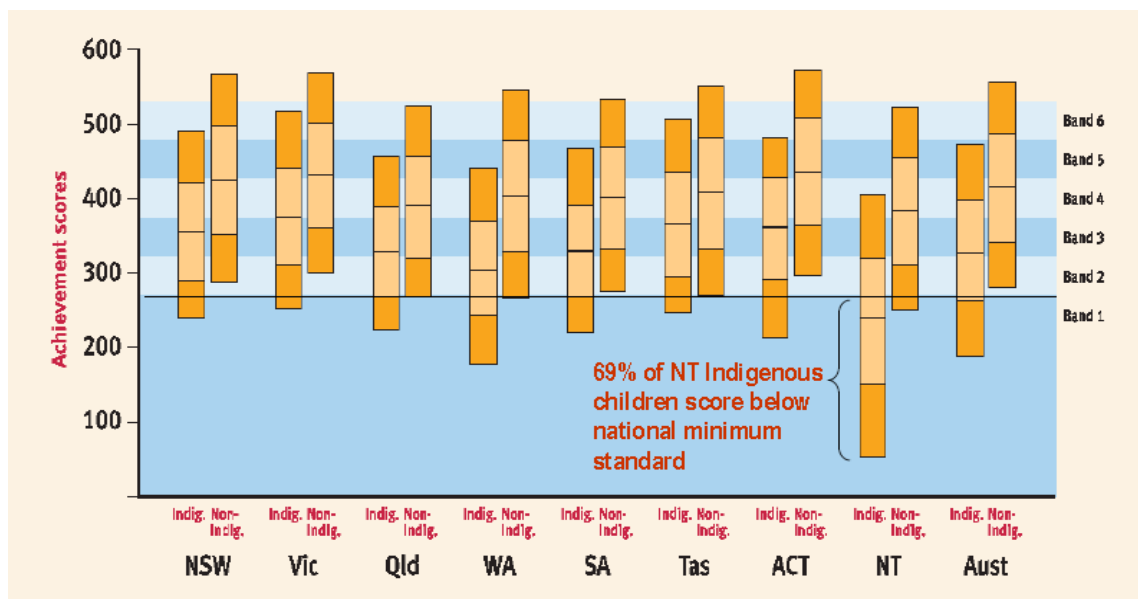
There are also promising screening programs implemented in hospital and midwifery services to identify mothers with postnatal depression to enable early intervention and additional supports in the care of their children. While not all of these programs have shown benefits for parent-child interaction, family functioning and children's development this remains an important area for practice improvements and future research.<sup>65</sup>

## 4. The economics of human capability formation

The stage-by-stage way in which a child's early capabilities lay the foundation for later capabilities in education and other domains of development has been informed by the research of two Nobel economics prize winners Gary Becker<sup>66</sup> and James Heckman<sup>67</sup>. Their human capital modelling based on USA population data has been a major influence on the reappraisal of early childhood and education policy that has occurred in most developed countries over the past decade. Heckman's findings indicate programs that deliver on the key principles of human growth and development in the early years of childhood offer the best returns on dollars spent on program development and implementation.<sup>67</sup>

The National Assessment Program for Literacy and Numeracy (NAPLAN) provides Australia with a convenient population measure of the human capabilities of literacy and numeracy during the school Years 3, 5, 7 and 9.<sup>69</sup> While NAPLAN assesses just a few aspects of all the knowledge and competencies that children learn in school, these scores nevertheless provide an indication of how these capabilities vary between States and Territories. In Figure 7 below it can be seen that the reading achievement of almost all non-Indigenous students in the NT is at or above the national minimum standard and has a similar distribution to their counterparts in other States and Territories. In contrast, over two-thirds (69%) of NT Indigenous students score below the national minimum standard, a far greater proportion than in any other State or Territory.

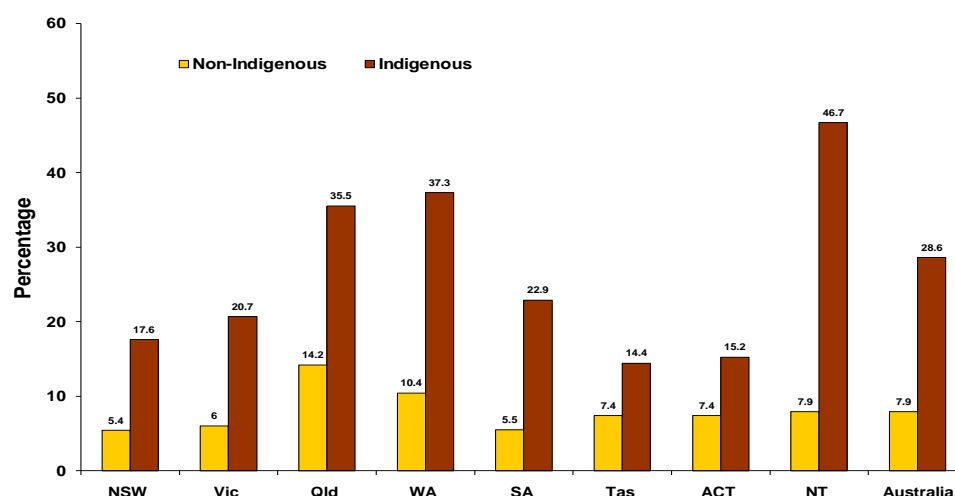
**Figure 7. NAPLAN Year 3 Reading, by Indigenous Status, by State and Territory: Australia, 2009**



Source: NAPLAN, 2009<sup>69</sup>

Given that 'skills beget skills, and early strengths beget later strengths' it is useful to consider the NAPLAN Year 3 reading results in relation to the developmental status of children as they commence their first year of school as measured by the Australian Early Development Index (AEDI).<sup>70</sup> The AEDI is a teacher-rated measure of over 100 behavioural items describing five domains of early childhood development which was used to assess all Australian 5 year olds in 2009. Figure 8 below shows the percentage of Indigenous and non-Indigenous children in each State and Territory who were assessed as 'developmentally vulnerable' on the AEDI language and cognitive skills domain (i.e. they had scores below the 10<sup>th</sup> percentile of the national population of 5 year olds on this domain scale).

**Figure 8. Percentage of children ‘developmentally vulnerable’ <sup>(1)</sup> on AEDI language and cognitive skills by jurisdiction and Indigenous status: Australia, 2009**



(1) ‘Developmentally vulnerable’ This refers to children who scored below the 10<sup>th</sup> percentile of the national AEDI population on the AEDI Language and Cognitive Skills domain scale

Source: AEDI National Support Centre <sup>71</sup>

These findings are of particular relevance to the NT for two reasons. First, they highlight the extent of the disparity between Indigenous and non-Indigenous children on this domain of early child development which is so critical to subsequent success in school learning. Second, the relative position of States and Territories in terms of their proportions of Indigenous and non-Indigenous children with AEDI scores in the vulnerable range on this scale is closely similar to the comparable relative positions of NAPLAN Year 3 reading scores as reported by jurisdiction and Indigenous status (refer Figure 7).

It would therefore seem that much of the present disparity observed in the poor overall educational outcomes of Indigenous children is attributable to developmental factors operating in the early childhood years before children commence school.

This suggests that current reform initiatives to ‘close the gap’ in the educational outcomes of Indigenous children should include a greater focus on what can be done to strengthen the capacity of families, communities, child care and early learning settings to better support children’s early development and their readiness for school learning.

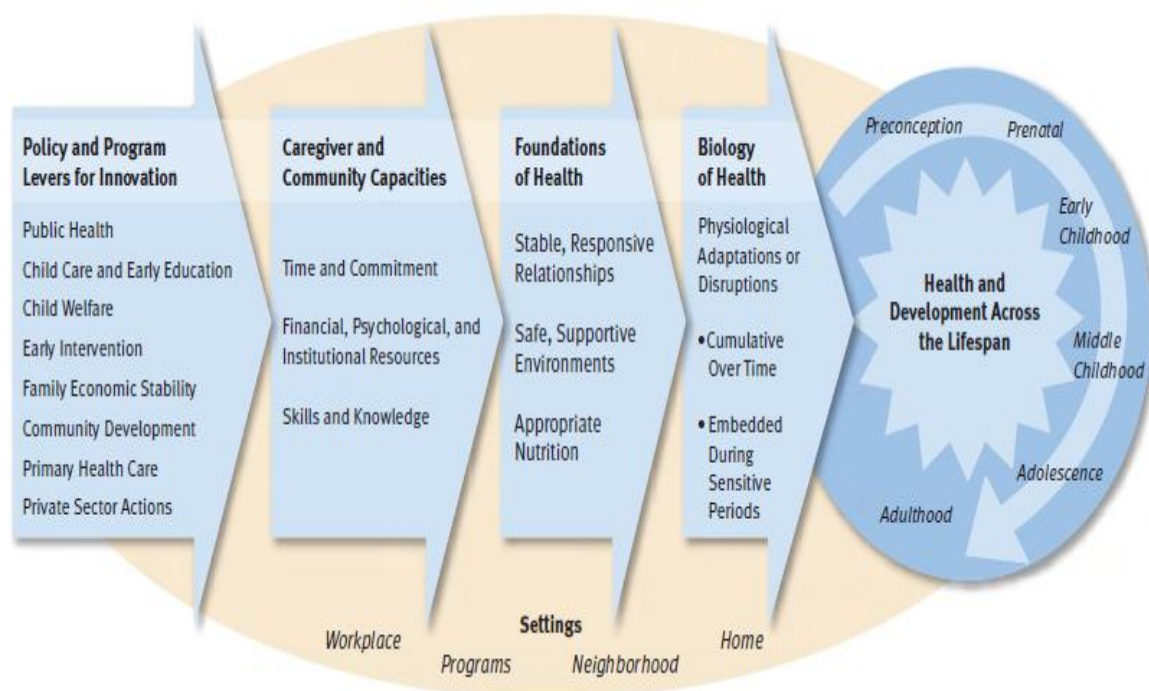


## 5. Implications for childhood policy and services

The recent growth in knowledge about early childhood development together with the range of new national partnership funding agreements between the Australian Government and the States and Territories offers a unique opportunity to strengthen policy and services for NT children. This has potential to not only improve children's developmental outcomes and support their successful transition into school learning – it can also make a lifelong difference to their health, employment and opportunities for participation in their communities and elsewhere.

Figure 9 below outlines four key areas of action and influence identified by the Harvard University Centre on the Developing Child as a suggested framework for re-conceptualising childhood policies and programs to be better aligned to achieve population-level improvements in health, capability and wellbeing.

**Figure 9. A framework for re-conceptualising early childhood policies and programs to strengthen lifelong health, capability and wellbeing**



Source: Center on the Developing Child at Harvard University, 2010<sup>11</sup>

There is now a range of evidence-based early childhood development programs for families and children which should be considered for implementation in the NT context. These include:

- home visiting programs that work with parents before birth, during infancy and early childhood
- integrated childhood services supporting multifunctional centres that provide non-parental care when parents are working or studying
- intensive child development programs delivered through primary health, child care or early learning settings
- relevant training and higher education for a suitable early childhood workforce
- whole of government coordination of policies, funding, strategy, evaluation and accreditation
- child development and family support centres that are accessible, affordable and available to all families.

The quality of early childhood programs and the fidelity with which they are delivered is a consistent feature of evidence-based programs which are more effective. This in turn requires the availability of a suitably qualified workforce that receives structured pre-and in-service training and which has access to more specialised professional support where needed. Maintaining the quality and effectiveness of such programs also requires accountability frameworks and information systems for the on-going monitoring of the outcomes achieved, for whom, and at what cost.

The international and national evidence reviewed in this discussion paper clearly demonstrates the critical importance of children's early environments of child rearing and learning for later outcomes in health, learning and behaviour. Children's outcomes are better when parents and families are able to provide nurturant and responsive care and give high priority to encouraging their children's early development. The capability of families in supporting their children's development is also better where parents and other caregivers have access to early childhood services that are well-coordinated within a community, where there is good continuity of care for children, and where more specialised family supports are available when needed.

These conclusions are also reflected in the following statement from the United Nations 2010 Status Report on the UN Convention on the Rights of the Child.

"All children are entitled to the full realization of rights, without discrimination, throughout their early childhood, as guaranteed by the *Convention on the Rights of the Child* and other internationally agreed instruments. They have the right to survive and to enjoy their early childhood and be fully respected both in their own right and as members of families, communities and nations, with their own concerns, interests and points of view. To exercise their rights, young children have particular requirements, including access to quality health and nutrition services and safe and emotionally fulfilling environments where they can play, learn and explore, under the responsive guidance of parents and other primary caregivers."<sup>72</sup>

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