Early Childhood Development
The best start for all South Australians

A COMPANION DOCUMENT TO THE ADELAIDE THINKER IN RESIDENCE REPORT
J. Fraser Mustard, Adelaide Thinker in Residence 2006-2007
Dr. J. Fraser Mustard

Dr. J. Fraser Mustard’s work as the eleventh Adelaide Thinker in Residence took place in two stages – in October and November 2006 and in February and March 2007. The objective of his residency was to increase interest and understanding across all sectors of the South Australian community about the crucial importance of the early years in developing a healthy and competent population.

This report, prepared for the Department of Education and Children’s Services, is a companion document to Dr Mustard’s Thinker’s Report, Investing in the Early Years: Closing the gap between what we know and what we do, published by Adelaide Thinkers in Residence, Department of the Premier and Cabinet, in April 2008. (Available at www.thinkers.sa.gov.au)

Dr Mustard is a noted authority on the socio-economic determinants of human development and health. He has received many awards and honorary degrees, including the Gairdner International Award, the Canada Council Izaak Walton Killam Memorial Prize, and the William J. Dawson Medal of the Royal Society of Canada. He is a Companion of the Order of Canada and a Laureate of the Canadian Medical Hall of Fame.

Throughout his residency, Dr Mustard highlighted the importance of early childhood development and the value of strong partnerships. He promoted innovation in parenting programs, built strategic legacies and enhanced South Australia’s reputation as a committed leader in the field.

He emphasised that the early influences and experiences in the life of every child have enormous implications for their futures and for the futures of those around them. He argues that integrated early childhood development programs are essential if we are to give future generations of South Australians the competencies that they need to become confident, capable and productive members of our communities.

Dr Mustard’s contributions have left a lasting impression on policy directions in South Australia and have supported the objectives of South Australia’s Strategic Plan, particularly with regard to expanding opportunity.

As a result of Dr Mustard’s influence, both through his residency here in Adelaide and through his wider body of work, South Australia will be even better positioned to provide the very best start for all South Australians.

We thank Dr Mustard for sharing his time, his insight and his commitment to early childhood development with the people of South Australia, and we commend his report to those among us who share his vision.

Partners in Dr Mustard’s residency include:

• Department of the Premier and Cabinet
• Department of Education and Children’s Services
• Department of Health
• Department for Families and Communities
• Aboriginal Affairs and Reconciliation
• University of South Australia
• University of Adelaide
• Flinders University of South Australia
• Department of Further Education, Employment, Science and Technology
Executive Summary

Dr J. Fraser Mustard’s work as Adelaide Thinker in Residence took place in two stages – in October and November 2006 and in February and March 2007. The objective of his residency was to increase interest and understanding across all sectors of the South Australian community about the crucial importance of the early years in developing a healthy and competent population.

Dr Mustard’s report draws urgent attention to the new knowledge that is emerging about early brain development and its effect on lifelong behaviour, learning and health. He brings out the importance of enhancing early child development in reducing social inequalities and establishing a highly competent population for the 21st century. He recommends that this knowledge be spread as widely as possible to all people whose work affects outcomes for very young children. This includes, of course, parents and other community caregivers.

Dr Mustard’s recommendations cover the need for improvements and change in the work of universities and TAFE and the need to raise the standard of education and training for staff in all disciplines that affect the development of very young babies and children.

He recommends more involvement in gathering reliable and comprehensive data on early child development and learning, and he advocates the continuing establishment of early child development and parenting centres linked to local primary schools throughout the state, with particular attention paid to families that are vulnerable. He emphasises the need for these centres to provide integrated services, with an integrated program that is supported through whole of government funding. He supports the inclusion of publicly funded daycare and preschool education within the centre program and he calls for the state to support paid family leave over a period long enough to influence the healthy development of their children.

With particular reference to the work of the Nobel Prize winning economist, J.J. Heckman, Dr Mustard emphasises the economic and social value that derives from providing the very young with the foundations for a healthy and successful life.

His final recommendation examines the possibility of setting up in South Australia an independent council for early child development and parenting that would not be subject to the short-term imperatives of the electoral cycle.
1. Neuroscientific research and teaching

RECOMMENDATION 1:1
The Government of South Australia should work with the universities and related institutions to establish a program or institute in human development based on developmental neuroscience and the related biological pathways that set trajectories in health, learning and behaviour. This program should support research to ensure optimum development of all children in the early years of life. It should also help existing child and family related disciplines to present this new understanding.

2. Measuring children’s development in South Australia

RECOMMENDATION 2:1
Given that 25% of children show poor development at the time of school entry, the state has to have in place the Australian Early Development Index (AEDI) as an outcome measure to assess how well families and communities are achieving equity in early child development.

RECOMMENDATION 2:2
The Government of South Australia, in cooperation with the AEDI partnership, should carry out an annual AEDI assessment for all children entering the school system in all communities and make the findings available in aggregate to those communities. This will help communities to work towards equity in early child development.

RECOMMENDATION 2:3
The Government of South Australia should, in partnership with the universities, establish a database that allows the AEDI results to be linked to children’s health status and their educational performance. As in Manitoba, Canada, these data should not be about individuals but about communities.

3. Taking steps towards improvement

RECOMMENDATION 3:1
South Australia should continue with its policy of putting in place universal integrated early child development and parenting programs linked to the primary schools that begin early in infancy, are of high quality, and continue into the early years of school.

RECOMMENDATION 3:2
The early child development and parenting centres should be capable of starting to work with parents and infants shortly after birth, if not during pregnancy. The centres’ program should help parents ‘learn parenting by doing’.

RECOMMENDATION 3:3
To make it possible for parents to be involved in these centres in the early years, South Australia should have a policy to allow parents with a new child at least 18 months parental leave, with income support (at least 80%). The first six months should be maternity leave and the next twelve months should be parental leave that can be shared between the mother and the father.

RECOMMENDATION 3:4
Early child development and parenting centres must, when appropriate, provide non-parental care when parents have to work or take education programs.

4. Changing government programs and policies

RECOMMENDATION 4:1
The Government of South Australia should establish a policy for the continuing support and funding of high quality early child development and parenting centres with a schedule for these centres to cover all of the state in ten years.

RECOMMENDATION 4:2
Once the government has set the appropriate legislation and schedule for the development of the centres, the post secondary institutions, along with the government, will need to have a strategic plan for providing relevant education and training for existing and future centre staff. At present, in early childhood settings, there are too few staff with appropriate education and training.

RECOMMENDATION 4:3
The government should establish an early child development applied research program with the universities to work with communities to assess the AEDI outcome measure and help the Government of South Australia and communities improve AEDI outcomes by recognising the need to take action when children are young.
RECOMMENDATION 4:4
The government should establish with the Council of Australian Governments (COAG) an effective 'whole of government' approach for policies related to the funding, evaluation, and accreditation of early child development and parenting centres.

RECOMMENDATION 4:5
The early child development and parenting centres should be accessible, available and affordable for all families with young children.

RECOMMENDATION 4:6
The government should develop a strategy to bring quality care programs into the early child development and parenting centre initiative.

RECOMMENDATION 4:7
The government should improve the effectiveness of their whole of government approach to early child development by working towards better integration of the work of the different ministries and government departments.

5. Educating child development staff

RECOMMENDATION 5:1
All students graduating from university and TAFE programs that relate to children and families should have education in developmental neurobiological science relevant for their work.

RECOMMENDATION 5:2
The South Australian Neuroscience Institute (SANI) should strengthen its base in developmental neuroscience including work in the gene environment interaction (e.g. epigenetics, microRNAs).

RECOMMENDATION 5:3
The universities should establish education programs for all staff working in early child development in order to ensure that they have a common knowledge base about experience based brain development that is relevant to their work.

RECOMMENDATION 5:4
Because brain development in the period before formal education sets a child’s capability to take part in formal education, the university faculties of education should ensure a sharing of this understanding by introducing new knowledge about experience based brain development for all students in primary and secondary teaching programs.

RECOMMENDATION 5:5
The government should provide incentives for the universities and TAFE to better integrate their programs for people working in child development and education.

RECOMMENDATION 5:6
In view of the importance of early child development for the future economy and quality of South Australian society, the government should set up a program for all public servants to ensure an understanding of what experience based brain development means for their work and the strategic goals of South Australia.

6. Involving the community

RECOMMENDATION 6:1
The government should set up community boards in association with the Department of Education and Children’s Services to develop and implement early child development and parenting programs linked to or part of primary schools.

RECOMMENDATION 6:2
All staff engaged in community based early child development programs should be well educated in the cultural diversity of Australia. Programs must have staff members who reflect the cultural characteristics of today’s Australian society.

7. Sensitivity to the needs of Aboriginal families

RECOMMENDATION 7:1
It is important for the Aboriginal community to help establish early child development and parenting centres sensitive to their language and culture. The centres should include non-Aboriginal families. These centres should provide programs that start at the birth of the child, if not during pregnancy.

RECOMMENDATION 7:2
The Department of Education and Children’s Services should ensure that the early child development and parenting centres are culturally sensitive, have Aboriginal staff, and attempt to introduce infants (birth to 7 months) to their Aboriginal language and English in the centres.

8. Supporting vulnerable families

RECOMMENDATION 8:1
The early child development and parenting centres should be able to have children in their program who are caught in family disruption and dysfunction and in the care decisions of the justice system. The child’s official care provider (for example, foster parent) should be included. Centres should also work with homeless parents from all cultures to provide stability for early child development.
RECOMMENDATION 8:2
The courts should have the power to assign vulnerable children to the centres with their designated care provider.

9. The views of young South Australian public servants and students

RECOMMENDATION 9:1
The Government of South Australia should set up a program for all its public servants of all ages to ensure they have a good understanding of early child development and human development in respect to health, learning and behaviour and how this relates to government programs and their work in government. The young public servants could be leaders to do this in the Government of South Australia.

RECOMMENDATION 9:2
A youth representative should be on the proposed Council for Early Childhood Development and Parenting.

10. Integrating the data

RECOMMENDATION 10:1
The data from the AEDI assessments should be integrated into a state data system for health and education and social indicators. All the individual data must be confidential and not used to label anyone.

RECOMMENDATION 10:2
The Government of South Australia should establish a linked integrated data system from the work of its various departments that relate to physical and mental health, early child development, education, behaviour and socioeconomic factors. This could be modeled on the program established by the government of Manitoba with the University of Manitoba more than 15 years ago. The findings from the integrated data base should be publicly reported annually.

RECOMMENDATION 10:3
Assessments of development and education of children should be population based for the age cohort, not just school based.

11. The value of investing state resources in early childhood

Recommendation 11:1
As the Government of South Australia invests in early child development and parenting centres, they must take steps to improve the necessary infrastructure and provide adequate sustained funding to ensure an incremental increase in the number of these centres over the next five to ten years.

RECOMMENDATION 11:2
In keeping with the ideal of public education, the Government of South Australia should incorporate its preschool program into the programs of the early child development and parenting centres and fully fund them for all children from birth.

RECOMMENDATION 11:3
One major goal of the early child development and parenting programs should be to reduce by 50% in 20 years the cost of mental health, addiction, crime and violence occurring in later life to individuals and society.

RECOMMENDATION 11:4
Another goal of the early child development and parenting program is to ensure that South Australia has the talent base to effectively compete in the globalised knowledge based economies of the 21st century with improved equity in high quality human development and enhanced social inclusion.

RECOMMENDATION 11:5
Since the early child development and parenting centres are part of an integrated program for human development (early child development and education), they should be publicly financed.

RECOMMENDATION 11:6
To achieve the whole of government approach for early child development, the Government of South Australia must develop an integrated budget for each early child development and parenting centre with one set of guidelines and one set of accountability measures. At the present state of development, annual AEDI assessment of each centre will be a critical outcome measure.

12. Establishing an independent body

RECOMMENDATION 12:1
Members of the South Australian community should consider establishing a council independent of the Government of South Australia to help set up child development and parenting initiatives. This could be called the South Australian Council for Early Child Development and Parenting, linked with the Canadian Council for Early Child Development and Parenting. (A group in South Australia is taking preliminary steps to see if they can establish such a council.)
Human societies have varied throughout history in their understanding of and attitude towards the development of young children and the future quality of societies. Five hundred years ago, Erasmus, a Dutch humanist and theologian, said, 'One cannot emphasise too strongly the importance of those first years for the course that a child will follow throughout his entire life'. During the 20th century, studies by Piaget, Vygotsky and others started to describe factors influencing early child development and its importance for future development of individuals. During this period it was generally assumed by most societies that early childhood development was handled by families, particularly mothers. It was also recognised by some that the social environment was important. This led to the statement, 'it takes a village to raise a child', and some communities established early child development programs such as those at Reggio Emilia in Italy.

Today the exponential growth in knowledge in the neurosciences and biological sciences has shown how brain development in the early years can set trajectories that affect health (physical and mental), learning and behaviour for life. The new understanding about early child development and its effect on human development has ramifications for most university disciplines, including health sciences, economics, developmental psychology, education, other social sciences, and for government departments concerned with the economy and the health, wellbeing and competence of its citizens (quality of human capital) and our attempts to establish equitable, tolerant, healthy, pluralistic, democratic societies.

We now know about how experience in the early years affects brain development and how the development of the brain and biological pathways in this period influences health, learning and behaviour throughout the life cycle. Understanding what we know about developmental neuroscience in the early years has implications for all our initiatives to monitor and improve human development.

The challenge for all societies is to close the gap between what we know about the determinants of early child development and what we do. This Thinker’s report will discuss how the Government of South Australia is trying to close that gap, and will make recommendations to further this.

Throughout this report, I will use some terminology that is different from the terminology used in a number of Australian and South Australian reports on early childhood. For ‘early education and care’ or ‘early learning’ the terminology used in this report is ‘early child development’. The reason for this is that this term embraces the new understanding that early child development includes the concept of early brain and biological pathway development, which can set trajectories for physical and mental health problems, as well as learning and behaviour throughout life. Since early brain development has effects on future health and behaviour, it is better in my opinion to use the term ‘development’ to reflect this, rather than ‘early learning’. For these same reasons, I don’t like to use the terms ‘day care’ or ‘child care’; however, in this report in order to ensure the readers’ understanding I will use the term ‘child care’ when I mean non-parental care programs that are called ‘long day care’ or ‘child care’ in South Australia.

This report is prepared for the Department of Education and Children’s Services, as the lead partner in my residency and is a companion document to my report prepared for the Adelaide Thinkers in Residence program.

Throughout the report, I will make reference to a number of appendices. These appendices can be found on the Adelaide Thinkers in Residence website www.thinkers.sa.gov.au.
How does experience in early life affect brain development?
To achieve reasonable equity in the competence, capabilities, coping skills, health and wellbeing of populations will require societies to apply the new understanding of how experience in the early years of life affects the development of the brain and related biological pathways that set trajectories that affect health (physical and mental), learning, and behaviour throughout the life cycle and can contribute to social and economic inequities and violence in societies.

How do experiences during early child development have an influence on the development of the architecture and function of the brain? The brain is composed of billions of neurons and trillions of nerve connections (synapses). An important question is how do the neurons in individuals that all have the same genetic coding diversify for their different functions? Secondly, what determines the connections (synapses) that form between the neurons to create the neural pathways that are key for the architecture and function of the brain? Experience transmitted to the brain in early life by the sensing pathways is key for the development of the architecture and function of the brain.

Early brain development and sensory pathway development

One breakthrough in understanding how stimuli from sensing organs in early life affect the differentiation and function of key sensing neurons in the brain comes from the work of Hubel and Wiesel (1965). They found that children born with cataracts in their eyes could not develop normal vision when the cataracts were removed later in life. If the children's cataracts were removed early, vision development was normal. In adults, removal of cataracts for those who had normal vision earlier in life restores vision. Extensive work in this field has shown that signals from the retina of the eye must reach the neurons in the part of the brain responsible for vision (occipital cortex) early in life. These signals activate the genetic pathways involved in the differentiation and function and architecture of the neurons in this section of the brain necessary for vision.

The response of the brain to poor input from one eye in early life is adaptive in that the nervous system alters its circuitry so that it differentially processes input from the eye without the cataract. The neurons and neural pathways related to the defective eye do not recover normal architecture and function after the end of the critical period, even when input from the disadvantaged eye is restored. This underscores the critical importance of early experience (visual signals from the eye) for the development of the neurons and neural pathways related to the occipital cortex involved in vision.

We now know that the auditory neurons and neural pathways in the part of the brain responsible for hearing (left temporal lobe) are sensitive to the effects of sound in infancy for their differentiation and function. It appears that the critical period for the differentiation of these neurons and neural pathway development, particularly in relation to language, is in the first seven months of life.

Speech is usually thought of as an exclusive function related to hearing. We now know that when the speaker is visible, the movement of the lips as well as sound contributes to the perception of speech. This is an example of how two sensing systems interact. If hearing is defective beyond 2.5 years of age (no implant correction), consistent auditory visual fusion declines (Shorr et al. 2005). This is an example of a sensitive or critical period in brain development involving two sensing pathways in early life.

Early brain development and language skills

Brain development in the early years creates a base that influences the development of language and literacy. We know that the sounds that an infant is exposed to when very young influence how the auditory neurons in the left temporal hemisphere of the brain differentiate and their neural pathways develop and function.

Infants exposed to two languages (eg Japanese and English) in the first seven to eight months of life will easily develop the neuron functions that can differentiate the sounds of the two languages. This sets a base for fluently mastering the two languages without an accent later in development. Individuals who develop capability for two languages early in life have a larger left temporal hemisphere of the brain than do individuals with monolingual backgrounds. This may be, in part, an explanation of why some individuals can also more easily master other languages later in life.

Studies have shown that the extent of children's language exposure in the early years has a significant effect on the verbal skills of children by age 3. There is a significant dose effect (Figure 1). The difference in verbal skills at age 3 years among children in different socioeconomic (SES) groups was related to the extent (dose) of language exposure in the first three years. Children with poor verbal skills at age 3 performed poorly in language and literacy competence at age 9 in the school system.

In these studies, there were children in the highest SES group that did poorly and children in the lowest SES group who did fairly well. These studies are an excellent example of how experience in the early years influences...
brain development and function and sets trajectories for language competence later in life.

Figure 1 shows, from the work of Hart and Risley (1995), the average vocabulary growth by social class (SES) for children in the first three years of life. The vertical axis shows the cumulative vocabulary words for these children. They also analysed the language experience of these children during the first 48 months. It was found that the children with the highest cumulative vocabulary words had the greatest language exposure during the period of early development. They were impressed at how well their measures of language development at age 3 predicted language skills at ages 9 and 10.

Early brain development and higher cognitive function

In the hierarchies of neural circuits that support complex behaviour, cognition and other functions of the brain, there are sensitive periods for the development of neural circuits at lower levels in the hierarchy. The pathways that perform more fundamental functions tend to lose their plasticity before the pathways that form for higher level functions. This sequencing of sensitive periods is logical, because higher levels in the hierarchy depend on precise and reliable inputs from lower levels in order to accomplish their functions (Knudsen et al. 2004).

In other words, early learning (brain development) begets later learning (later brain development), and, as Heckman (2000) states in his papers, ‘skills beget skills’. Experience dependent shaping of high level circuits depends on the quality of the input provided by lower level circuits, and the function of high level circuits cannot be adequately developed until the functions of the lower level circuits are stable and reliable. Chuck Nelson (in Shonkoff & Phillips 2000) has illustrated the neural pathways development for the sensing pathways (sound, vision, etc), language and cognition (Figure 2). Thus, infants with recurring middle ear infections will not have normal development of their neurons for sound.

This is one reason why infants with repeated middle ear infections do poorly in language and literacy in later life.

The sensitive periods or plasticity for most lower level neural pathway circuits end relatively early in life, often by 4 years of age. In contrast, sensitive periods for some high level circuits remain open (plastic) for a longer period. This may be a reason why, with proper treatment of dyslexia, normal neural pathways can be established.

This chart (Figure 2) shows the sequencing of neural pathway development in relation to the sensing pathways, language and higher cognitive functions. Myelination of nerve fibres occurs throughout the early period of life up until about age 25. The timing and extent of myelination is related to mental experience and an animal’s developmental environment. Abnormal myelination formation is suspected of contributing to schizophrenia, autism, bipolar disorders, and dyslexia. (Fields 2005)

Early brain development and the stress or allostatic system

A brain function that is affected by early life experience and affects individuals throughout life is what is often referred to as stress or the behaviour emotional pathway. This pathway is often referred to as the limbic hypothalamus pituitary adrenal (LHPA) pathway. This pathway, identified by Selye (1936), a Canadian scientist, more than 70 years ago, is crucial for how mammals and other animals cope with the changes and challenges in the environments in which they live. This neural pathway is often referred to as the ‘truine’ pathway. It is one of the oldest brain pathways in mammals. Bruce McEwen (2002) has proposed that this pathway should be called the allostatic pathway. This pathway works as a stress, emotional and behaviour ‘thermostat’ for all animals and humans. It is vital for everyday existence and we are
now learning how the development of this pathway and its function in early life affects cognition, emotions and behaviour and risks for diseases (physical and mental) throughout life.

The health conditions that appear to be related to stimulation of the LHPA pathway and overproduction of cortisol in different stages of life are listed in Table 1. They include behaviour problems such as attention deficit disorder and depression, poor cognition, type II diabetes, possibly obesity, malnutrition, cardiovascular diseases such as high blood pressure and coronary artery disease, memory loss in individuals as they age, abnormal immune systems response, and drug and alcohol addiction. Many of these conditions are influenced by the interaction of neurotransmitters like serotonin and dopamine with the prefrontal cortex of the brain.

Table 1: Health Problems Related to Early Life and the Limbic HPA Pathway

<table>
<thead>
<tr>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coronary Heart Disease</td>
</tr>
<tr>
<td>Non-insulin Dependent Diabetes</td>
</tr>
<tr>
<td>Obesity</td>
</tr>
<tr>
<td>Blood Pressure</td>
</tr>
<tr>
<td>Aging and Memory Loss</td>
</tr>
<tr>
<td>Mental Health (Depression)</td>
</tr>
<tr>
<td>Drug and Alcohol Addiction</td>
</tr>
</tbody>
</table>

McEwen 2002

Touch is a very important sensory stimulus in the early years in respect to the development and function of the LHPA pathway. This evidence comes from studies in mice, rats, monkeys, human and other animals.

When we first started to improve the survival of premature infants, they were isolated in incubators for days or weeks after birth. They had limited human touch. A significant number of these premature infants, as they grew older, developed behaviour problems. Today, we do not isolate premature infants from human contact, but bond them to the mother through what is sometimes referred to as the kangaroo technique. These infants have fewer behaviour problems later in life.

Genes and environment

Biologists have accepted the hypothesis that the interaction between genes and their environment can affect the function of the genes. Today there is an explosion in knowledge about how the function of normal DNA can be altered by experience. The pathways by which sensory experience mediates brain function has major implications for our understanding of experience based brain development in early life and the effects on health (physical and mental), learning, and behaviour. There are several pathways that can alter gene function or gene products (proteins). These include epigenetics, microRNAs, and proteomics.

Epigenetics is now recognised to have a major role in regulating the function of genes in humans, leading to individuals with the same genotype having different phenotypes. Methylation and demethylation of the cytocine base in DNA is a process by which sections of genes can be turned on or off. Acetylation and deacetylation of the histone proteins, which are the spools on which DNA winds (chromatin), also influence gene expression. Genes are inactivated when the chromatin is condensed and are expressed when chromatin is open. The chromatin states are controlled by reversible DNA methylation and histone modifications. Active regions of chromatin have unmethylated DNA and have high levels of acetylated histones whereas inactive regions of chromatin contain methylated DNA and deacetylated histones. There is now strong evidence that these effects on gene function are influenced by experience such as nutrition, drugs, and sensory stimuli.

In genetics, a major focus for many years has been how messenger RNA carries the genetic information from DNA to places in the cell where proteins are made. The messenger RNA rounds up the amino acid units to make the proteins. Now this field has changed because we now know that cells are full of small RNAs (microRNAs) that do not code for protein synthesis but are directly involved in gene function and protein synthesis. MicroRNAs are about 22 nucleotides long. One effect of microRNAs on protein synthesis is their transfer into the cytoplasm where they combine with the messenger RNA and degrade it. MicroRNAs have been found to be involved in DNA methylation and histone acetylation. Researchers have been exploring the effects of microRNAs on epigenetic processes and the microRNA expression by epigenetic mechanisms. This work with microRNAs has suggested that the genes for small RNAs are important in evolution. Some have proposed that microRNAs may carry genetic information for the next generation independently of DNA by hitching a lift in the sex cells. This has opened up the concept that there could be inheritance of characteristics acquired during an individual's lifetime that are not due to gene mutation.

A characteristic of epigenetic mechanisms and microRNAs is that they can result in the heritable silencing of genes without a change in their coding sequence. An important question is, how does experience during development affect epigenetics and microRNAs leading to changes in gene function without mutation of the genes?
Studies of identical twins (monozygotic) have shown differences in adult life that can be related to differences in gene expression. In a study by Fraga et al., they found that identical twins are epigenetically indistinguishable during the early period of life, but they showed in adult life major differences in the distribution of 5-methylcytosine DNA and histone acetylation. Approximately one-third of the twins had epigenetic differences in DNA methylation and histone acetylation. This work demonstrated that different phenotypes can be found in individuals with the same genotype. In one identical twin study, it was found that there could be a 20-30% variance in behaviour in adult life.

Recent experimental work has shown the lifelong dynamic nature of epigenetics. Michael Meaney, Moshe Szyf, and their colleagues at McGill University, have demonstrated the effect of maternal care in the early years on rat pups, on methylation of DNA in the hippocampus and the subsequent development and behaviour of the rats. The hypothalamic-pituitary-adrenal response to stress involving the hippocampus is an important defense pathway in mammals. The mother pup contact with newborn rats affects behaviour, the stress response, and memory in later life. In this work, they found that strong licking and grooming (touch) in the first six days is associated with less methylation of the gene for the glucocorticoid receptor in the hippocampus resulting in good expression of the glucocorticoid receptor gene throughout life. Glucocorticoid interaction with this hippocampus receptor is able to decrease the activity of the limbic-hypothalamus-pituitary-adrenal (LHPA) pathway in response to stress. This pathway is involved in the stimulation and production of glucocorticoid such as cortisol from the adrenal gland. Control of stress levels and cortisol is important for normal development and prevention of behaviour problems and mental and physical health disorders in adult life. This evidence from studies with rats may be an explanation of how neglect and abuse in early life can lead to significant behaviour problems later in human development.

An important study of environment and gene function comes from studies of the serotonin transporter gene and depression. In early childhood children with two short transporter genes (mother and father) who are brought up in adverse circumstances in early life have a high risk of mental health problems like depression in adult life. Those with the long transporter gene structure are resilient. Those with the short transporter gene structure brought up in good early life circumstances are not at risk. We do not know at the present moment what process is influencing the function of these genes, but it is a clear demonstration of environment and gene interaction. This story is also true for rhesus macaque monkeys. The weight of all of this evidence is that it is no longer nature versus nurture but the interaction of nature and nurture that determines brain function.

The effects of early experiences (nurture) on brain structure and function

Experience in early life affects gene expression and function and neural pathways. It shapes:

- temperament and social development
- language and literacy capability
- perceptual and cognitive ability
- how we cope with our daily experiences
- physical and mental health and behaviour and addiction in adult life
- physical activity and performance (eg skiing, skating, swimming, etc).

The early years including the in utero period are critical and sensitive for the development of neuron function and neural pathways. The neurons and pathways involved in emotions and behaviour, language and literacy are very sensitive to the early period of brain development. The early neural pathways are not as plastic as some of the other pathways that form later. The brain architecture and function that forms early is hard to change by the time the children are in the school system. Drugs and social support can be used to help manage some of the behaviour problems such as addiction and mental health problems that manifest in later life. However, it is difficult to fully reduce the burden of these problems in later life.

In terms of cognitive development, it is very difficult for schools to improve language and literacy for children who have poor verbal skills in the early period of development before they enter the school system. All the new knowledge about experience and brain development supports the conclusion of individuals concerned with public policy that to enhance human development there is a need to put in place initiatives to ensure quality experience based brain development (nurture) in the early years of life, including the in utero period. More detail about developmental neurobiological science is provided in Appendix 1 on <www.thinkers.sa.gov.au>.

Establishment of the South Australian Neuroscience Institute

Recognition of the exponential growth in new knowledge from research in the neurosciences and its importance for most academic disciplines led to establishing the South
Australian Neuroscience Institute (SANI). SANI was conceived in 2003, derived in part from the Centre for Neuroscience at Flinders University. It was established by agreement of the three South Australian universities in 2004 and launched in August of the same year during the first component of Baroness Greenfield’s appointment as Adelaide Thinker in Residence. The program is co-chaired by Professor Marcello Costa (Flinders University) and Professor Robert Vink (University of Adelaide).

SANI has provided an excellent description of modern neuroscience and what it means for societies.

‘Neuroscience is an integrated discipline that comprises all of the scientific areas related to brain and behaviour. It encompasses many of the most dynamic areas of current scientific research and it touches every aspect of our lives. Neuroscience research ranges from the function of single molecules to the behaviour of the whole person. The brain is the most complex kilogram of matter known to us. It develops from a single cell, at the start of our lives. How this happens is the subject of developmental neuroscience, one of the fastest moving areas of modern biology. Scientists study how experience modifies neural circuits as we learn throughout our lives, and try to understand the changes in our nervous system as we age. Studying how we make decisions, the nature of intelligence and creativity and our aesthetic sensibilities all fall within the function of our brain.

‘The remarkable performance of our nervous system in everyday life is shown in stark relief, when things go wrong. Identifying the genes that underlie inherited brain disorders, through to understanding the changes that occur after damage to the central nervous system, are also the realm of neuroscience. The nervous system is responsible for the moment-to-moment control of nearly all of our internal organs, and at the same time underlies our most complex abstract thoughts and our most subtle emotional experiences. To understand our nervous system is really to understand our bodies, brains and being.’

SANI has established programs in neuroscience and health, and a graduate program in neuroscience for teachers in collaboration with DECS. Although started at Flinders University, the plan is to make it a cross-university degree.

‘The overall aim of the program is to provide a framework for understanding the principles of modern neuroscience; critically appraising neuroscientific literature as it applies to learning; and application of the principles of neuroscience to understanding classroom practice and behaviour. Four new topics have been developed especially for the program. They are: Sensing and moving; Perceiving and acting; the learning brain; Knowing what we know; the neuroscience of cognition and The Behaving brain.’ This course will produce a group of educators with a much better understanding of brain development and function and appropriate critical appraisal skills to evaluate much of the neuroscientific literature which is in the public domain. Engagement of professional educators with working neuroscientists will help develop linkages between research into brain function and educational practice, ultimately aiming to improve the learning environment for teachers and students alike.’ Greenfield (2006)

This is an important initiative for South Australia. The development of the program has been strongly supported by the South Australian Department of Education and Children’s Services (DECS) which has undertaken to provide 15 scholarships a year for three years to allow teachers to participate in this program.

Since early brain development, particularly the limbic HPA pathway, affects physical and mental health problems later in life, it is important for the health sciences, particularly in respect to conditions such as type II diabetes, blood pressure, coronary artery disease, mental health problems such as depression, and behaviour (eg attention deficit disorder, drug and alcohol addiction). The new knowledge should be a major part of the curriculum in the health sciences. It is particularly relevant for studies in the management of intergenerational health.

Greenfield, in her report for Adelaide Thinkers in Residence, states: ‘The Graduate Certificate in Neuroscience offers unique opportunities for South Australian teachers to act as exemplars to the profession in showing how it can integrate with the wider scientific research community. It is the first ever such initiative, not just in Australia but in the world.

‘Once sufficient data has been gathered to justify these initiatives, there will presumably be a case for them to be conducted at a federal level. More specifically the Graduate Certificate in Neuroscience for teachers could become an Australia-wide endeavour, enabling interchange of students, instructors and course material between the states.’ Greenfield, (2006), pp 51-52

In my discussion with staff involved in the early child development program at Flinders University and the University of South Australia, they welcomed the concepts set out by SANI but had not yet decided how to integrate with their existing programs the new knowledge about experience based brain and biological development in the early years and its effect on health (physical and mental), learning, and behaviour throughout life.

In our meetings with Marcello Costa and his colleagues, we discussed the intellectual strengths in developmental neuroscience in South Australia that could contribute to early child development education and health and behaviour. We discussed the Canadian Institute for
of Early Child Development series. This module provides insights as to how social and biological forces work together, particularly in the early years, to produce long term developmental differences. Understanding these ideas inspires a fresh appreciation for the wonder of development and, especially, the long and powerful reach of early childhood.

2. Brain Development – What exactly do we need to know about early brain development? Are the early years really that important? This module explains why it is important for early childhood educators to have some understanding about experience based brain development and is an excellent addition to a traditional child development course. Current research is presented in a balanced and accessible way. Leading neurobiologists and other researchers discuss their work in everyday language. In addition, video footage illustrates lab research with children and a highly interactive review explains brain architecture and structure development.

3. Genetics and Experience – We now know that the unfolding of genetic inheritance is inseparable from the contexts in which a baby or child lives. Children develop in a complex mix of family, home, childcare settings, community and society which, in turn, are informed by the values and practices of a particular time and culture. At the same time, the child is born with a specific genetic nature or potential that is shaped and also shapes how the child responds to these experiences. Those who are involved with young children have a critical responsibility to provide the best, most nurturing contexts to support optimal healthy development of the children in their care.

4. Coping and Competence – Competence and coping skills are clearly desirable outcomes of childhood. These skills are developed through a process called self regulation that crosses all developmental domains. Humans begin life as relatively helpless, completely dependent creatures. We are not equipped with the kind of survival instincts and capacities characteristic of most species. Yet we have an enormous capacity to learn. Our brains seem to be prepared to develop exponentially, especially during the first few months and years, and this development is driven by experience.

5. Communicating and Learning – We live in an increasingly complex world. All children need opportunities to develop their intellectual capacity in order to be well equipped for life. In the early years, children's skills in communication, language and learning grow exponentially. Researchers, practitioners and, increasingly, society at large, understand that the...
first months and years of life are critical to learning. Although children’s abilities are clearly influenced by their genetic potential, research supports the fact that a child’s experiences, in and out of the home, are crucial for gene expression. Adults who are around infants and young children play a vital role in supporting communication and learning.

(From The Science of Early Child Development program. Red River College)

SANI’s integrated program in neuroscience involving the three universities is a valuable strategy for South Australia because the new knowledge affects not only child development, education, and the health sciences, but also all university disciplines. Could the post secondary education institutions working with SANI provide all university students with a good working knowledge of developmental neuroscience and its implications for education, psychology, social sciences, economics (see Chapter 1), and the health sciences?

If this can be done, it would be recognition of the base Baroness Greenfield helped establish with universities in South Australia during her period as the Adelaide Thinker in Residence.

Recommendations

RECOMMENDATION 1:1
The Government of South Australia should work with the universities and related institutions to establish a program or institute in human development based on developmental neuroscience and the related biological pathways that set trajectories in health, learning and behaviour. This program should support research to ensure optimum development of all children in the early years of life. It should also help existing child and family related disciplines to present this new understanding.
How well are children in South Australia developing?
When I came to Australia in 1999, as a guest of a project in the Ministry of Health in the federal government about the social determinants of health, I found they had no national longitudinal study of children and youth to explore how early child development in Australia affects health, learning and behaviour. Following discussions with Jane Dixon, who headed the social determinants of health project, the federal government established a national longitudinal study of children and youth.

The results of the national Longitudinal Study of Australian Children (LSAC) show a socioeconomic gradient (based on family income) for child development at age 4 before they enter the school system. The average score for the lowest income group was 96, and 104 for the highest income group. In the Canadian national longitudinal study, there was a similar socioeconomic gradient for child development based on the concept of vulnerable children (Figure 3). Thus, in both countries, a larger portion of children in the poor socioeconomic sector showed poor development. Although the Australian outcome index and Willms' vulnerability measure are measuring similar components of child development, the studies use different strategies to express the results. The Australian protocol was designed to establish a negative and positive index. The Canadian strategy estimates the percentage of vulnerable children by socioeconomic status. In both countries, the estimates of child development are a linear gradient when plotted against the socioeconomic status of the children. Thus, in Canada and Australia, although a larger portion of children in the poorest social class are vulnerable, the largest number of children showing poor development are, because of its size, in the middle class.

The total number of vulnerable children in the approximately 100,000 children in the 0 to 6 age group in South Australia is about 25,000 (one quarter of this age group). This is a large number for a state that is presently losing population from its 1,400,000 inhabitants and has a low birth rate. If South Australia is to have the quality of population appropriate for the opportunities and demands of this century, it should take steps to decrease the number of vulnerable children at the time of school entry. South Australia's plan for setting up early child development and parenting centres (age 0 to 8) linked to the primary schools is an important step to improve early child development and the competence of the next generation.

Fig. 3: Vulnerable Children Aged 4-6
Ontario - NLSCY 1994-1998

Australian Early Development Index (AEDI)

In Canada, we felt there needed to be a community based population assessment of early child development, as well as the national longitudinal study. The late Dan Offord and Magdalena Janus, at McMaster University, developed the Early Development Instrument (EDI), which is a crude measure of brain development and its function, to let us assess early child development in communities at the time of school entry (kindergarten).

One of the problems in assessing early child development on a continuing community population basis was the lack of a suitable population based measure of children in different communities at the time of school entry. In Canada, the first time after birth that we could easily sample the population of children in communities was at the time of school entry (kindergarten).

The Early Development Instrument (EDI) assesses five development domains. These assessments (listed below) are macro indicators for population based assessments of brain development, not diagnostic indicators for the development of individual children. In Australia, the EDI has been adapted for use and is referred to as the Australian Early Development Index (AEDI). The measures are as follows.

1. Physical health and wellbeing
   This is a measure of brain development in connection with how it affects physical health, physical activity, coordination and wellbeing.
   Above the 90th percentile, a child is physically ready to tackle a new day at school, is generally independent, and has excellent motor skills.
   Below the 10th percentile, a child has inadequate fine and gross motor skills, is sometimes tired or hungry, usually clumsy, and may have flagging energy levels.
2. Social competence

Above the 90th percentile, a child never has a problem getting along, working, or playing with other children; is respectful to adults, self-confident, has no difficulty following class routines, and is capable of pro-social behaviour.

Below the 10th percentile, a child has poor overall social skills and exhibits regular serious problems in more than one area: getting along with other children; accepting responsibility for their own actions; following rules and class routines; and showing respect for adults, children, and others’ property. He or she lacks self-confidence and self-control, finds it difficult to adjust to change, and is usually unable to work independently.

This is, in part, a measure of the LHPA pathway and its function.

3. Emotional maturity

Above the 90th percentile, a child almost never shows aggressive, anxious or impulsive behaviour, has good ability to concentrate, and is often helpful to other children.

Below the 10th percentile, a child has regular problems managing aggressive behaviour, is prone to disobedience, and/or is easily distractible, inattentive, impulsive, usually unable to show helping behaviour towards other children, and is sometimes upset when left by the caregiver.

This is partly a measure of the LHPA pathway (allostatic pathway) and its effects on behaviour and mental health problems.

4. Language and cognitive development

Above the 90th percentile, a child is interested in books, reading and writing, rudimentary mathematics, is capable of reading and writing simple sentences and complex words, and is able to count and recognise numbers and geometric shapes.

Below the 10th percentile, a child has problems in both reading/writing and numeracy, is unable to read and write simple words; is not interested in trying, is often unable to attach sounds to letters, has difficulty remembering things, counting to 20, recognising and comparing numbers, and is usually not interested in numbers.

This is a measure of the development of hearing, vision, and the higher orders of brain function that affect language and cognitive development.

5. Communication skills and general knowledge

Above the 90th percentile, a child has excellent communication skills, can tell a story and communicate with both children and adults, and has no problems with articulation.

Below the 10th percentile, a child has poor communication skills and articulation, limited command of language, has difficulty talking to others, problems understanding and being understood, and has poor general knowledge.

This assessment reflects higher cognitive functions and ability to communicate and understand complex issues.

Children are deemed vulnerable in terms of early brain development if they are in the bottom 10 percentile in at least one of the AEDI five subscales. This ranking indicates that they have a developmental language, social-emotional, cognitive or physical problem that is likely to interfere with their capability to learn and their behaviour in school.

The EDI results for Canada and Australia when plotted against the socioeconomic status of the children are similar (Figure 4, Figure 5). They show the same socioeconomic gradient for vulnerable children as do the data from the National Longitudinal Survey of Children and Youth (NLSCY) in Ontario, Canada and the Australian Longitudinal Study.

Figure 4 shows the AEDI results for some Australian children by socioeconomic status (SES). The vulnerability measure is the percent of children in the bottom 10% on one of the measures. The income of the family is the socioeconomic measure.
This shows the relationship between the percentage of Canadian children in the bottom 10% in one of the EDI measures and family income. This, like the Australian data, shows a SES gradient.

Canadian results

The most complete assessment of children entering primary school using EDI in Canada has been in British Columbia. Hertzman's team (Kershaw, Irwin, Trafford, Hertzman 2005) has published an atlas of EDI results for all districts in British Columbia. The EDI results for Vancouver show a socioeconomic gradient by district according to family income (Table 2).

In Vancouver, schools in districts with the greatest proportion of children entering school with low performance on the EDI have poorer test results in grades 4 and 7 (Table 3). Similar findings were obtained in Toronto. Grades 3 and 6 literacy test results were poorest in Toronto schools where the greatest number of kindergarten aged children showed low EDI scores. From a population based assessment, these schools were not able to substantially improve the literacy levels of the students in these districts at grade 3 and grade 6.

Table 3: Vancouver Grade 4 & Grade 7 Test Results

<table>
<thead>
<tr>
<th>District</th>
<th>Income</th>
<th>Proportion failing to meet standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>13.6</td>
<td>17.8</td>
</tr>
<tr>
<td>1</td>
<td>26.7</td>
<td>33.9</td>
</tr>
<tr>
<td>2-3</td>
<td>29.5</td>
<td>43.1</td>
</tr>
<tr>
<td>4-5</td>
<td>48.4</td>
<td>68.3</td>
</tr>
</tbody>
</table>

In British Columbia, researchers at HELP (Human Early Learning Partnership – University of British Columbia) have linked EDI data for children at school entry with the data sets for the schools' grade 4 Foundation Skills Assessment (FSA) for these children in tests of reading and numeracy (Table 4). These data have allowed researchers to study the learning trajectories of children from their development scores (EDI) at school entry to their performance in grade 4. Table 4 shows the comparison of children's EDI results in kindergarten compared to their grade 4 test results in reading (the results for numeracy were similar).

Table 4: Vancouver EDI and Grade 4 Reading Tests

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
<th>Column C</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDI No. of EDI</td>
<td>% Failing Grade 4 Test</td>
<td>% Not Passing Grade 4 Test</td>
</tr>
<tr>
<td>0</td>
<td>13.6</td>
<td>17.8</td>
</tr>
<tr>
<td>1</td>
<td>26.7</td>
<td>33.9</td>
</tr>
<tr>
<td>2-3</td>
<td>29.5</td>
<td>43.1</td>
</tr>
<tr>
<td>4-5</td>
<td>48.4</td>
<td>68.3</td>
</tr>
</tbody>
</table>

In Column A of Table 4, the children are divided according to the number of the five EDI measures they were vulnerable in when they were in kindergarten (0, 1, 2-3, or 4-5). *Column B shows the percentage of children taking the reading test who did not pass. **Column C shows the percentage of the total age group who did not pass (this includes the children who should have taken the test but for various reasons, did not, eg due to illness, truancy or because they were held back in a lower grade).

The gap between the percentage failing and the percentage 'not passing' grows larger as the number of EDI vulnerabilities grows, probably indicating that absence due to illness is a small factor in contributing to the gap. The results for the grade 4 numeracy tests are similar to those for reading. The pattern is clear: increased vulnerability in kindergarten based on the EDI assessment increases the likelihood of problems for children in grade 4 reading and grade 4 numeracy tests. These results also show that school based assessments miss a number of children in the age group that should be doing the test. This is similar to the results from studies in Manitoba. In other words, school based tests do not
reflect development for all children in an age cohort in such functions as language, literacy, and numeracy.

In Manitoba, they have examined school based assessments of pass and failure versus population based assessments for the age group. Their results show that at grade 3 the pass/fail rates based on school tests ranged from 83% passing in the low income group to 94% passing in the high income families. However, if the pass/fail rate is based on a population assessment of all the 8 year olds that should have written the test, plus those that wrote the test, the pass rate dropped to 50% for the children from low income families and to 84% for the children from high income families. This brings out the importance of age specific population measurements for child development rather than school based tests that do not reflect the whole age group.

Australian data

The AEDI data for Australia and South Australia are similar. The data for the Perth suburbs show a clear gradient for the EDI results against the socioeconomic status of the districts (Table 5). We were not able to get the data for South Australia linked to the SES status of the districts. The SES scale goes from 1 to 5: 1 is poor; 5 is more affluent.

Table 5: Proportion of Vulnerable Children - Age 5, Perth - AEDI

<table>
<thead>
<tr>
<th>Suburb</th>
<th>SES</th>
<th>Vulnerability (% of children)</th>
<th>1 Measure</th>
<th>2 Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canningvale</td>
<td>5</td>
<td>17.6</td>
<td>7.8</td>
<td></td>
</tr>
<tr>
<td>Thornlie</td>
<td>4</td>
<td>17.8</td>
<td>10.9</td>
<td></td>
</tr>
<tr>
<td>Huntingdale</td>
<td>4</td>
<td>20.0</td>
<td>8.4</td>
<td></td>
</tr>
<tr>
<td>Gosnells</td>
<td>3</td>
<td>27.6</td>
<td>10.0</td>
<td></td>
</tr>
<tr>
<td>Langford</td>
<td>2</td>
<td>39.3</td>
<td>19.6</td>
<td></td>
</tr>
<tr>
<td>Maddington</td>
<td>1</td>
<td>46.9</td>
<td>29.7</td>
<td></td>
</tr>
</tbody>
</table>

Adapted from Brinkman 2000

The data for South Australia show a marked variation in the vulnerability of children at the time of entry into formal schooling. The proportion of children in the bottom 10% in one of the AEDI measures ranged from 50% to 10.5%. The children vulnerable on two of the measures ranged from 30% to 4.2% (Table 6).

In Australia, they have examined the relationship between the AEDI measures and the Longitudinal Study of Australian Children (LSAC). They found validity with LSAC data. The AEDI is a valid macro community based assessment of early child development that can, with proper data linkage as shown for Vancouver, be related to actual performance of the children in the school system.

Table 6: AEDI results for some districts in South Australia

<table>
<thead>
<tr>
<th>District/Suburb</th>
<th>Vulnerabilities 1 AEDI Measure</th>
<th>2 AEDI Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salisbury</td>
<td>32.5</td>
<td>15.0</td>
</tr>
<tr>
<td>Ingle Farm</td>
<td>18.6</td>
<td>11.6</td>
</tr>
<tr>
<td>Para Hills</td>
<td>20.8</td>
<td>19.2</td>
</tr>
<tr>
<td>Pooraka</td>
<td>16.9</td>
<td>8.4</td>
</tr>
<tr>
<td>Salisbury East</td>
<td></td>
<td></td>
</tr>
<tr>
<td>North Western Adelaide</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Albert Park</td>
<td>27.8</td>
<td>16.7</td>
</tr>
<tr>
<td>Alberton</td>
<td>10.5</td>
<td>10.5</td>
</tr>
<tr>
<td>Athol Park</td>
<td>26.7</td>
<td>13.3</td>
</tr>
<tr>
<td>Croydon Park</td>
<td>43.3</td>
<td>30.0</td>
</tr>
<tr>
<td>Ferryden Park</td>
<td>43.8</td>
<td>28.4</td>
</tr>
<tr>
<td>Mansfield Park</td>
<td>42.0</td>
<td>16.0</td>
</tr>
<tr>
<td>Pennington</td>
<td>26.5</td>
<td>14.7</td>
</tr>
<tr>
<td>Rosewater</td>
<td>50.2</td>
<td>16.0</td>
</tr>
<tr>
<td>Royal Park</td>
<td>16.7</td>
<td>8.3</td>
</tr>
<tr>
<td>Seaton</td>
<td>50.0</td>
<td>31.0</td>
</tr>
<tr>
<td>Woodville Gardens</td>
<td>32.0</td>
<td>20.0</td>
</tr>
<tr>
<td>Woodville North</td>
<td>28.0</td>
<td>16.0</td>
</tr>
<tr>
<td>Onkaparinga</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Christie Downs</td>
<td>27.6</td>
<td>10.3</td>
</tr>
<tr>
<td>Hackham</td>
<td>27.3</td>
<td>9.1</td>
</tr>
<tr>
<td>Hackham West</td>
<td>37.0</td>
<td>25.9</td>
</tr>
<tr>
<td>Morphett Vale</td>
<td>31.1</td>
<td>16.8</td>
</tr>
<tr>
<td>Mid North</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belalie</td>
<td>16.7</td>
<td>9.7</td>
</tr>
<tr>
<td>Boorooloo Centre</td>
<td>17.6</td>
<td>5.9</td>
</tr>
<tr>
<td>Burra</td>
<td>22.2</td>
<td>11.1</td>
</tr>
<tr>
<td>Crystal Brook</td>
<td>20.8</td>
<td>4.2</td>
</tr>
<tr>
<td>Georgetown</td>
<td>30.0</td>
<td>20.0</td>
</tr>
<tr>
<td>Peterborough</td>
<td>23.5</td>
<td>5.9</td>
</tr>
<tr>
<td>Port Pirie</td>
<td>28.7</td>
<td>13.0</td>
</tr>
<tr>
<td>North and Far West</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coober Pedy</td>
<td>29.4</td>
<td>20.6</td>
</tr>
<tr>
<td>Leigh Creek</td>
<td>42.1</td>
<td>31.6</td>
</tr>
<tr>
<td>Port Augusta</td>
<td>43.1</td>
<td>22.9</td>
</tr>
<tr>
<td>Roxby Downs</td>
<td>15.6</td>
<td>4.4</td>
</tr>
<tr>
<td>Whyalla</td>
<td>27.4</td>
<td>14.4</td>
</tr>
</tbody>
</table>

Adapted from Brinkman 2000

With the help of John Glover and his colleagues from the University of Adelaide, we looked at the AEDI results for Port Augusta and Alberton and the reading, writing, and numeracy scores for the schools in these communities (Table 7). In Port Augusta, schools that would probably have a high proportion of the children entering the school vulnerable in one of the AEDI measures scored poorly in reading, writing, and numeracy in grade 3. In contrast, in Alberton, which had far fewer children vulnerable on the AEDI result, the test scores in reading, writing, and numeracy for the schools were much better than in Port Augusta.
Augusta. These data are not as robust as those from British Columbia because in British Columbia they can link the actual children tested with EDI to the school tests. In South Australia, it has not yet been possible to track the actual children assessed by AEDI with the school test results and many children probably go to school outside the district where the AEDI assessments were made; however, the pattern is similar to the results for British Columbia.

One of the first regions in Australia to use the AEDI was the North Metropolitan Health Services Program in Perth, Western Australia. In Floreat, the percentage classified as vulnerable on one AEDI measure at school entry in 2003 was 47.2% and in Wembley, 47.1%. This was a surprise to the community health staff and local agencies, given the socioeconomic status of these communities. In these two communities, substantial efforts were made to improve early child development over the next three years. Approximately 150 children were involved in this initiative. As a result of improved early child development initiatives, the number of vulnerable children based on the AEDI results in 2006 in Floreat was 14.3%, and in Wembley, 11.8%. Similar levels of improvement were not evident in neighbouring non-intervention communities of Perth. It is likely that the enriched programs were mainly affecting children three years ago in the 2-3 year age group. These data indicate that improved early child development programs for 2 to 3 year olds can improve AEDI results within three years. The AEDI measure is important for communities and government to be able to demonstrate how early child development and parenting programs can improve child development.

Table 7: Suburb AEDI and School Performance

<table>
<thead>
<tr>
<th>Suburb</th>
<th>AEDI % Children Vulnerable on One AEDI Measure</th>
<th>Tests Year 3 Students Reading Writing Numeracy % below benchmark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Augusta</td>
<td>43.1</td>
<td>27 43 33 (includes exempted)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>16 32 23 (excludes exempted)</td>
</tr>
<tr>
<td>Alberton</td>
<td>10.5</td>
<td>13.1 11.7 10 (includes exempted)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>11.6 10.2 8 (excludes exempted)</td>
</tr>
</tbody>
</table>

Clearly, if communities in South Australia are to reduce the number of vulnerable children at entry into grade 1 and reduce the inequity in school performance, they will have to invest in high quality early child development programs involving parents that begin before school entry. These programs should provide optimum experience for brain development for the children in the programs and at home with their parents. The AEDI results show the quality of early child development in a community.

Recommendations

RECOMMENDATION 2:1
Given that 25% of children show poor development (across all social classes) at the time of school entry, the state has to have in place the Australian Early Development Index (AEDI) as an outcome measure to assess how well families and communities are achieving equity in early child development.

RECOMMENDATION 2:2
The Government of South Australia, in cooperation with the AEDI partnership, should carry out an annual AEDI assessment for all children entering the school system in all communities and make the findings available in aggregate to those communities. This will help communities to work towards equity in early child development.

RECOMMENDATION 2:3
The Government of South Australia should, in partnership with the universities, establish a database that allows the AEDI results to be linked to children’s health status and their educational performance. As in Manitoba, Canada, these data should not be about individuals but about communities.
How can we improve the development of our children?
There is a wide range of studies in developed and developing countries involving birth cohorts, randomised controlled trials, and observational studies, that in terms of early child development outcomes, are compatible with what we now know about experience and early child and brain development and the effects on health, learning, and behaviour throughout life.

Studies of early development

Romania

A number of observations come from the studies of infants and young children in orphanages. Studies of children from Romanian orphanages adopted into middle class homes in Great Britain, Canada, and the United States following the collapse of the Communist government are instructive. In the UK, Rutter and colleagues (1998) compared the development of orphanage children from Romania adopted into British middle class homes with non-deprived UK born children placed into adoption before the age of six months. The Romanian orphanages did not usually provide good environments and experience for optimal early child development of the infants, toddlers, and young children. This study found that the earlier the adoption of the Romanian children after birth into middle class British families, the better the outcome.

In Canada, the Romanian Adoption Project (Ames 1997; Nelson et al. 2007) compared children from the Romanian orphanages adopted into Canadian middle class families within the first four months after birth with those who had spent eight months or longer in the orphanages. Both groups were compared with Canadian born middle class children raised within their family environment. When the children reached 10 years of age, they found that the Romanian group that spent more than eight months in the orphanages before adoption had lower IQs than the children adopted early and the children from middle class British Columbia families. This finding is in keeping with the observation that IQ is influenced by the quality of child development in the very early years. The late adoptees had lower school achievement scores, more attention deficit disorders and other behaviour problems. Parents who had adopted the children who had been eight months or more in the orphanages reported far greater parenting stress in helping these children than parents who had adopted children soon after birth. In terms of attention deficit hyperactivity disorder, 34% of the late adoptees had a clinical diagnosis, while only 3% of the British Columbia group and 9% of the early adoptees had this problem.

Britain

The findings from longitudinal studies of birth cohorts have increasingly provided evidence about how the conditions of early life can affect health and development over the life course. Wadsworth and colleagues (1991) in a detailed study of the 1946 British birth cohort found that conditions in early life can set risks for both physical and mental health problems in adult life. Power, Manor and Fox (1991) in their studies of the 1958 British birth cohort explored the causes of inequalities in health. In the initial work, they concluded that circumstances prevailing at each stage of child and adolescent development were related to the health differences when the children became adults.

In more recent work, Power’s team (1997) have presented further evidence that the manner in which brain and biological pathways develop in early life influences risk of adult diseases. In a study of the 1970 New Zealand birth cohort, Poulton et al. (2002) came to the same conclusion that poor socioeconomic environments for early child development have long lasting negative influences on adult health. The results from all these longitudinal birth cohort studies show that the socioeconomic gradient in health found in adults begins in childhood.

Jeffers and colleagues (2002) have examined the relationship between birth weight, childhood socioeconomic environment, and cognitive development in the 1958 British birth cohort. They found that the postnatal environment had an overwhelming influence on cognitive function. Birth weight had a weaker but independent association. Low birth weight children in the upper social class had better mathematics results than the low birth weight children in the lower social classes at age 7 and 11. Furthermore, the school system did not change the performance for the low birth weight children who were in the low social class.

Power, Li, and Hertzman (2008) have looked at cognitive development and cortisol from the 1958 British birth cohort. They found a correlation between cognition and cortisol levels. They found a causal relationship in either direction.

Chicago

In the examination of the effect of child and parent centres in the Chicago Longitudinal Study (Reynolds et al 2004), it was found that the child and parent centres located in or proximal to public elementary schools for children from ages 3 to 9 produced differences in child development when compared with children not in the program. A key finding was that there was significantly higher educational attainment and fewer juvenile arrests.
The results from this operational research project are compatible with the neurobiological evidence about experience based brain development in the early years. Although this initiative improved early child development, the gains were probably less than what would have been achieved if the families with young children had been brought into centre based early child development and parenting programs at an earlier age.

Other studies

The 1970 longitudinal British birth cohort studies (Egerton and Bynner 2001) clearly show that young children in centre based preschool programs do better in school than children who are not in these programs. In these studies they show quite conclusively that quality early child development programs and parenting practices were important predictors of the movement up or down of children from all social classes in the school system. In further analysis of the 1970 British birth cohort, Feinstein (2003) found that the development score at 22 months of age predicted educational qualifications at age 26. The overall conclusion from this and other studies is that the majority of children who show low performance in the first two years are unlikely to have the poor development fully reversed within the present education programs when they are in the school system.

The U.S. Infant Health and Development Program (IHDP) study of children from birth to age 3 has examined cognitive and language development. The investigators found that the quality of the program and parent involvement during this period had a significant effect on outcome by age 3. Brooks-Gunn (2001 & 2002) concluded from their work with the IHDP data that high quality centre based care showed excellent results in improving early child development. She has concluded that the provision of universal high quality centre based child development programs are beneficial to everyone including children cared for solely by their mothers. She concluded that in the timeframe of these studies, positive benefits continued into the late elementary and high school years.

In their studies of low birth weight premature infants, Brooks-Gunn and her colleagues found sustained effects of centre based programs (age 1 to age 3) on the Wechsler Intelligence Scale for Children (WISC) verbal scores at age 8. This program included home visits. Since the children were all premature, they had appropriate healthcare. A striking finding in this study was that the children who used the centre based program for more than 400 days over the two year period had much better verbal scores at age 8 than the children who spent less time in the early years centres. The children who attended these centres (short or long term) scored much better than the children who were not randomised to the centre based programs. These findings provide evidence of a dose effect (experience) in the 1 to 3 year age group on brain development in the early years. Again, these findings are congruent with what we know about the dose effect in terms of stimulation and brain development in the very early years. This is in keeping with the evidence that verbal skills at age 3 are dependent on language exposure during the early period.

The Perry Preschool program (Schweinhardt et al 2005) in Ypsilanti, Michigan found in a randomised trial that a centre program during the school year for 3 to 4 year olds on weekday mornings along with a weekly 90-minute home visit to each mother and child on weekday afternoons during the school year had a significant effect on child development. The children in the program significantly outperformed the group not in the program. (Sixtyfive percent in the program graduated from high school in comparison to 45% of those not in the program.) A higher proportion of the children in the program went on to university.

Another key finding from the Ypsilanti study was the substantial reduction in crime in the intervention group. The reduction in antisocial behaviour was substantial, leading to far fewer violent crimes, property crimes, or drug crimes and arrests. The economic return to society and individuals of the program was calculated as $258,888 per participant on an investment of $15,166 per participant. Of that return, $195,621 went to the general public ($12.90 per dollar invested) and $63,256 went to each individual ($4.17 per dollar invested). Of the public return, 86% came from crime savings, 4% came from education savings, 7% came from increased taxes due to higher earnings, and 1% from welfare savings. This study shows that good early child development programs as well as helping the individuals have a significant effect on the costs to society of poor early child development.

Although this program had an initial effect on IQ, it was not sustained. This finding is perhaps not unexpected since the weight of the evidence today is that IQ is strongly influenced by the conditions during early infancy (Wickelgren, 1999). The Ypsilanti Study is by today’s standards a late intervention study. It is better to start programs to enhance early child development when new mothers are pregnant and certainly when the child is born.

The Abecedarian project (Campbell and Ramey, 2002; Ramey et al, 2000), a randomised trial in North Carolina, provides important information about the value of early intervention with a high quality early child development program on cognitive development over more than 20 years. In this program, a group of African American
children whose mothers had IQs ranging from 74 to 124 (average 85) were at four months of age randomised initially into two groups: a control group, and a group exposed to a full year preschool centre based program starting at four months of age. At the time of school entry, the intervention group and the control group were randomised into two groups one of which was put into a special school program for the first three years and the other went into the normal school program.

- The control group randomised at the time of school entry into the special three year program, showed better performance in reading skills than the control group not randomised to the school program.
- The children in the original preschool intervention group maintained their improved skills in reading and mathematics throughout the period in the school system.
- The children in the preschool program not placed in the special three year school program lost a portion of their gain by age 21 in contrast to the group from the preschool program that also had the special three year program in the first three years of the special school program (Figure 6).

The findings for mathematics also showed a benefit of the preschool program. This study is compatible with the new knowledge from developmental neuroscience in that brain architecture and function develops in steps in the early years. The early neural pathways set the stage for the next steps. In Heckman’s language, ‘skill begets skill’.

In reviewing all of this evidence, there is a general consensus amongst those who work in the field and understand the new knowledge about experience based brain development that to enhance early child development, it is important to work with parents and their children in centre based programs soon after the child is born to help develop brain architecture and function (McCain et al. 2007).

**Adult literacy**

In Chapter 1 the relationship between experience based brain development in the early years and language and literacy was reviewed. Population assessments that relate to this are the OECD studies of literacy. In this work they use a scale of 1 (low) to 5 (high) to estimate the literacy competence (prose, document and quantitative) of the population. Table 8 shows the results for developing and developed countries. Figure 7 shows the socioeconomic gradients for document literacy scores of Sweden, Finland, Canada, Australia, and the United States. Both Canada and Australia have more than 30% of their population below the mean value for developed countries. Both countries could take steps to at least match Sweden and Finland. The other comparison of interest is the UNESCO study of language and mathematics ability in Latin American primary schools. Cuba’s performance is orders of magnitude better than the other Latin American countries. The mean values for Cuba in mathematics and language are two standard deviations better than the mean values for the other Latin American countries. In view of what we now know about early child development and school performance, it is likely, that this is largely the result of Cuba’s early child development programs. Figure 8 shows the participation of families with young children in early child development programs in a number of countries. Close to 99% of families take part in Cuba’s programs which begin at birth. Participation continues at this high level until the children enter school. Sweden and Finland start with the 1 to 2 year age group and climb to 70% to 95% involvement of children by age 3. In contrast, Brazil, with one of the poorest literacy scores for Latin America, starts later and has less than 40% involvement of its children in the 4 to 5 year age group. This data linked to the literacy performance data shows that countries with high quality early child development programs that start early have high performance for their children in language and mathematics in the school system and more competent adult populations in language and literacy.
Table 8: Document Literacy 1994-1998
Ages: 16 to 65

<table>
<thead>
<tr>
<th>Country</th>
<th>Level 1-2</th>
<th>Level 4-5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweden</td>
<td>23%</td>
<td>34%</td>
</tr>
<tr>
<td>Canada</td>
<td>42%</td>
<td>23%</td>
</tr>
<tr>
<td>Australia</td>
<td>43%</td>
<td>17%</td>
</tr>
<tr>
<td>United States</td>
<td>48%</td>
<td>18%</td>
</tr>
<tr>
<td>Chile</td>
<td>85%</td>
<td>3%</td>
</tr>
<tr>
<td>Mexico</td>
<td>84%</td>
<td>1.7%</td>
</tr>
</tbody>
</table>

Fig. 7: Socioeconomic Gradients for Document Literacy Scores

Early childhood development and parenting centres

The best early child development interventions take place in comprehensive, integrated programs that combine nurturing and care, nutrition and stimulation. They focus on the whole child and involve families and communities. They begin preferably during pregnancy, and are sustained through primary school.

Figure 9 illustrates the sources of brain stimulation in late utero and the early period of life that set the architecture and function of the brain. From what we now know about developmental neuroscience, the parents (caregivers) have the biggest effect in the first two to three years. The importance of their involvement in the centres is that a good way to learn parenting is by doing. This means that the staff in the centres have to know how to work with infants, toddlers and young children as well as with the parents. Programs that do this attract large numbers of families with young children from all social classes. This means that early child development and parenting centres are not babysitting centres but in fact are child development programs.
The centres create a new ‘tier’ for the early period of development, before the public education ‘tier’. Their approach is intergenerational and cross-cultural. Programs support the growth and development of parents; prepare the next generation for parenthood and enhance their ability to function as contributing members of society. They provide a meeting place for families and help set the foundation for pluralistic societies.

Principles for government program development

The Early Years Study (1999) outlined the ingredients of a successful early child development program.

- Every child and family may attend. Programs are available, affordable, equitable, and optional.
- Nurturing relationships, responsive interactions and purposeful problem based play accelerate early learning and enhance opportunities during the early sensitive periods of the development of brain architecture and function.
- The parent-child relationship is the most powerful influence on children’s early development particularly in the first two years. Respectful, reciprocal partnerships with families and communities strengthen the ability of early childhood settings to meet the development needs of young children.
- Respect for diversity, equity, and inclusion are prerequisites for honouring children’s rights and optimal development and learning.
- Early childhood programs are proactive: reaching into their communities to connect with families; disseminating the knowledge of early child development and the benefits of quality programs; connecting the early childhood environment to the community and acting as key advocates for children and families.

Components of an early child development and parenting centre

Problem based play: Programs optimise development of neural pathways during all periods of early childhood from infancy to grade one and beyond. Environments that promote learning through play based, problem solving offer children an array of opportunities to explore, discover and create. Consistent play opportunities with other children provide rich sensory stimulation that the young child absorbs and integrates into core brain development. The curriculum and pedagogical approach promotes children’s active participation in environments designed to support problem based play in a social environment.

Parenting: The ability of parents and other family members to respond to and stimulate their children from birth builds the child’s core competency and coping abilities. Families need ‘just in time’ access to parenting and child development information and guidance from trusted sources. The participation of parents, other family members, and other caregivers is guided by the centre staff. Participation strengthens the involvement and engagement of parents in their own child’s early learning and development. In turn, they are able to transfer their understanding and knowledge to other parents and caregivers. Informal conversations, family events and structured sessions provide venues for information, specialised equipment, toys and learning resources. Centres are linked to home visiting and home care satellites to extend their reach into the community and provide a platform for the delivery of early identification and intervention services.

Full year/Full time options: Programs are designed to accommodate the different and changing needs of families. To enable all families to participate, programs offer a flexible range of parent-and-child and child-only enrolment options, including part time, full time, occasional, and respite care. Flexible enrolment permits parents to pursue work, training, or the care of other family members and allows a smooth transition to work from parental leave for parent and child.

Pre- and post-natal supports: Expecting and new parents benefit from child birth and child development information, group discussions, and workshops offered in accessible environments connect them to neighbourhood/community resources.

Health, safety and nutrition: Programs meet the highest health and safety standards and promote healthy behaviours in children and families. Optimal early child development begins with adequate nutrition from conception on. Prenatal programs can provide nutritional
Design of a system for early child development and parenting centres

Early child development and parenting centres should be located in neighbourhoods, preferably as part of the primary schools, responsive to community needs and supported by a legislative and funding framework.

Location: Primary schools are already centres for children; with a few modifications they can service children and families from prenatal through to high school. Early childhood programs can be integrated into schools and serve as the hub for program delivery with other community spaces providing venues for overflow activities. In urban areas, most families should be able to walk to their centre. In rural and isolated areas, additional resources may be needed for transportation, and some program components may be delivered through home visits as part of a network of mobile vans.

Early childhood professionals: Knowledgeable, responsive early childhood professionals are essential to programs that are sensitive to the needs of young children and their families. Skilled staff are supported by pre- and in-service training in early child development and parenting support; by environments that encourage responsive, individualised attention to children and parents; and by levels of remuneration that reflect the value of the work. Existing ECE diploma and degree programs and primary school teacher education can be realigned to prepare an early childhood workforce and leadership to work in integrated settings. Specialised staff members work in collaboration with child development professionals to meet the needs of vulnerable young children and their families. Professional early childhood teams jointly plan and deliver the program and link with early childhood or family support specialists as required.

A planned program direction and specific development goals for children and families are important. Quality early child development environments incorporate an informed understanding of what child development means. They have specific learning goals for children that support social competence, physical health and wellbeing, emotional maturity, attention, language, and thinking skills as well as the foundation knowledge and concepts needed for reading and understanding numbers.

Local authority: An integrated local authority, including district school boards, public health units and local governments, is mandated to oversee planning, monitoring and management. It is the mechanism that allows pooled program funding, joint staff and shared physical and program resources.

State/territorial infrastructure: A system of early child development centres requires adequate funding and a legislative framework that integrates existing responsibilities for child development and family support services. Major government agencies have responsibility for workforce development and can support quality through a research agenda and public accountability through data collection, monitoring and reporting.

Funding: Quality, sustainable programs require government funding. Public funding should cover the core operating costs, sufficiently to ensure that all children experience at least a half day program under age 3 and families are provided with pre- and post-natal and parent/child programming.

Measuring progress: Community and state population based assessment, including birth outcomes, immunisation rates, and AEDI are essential to monitor local and regional early child development performance. Systematic data collection and monitoring and a stable framework for research and evaluation provide accountability and support quality.

Cost: A substantial investment in early child development will be necessary if societies are to improve the competence, health and wellbeing of future adult populations. Cost will be at least per infant, toddler, and young child equal to the cost per child in the public school system.

Other components

Other components that support early child development and parenting include:

- increased parental and maternity leave and benefits
- family friendly workplaces
- income transfers and tax incentives
- integrated, independent outcome measures
- community information networks.

Increased parental and maternity leave and benefits: Parental leave benefits protect and promote the health and wellbeing of the mother and her unborn and newborn child. They allow mothers to breastfeed their infants for a longer time promoting maternal and child health. Leaves facilitate the child-parent attachment essential for optimal brain development and the establishment of good
parenting. The first six months are for the mother; the next six months to one year should be shared by the mother and father. Canada has doubled its leave policy since the release of the Early Years Study. This is a good start but there is room to extend leave and improve benefit levels to ensure families are not economically disadvantaged. As in other countries, leaves could be more flexible, allowing easier transitions for parents returning to work.

Family friendly workplaces: Family friendly policies in the workplace help to bring about work/family balance and allow parents more opportunity to support children's development during the crucial early years. In addition to extended parental and maternity leave and benefits, possible options include:

- flexible work arrangements such as part-time work, flexible hours of work, priority for dayshifts and opportunities to work at home
- unconditional paid leave days which can be used to attend to family responsibilities including the care of sick children
- flexible use of employee payroll benefits for early child development
- workplace child development and parenting centres in companies with unique scheduling requirements linked to the primary schools could also be established.

Parents who are better able to meet family responsibilities are absent less and are more productive. The constant tension that many parents, particularly mothers, experience between meeting the needs of their young children and fulfilling work related obligations creates stress levels that can lead to higher rates of absenteeism, work disruptions and expensive staff turnover. Work schedules that allow parents to take part in their young children's programs are another example of a family friendly work policy. Regular parent participation in early child development and parenting centres benefits parents who are able to learn from staff and from each other. Workplace policies can, and do, make a difference but they cannot compensate for lack of consistent, quality programs for young children.

American studies on the effectiveness of Early Head Start showed that 3 year old children attending the program performed better in cognitive and language development, displayed higher emotional engagement with their parent and less aggressive behaviour. Compared with controls, Early Head Start parents were more emotionally supportive, provided more language and learning stimulation, read to their children more, and spanked less. Preventing family poverty through tax measures, adequate income transfers, and labour force policies needs to be part of a comprehensive approach to early childhood development. More egalitarian societies are also healthier and more cohesive. The Early Years Study (McCain & Mustard 1999) suggested:

‘[R]educing the social distance or disparity between those at the top of the socio-economic ladder and those at the bottom can become a project for all sectors of society in building the new system and can build social capital.’

In their paper, ‘Success by Ten’, Ludwig and Sawhill (2006) from the Brookings Institution in Washington, on reviewing all the evidence, outline three important principles for programs to improve early child development:

- Intervene early.
- Intervene often.
- Intervene effectively.

This is in agreement with all the evidence we now have from developmental neurosciences and biological sciences and studies of how experience in early life, including the in utero period, has significant effects on the development of brain architecture and function. Ludwig and Sawhill also make the point that programs to improve development in the early years should also feed into quality elementary school programs. Finally, to intervene effectively in early child development will require a well educated, trained staff with good salaries.

In applying the new knowledge about early child and brain development and its effects on health (physical and mental), behaviour, and learning throughout the life cycle, the reason for using the term early child development rather than early learning or daycare is apparent. It would be beneficial if the primary schools could also consider involving parents to a greater degree.

The children's centres that DECS is developing with the primary schools are building capabilities to meet the goals set out in the McCain Mustard report and in the Ludwig and Sawhill paper and other reports.

This implies that the daycare programs (non parental care) should become part of the early child development and parenting centres. Under the present arrangements, this would be difficult to do because the commercial for-profit daycare providers would be opposed to daycare becoming part of a publicly financed network of early child development and parenting centres linked to the public school system.
Recommendations

RECOMMENDATION 3:1
South Australia should continue with its policy of putting in place universal integrated early child development and parenting programs linked to the primary schools that begin early in infancy, are of high quality, and continue into the early years of school.

RECOMMENDATION 3:2
The early child development and parenting centres should be capable of starting to work with parents and infants shortly after birth, if not during pregnancy. The centres' program should help parents 'learn parenting by doing'.

RECOMMENDATION 3:3
To make it possible for parents to be involved in these centres in the early years, South Australia should have a policy to allow parents with a new child at least 18 months parental leave, with income support (at least 80%). The first six months should be maternity leave and the next twelve months should be parental leave that can be shared between the mother and the father.

RECOMMENDATION 3:4
Early child development and parenting centres must, when appropriate, provide non-parental care when parents have to work or take education programs.
How well are children in South Australia developing?
In South Australia there has been a century of initiatives by groups in communities and governments to establish programs to support families and early child development. Today, in Australia, early child development programs and services have separate and layered auspices involving the federal government, the state governments, municipalities, and non-government organisations. At the federal government level, at the time of my residency in 2007, early child development initiatives are shared by the Department of Families and Community Services and Indigenous Affairs, and the Department of Education, Science and Training. The Department of Family and Community Services and Indigenous Affairs administers the national childcare policy and the strategic direction for all types of early child education and care programs except for those in schools and what are referred to as preschools (age 3 to kindergarten or grade 1). Preschool in Canada can mean from birth to grade 1.

A mix of government responsibilities

The federal government in its support of early childhood has promoted daycare, not programs for early child development that involve parents. Over the last two decades in Australia, as in other countries, there has been a growing need for non-parental care for children of working parents or parents who are students or disrupted families. The early child development programs are largely seen as an issue arising out of parents' employment.

The federal government oversees some (what they consider) quality issues and long daycare, family daycare, and out of school hours care. The state and territory governments set the regulations and issue licences for long daycare services.

The federal Department of Education, Science and Training is responsible for formulating national policy in school and preschool education although school and preschool provision is primarily under the control of the state and territory governments. The federal government influences these initiatives through setting the national agenda and funding. The national funding policy is based on choice for parents and creating incentives for schools to raise private income. Critics have pointed out that Australia’s complex and multilayered system of policy development, funding, and programs that influence early child development inhibits attempts by communities to create integrated programs for early child development.

The Organisation for Economic Co-operation and Development (OECD) (2001) in its assessment of Australia, felt that there is a wide range of beliefs and policy directions depending on various government departments and their philosophy, type of setting and community perception. They make the point that one constraint for putting in place integrated early child development programs in Australia is, in part, the complexity of government programs without a clear vision in a federation of states with multilayering of administration and regulation.

Quality issues

The low pay, low status and training levels of many staff in early child development initiatives affects the quality of many programs. Despite state regulation and national monitoring of quality through what are called quality assurance systems, the evaluation is considered to be weak in respect to early child development. The initiatives for monitoring programs and services allow for monitoring of programs but not for assessment of their quality or their effect on early child development.

The AEDI results along with the data from the national longitudinal study show that Australia has a problem in ensuring equity and quality in early child development for all families with young children. Many for-profit daycare programs provide good custodial care but do not provide quality early child development programs. Because of the long term effects of brain development during this period, some of these daycare programs may be damaging young children. As the state moves towards universal early child development and parenting centres linked to or part of the primary schools, the conventional daycare centre will become of less value and importance. Some not-for-profit daycare centres that have many features of quality early child development centres could become part of DECS’ children’s centres.

The application of the new knowledge from developmental neuroscience and biology conclusively shows that the quality of the sensory inputs into the brain in the early years has major effects in the differentiation of neurons and their function and the formation of the neural pathways that affect health, learning, and behaviour throughout life. Thus, while centre based programs are important for child development, the largest effect in the first two to three years of brain development will be centre based programs that involve and interact with the parents since parents (caregivers) will have the most continuous interaction with infants, toddlers, and young children.

Virtual Village report

The report released in 2005 by the Government of South Australia, The Virtual Village: Raising a Child in the New Millennium, addresses many of the issues that have to
be faced in setting up early child development centres for all families with young children. In this report, they made a strong case for an integrated model of children’s services. I would rephrase this to an integrated program for early child development. For many societies, the term ‘service’ implies, as in the health care system, diagnosis and treatment of problems, not development and preventing development problems.

In the Virtual Village report, they made several recommendations about early child development in South Australia.

1. ‘It is recommended that a joint effort approach to early childhood services be pursued through the creation of a new whole of government framework for early childhood services.’ (page 180)

2. ‘It is recommended that the governance for the whole of government framework for early child development services include the establishment of a South Australian Children’s Council with responsibility for integrated planning and oversight of all early childhood services.’ (page 182)

3. ‘It is recommended that the focus of early child service development is on strengthening and integrating universal services in South Australia.’ (page 184)

4. ‘It is recommended that integrated Child and Family Centres are developed commencing in 2005.’ (page 185)

The announcement of the Government of South Australia that it is establishing 20 children’s centres (ages 0 to 8) for early child development and parenting in association with the primary schools is an important response to the Virtual Village report.

In the government documents describing the children’s centres, it states, ‘that the children’s centres’ qualified early childhood staff work together with families to provide quality learning and care to support children’s development, health, and wellbeing’. In this announcement, they state, children’s centres will offer a mix of programs: high quality development and care from birth through to the early years of school; child health information; family support; play groups and play activities; early assessment of children’s development. At some centres there will also be health services such as hearing and eye tests, immunisation and specialised support such as speech and occupational therapy. These goals are similar to what we recommended for early child development and parenting centres in the Ontario Early Years Study (McCain and Mustard 1999) and, more recently, in the Canadian Council for Early Child Development’s report, Early Years Study 2: Putting Science into Action (McCain et al. 2007).

In my meetings with groups in Murray Bridge, Riverland, Port Augusta, Parks, groups in Northern Adelaide and Southern Adelaide, it was clear that they were already trying to sort out how they could create integrated early child development programs linked to or part of the primary schools. One of the major issues the government and communities face is how to create some order out of the diverse programs funded by different sections of government and non-government agencies in the field of early child development.

Whole of government approach

The phrase that kept being repeated to me in communities trying to build integrated early child development programs was the need for a ‘whole of government’ approach to the diverse programs that support early child development.

It is to the credit of the Government of South Australia that establishing the committee, the Inter-ministerial Committee on Child Development chaired by the Minister for Education and Children’s Services, is a step towards establishing a whole of government approach for the policies and financing of programs and staff for early child development and parenting centres. However, I did not get the clear message that all the ministries really understood what their commitment should be. For this committee to function better, the government may have to put all the components into a ministry of human development with the necessary authority to build integrated programs for early child development. For this to take place, it will need the commitment and leadership of the Premier.

The DECS initiative to develop children’s centres in association with the primary schools is a major step forward to provide early child development programs as part of education and very much in keeping with the conclusion of Jean Brooks-Gunn and others (2002 and 2006), and the Canadian Council for Early Child Development’s recent report, Early Years Study 2 (McCain et al. 2007) and other studies.

Fragmentation of approach

In Elliott’s review of early child development in Australia (2006), she makes the point that the fragmentation in early child development programs in communities does not help improve early child development. She points out that there is little consistency between programs from one centre to the other, no agreement on desirable development outcomes, considerable variation in staff profiles and large numbers of staff with minimum educational qualifications and limited professional development opportunities. There is indecision about the
appropriate credentials for early childhood staff especially in what is considered childcare, and a confusing array of industrial awards and staff classifications that result in low salaries and impact negatively on staff recruitment, training, retention and career progression.

She makes the point that a systematic strategic approach for programs for all families with young children is urgently needed. Unless this happens, existing early childhood development initiatives will continue creating what are best described as chaotic early child development initiatives. Figure 10 is an attempt to show the existing pattern of early child development and programs in South Australia. It is clear that the centres DECS is now introducing into communities will provide the opportunity to create orderly and effective programs.

Rationalising the range of programs and services, layers of tradition, and the mosaic of funding patterns of the governments for the support of a variety of activities in early child development will be difficult and requires legislation and specific funding for the children’s centres.

Figure 10 illustrates the different South Australian government departments, federal government, community organisations and non-government organisations that support diverse non-integrated programs in early child development. Establishing integrated programs for early child development from this mixture will be difficult and slow.

In my discussions with Professor Philip Gammage, an early childhood education research fellow to DECS, he outlined some of the issues that have to be addressed to establish integrated early child development programs.

• There needs to be integration of policies at the level of the ministers and the chief executives.
• There needs to be excellent communication between the different ministries and within the ministries.
• There needs to be an approach to ensure quality of staff and parity of status for people working in early child development.
• There has to be a willingness to avoid disputes over any putative levels of professional superiority, or notions that no part of education, care, health, or family support is intrinsically more important than another.

The whole of government approach established in South Australia must play an important part in facilitating integration of existing government programs. Although steps in the right direction have been taken, there is still a long way to go.

Establishing the Council for Early Child Development outlined in Chapter 12 could help the Government of South Australia and DECS set up integrated early child development and parenting programs.

In Canada, the government of Manitoba has established a form of whole of government approach for early child development called Healthy Child Manitoba. It would be useful if the governments of South Australia and Manitoba could find an opportunity to discuss their successes and failures with a whole of government approach for the development and support of early child development programs. Manitoba does not have the advantage South Australia has by combining child development and education in one ministry.

The Department of Education and Children’s Services has the potential to become a department of human development (ages 0 to 18).

The alternative to a whole of government approach is to establish a single ministry of human development, which embraces the neurobiology story of brain development as it relates to early child development, education, youth development, and adult health and wellbeing. This would have to incorporate many of the activities located in a variety of government departments. Although the whole of government approach would be easier within present institutional structures of governments, the different government groups I met with had only a limited understanding of experience based brain and biological development and its effects on health, learning, and behaviour.

The cost of putting in place early child development and parenting programs with educated, well trained staff available to all families with young children will be substantially greater than the present expenditures by the federal government and the Government of South Australia on early child development programs and services in South Australia.
Expenditure and funding: child care vs early child development

In 2004-05 the total expenditure in Australia on what are classified as children’s services was considered to be $2,487 million. Of this, the federal government expenditure was $1,886 million. This is about 76% of the total Australian expenditure. Most of the federal government support (that is $1,468 million) assisted families to cover childcare fees via the Child Care Benefit scheme. The federal government’s childcare benefits programs have, at present, a major effect on what states can do to establish early child development programs available to all families from birth to the time of school entry, particularly the 0 to 3 age group.

Australia is at a crossroads because of the conflict between the concepts of many daycare programs and early child development programs. The developing trend for welfare oriented childcare for poor and lower income families and educationally oriented preschools (Australian term) and kindergartens for middle income and more affluent families could further polarise early child development outcomes already considered by some to be creating inequities in early child development.

The federal government and state and territory governments have different roles and responsibilities in funding children’s services or programs that relate primarily to their resources, different ideologies, and different policies and administrative objectives. As mentioned earlier, the legacy of the care vs education divide has meant that the federal government funding is directed primarily to daycare for children ages 0-12 whose parents are in paid employment or are enrolled in study or training programs. In contrast, state and territory governments are responsible for providing educational and developmental opportunities for children, such as preschool services (age 4 to 5). Since the brain develops sequentially, it is not very smart to sustain this split.

Given the costs of daycare services and with little public funding, families have come to accept that early child development in the form of daycare is essentially a fee-for-service care commodity. Most early childhood care services are independently operated by for-profit commercial providers or not-for-profit groups. Families ineligible for childcare subsidies and/or whose children attend non-government preschools or kindergartens usually pay substantial fees for these childcare services. In some states, fees in preschools not attached to public schools start at about $30 to $40 per day. Childcare centre fees can start at about $60 to $70 per day. Many parents today seeking early childhood programs that provide some non parental care become part of childcare consumerism as they must find and pay for a service that may only partly meet their child’s and family’s needs for quality early child development and does not ensure equality of development for all young children.

Given this environment for early childcare, parents have become consumers of daycare services that appear to meet their immediate needs of care for children while they work, but not necessarily the needs in terms of development for their children. The Government of South Australia’s initiative to place children’s centres with its primary schools, could diminish the effect of early childcare consumerism and better integrate early child development with public education. This would require changes in the policies of the federal government, which promotes educational consumerism.

Federal support of for-profit daycare centres will be a barrier to funding and establishing early child development and parenting centres beginning with infancy. Some of the for-profit daycare programs are not quality early child development programs. Some may be damaging early child development and should be closed.

State and territory government expenditure on children’s development programs and services for 2004-05 was approximately $600.3 million. Most of the money, around 84% or $503.2 million, was directed to preschool (ages 4 to 5) provision.

The present government expenditures on early child development programs in South Australia appears to be around $160 million per year. If South Australia were to put in place a universal program for early child development and parenting (ages 0 to 8) as outlined in this report, with a high quality staff, the appropriate child/ staff ratios, and funding of staff at the same level as teachers, the cost would be about $750 million per year if more than 90% of families with young children took part. This would mean a substantial increase in funding in South Australia for early child development. Some of the costs could be met by fees on a sliding scale as long as the fees did not prevent accessibility, and by restructuring programs to allow access to the Commonwealth Child Care Benefit where possible.

The cost to individuals and society as a result of poor early child development in respect to crime and violence in South Australia is at least $3 billion per year and for mental health and behaviour problems including addiction about $4 billion per year. The $750 million per year investment in early childhood would cut the costs to society and individuals of crime and violence, mental health, and abnormal behaviour by more than 50% in 20 years (see Chapter 11).
Early child development and parenting centres

The goal of the State Government’s early child development and parenting centres is to enhance early child development and be available for families and children from birth until they enter the school system. These centres have the potential to do the following.

• Identify and respond to the development needs of young children and their families.
• Provide high quality early child development programs and non parental care as required for children from birth to age 8.
• Provide access to early childhood, health and family expert professionals.
• Link families with young children with children’s services.
• Encourage community involvement in early child development.
• Reduce isolation for parents and young children.
• Provide opportunities for parents to participate in programs with other parents in the community.
• Support, through non-parental care, working parents and those who want to study.
• Provide a convenient and accessible location to learn more about parenting and young children’s learning and development.
• Provide the community with a strong voice about the early child development programs and the development outcomes of the community’s children.
• Help the development and sustainability of the local community.
• Provide community leadership opportunities.
• Provide space for community groups to meet, with and without their children.

The goals proposed for these centres are very compatible with what we proposed in Canada and with what is taking place in other countries such as Scandinavian countries and Cuba.

Elliott (2006), in her review of early child development programs in Australia makes the following points:

‘Had strong government policy and funding commitment to fully integrated services for children aged 0 to 5 years been implemented at any point in the last 30 years, a holistic and cohesive approach to nurturing and educating children could have emerged. The hope expressed in the debates, sentiments and lobbying in the early 1980s was that the new childcare centres or ‘children’s centres’ were envisaged as integrated children’s services, catering for families’ care and education needs. It just did not happen.’

South Australia’s leadership

In her report, Elliott recognises the advances that have been made by the Government of South Australia in setting out a plan for early child development programs linked to the primary schools. South Australia is a leader in Australia.

‘To date, the only comprehensive, cohesive and mandatory curriculum framework across early childhood services in Australia is the South Australian Curriculum Standards and Accountability Framework (SACSA). The framework provides a coherent curriculum entitlement for all children from birth to 5 years across preschools and integrated children’s services administered by the South Australian Department of Education and Children’s Services. It is part of the broader curriculum framework adopted across all South Australian government schools and early childhood services ... Curriculum improvement is fundamental to addressing success for all children, particularly during critical periods in the Early Years, when learning can be maximised. If this early advantage is missed, learning may be much slower, more difficult, and more expensive, in social and economic terms, to revisit in later life.’

The state of Victoria is also proposing to invest in children’s centres. Their proposed 46 new centres will try to integrate programs for infants, toddlers, and young children encompassing maternal and child health, childcare, kindergarten, and family support services. They, like South Australia, consider this an important part of the national reform agenda for Australia. They also strongly encourage the federal government to work with them to make the initiatives to improve early child development a reality. Can the Council of Australia Governments (COAG) respond appropriately to the initiatives in states such as South Australia and Victoria?

In my discussions, I did not find the leadership in the federal government fully understanding what their policies should be to enhance the role of the states in child development. The main focus of the federal government (political and policy) appears to be on private for-profit childcare and not on early child development.

For South Australia to put its first 20 programs in place, they will have to create. In many cases, the physical space linked to the primary schools. Also, they will need to prepare more quality early child development staff for the centres and set up pay scales that recognise the value and importance of their work in early child...
development and parenting centres. Preparing staff for these centres will require sophisticated education and training that includes the new understanding of how experience based brain development in the early years can set trajectories in health, learning, and behaviour for life. Expansion of the number of centres for the future will, in part, depend on how quickly the post secondary institutions can put in place quality education and training programs with a significant neuroscience and biological development component.

In Canada, Red River College in Manitoba has prepared a multimedia program, 'The Science of Early Child Development', for their students. Many of the participants in this presentation are members of the Canadian Institute for Advanced Research's program in Experience based Brain and Biological Development. This program is now used in Canadian and American universities and colleges. It is a good summary of the developmental neuroscience component for the education of students in early child development. (See chapter 1.)

Recommendations

RECOMMENDATION 4:1
The Government of South Australia should establish a policy for the continuing support and funding of high quality early child development and parenting centres with a schedule for these centres to cover all of the state in ten years.

RECOMMENDATION 4:2
Once the government has set the appropriate legislation and schedule for the development of the centres, the post secondary institutions, along with the government, will need to have a strategic plan for providing relevant education and training for existing and future centre staff. At present, in early childhood settings, there are too few staff with appropriate education and training.

RECOMMENDATION 4:3
The government should establish an early child development applied research program with the universities to work with communities to assess the AEDI outcome measure and help the Government of South Australia and communities improve AEDI outcomes by recognising the need to take action when children are young.

RECOMMENDATION 4:4
The government should establish with the Council of Australian Governments (COAG) an effective ‘whole of government’ approach for policies related to the funding, evaluation, and accreditation of early child development and parenting centres.

RECOMMENDATION 4:5
The early child development and parenting centres should be accessible, available and affordable for all families with young children.

RECOMMENDATION 4:6
The government should develop a strategy to bring quality care programs into the early child development and parenting centre initiative.

RECOMMENDATION 4:7
The government should improve the effectiveness of their whole of government approach to early child development by working towards better integration of the work of the different ministries and government departments.
CHAPTER 05

How should we staff the early child development and parenting centres?
At present, the individuals working in the poorly integrated network of programs and services for early child development programs in communities are of varying quality and have a variety of backgrounds. A key infrastructure development will be to educate and train highly competent staff for quality integrated early child development and parenting centres.

Need to disseminate new knowledge

In discussions with staff involved in children's programs in different communities, many appreciated that the new understanding of how experience based brain development in the early years sets trajectories that affect health (physical and mental), learning, and behaviour was important for their future work. In the health field, those working with young children are mainly taught how to diagnose and treat problems rather than how early experience sets the architecture and function of the brain. With this new framework of understanding, it does not make sense for individuals such as nurses working in early child development and home visiting to have a different education base about experience based brain development than other staff working in early child development centres. The present diverse education for staff working with infants, toddlers and young children makes it difficult to establish integrated programs and contributes to 'turf wars'.

We had discussions with leaders from the university education programs including those with early child development components. There was interest (not yet universal) in bringing the new knowledge about experience based brain and biological development into the education and training of early childhood staff and primary and secondary school teachers.

There are at least six major groups (early child development teachers; public health staff; teachers in grades 1 to 12; psychologists; health care providers; and social workers involved with families with young children) that could benefit from better understanding of the implications of experience based brain development for their work and the role of children's centres working with parents to enhance early child development.

The task will be to link the new knowledge from the neurobiological sciences with health, education and the social sciences.

Chapter 1 summarises what we know about how early experience shapes brain architecture and function.

Staff working with families with young children and their parents need a basic framework of understanding about how experience and brain development in the early years affects the next stages of development for children and teenagers. The later neural pathways that develop in the brain build on the earlier pathways. The staff must be capable of working with the parents to help them understand experience based brain development and why their interaction (stimulation) with infants and toddlers each day has the largest effect on brain development during the early period of development.

The senior staff in the centres should be capable of spotting poor development and call in expert assistance to help parents and their children. They must understand how interaction with young children affects multiple aspects of brain development. For example, reading or talking to an infant or toddler requires holding the child. This interaction in early life affects the sensory pathways for sound, vision, touch, temperature, and smell, which affects the developing architecture and function of the brain (limbic HPA pathway) in respect to attachment and behaviour.

A young child's play and exploration is a form of problem based brain development and learning.

One of the key functions of the brain that is affected by the quality of early experience is behaviour. As discussed in Chapter 1, the quality and frequency of touch and other stimuli in the very early years sets neurobiological pathways that influence, through the LHPA pathway, the brain's prefrontal cortex. As discussed in Chapter 1, disrupted pathways contribute to mental health problems, antisocial behaviour and other behaviours, and risk of drug and alcohol addiction throughout life. The capability of centre staff to work with families and infants and toddlers at this stage of development is very important to reduce these risks.

Quality of parenting

Parenting is obviously very important in the first two to three years of a child's life. In the Canadian study of parenting, the National Longitudinal Survey of Children and Youth (NLSCY), only about one third of parents were considered by the researchers to be 'very good' (ie authoritative), about one half were considered 'good', and about 15% were considered 'bad' (ie permissive authoritarian). The prevalence of children with poor development and behaviour problems (vulnerable children) in relation to the quality of parenting at the time of school entry in Ontario is shown in Figure 11. Poor parenting leads to poor stimulation for the developing brain in the early period of development.
These data come from the Statistics Canada National Longitudinal Survey of Children and Youth (NLSCY). Only 19% of the children with good parenting were considered vulnerable while more than 40% with poor parenting (permissive irrational) were considered vulnerable.

The findings from the Australian National Longitudinal Study of children show a similar distribution for the quality of parenting as in Canada in relation to early child development. This does not mean that the parents are bad but that many do not have good support to learn parenting or have health problems such as postpartum depression for which they need help.

Centre staff and parenting interaction in quality early child development and parenting centres can improve parenting with positive benefits in early child development. In Ontario, we found that many parents with young children (including the middle class) welcomed the chance to improve their parenting skills with support from integrated child development and parenting centres.

There are a number of studies from a variety of countries showing that centre based programs involving parents and their children (ages 0-8) have the best outcomes for early child development. Although these programs are not compulsory in most countries, the uptake by families with young children varies from 60% to nearly 100%. The centres that achieve these levels of participation have well qualified staff; are sensitive to working with families from different cultures; provide safe quality non-parental care when necessary. Increasingly, there is interest in the early child development and parenting centres being located in the primary schools.

In countries with a high percentage of parents involved in early child development programs, provision of parental leave from work with significant income support (some provide parental leave for 18 months) is available. Australia’s policy on parental leave and income support is behind countries such as Sweden and even Canada.

Developing a common understanding of early brain development

As discussed earlier in this section, staff involved in early child development programs should have a good understanding of early brain development and its effect on health, learning, and behaviour throughout life. At present, the staff working in early child development have diverse backgrounds ranging from learning through experience to four-year university degree and (occasionally) postgraduate programs with varying understanding of the factors influencing experience based brain development and the development of the neurobiological pathways. Many with university degrees come with backgrounds in nursing, speech pathology, mental health, family medicine, pediatrics, childcare and education with a poor background in developmental neuroscience and related biological sciences. These diverse groups would benefit from a common base of understanding of child development and how early experience affects brain development.

Many experienced staff with varying levels of education working in early child development programs have had a practical learning experience and could be valuable staff for the children’s centres. There should be a special education program established to allow these individuals to upgrade their understanding and skills in relation to developmental neuroscience and early child development.

The two-year diploma in Technical and Further Education (TAFE) provides many of the staff for childcare programs. The current diploma program does not include much exposure to information about early child development and experience based brain development.

Currently there are two four-year degree programs for early child development in the universities. Although these degree programs are situated within schools of education, they do not appear to be well integrated with the training and education for teachers in primary and secondary schools. There needs to be better integration of the early child development and education programs. One sector of major importance is language and literacy. Another is brain development in the early years and behaviour. School based teacher education programs at the universities would benefit from a deeper understanding of how early child and brain development affects behaviour and learning in schools.

It is useful to remember that the brain pathways develop in steps and are a hierarchy. Each step affects the next step. Heckman (Chapter 11), in his economic analysis of
learning, makes the point that skill begets skill. Children who enter the schools with poor development and skills will have difficulty closing the gap in education performance between them and the students who have had good early child development at the time of school entry.

To develop an integrated development and education program for those who work with children 0-12 years will be difficult given the history of the development of university programs in education. Sweden apparently has been able to do this. The recent addition of early child development programs as part of existing university education programs has created some tensions. In establishing an integrated education program, the challenge will be to integrate cultures that presently have different backgrounds.

The individuals in early child development have a sense about how experience in the early years influences development and that there is now a sound developmental neuroscience explanation. Good play programs for young children are a form of problem based learning. More traditional education programs for older children have been based on a more didactic teaching and learning style that does not include problem based learning and a base in developmental neuroscience.

If South Australia is to produce a new generation of teaching staff for children 0-12 years, it will have to create an incentive for universities to better integrate developmental neuroscience with the traditional education programs. Perhaps one way to speed up this process is for DECS to stipulate that promotion and recruitment of teachers depends on some form of certification in developmental neuroscience. It is important that school principals who do not appreciate the importance of early child and brain development undertake a post graduate program in developmental neuroscience, perhaps at the MA level, if they are to be responsible for programs integrating early child development with education.

In meetings with TAFESA and the universities, I discussed the development of a more integrated approach to preparing students for careers in early child development and education. There was some interest in developmental neuroscience and biological science being part of any new initiative in post-secondary education programs to improve the quality of staff.

South Australia already has established the inter-institutional South Australian Neuroscience Institute (SANI) (Chapter 1). It should be possible for the early child development and education programs in the universities to establish a South Australian Institute for Early Child Development and Education linked to SANI.

Achieving quality
The quality of the new early child development and parenting centres being established in association with the primary schools is important. At present, South Australia does not have a mechanism for evaluating the quality of daycare staff and those in child development programs. At present, this is difficult to do. In a recent study in Alameda County in California, Whitebook et al (2003), looking at programs for early child development and their quality, made the following conclusions.

- Subsidy is not buying equitable care across sectors of the system, and public dollars are frequently purchasing substandard care.
- Additional research should examine the importance of a linguistic and cultural match between children, parents, and caregivers in relation to outcomes for children.
- There is disparity in levels of professional preparation, where teacher standards are not set uniformly, and where differing regulations for different sectors actually reinforce wide disparities in professional preparation.
- Children and families are exposed to a level of workforce instability in early care and education that remains strikingly higher than teacher turnover in K-12 education. Given that young children are much more sensitive to changes in caregiving relationships, turnover in this field remains an extremely pressing issue.
- Participation in the Child Development Corps (for centre staff and licensed family child care providers) was consistently associated with providing higher quality care.

Phillips et al. (2003) looked at the literacy competence of staff in the California study and, found that higher English literacy skills among childcare teachers and providers were positively associated with offering higher quality programs for young children. Given how language exposure in the first three years affects subsequent language and literacy capability of students, this is an important issue for the centres that DECS is establishing.

All this and other evidence leads to the conclusion that quality early child development programs require a high quality literate staff with a broad education base.

Given the need to provide a quality developmental neuroscience and biology education for individuals in early child development and the shortage of professional staff well versed in experience based brain development in the early years, could the faculties of education get together to provide, with SANI, a developmental neuroscience program relevant to early child development and education to upgrade staff working
in this sector? Perhaps the universities could follow the example of SANI and establish an inter-university program for training staff for future careers in early child development that is linked to the diploma program in TAFESA.

Recommendations

RECOMMENDATION 5:1
All students graduating from university and TAFE programs that relate to children and families should have education in developmental neurobiological science relevant for their work.

RECOMMENDATION 5:2
The South Australian Neuroscience Institute (SANI) should strengthen its base in developmental neuroscience including work in the gene environment interaction (e.g. epigenetics, microRNAs).

RECOMMENDATION 5:3
The universities should establish an education program for staff working in the range of early child development occupations in order to ensure that they have the new knowledge about experience based brain development that is relevant to their work.

RECOMMENDATION 5:4
Because brain development in the period before formal education sets a child’s capability to take part in formal education, the university faculties of education should ensure a sharing of this understanding by introducing new knowledge about experience based brain development for all students in primary and secondary teaching programs.

RECOMMENDATION 5:5
The government should provide incentives for the universities and TAFE to better integrate their programs for people working in child development and education.

RECOMMENDATION 5:6
In view of the importance of early child development for the future economy and quality of South Australian society, the government should set up a program for all public servants to ensure an understanding of what experience based brain development means for their work and the strategic goals of South Australia.
How can communities promote early child development?
I visited Murray Bridge, Renmark and Berri, Café Enfield, Parks Centre for Early Childhood and Parenting, Mawson Lakes, Kaurna Plains, Playford City Council, Elizabeth Civic Centre, Port Augusta, and other communities. I was impressed with the understanding of most of these groups about the importance of early child development for the future long term health, learning, and behaviour of the young children. While they varied in their understanding of developmental neuroscience, many individuals with limited formal training were doing an excellent job in early child development.

Some were operating what are called daycare centres but were in effect close to early child development centres in their understanding of early child development and the way they operated their programs and involved parents.

In moving towards a more integrated early child development program with qualified staff, it is important that DECS makes it possible for these competent individuals to upgrade their skills and understanding of the neuroscience base for early child development. Suitable courses might be modeled after some of the initiatives of SANI in collaboration with an inter-institutional early child development program.

Problems of fragmentation

In these visits the factors contributing to the fragmentation of early child development programs were emphasised. As previously indicated, many early child development initiatives (including daycare) operate under different policies and accountabilities and regulations. Furthermore, the funding for early child initiatives came from both the federal government and the state. This makes difficult the development of a single integrated system in the centres that DECS is establishing. Obviously government policies need to make it possible to create order out of the unconnected early child development activities described in Chapter 4.

Most of the individuals I met with in the communities pleaded for a whole of government approach to the development and operation of integrated early child development centres. The Government of South Australia through the Inter-Ministerial Committee on Early Childhood chaired by Jane Lomax-Smith involving the ministries of Health, Families and Communities, Education and Children’s Services and other groups is clearly a step in the right direction. However, although there appeared to be a commitment to building an integrated program structure, I did not get a sense that all the ministries shared the same vision and commitment to establishing a whole of government approach for the support and accountability of the early child development initiatives.

The ministry of health, with its demanding responsibilities in medical care, seemed to be having difficulty in providing the kind of participation to enable it to be part of an integrated early child development initiative. We found the arrangements for children’s mental health were not coherent and lacked the capability to help build with early child development centres a program to substantially reduce future mental health and behaviour problems.

One of the things that was impressive was the initiative that has been established to help mothers suffering from mental health problems like depression cope with the development of their infants and toddlers. The unit at Mayo House was impressive. This is an example of how special services can be linked to early child development centres to help support environments for early child development when parents need help.

One of the tensions and stresses we found was with the home visiting programs provided largely by nursing staff. The centre based children’s programs are in the Department of Education and Children’s Services and the home visiting program is the responsibility of the Department of Health. The evidence is that both these initiatives lead to an improvement in early child development. If both programs are integrated under one administrative unit, the outcomes are further enhanced. It will, however, be difficult to achieve such an integration if these two valuable initiatives remain the responsibility of different departments. In this sector there are some turf wars and professional status issues that have to be addressed.

Port Augusta is one of the several communities that could put in place, with community and government support, an integrated early child development and parenting program for all families with young children including the Aboriginal community. This would be an important step for South Australia and Australia. I asked the people we met with during my visits to Port Augusta to develop a program focused on equity in early child development for all young children. Their paper entitled The Equity of Opportunity for All Young Children: Port Augusta is available as Appendix 3 to this report at <www.thinkers.sa.gov.au>. The Aboriginal Roundtable also prepared a report about early child development centres entitled Aboriginal Partnerships in Early Childhood Development and Parenting Centres which can be found as Appendix 2 at <www.thinkers.sa.gov.au>.

One of the reasons for selecting Port Augusta as a possible pilot site to establish a universal quality accessible
early child development program is that, in the recent AEDI assessments, over 40% of the children are vulnerable in more than one domain at the time of school entry. One of the conclusions of the Port Augusta report is as follows:

'Reduced exposure to formal “intersections” that provide early detection, intervention and early learning and development can hinder the potential best start in a child’s life. An integrated model of service that is community owned and culturally diverse will reduce the perception of an agency style service whilst increasing social and cultural access to families who have been historically difficult to engage. In addition, an integrated model would also reduce current operating and communication difficulties between large government departments and service providers.' The Equity of Opportunity for All Young Children: Port Augusta, page 8

They conclude that once families with young children become part of the early child development programs, preparation for entry to the education system will be improved. However, they point out that without access to the program, whether this is due to cultural differences, perceptions, fear of the system, cost, or lack of understanding, families with young children will have difficulty in taking part in the programs.

The South Australian government recently announced that Port Augusta will be one of the sites for a children’s centre based on a hub and spoke model. They propose that the centre will provide a ‘whole of government’ approach to early child development. One of the observations of the Port Augusta committee was that the myriad of services, various accountabilities and budget lines, and methods of reporting outcomes were cumbersome and confusing. There obviously is difficulty in trying to understand who does what in providing early child development programs in Port Augusta. They make the point that one of the difficulties for the government in implementing their proposal to integrate the early child development programs is that the current activities are accountable to different departments and units within departments with different objectives. This includes programs supported by the federal government. The Port Augusta team proposed establishing an incorporated organisation to integrate the funding, administration and performance and accountability of the children’s centre that blurs the steering effects of the present funding and accountability.

A key issue for all these community developments is a strategy to develop the personnel that allows them to work in an integrated manner with a shared vision and understanding for early child development. Among the recommendations from the Port Augusta team were the following:

- Completion of a feasibility study to scope the implementation, costing and evaluation of an integrated early child development program beginning with conception.
- Establishment of an Enabling Committee with appropriate membership that represents the diverse demographics of the Port Augusta community to guide and support the scooping process.
- Establishment of an incorporated organisation in Port Augusta to facilitate the integration of resources relevant to early child development programs and services.

Their concept of a hub and spoke model could be very appropriate for Port Augusta. A centre linked to the six DECS primary schools could achieve strong integration with early child development and primary school education. This concept may also work in other regions, for example, using the Parks community centre as the hub linked to the primary schools in that region.

In the visits to communities such as Murray Bridge, Port Augusta, Renmark, Berri, and some communities in Adelaide, that had emerging early child development centres, there was a strong commitment in being able to establish integrated programs. However, the different policies, funding levels, accountability, and staff requirements make it difficult to achieve this integration. In several sites there was reasonably good coordination, but most supported the concept of establishing integrated programs. There is a substantial difference between coordination and integration in what can be achieved.

The staff of the various government departments involved at the community level appreciated the need for an integrated program in community based DECS centres for early child development and parenting. However, they foresaw difficulties because of the different rules, regulations, and accountability of their various departments and programs.

I found in many communities exceptionally talented individuals providing excellent programs for families with young children including children who had disabilities.

Need for integrated funding

One funding arrangement that must be improved for the long term development of children’s centres is that while DECS funds programs in the age 4 to school entry period, it does not have the resources to manage and fund most of the 0 to 3 years programs because of the policies and funding arrangements of the federal government for
daycare and the restricted resources of the state. The centres being established by DECS will need integrated funding arrangements for children ages 0 to 8.

DECS has a major role in establishing effective early child development and parenting centres in the diverse communities of South Australia. They also have the challenge of getting staff with traditional backgrounds in education to understand the importance of early child development for education, health, learning and behaviour. Fortunately, at the senior level in DECS, they understand the importance of the children's centres for improving the quality of education programs as well as the long term benefits in health and behaviour.

Recommendations

RECOMMENDATION 6:1
The government should set up community boards in association with the Department of Education and Children's Services to develop and implement early child development and parenting programs linked to or part of primary schools.

RECOMMENDATION 6:2
All staff engaged in community based early child development programs should be well educated in the cultural diversity of Australia. Programs must have staff members who reflect the cultural characteristics of today's Australian society.
How can government work with Aboriginal communities and families to improve outcomes for their children?
One of the valuable interactions the Thinker had was with the Aboriginal Roundtable group. The Roundtable was established to work with me during my exploration of early child development and the Aboriginal community.

The Aboriginal community in Australia and South Australia, like that in Canada, had their cultures and way of life devastated by the European settlers. This led to disruption of their social structures and way of life. Although some families and groups have since been able to provide good environments for early child development, it has been difficult for many.

Physical and mental health problems including alcohol and drug addiction in the Aboriginal population are the classic problems of disrupted societies and poor experience based brain development in the early years. Based on today's knowledge, culturally sensitive child development and parenting centres that are affordable and accessible for all families can substantially reduce these problems for future generations of Aboriginal children as well as other cultural groups.

We asked the group the specific question, 'What would it take for Aboriginal people to be partners in their communities in early child development and parenting centres?' Their response to this question is provided as Appendix 2 to this report available on www.thinkers.sa.gov.au.

**Roundtable report**

The participants of this Roundtable group were: Brian Butler, Lewis O'Brien, Veronica Brodie, Mary Buckskin, Kathy Chisholm, Colleen Clarke, Cyril Coaby, Cathy Leane, Jillian Miller, Lowitja O'Donoghue.

The two opening paragraphs of their report clearly state the challenge Australian society faces to ensure equity in the development of the next Aboriginal generation and ensure they are socially included members of Australian society. This is a tough challenge for Australian society as it is for Canada.

In some of my discussions with members of the non-Aboriginal community, they complained that many of the male Aboriginals used drugs, drank excessive amounts of alcohol and had no sense of time or social responsibility. I pointed out these problems are also seen in the non-Aboriginal community. These behaviours occur in all societies if their culture and environment for early child development has been disrupted and is weak. It is wrong to blame these individuals for their behaviour since they are victims of poor early child development resulting in brain dysfunction caused by adverse experiences in the very early years. The blame for these problems lies with the disruption of Aboriginal culture and communities and their families by European settlement.

This is in keeping with the concept, 'It takes a village to raise the child'. If the village is disrupted, so will child development be disrupted.

One of the important points in the Roundtable participants' response is that they would like to see early child development and parenting centres that can help prevent children from being taken away from their families. They see one of the roles of the children's centres as supporting parents to be better parents. All the evidence from Canada's and Australia's Aboriginal populations is that our policies of taking children away from their families have been extremely disruptive for children and damaged the development of many children. Thus, one of the goals of culturally sensitive early child development and parenting centres is to involve the Aboriginal families, beginning if possible at pregnancy, and certainly after the child is born. This is also true for families from other cultures.

The group emphasised that government programs (services) are built on the dominant English culture with Aboriginal participation on non-Aboriginal terms. They made the point that they have survived in Australia for 60,000 years and cannot easily give up Aboriginal principles to take part in children's centres that ignore their culture and history. If their children are to become socially included members of a pluralistic, modern, democratic state, the centres for early child development must be culturally and language sensitive, developing cross-cultural understanding and not at the expense of the Aboriginal culture.

This has important implications for the education and training of the staff in the early child development and parenting centres. Furthermore, they felt that many of the senior staff and leaders for the centres should have an Aboriginal background. This is equally important for other cultures in the increasingly pluralistic Australian society.

The participants appreciated the new evidence that exposure to two languages in the first seven months of life makes it easier to master, during later stages of development, the two languages without an accent. It also makes it easier to learn other languages later in development. Since language is an important part of all cultures, there are clearly advantages in establishing early child development programs that help develop pluralistic multicultural societies that help preserve language and culture wherever possible. The French speaking population in Canada that lives outside of Quebec is interested in this strategy to help them preserve their
language capability and their culture. They are setting up in Manitoba early child development and parenting centres that use English and French in the very early years. Early child development and parenting centres that have bilingual programs beginning at birth would interest the Aboriginal community.

**Importance of health**

The health of Aboriginal children is extremely important for early child development. Participants made the point that you can’t teach a sick child. Poor child health can influence the development of brain function. One of the important observations of the Aboriginal community in Australia is that very young children frequently suffer from repeated middle ear infections with negative effects on experience based development of the brain for hearing and language capability (see Chapter 1). This observation is in keeping with the understanding from developmental neurobiology of the parts of the brain that interpret sound. This part of the brain is most plastic in the first seven to eight months. Impairment of hearing during this period, because of its effect on the development and differentiation of the hearing neurons in the left temporal lobe, can lead to significant deficiencies in language and literacy later on in development.

All early child development centres should be closely linked with the health care system to ensure there is early diagnosis and treatment of problems such as middle ear infections that affect hearing development. It also means that all staff in the early child development centres should receive a thorough education in how illness that affects the sensing pathways (e.g. vision, sound, touch etc.) in the early years affects later development.

**Family capacity building**

Participants made the point that the children’s centres should have programs for family capacity building and include expertise to deal with all family issues including housing, health and the development of family budgeting skills. They emphasised that the parents’ culture, authority, and capacity to discipline their children should not be undermined. They also make the important point that parent involvement with the centres should facilitate their learning as parents. Furthermore, because a high proportion of Aboriginal children are born to young mothers, the centres should be closely linked to opportunities for the parents to continue their education. They felt that the centres must be easily accessible and affordable and that home visiting should be a component of the centres’ function.

A tragedy of the interfacing of the Aboriginal community with the largely English and European cultures is that there has been little education, until recently, in the private and public schools about the history of Australia and the Aboriginal community. I was stunned to learn that many Australians of middle age or older (40+) had not been taught in the school system the history of the Aboriginal population and its culture and the effects of English and European colonisation. Many older members of the Aboriginal community felt that the colonists simply wanted them to disappear (they considered this a form of genocide). This makes Aboriginal cultural sensitivity in the education and training of staff for early child development and parenting centres very important.

Staff qualification should include knowledge, respect for, and experience in Aboriginal cultures and communication skills. In the preparation of staff for the centres, these themes should be a key component of university and TAFESA education programs.

Participants wanted the Aboriginal community to be involved in decision making and in the work of the centres. There should be a strategy for ongoing discussion between the centre staff and the Aboriginal communities to enhance the work of the early child development programs. The governance strategy should include members of the Aboriginal community.

A major challenge for Australia has been to overcome the social disruption and neglect caused by the original European settlers. Considerable progress has been made in Australia over the last 40 years to improve the circumstances for the Aboriginal population. I felt that South Australia was taking steps to provide for better development of Aboriginal children to help them be valuable included members of the next generation of adults.

The establishment of culturally sensitive early child development and parenting centres could enhance the establishment of a pluralistic tolerant educated population with increasing participation of the Aboriginal community. This should be one of the important objectives of the centres’ programs in South Australia.
Recommendations

RECOMMENDATION 7:1
It is important for the Aboriginal community to help establish early child development and parenting centres sensitive to their language and culture. The centres should include non-Aboriginal families. These centres should provide programs that start at the birth of the child, if not during pregnancy.

RECOMMENDATION 7:2
The Department of Education and Children’s Services should ensure that the early child development and parenting centres are culturally sensitive, have Aboriginal staff, and attempt to introduce infants (birth to 7 months) to their Aboriginal language and English in the centres.
How can government support vulnerable families to improve outcomes for children?
At present, when the courts have to deal with family problems, they end up separating the child from its parents. In both Canada and in South Australia, when this happens, the young children are left in limbo and the Canadian family court judges recognise that the young children may be damaged permanently. If early child development and parenting centres are established in communities, the courts can recommend that the child be part of an early child development program with whatever caregiver is assigned by the courts. This could be a very powerful way of breaking cycles of poor early child development when there is family disruption.

In the case of homeless parents (often a single parent) with young children, it is important to provide, for the parent and the young child, access to an early child development and parenting centre. There is a variety of ways this can be done but a key requirement is having a residential base for the homeless parent and child and an accessible early child development and parenting centre for the child and parent.

The early child development and parenting centres in communities can, if properly managed, be effective institutional instruments to ensure good early child development for all young children regardless of socioeconomic background and parenting structure.

The professionals working in health care who are involved with pregnancy and mothers with young children should be fully integrated with the early child development and parenting centres. If the centres can involve women when they are pregnant, then the people with the health background can work with the centre staff to ensure the mothers understand the importance of high quality prenatal development. During infancy and the toddler stage, they can provide support for the families and centre staff when the children become ill.

Another important role is supporting parents who have mental health problems, such as depression, and providing interaction with their young children. It is important that the early child development and parenting centres can provide the support and guidance necessary for these parents in early child development. Mayo House in Adelaide has a very good program for mothers with depression. Port Augusta has an excellent program for young children with development and behaviour problems. These programs should be closely linked with or be part of early child development and parenting centres.

We now recognise how adverse experience based brain development in the very early years can lead to alcohol addiction and drug use as well as mental health problems. It is important that the staff in the centre as well as the home visiting staff understand this. The centre's staff must work with the vulnerable families and the courts to prevent the kind of environments that cause faulty development of the brain. This is one of the issues that should be addressed by the inter-ministerial committee.

Recommendations

RECOMMENDATION 8:1
The early child development and parenting centres should be able to have children in their program who are caught in family disruption and dysfunction and in the care decisions of the justice system. The child's official care provider (for example, foster parent) should be included. Centres should also work with homeless parents from all cultures to provide stability for early child development.

RECOMMENDATION 8:2
The courts should have the power to assign vulnerable children to the centres with their designated care provider.
How can young professionals promote early child development?
The Office for Youth in the Government of South Australia set up the Policy Action Team (the A-Team) to provide an opportunity for a young group to interact with the Adelaide Thinker in Residence on the issue of early child development.

The group had varying positions: Kate Seaman (office of the Minister for Health as the A/Executive Officer); Steph Russell (social worker in Central Northern Primary Health Care); Yanni Rose (administrative officer, DECS); Emily Oliver (Office for Problem Gambling, DFC); Jessie Jovanovic (School of Education, University of South Australia); Christine Haling (speech pathologist, Department of Health); Adam Cirillo (project officer, DFEEST); Tarnlee Austin-Butler (Aboriginal Youth and Family Services, Department of Families and Communities); Andrew Alexander (administration officer, Department of the Premier and Cabinet).

All of the members were under 30 years of age. This team of nine had a superb facilitator in Mia Handshin and good support from Dr. Tahnya Donaghy, the Director for the Office for Youth, and Kathy Eleutheriou, who organised everything. Their full report is in Appendix 4 at <www.thinkers.sa.gov.au>.

For this Thinker, this was an unusual and refreshing opportunity to meet with young individuals from the University of South Australia and a number of government departments in order to explore their thoughts on the subject of early child development. The focus question they were given by the Office for Youth was:

'Within the context of integrated service delivery, how do we engage young women with children from disadvantaged backgrounds to ensure they benefit from the Children's Centres?'

In developing their ideas, they met with various groups from within the government and universities. They made an important point that to engage young mothers from disadvantaged backgrounds in a universal approach to child development requires cultural sensitivity. In respect to the recommendation they made three points:

- Disadvantage is hard to define. It can be more than socioeconomic circumstances.
- Disadvantaged families and children occur in all social classes.
- 'Labeling' individuals or communities as disadvantaged could lead to stigma for individuals and their communities.

Five key recommendations

The A-Team made five key recommendations, which require careful consideration by the government, post-secondary education institutions, education (primary and secondary schools), and communities. These are presented in depth in their report. These views have implications for the establishment of the children's centres in South Australia.

Recommendation 1

Provide sufficient funding to develop and sustain Children's Centres.

One of the points they make is that the federal government and state of South Australia should avoid market driven approaches for early child development since this fragments programs and leads to confusion in community based early child development programs and inequities.

'In recent years Australia has increasingly seen a market driven approach to the provision of educative care (National Association for Community-Based Children's Services [NACBCS] 2003). This has resulted in the fragmentation of children's services for the early years across jurisdictions, areas of responsibility and funding (OECD, 2001). The Organisation for Economic Co-operation and Development (OECD, 2006, pp. 13-14) calls for "a systematic and integrated approach to Early Childhood Educative Care" through a universal approach to access for young children and their families and a substantial public investment in services relating to the early years.‘ (page 14)

They make the point that business should be part of the strategy to enhance availability and accessibility to quality early child development programs. This has implications for community development and parental leave programs.

'For instance, the Delfin real estate company has been successful in investing, establishing and advocating for the provision of education based services in newly developing suburbs such as Mawson Lakes (Delfin Lend Lease Ltd. 2007). Furthermore, companies such as Westpac and ANZ have recognised the integral role of parents in the labour force and early child development. Westpac have put significant resources into childcare services for their employees while ANZ offers all employees 12 weeks paid parental leave to primary caregivers. According to the Equal Opportunity for Women in the Workplace Agency (2007), ANZ "...turnover rates have decreased and the percentage of female employees returning from parental leave increases annually, currently standing at 89.9%.”' The overall
economic viability of 12 months paid parental leave (at 80% of an employee’s average income) would be undoubtedly strong.’ (page 17)

Recommendation 2
Provide universal education and training in Early Childhood Development to cultivate community understanding of the importance of the early years.

The A-Team recognised that experience based brain development affects health (physical and mental), learning, and behaviour throughout life. Because of the importance of the new knowledge for society, they suggest that universities create a South Australian Institute of Human Development. They identify three functions of the Institute.

- Delivering neuroscience and early childhood development components universally within university curriculums for all undergraduates.
- Creating both a diploma and an undergraduate degree with a holistic approach for early childhood development in integrated services.
- Conducting further research into early childhood development, health, social services and the neurosciences.

In this section of their report, the Team proposes adding early child development as part of the high school curriculum.

'As the saying goes "the children are our future", so why not educate our children about children?' (page 22)

I strongly support these ideas.

Recommendation 2.4
Provide education and training for the upskilling of existing health care professionals and early childhood educators in the areas of neuroscience and early childhood development.

Recommendation 2.5
Provide incentives and opportunities for people from diverse backgrounds (culturally and socially) and/or people who are bilingual (or interested in learning a second language) to train in Early Childhood Development.

This has implications for the development and staffing of the children’s centres.

Recommendation 3
Create awareness within the community about the needs and services associated with Early Childhood Development.

Here the A-Team emphasises the need for parents and their community to understand the importance of early child development. They have suggestions about how to do this. They make the point that the early child development programs are not just a babysitting service but must involve the community and family.

'Most parents take it for granted that they will send their child to school, usually the only question is, "which school?" The A-Team recommends the whole community be educated about early childhood development with the hope of initiating a cultural shift, so that early childhood development opportunities are also a "given". So whether or not you, your partner and your child engage in an Early Childhood Development and Parenting Centre is not the question, it is merely which centre?

'By starting "school" prior to or at birth, there is potential for the entire family to gain the opportunity to become involved in the "school", whatever stage the family and child may be at. This can, in turn, encourage future involvement in education throughout the life of the child. Early engagement in "schooling" would also aid in developing the notion that Early Childhood Development and parenting centres are just that, development and education centres for you and your child, not just a babysitting service.' (page 28)

Recommendation 4
Establish an independent South Australian Early Child Development Council led by an Ombudsman for children and families to advocate for healthy Early Childhood Development.

This recommendation to set up a Council on Early Child Development for South Australia is an important goal for closing the gap between what we know and what we do for early child development. More will be discussed in this report (Chapter 12) about setting up a non-government Council for Early Child Development and Parenting.

Recommendation 5
Facilitate community participation in the development, implementation and running of Children’s Centres.

This sets out how the centres should be linked to the characteristics of the community. This implies that there will be some cultural and linguistic variation among the centres. The Team covers five points.

- Cultural inclusion.
- Access to Centres.
- Community engagement.
- Best practice.
- Facilitate community participation in the development, implementation and running of Children’s Centres.
The Team’s conclusion clearly sets the goals in early child development for South Australia in the 21st century.

‘Putting all the pieces of the early childhood puzzle together in order to form the right picture for South Australia is a large and challenging task, but it is by no means unachievable. In the words of Margaret Mead, we should “never doubt that a small group of thoughtful, committed citizens can change the world, indeed it’s the only thing that ever has”.

‘The more the A-Team have thought about this issue, the more we have realised that this topic is intertwined with every key social issue South Australia currently faces. And so, borrowing from Mead’s wisdom, we should “never doubt that a group of carefully planned and willingly supported Children’s Centres can change the state”. In fact, we should not underestimate the power that getting the early childhood picture right has to change the world for all South Australians.

We look forward to working with you to change the world!’ (page 45)

Recommendations

RECOMMENDATION 9:1
The Government of South Australia should set up a program for all its public servants of all ages to ensure they have a good understanding of early child development and human development in respect to health, learning and behaviour and how this relates to government programs and their work in government. The young public servants could be leaders to do this in the Government of South Australia.

RECOMMENDATION 9:2
A youth representative should be on the proposed Council for Early Childhood Development and Parenting.
How can we measure how well our children are doing?
Research in early child development covers many research sectors ranging from molecular biology, genetics, epigenetics and developmental neuroscience to the social environment and parenting structures that influence early child and brain development. There are four broad sectors of research.

- Population studies of early child development and human development including birth cohort studies. This is important operation research to monitor the effectiveness of the early child development and parenting initiatives in each community.
- Randomised controlled trials of interventions to improve early child development.
- Molecular biology and developmental neuroscience in the study of experience based brain and biological pathway development in respect to health, learning and behaviour.
- Genes, epigenetics, the environment and the control and regulation of gene function.

In population based studies of human development, the end points range from prenatal studies, birth and postnatal studies, early child development, learning, and behaviour, the determinants of health (physical and mental), to death.

The population studies based on birth cohorts provide a base to look at early life experiences and brain development and the effects on health, learning, and behaviour throughout life. Barker (1997) demonstrated in a retrospective study that pre-birth development was a factor in cardiovascular disease (coronary heart disease and high blood pressure) in adult life. Although initially controversial, this has been replicated in a number of recent studies. This has led to continuing research on how the basic neurobiological pathways that develop in utero and in infancy can affect adult health in cardiovascular disease. The development of the LHPA pathway is an important area of research.

**Studies of birth cohorts**

The studies of birth cohorts in countries such as the United Kingdom, Sweden and New Zealand have shown a clear relationship between the environment for early child development after birth and health (physical and mental), learning and behaviour in the later stages of development.

In respect to the stress cortisol pathway (LHPA pathway), Power and others (2006) were able to show from study of individuals from the 1958 British birth cohort that those who had an adverse early childhood had mean resting salivary cortisol levels at the end of the day higher than the values for those who had a good early childhood.

This study, which has linked biological measures with socioeconomic measures, was made possible by being able to examine salivary cortisol, which is a direct measure of plasma cortisol. This evidence is in keeping with the hypothesis that the poor health and development in some of the 1958 birth cohort is related to adverse early child development and a dysfunctional LHPA pathway that was probably set in early life.

A similar finding was made in rhesus macaque monkeys with the short serotonin transporter gene. Animals with the short gene structure, separated from their mothers, developed abnormal LHPA and serotonin pathways in the brain. These animals showed abnormal behaviour and an addiction to alcohol when they became adults. In the rat studies of Michael Meaney (2001) and his colleagues, they found that rat pups not subject to arch back feeding and intense licking in the first week after birth developed significant behaviour problems and memory loss with elevated blood glucocorticoid levels at the end of the day. They have been able to show an epigenetic effect on the gene for the cortisol receptor in the hippocampus. Apparently, rat pups not subject to arch back feeding and vigorous licking have persistent methylation of the normal gene for the glucocorticoid receptor. This is an example of early experience affecting gene function. Methylation of DNA inhibits the expression of the normal gene function which leads to inadequate receptor capability.

Caspi et al. (2003) explored this new knowledge about experience and gene function in the New Zealand 1970 birth cohort. They found, as in monkeys, that individuals who had the short serotonin transporter gene and an adverse early childhood development were at risk for mental health problems in their 20s. Those with the short serotonin transporter gene who had good early child development were not vulnerable to depression in their 20s. Those with the long gene structure brought up in an adverse environment were resilient. This, although not yet studied to see if it is an epigenetic effect, is a clear example of experience in early life affecting gene function leading to a mental health problem. This work shows that some children in adverse early child development environments can be resilient whereas others with a short gene structure are vulnerable.

These examples show that it is now possible to link basic research related to neurobiological pathways and genes to population based studies of early development in animals and humans. This will be a key area for future research.

When examining population data and the relationship between socioeconomic factors and poor early child development, it is important that the sampling reflects all of the population in all social classes. As pointed out in Chapter 2, school based tests do not capture all the age group being studied.
Canadian longitudinal findings

In Canada, the National Longitudinal Survey of Children and Youth (NLSCY) created a database on the characteristics and life experiences of Canadian children from infancy to later stages of development. The NLSCY analysis showed that 28.6 percent of Canadian children are classified as vulnerable at the time of school entry; that is more than 1 in 4 children. This is indeed a troubling statistic. In the interests of accuracy, I quote from their report.

'One of the surprising findings of the study was that the relationship between childhood vulnerability and family income was not as strong as previously believed.' Quoting their statistics, '37.1 percent of children in the lowest income quartile are classified as vulnerable. In the highest income quartile (rich kids), 24.2 percent are classified as vulnerable. The majority of Canadian children classified as vulnerable are in the middle class – in families whose incomes are above the poverty threshold.' (From Hon. Margaret McCain’s presentation to the Atlantic Canada Child Welfare Forum, May 2-3, 2007 in Halifax, Nova Scotia. <http://www.cwlc.ca/files/file/about/Margaret%20McCain.pdf>.)

These results refute the stereotype that the majority of children with developmental problems are from poor families. It is simply not the case. It is true that 37.1 percent of children living in poverty do poorly but look at the other side of the picture: 62.9 percent of children living in poverty do well.

The late Dr. Dan Offord (1996), a child psychiatrist and Founding Director of the McMaster Centre for Study of Children at Risk (now the Offord Children’s Centre at McMaster University) carried out extensive research on the effects of poverty on children. His research confirmed the NLSCY’s findings that increasing the family income to above the poverty line would only reduce the prevalence of childhood vulnerability by 10 percent. In Canada, this supports the argument that early childhood development programs should be available for all families with young children as did the A-Team report in Chapter 9.

Importance of community studies

Community based population outcome measures are important for research in early child development and the outcomes for child development programs in communities. As set out in Chapter 2, AEDI assessments are a macro measure of early brain development at school entry in respect to physical activity and control, emotional regulation, social interaction (competence), language and cognitive function and communication and cognitive skills. These are not precise measures of brain function but they fit what we know about the development of neural pathways in early life and their function in respect to physical activity, emotion, language and communication. One example of the predictive value of this measure is that children who do poorly in this test assessment do not do well in school (see Chapter 2). Preliminary studies show that communities with low EDI scores can, if they improve programs for child development, improve outcomes on this assessment. Individuals working in these fields are now adding biological markers such as salivary steroids and epigenetic (gene function) measures to their studies.

The primary thematic challenge in population research of early child development is to understand how different social experiences ‘get under the skin’ in early life and, through their effects on developing neurobiological and biological pathways, set trajectories for life in human health (physical and mental), learning and behavior.

The different social experiences may be captured by a number of different constructs. Perhaps the most common is that of social partitioning (sometimes also called ‘social gradients’ or ‘socioeconomic status gradients’). The concept is that differences in social status position in hierarchical structures in early life are strongly related to differences in health and development outcomes in later life. ‘Social’, in this context, refers broadly speaking to the environment, whose influences are mediated by the experiences that an individual has from prenatal to adult life. It does not just refer to differences in income. It is also important to emphasise that ‘social partitioning’ stands neither simply for differences between poverty and non-poverty groupings, nor for differences within social classes. The social partitioning of experience affects all individuals in the traditional social classes, and is therefore important within and among social classes.

The social partitioning phenomenon applies not just for health outcomes, but also for a wide variety of behavioral, cognitive and developmental outcomes such as literacy, numeracy, attention deficit disorder, antisocial behaviour and mental health problems. Since brain development in early life affects all these functions, this relationship is not unexpected. A challenge is to understand the more general and more basic phenomenon of how social experiences in early life can affect brain and human development.

The phrase ‘get under the skin’ used by some researchers implicates ways in which sensing pathways pick up signals from the environment and affect the development of key neurological and biological systems. The phrase captures the idea that different
social experiences can establish genetic functional and structural changes in neurobiology that affect function in the later stages of life.

Taking the question much further

There is a long tradition of trying to understand the effects of environmental experiences on health, learning, and behavior. We can now take this question much further. The challenge is to link the new knowledge from neurobiology and gene control and function with experience in the social environment. The focus is not just on how such different experiences induce problems, but also in how they affect development differentially, and predispose organisms to later health (physical and mental), learning or behavioral outcomes.

In humans, studies of the development and acquisition of language have shown how early experience has a major effect on brain development and function. Infants up to the age of about seven months are sensitive to all the phonemic contrasts that occur in their family as well as to other languages. By the ages of seven to eight months, if they are only exposed to one language during this period, they are sensitive to the phonemic contrasts of their family, but not to other languages. Likewise, there is strong evidence that there are ‘critical’ or ‘sensitive’ periods for language acquisition that show a declining developmental function with increasing age. Considerable research has been done on the relationship between language acquisition, lateralisation of brain function, early development and the special language processing neural structures that are being set by early language experiences.

If the concept of ‘biological embedding’ is to be more than a metaphor, its value depends on identifying the actual processes by which this takes place. To do this, there needs to be a scientific working relationship among scholars in three areas germane to this task:

- integrated neurobiological knowledge that involves a number of fields, from physiology and immunology to neuroscience to genetics, genomics, and molecular biology
- studying how these neurobiological pathways delineate population-based partitioning in health, learning, and behavior
- studying innovative statistical modeling approaches for the population studies, including nonlinear dynamic systems, multilevel analysis, and trajectory modeling.

The genetic story that is unfolding in respect to early development and neuron function and synapse formation shows how the social environment (experience) can affect gene function (genotype versus phenotype). Thus, although identical twins have the same genes (genotype), they can, in the case of behavior as young adults, have a variance in behaviour of 20% to 30% (phenotype). The exponential growth in our understanding of the control and regulation of gene function in the last two decades provides us with the ability to study the same genes in different environments. By the ages of seven to eight months, if they are only exposed to one language during this period, they are sensitive to the phonemic contrasts of their family, but not to other languages.

Likewise, there is strong evidence that there are ‘critical’ or ‘sensitive’ periods for language acquisition that show a declining developmental function with increasing age. Considerable research has been done on the relationship between language acquisition, lateralisation of brain function, early development and the special language processing neural structures that are being set by early language experiences.

If the concept of ‘biological embedding’ is to be more than a metaphor, its value depends on identifying the actual processes by which this takes place. To do this, there needs to be a scientific working relationship among scholars in three areas germane to this task:

- integrated neurobiological knowledge that involves a number of fields, from physiology and immunology to neuroscience to genetics, genomics, and molecular biology
- studying how these neurobiological pathways delineate population-based partitioning in health, learning, and behavior
- studying innovative statistical modeling approaches for the population studies, including nonlinear dynamic systems, multilevel analysis, and trajectory modeling.

The genetic story that is unfolding in respect to early development and neuron function and synapse formation shows how the social environment (experience) can affect gene function (genotype versus phenotype). Thus, although identical twins have the same genes (genotype), they can, in the case of behaviour as young adults, have a variance in behaviour of 20% to 30% (phenotype). The exponential growth in our understanding of the control and regulation of gene function in the last two decades provides an answer to why identical twins can have variance in behaviour (phenotype). In respect to gene function, there are many new concepts involved in the field of genomics. This includes candidate genes, micro RNAs, and epigenetics. They are all related to studying pathways that affect gene function.

Development of new tools marrying the vast literature on behaviour with genomics could also spark increasing involvement by social and behavioural scientists in developmental neurobiology and genetic studies of behaviour. This will be a major development in research on early child development.

Linking database information with human development

We now know enough about early child development and trajectories in health, learning, and behaviour to take steps in states and regions to establish integrated databases linking measures of early child development and neurobiological pathways to human development, health, behaviour and literacy. The Manitoba Centre for Health Policy has been able to integrate the population datasets from the different government administration files to track the health, education and wellbeing of the Manitoba population throughout life. Their linked data system now includes the school and EDI results as well as health data.

The Manitoba studies also demonstrate the importance of population groups reflecting the whole population under study. One of the weak aspects of studies of school performance tests is that the sample only includes the children in the age group that will write the test (Figure 12). In Manitoba, they studied the grade 3 test results in relation to the population age group. The pass rate for the children who wrote the test ranged from 83% for students in the lowest SES group to 94% in the highest SES group. When the whole population of 8 year olds who should have been writing the test were considered, only 50% in the lowest SES group passed compared to 84% in the highest SES group. This SES gap in education widens as the children progress through the school system.
A basic flaw in the OECD PISA literacy study of 15 year olds in the school system in developed countries is that the results do not reflect the performance of all 15 year olds. In some countries as many as 20% of age eligible children did not do the test. Thus, it is not a true measure of literacy for all 15 year olds in these countries.

Integrating the data

Manitoba’s social service and health programs data were, like those of most jurisdictions, compartmentalised. The government tends to view children and youth differently, depending upon whether they work from the perspective of health, family services or education. The government databases house valuable information on individual Manitobans, but the data only relate to the mandate of a specific department. The Ministry of Education collects basic demographic data on students, teachers, schools, tests and grades. Education is inevitably viewed as a process involving the school and the child, not early child development. Health collects data on physician contacts and hospitalisations and the health of Manitobans. Family services knows who receives welfare payments and which children are in foster care or receiving protection services.

Manitoba Centre for Health Policy’s (MCHP) linkage and integration across departmental and population databases provides researchers, practitioners, policy makers and the public with information about the social environment and the health, wellbeing, and competence of the population.

Among the activities of the centre are the following.

- Access to a population linked database makes it possible to assess the true high school withdrawal rates and determine the early life trajectories.
- Centre data can be used to understand the ‘overlap’ across ministries in the high risk populations they serve. For example, how many of the children who are failing their first years of school or who withdraw from school have parents receiving income assistance and how many are or were in ‘protection’ or in care of Family Services?
- Centre data can be used to understand how costly it is to ‘treat’ individuals who are the ‘responsibility’ of Family Services, and to provide evidence for preventive programs. For example, children of very young mothers have high health care costs, and poor educational outcomes, despite remarkably good health status at birth. What causes this?
- The Centre can provide evidence on how well screening programs, such as Baby First, work. (Baby First is designed to identify children at risk of being taken into care/protection.)
- The Centre can provide information not only on characteristics of individuals receiving a program (in this case the Healthy Baby Prenatal Benefit) but on those not receiving the program. This is useful information in the development of strategies to reach all families with young children.
- The Centre can identify the health, development, and social risk characteristics of families/individuals who become long term income assistance recipients as opposed to short term.
- The Centre invites departmental input to Working Groups (for example the Needs Based/Population Based Funding Allocation Methodology for Manitoba Regional Health Authorities work for Manitoba Health) which can provide insight into government planning needs.
- The Centre work, including definitions and methods, is made available to departments which permits replication and updates.
- The Centre provides arms length evidence coming from outside the political process.
- The Centre can produce indicators (combining scores on all language and other tests into one) which the internal processes might not routinely do.
- External use of departmental data sometimes provides new insights about the data and their possible use internally.
- Creation of these powerful linked data opportunities helps academic researchers compete for external funding and provides for quality government research of population developments.

There are several reasons for governments to make the investments now in research in respect to the early years. They will need to have outcome measures to show that their policies and investments in early child
development centres are improving the health, wellbeing, and competence of future populations. Governments cannot wait for 25 years to show the benefits of early child development programs. However, we now know that we can improve low AEDI results in districts in three to four years. We now know that this improvement affects school performance and future trajectories in health, learning, and behaviour. A linked database would allow the government to show over time the improvements in the health, wellbeing and competence of the population in South Australia. A linked database involving health, education, and the AEDI is key for government to be able to show over the long term the benefits of investment in early child development on longer term human development.

An important area of research is related to linking the work of the early child development and parenting centres with the AEDI outcomes. This technique should allow communities and government to assess and improve early child development in communities. The results from Perth illustrate what can be done. This could be developed in partnership with the group in Melbourne (Frank Oberklaid) and Fiona Stanley’s group at the Telethon Research Centre in Perth and with Clyde Hertzman’s Human Early Learning Partnership (HELP) in British Columbia.

Measuring brain and biological development

Another area of research is putting in place measures of brain and biological development that can be linked to the population measurements to better link results from the natural sciences with the social sciences and understand how the social environment ‘gets under the skin’. One of the methods is to sample the blood cortisol levels by measuring cortisol levels in saliva. This reflects the function of the LHPA pathway, which develops early and affects behaviour, mental health and drug and alcohol addiction as well as cardiovascular disease.

The new knowledge about the LHPA pathway and cortisol is being applied by Clyde Hertzman’s Human Early Learning Partnership (HELP) in British Columbia in conjunction with their community population EDI studies. Also Margaret Sims (2005) in Perth is applying this measure to studies of the quality of daycare. Poor daycare in very early years (age 0-2) may set the LHPA cortisol pathways so that they adversely affect the trajectories in health, learning, and behaviour.

The other technique that relates to early child development is the field of experience and gene function. Epigenetics is one example. Moshe Szyf at McGill University (2004) is applying this technique to the study of epigenetic effects on gene function in early child development leading to behaviour and mental health problems.

Finally, if there are good population and longitudinal studies, individual researchers can study specific questions such as how environmental stimuli influence autism, depression, addiction, and other problems in behaviour and how these stimuli also affect gene function.

South Australia’s research advantage

Many scientists informed me that the proportion of national research funding attracted to South Australia has fallen substantially. Unless this problem is addressed, the state’s research capacity will decline.

The size of South Australia gives it particular advantages in developing applied research programs which link research activities and service practice. In relation to early childhood development there are existing programs with a strong track record. These include the University of Adelaide’s Public Health Information Development Unit directed by Dr John Glover which has skills in population epidemiological and geographical mapping that can be used in assessing the effectiveness of early child development programs. Dr M. Sawyer and Dr P. Baghurst of the Women’s and Children’s Hospital in Adelaide also have extensive experience in undertaking grant funded research in areas relevant to mental health and early childhood development.

Recommendations

RECOMMENDATION 10:1

The data from the AEDI assessments should be integrated into a state data system for health and education and social indicators. All the individual data must be confidential and not used to label anyone.

RECOMMENDATION 10:2

The Government of South Australia should establish a linked integrated data system from the work of its various departments that relate to physical and mental health, early child development, education, behaviour and socioeconomic factors. This could be modeled on the program established by the government of Manitoba with the University of Manitoba more than 15 years ago. The findings from the integrated data base should be publicly reported annually.

RECOMMENDATION 10:3

Assessments of development and education of children should be population based for the age cohort, not just school based.
Why invest in early childhood?
There is now strong agreement among a number of economists that the quality of human capital is a factor influencing economic growth and the social stability and quality of societies. One measure of the quality of a society and its human capital is the quality of education and health and the level of equity across the population.

A number of economists now understand the impact of early child development on levels of education (cognitive) and behaviour (non-cognitive). For most of these economists there will have to be increased investment in early child development if we are going to close the gap between what we know and what we do.

Economic costs (in Canadian dollars)

Heckman and others (2000 and 2006) have estimated that the cost to US society of poor early child development in relation to behaviour and crime measured in terms of costs to individuals and society is close to $1.3 trillion per year. One estimate of costs for Australia is about $30 billion per year. For the state of South Australia, the cost is about CAD$3 billion per year. Although these are rough estimates and crime and violence in Australia is less than in the United States, the magnitude of the costs to society and individuals is still large.

The Ontario Mental Health Foundation has recently done a study of the costs in the province of Ontario to individuals and society of mental disorders and substance abuse. The annual cost was estimated to be about CAD$34 billion per year. Based on the fact South Australia has about one eighth the population of Ontario, it is likely the cost to individuals and society in South Australia for mental health and substance abuse is around CAD$4 billion per year.

Since we now understand how early child development affects mental health disorders, substance abuse and antisocial behaviour and crime, the cost to individuals and society for all these problems in Ontario is probably around CAD$65 billion per year.

A universal high quality early child development program beginning with the birth of a child, if not earlier, could reduce these costs by more than 50% in 25 years (the time it would take with high quality early child development programs to influence the quality of the next generation). The cost in Ontario for quality early child development and parenting centres for all families with young children (0-6) would be about CAD$6 billion per year if all families with young children used the centres. To reduce these problems in South Australia, by setting up high quality early child development and parenting centres for all families with young children, would cost South Australia about CAD$750 million per year if all families with young children (0 to 8) use the centres. Even if this program only improved outcomes for 50% of the young children in society, it could reduce the future costs to individuals and South Australian society in terms of mental health, behaviour, and crime and violence by at least $3 billion per year. There would also be benefits in terms of the cognitive and non-cognitive function of a high quality workforce needed for an innovative society to keep up with the exponential growth in new knowledge and technology in the 21st century.

The importance of early child development in terms of human development, the quality of societies and economic growth is now increasingly recognised by a number of economists. Jacques van der Gaag (2002), a Dutch economist, in a World Bank publication set out the importance of quality early child development for developing countries. These points are also relevant for developed countries. He made the following points about the gradual acceptance by some economists of the importance of the quality of human capital for economic growth and the quality of societies.

Initially, the planning for economic growth in developing countries comprised three stages. First, at the macro level, a desired level of economic growth was chosen. Since labour (regardless of quality) was thought to be abundantly available, the desired growth rate was determined by the level of overall investment. At the middle stage of the research on the determinants of economic growth, the optimal distribution of this investment by region and by industry was considered important, and, at the third stage, individual investments for projects were evaluated and allocated. Apart from examining the abundance of labour, no assessments of the quality of human capital were used in these planning models. This strategy for economic growth proved not to be as effective as the planners wished.

Quality of human capital

Gradually the economic models for developing countries began to recognise that the quality of human capital (competence, health, and behaviour of individuals) was important. In 1979, the Nobel prize for economics was awarded to T.W. Schultz (1971, 1972) (and W.A. Lewis). Schultz's major contribution to the field was in showing that the behaviour of people in developing countries is, like the people in developed countries, reacting to incentives and opportunities and was a factor in economic growth. He stressed the importance of investing in human capital (skills and knowledge) to increase entrepreneurship and productivity (especially in agriculture).
Another Nobel laureate (in 1993). R.W. Fogel (2004), emphasised the importance of 'people development' in yet another way. Taking a historical view of economic growth in developed countries, Fogel brought out the importance of the contribution of technological change to the improvement in the health and competence of populations. He concluded that the 'technophysio' evolution (a term used by him) accounted for about half of British economic growth over the past two centuries. He states: 'Much of this gain was due to the improvement in human thermodynamic efficiency. The rate of converting human energy input into work output appears to have increased by about 50% since 1790.' Fogel recognised the importance of early childhood development in the quality of the labour force.

Amartya Sen (1999), who received the Nobel prize in 1998, also recognised the central role of investing in people. He demonstrated that the resulting higher income, from higher productivity, reduces poverty and increases economic wellbeing. Sen also underscored better health, higher education levels, and improved nutrition as key goals which, in addition to higher income, represent non-monetary aspects of the quality of life (ie of 'human development') that are valuable in and of themselves. In his latest book Sen extends this concept, to emphasise that individual freedom is the ultimate goal of economic life. In this book, Sen uses a very broad definition of freedom, which includes freedom from hunger, disease, ignorance, all forms of deprivation, poverty, as well as political and economic freedom and civil rights.

Van der Gaag (2002) linked early child development to education performance and the social capital of a society and concluded: ‘Good education is a goal in itself and fosters economic prosperity.’ He also recognised the link between early child development and physical and mental health in adult life and the social capital of a society. Finally, he makes the point that early child development programs enhance the equity and equality of a society. This is an important point for the Social Inclusion Committee of the Government of South Australia. Inequity and inequality in societies are a major factor in social exclusion. The Social Inclusion Committee must become more involved in the early child development initiatives of the Government of South Australia if future social exclusion is to be minimised.

Value of early years intervention

Heckman (Nobel Laureate in Economics, 2000) has done extensive work on the quality and competence of the US labour force and the factors influencing competence and concluded that a major contributor to the failure to improve the competence of the US labour force over the last 25 years is the lack of investment in early child development. He has emphasised the role of a well educated and adaptable work force for the success of today’s economies with exponential growth in new knowledge and technologies. In reviewing all the evidence about early childhood experience and its effect on adult productivity, he has made the point that the period of early child development sets cognitive and non-cognitive capabilities which are important for labour productivity. He has, with his colleagues, explored the return to investment in human development as a function of the age when the investments are made. He has concluded that the investment in the early years has the greatest return on human development. His analysis of the effect of intervention in the early years on development is clearly presented in the recent paper with Knudsen, Cameron and Shonkoff (2006).

Heckman concluded, after reviewing the evidence from the natural and social sciences, that ‘skills beget skills’. That is, all capabilities are built on a foundation of capacities that are developed early in life. This principle stems from two characteristics that are intrinsic to the nature of learning: (1) early learning confers value on acquired skills, which leads to self reinforcing motivation to learn more; and (2) early mastery of a range of cognitive, social, and emotional competencies makes learning at later ages more efficient and therefore easier and more likely to continue. For example, young children at risk of school failure who participate in early child development programs are less likely to repeat grades or to require special education services, thereby resulting in lower costs to the education system and improved individual performance.

In his analysis of the intervention literature, he concludes that enriched early child development programs improve achievement across a broad range of outcomes (eg academic achievement tests, years of schooling completed, behaviour, adult wages, and home ownership). In contrast to the documentation of significant long term effects from quality early child development programs, later remediation efforts have been shown to be considerably less effective. Heckman concluded, based on US data, that school age remedial programs for children and youth with cognitive and non-cognitive limitations, have generally had a poor record of success. Similarly, public job training programs, adult literacy services, prisoner rehabilitation programs, and education programs for disadvantaged adults have yielded low economic returns, with the returns for males often being negative. In some studies in which later intervention showed benefits, the performance of these children was still behind the performances of children who experienced quality early child development programs.
Heckman makes the point that although investments in older individuals realise relatively less return overall, such investments can be beneficial to individuals and society. He emphasises, however, that the advantages gained from effective early child development programs are much greater than later interventions. In most developed societies we allocate considerable resources to helping adults who have had a poor start and under-invest in the critical period of early child development.

The Economist magazine (5 October 2006) in a series of articles on the globalised knowledge based economies and the need for talent, made the following points.

- Everybody’s doing it – Companies of all stripes have become aware of the need to gather talent.
- The world is our oyster – The talent war has gone global and so have talent shortages.
- Opening the doors – Governments are joining in the hunt for talent.
- Nightmare scenarios – Western countries’ worries about losing jobs and talent are only partly justified.
- Masters of the universe – The war for talent is shifting the balance of power from companies to workers.
- The revenge of the bell curve – As talent becomes more valuable, inequalities and inequity are widening.
- Meritocracy and its discontents – Not everybody is happy with the talent elite.

A key issue in the battle for brain power (talent) is how to fund early child development and parenting programs (0 to 6) to establish a talented competent population.

In discussing the importance of early child development The Economist (18 July 1998) in ‘A survey of women and work: for better for worse’ concluded:

‘It is perfectly possible to devise a system that will produce more children and still keep women at work, though it may not come cheap. The principle of free education for school age children is already entrenched throughout the rich world; there would be nothing incongruous about extending it further down the age range. In the Nordic countries, widely available and good quality child development programs, together with generous maternity and parental leave arrangements, have kept birth rates near replacement level even though most women go out to work. Many other rich countries make a nod in this direction by subsidising child care and giving either tax allowances for children or some form of direct child benefit.’

On all socioeconomic measures the Nordic countries outperform the other developed countries including Canada and Australia.

Fiona Stanley, Sue Richardson and Margot Prior in their book, Children of the Lucky Country, bring out the revolution in the role of women in today’s society and the need of programs that support early child development. Clearly, all societies have to recognise the revolution in the socioeconomic conditions of the new knowledge based economy and the role of women.

Ludwig and Sawhill (2006) in their paper for The Brookings Institution state in their assessment of early child development in the US:

‘Preserving the status quo has its own consequences. Specifically, a course of inaction runs the risk that our society forgoes the chance to help all our children realise their full potential and to improve the skills (and consequent competitiveness) of America’s future workforce. Based on the available evidence, we think that present knowledge strongly favors our proposal of stepped up investments in early education from birth to age ten.’

These and other economists and experts in early child development recognise that to close the gap between what we know and what we do there has to be increased investment in early child development and parenting programs.

**Recommendations**

**RECOMMENDATION 11:1**
As the Government of South Australia invests in early child development and parenting centres, they must take steps to improve the necessary infrastructure and provide adequate sustained funding to ensure an incremental increase in the number of these centres over the next five to ten years.

**RECOMMENDATION 11:2**
In keeping with the ideal of public education, the government of South Australia should incorporate its preschool program into the programs of the early child development and parenting centres and fully fund them for all children from birth.

**RECOMMENDATION 11:3**
One major goal of the early child development and parenting programs should be to reduce by 50% in 20 years the cost of mental health, addiction, crime and violence occurring in later life to individuals and society.

**RECOMMENDATION 11:4**
Another goal of the early child development and parenting program is to ensure that South Australia has the talent base to be able to effectively compete in the globalised knowledge based economies of the 21st century with improved equity in high quality human development and enhanced social inclusion.
RECOMMENDATION 11:5
Since the early child development and parenting centres are part of an integrated program for human development (early child development and education), they should be publicly financed.

RECOMMENDATION 11:6
To achieve the whole of government approach for early child development, the Government of South Australia must develop an integrated budget for each early child development and parenting centre with one set of guidelines and one set of accountability measures. At the present state of development, annual AEDI assessment of each centre will be a critical outcome measure.
How can business and community leaders invest in early child development?
The South Australian government has created children’s advisory groups and councils over the years. In the Virtual Village report (Government of South Australia 2004), the committee recommended that the government establish a South Australian Children’s Council with responsibility to work on integrated planning, oversight and evaluation of all early childhood services in South Australia. The Council would be responsible for coordinating the whole of government effort in early childhood services (programs) including implementation of the recommendations of the inquiry, planning statewide program developments, approving local Annual Management Plans and preparing multi-lateral budget bids to implement the proposed Framework for Early Childhood Services (programs). The Council would approve applications from communities and centres for the development of Child and Family Centres, based on the capital upgrading of preschool centres, school sites or childcare centres.

Establishment of Council for the Care of Children

The government did not establish the Children’s Council as recommended in the Virtual Village report but did set up the Council for the Care of Children in 2005.

The purpose of this Council is to:

- promote the rights and interests of children
- advocate for or on behalf of children
- advise government
- inform the community about the best care and support for children.

The Council recognised that:

- what happens to a child in his or her earliest years is vital for future successful development
- a happy healthy childhood lays the foundation for a full and active adult life
- it is only by families, communities and governments working together that we can achieve this for all children.

The Council also recognised that in amendments passed in 2005 to the Children’s Protection Act 1993 two very significant amendments were introduced in Part 1, Section 4:

- Every child has a right to be safe from harm.
- Every child has a right to care in a safe and stable family environment or, if such a family environment cannot for some reason be provided, in an alternative form of care in which the child has every opportunity that can be reasonably provided to develop to his or her potential.

The Council concluded that the legislation should bring a whole of government, whole of community commitment to the care and protection of children and support for their families.

This Council has been established by the government and is, therefore, dependent on continuing government support and is accountable to the government in power. The Council reports to the Minister for Families and Communities and has a major responsibility for child protection. Could the Council report to the chair of the Inter-Ministerial Committee on Early Childhood, since the Council’s work will affect all government units involved in early child development, care and protection? This Council is, in effect, concerned with the ‘rights of the child’ brought out in a recent United Nations publication but its mandate is not universal.

Children do not choose their parents; thus, communities working with parents have a primary role in protecting the rights of the child. This is true for all children. The early child development and parenting programs provide a base for universal coverage for the rights of the child.

In discussion with some members of the community, it was felt that they should be establishing a council on early child development with a complete perspective on early child development for all young children in South Australia.

Recognising that it would take time to establish quality early child development programs linked to or part of the primary schools and that governments change every four to five years, sometimes with different ideologies, we established in Canada, a national Council for Early Child Development funded by support primarily from the private sector. This was, in part, to ensure a sustained development of early child development and parenting programs in Canada over the next 25 years regardless of changes in ideology and government. South Australia might benefit with such a council and it could help close the gap between what we know and what we do.

The gap between what we know and what we do

The Canadian Council felt a key issue for early child development is, why is there such a gap between what we know and what we do? Among the factors contributing to this gap are:
• lack of understanding in all sectors of society about experience based brain and biological pathway development and the effect on the life trajectories in health (physical and mental), learning, and behaviour
• the time it will take to show the benefits of early child development programs on human development
• social and cultural factors
• professional silos
• failure to integrate knowledge from the natural and social sciences about early child development and human development in respect to health, learning, and behaviour
• cost of quality early child development programs.

The primary goal of the Canadian Council is to close the gap between what we know and what we do in all sectors of society in order to take steps to improve early child development for all families with young children.

The Council’s role in Canada
• Recruit and train Fellows to work with all sectors of communities in Canada to enhance understanding about early child development and its effect on human development.
• Provide with government support an annual report on the status of early child development by districts and regions.
• Work with post-secondary institutions to analyse factors contributing to poor early child development in communities.
• Help communities to take steps to improve early child development.
• Help integrate the early child development programs with the primary schools.
• Help integrate programs for children with special needs as part of the programs of the centres and reduce the need to separate children with special needs from the other children.
• Help monitor the effectiveness of home visiting programs and their interaction with the children’s centres.
• Help government create and implement policies for quality universal early child development and parenting programs.

Fellows Program: The Council’s Community Fellows Program began in February 2006 by bringing together the first ‘class’ of Fellows to engage in a series of individual and group activities during which they could share, learn, and support one another in the application of the new knowledge about early brain and child development in their communities.

The goals of the program are to:
• expand existing expertise and knowledge within communities and provinces through cross-fertilisation and networking
• increase leadership and technical skills necessary for community based and cross-systems work on early child development
• estimate the development of integrated early child development and parenting programs for all parents with young children (an integrated centre or hub and spoke model) linked to or part of the primary schools.

The Council’s Fellows are provided with the following supports and resources:
• an on-line, multimedia curriculum resource on the science of early child development. (They use the Red River College resource curriculum. See chapter 1 for more detail.)
• strategic retreats: These retreats are for an in-depth discussion on the science of early child development, the outcome measure (the Early Development Instrument EDI), community mapping and community involvement. They also review how well we are closing the gap between what we know and what we do.
• Stipends to cover the cost of their work in the communities.

The 6-point Canadian action plan

The Council aims to put science into action to promote early child development and parenting centres through a 6-point action plan.

Point One: Harness the evidence.

Point Two: Connect and work with communities and groups in communities.

Point Three: Help develop public policies for universal non-compulsory early child development programs beginning with pregnancy for all families.

Point Four: Cultivate leaders.

Point Five: Monitor results (EDI) and help communities improve outcomes.

Point Six: Integrate and expand existing programs within the early child development centres linked to or part of the primary schools.

Societies have to work out strategies for free market capitalism with social accountability to meet these challenges of the 21st century:
• exponential growth in knowledge and technologies
• population growth
• ageing populations
• resource constraints
• the need for sustainable development
• equity and equality of opportunity for all citizens.

For all families with young children, society has to put in place universal high quality early child development and parenting programs, if society is to meet those challenges.

The primary objective of an equivalent council in South Australia would be the same – to close the gap between what we know and what we do.

Recommendations

RECOMMENDATION 12:1
Members of the South Australian community should consider establishing a council independent of the Government of South Australia to help set up child development and parenting initiatives. This could be called the South Australian Council for Early Child Development and Parenting, linked with the Canadian Council for Early Child Development and Parenting. (A group in South Australia is taking preliminary steps to see if they can establish such a council.)
Some thoughts on early child development in South Australia, South Australia’s Strategic Plan and ideas from previous Adelaide Thinkers in Residence
I believe South Australia is a leader in the English speaking culture in taking steps to close the gap between what we now know about early brain and child development and what we as societies are doing to ensure equality of development for all infants, toddlers, and young children. Governments in some developed countries have increasingly taken a role working with communities and parents to ensure equity in development for young children in their rapidly changing societies and cultures. This is in keeping with the increasing interest in the rights of the child and the role of society and parents to protect these rights.

Programs for early child development have developed in various ways and have varying goals based on national and community culture and understanding of early child and brain development. In this report, I use the term early child development to cover early development and its effect on health, learning, and behaviour throughout life. A key reason for this term is that the neurological and biological pathways that develop during this period influence the risks for physical and mental health problems later in life as well as learning and behaviour. This period of child brain development is much more than early learning or education in the conventional sense. Obviously, brain development during the early years affects ability to learn in the formal school system but its effect on physical and mental health in later childhood and adult life is equally important.

Daycare may provide babysitting or care services, but does not always provide environments for high quality early child development involving parents. Thus, in this report, the term daycare is not used. Good early child development programs involving parents can, like the school system, provide non-parental care for families where parents with young children are part of the labour force or continuing their education.

South Australia’s commitment to early child development

In 1985, recognising the needs of children in environments leading to poor development, the Children’s Services Act was passed in South Australia leading to setting up the Children’s Services Office. In 1993, the Department of Education, the Department of Employment, Training and Further Education, and the Children’s Services were amalgamated to form the Department of Education, Employment and Training (DEET). This alignment of Children’s Services and Education was unique in English speaking societies and a step in the direction of a philosophy of integrating early child development with human development. This was a structure that could allow integration of early child development, education, and employment and training. It was a potential ministry of human development. Subsequently, there were further arrangements leading to the Department of Education and Children’s Services and a new department for older individuals (DFEESEST).

Recognising the importance of early child development for human development, the South Australian Minister for Education and Children’s Services, the Hon. Jane Lomax-Smith MP established the Inquiry into Early Childhood Services in June 2004. The Minister set broad terms of reference for the Inquiry and established a steering committee of experts, which she chaired. Mr. Brenton Wright, an independent leader with experience in the field, was appointed to lead the Inquiry. Early childhood services were defined as all services that are provided to children and families from before birth to 8 years of age. These services include healthcare, childcare, preschool programs, child and family support programs, care and protection services, and other special programs.

The recommendations from the Inquiry, outlined in the report The Virtual Village: Raising a child in the new millennium (Government of South Australia, 2004), were based on the major themes that emerged from the steering committee’s work. The committee strongly recommended that the focus should be on strengthening and making accessible universal services for children. This was seen as the most effective way of providing programs that every family with young children can expect to use and benefit from in the process of raising a child from birth up to 8 years of age.

Consistent with the general direction of strengthening universal services for child development, the committee recommended the following initiatives.

- Building an integrated early childhood service system based on the development of a new concept of Child and Family Centres. The Centres will act as one-stop shops for a range of early childhood services, and build on the strengths of programs in early childhood health, preschool education and childcare.
- Building a system that improves transitions through the stages of early child development through to the 8 year old stage in Junior Primary School.
- Building a workforce that can meet the challenges of early child development in the new millennium, by addressing a range of issues from recruitment through to education and training and career pathways.
- Establishing South Australia as the family-friendly state.
• Building a system that meets the needs of Aboriginal children and their families.
• Improving the provision and co-ordination of services for children with additional needs.
• Making the provision of high quality information services a priority.
• Establishing a ‘whole of government’ planning and management system for early child development which can meet the challenges of integrating programs
• Building research and evaluation of early child development initiatives.

Progress in meeting some of these recommendations has been slow.

South Australia’s Strategic Plan 2007

South Australia’s Strategic Plan (2007) will be affected over the years by investment in children’s centres linked to primary schools which, through good early child development, will lead to the emergence of a healthy, competent, capable population for this century. A high quality universal early child development and parenting program is crucial if the goals set out in the government’s Strategic Plan are to be achieved in the next 25 years. Here are some examples of links between the Strategic Plan goals and a quality early child development program.

1. Growing Prosperity
‘Investing heavily in the education and skills of South Australians, and building on our education export industry...’ (page 12).

2. Improving Wellbeing
‘Investing in infrastructure and programs that focus on primary healthcare and early intervention’ (page 18).

Early child development, primary healthcare and early intervention are the key to reducing the burden to society and individuals of physical and mental health problems in adult life.

3. Attaining Sustainability
‘The sustainable use and availability of water is one of the most urgent resource challenges for South Australia. While much has been done to protect water resources, without further innovation and improved management practices, the economy, and the quality of the environment will suffer.’ (page 24)

A competent population that is capable of innovation is essential to handle this problem and the future of the state of South Australia.

4. Fostering Creativity and Innovation
‘Today the state has a strong science and technology research base to promote innovation. It is supported by three South Australian universities, the recent addition of campuses of Carnegie Mellon, and the impending delivery of courses in Adelaide by UK-based Cranfield University...’ (page 28)

A competent, healthy student population is key for future creativity and Innovation in South Australia.

5. Building Communities
‘A robust economy gives us the opportunity to ensure that the benefits are shared by all South Australians as we grow together. We want a fair society, with many more South Australians engaged in political and civic life.’ (page 30)

Quality programs in early child development are important for a future robust economy and an equitable society with involved citizens.

6. Expanding Opportunity
‘We want South Australia to be a place where everybody has the opportunity to reach their potential and achieve their goals, and to be the very best they can. South Australia should be the place to get the best possible start in life, and where people who are on the margins of society, or are otherwise socially excluded, can find a way back in. South Australia’s Aboriginal communities should enjoy the same opportunities as others. Education at all levels is the key to expanding opportunity for all South Australians; strongly valuing education helps all South Australians to share the benefits of a strong economy.’ (page 34)

This Thinker believes that a quality early child development program is the basic foundation for effective education.

The future

A Community Engagement Board will be established to serve as a conduit between state government and the community. The Community Engagement Board will be made up of representatives from a number of government advisory boards and councils. Its roles will include advising the Executive Committee of Cabinet on community. This body can play a key role in helping communities establish quality early child development programs. This group could and should be linked with the proposed Council on Early Child Development (see Chapter 12).

In Objective 6 of the Strategic Plan (page 35) there are specific suggestions that relate to early child development.
We need to give children the best start in life we can. This means maximising the number of babies who are born healthy, who are stimulated early to develop literacy, who are in an environment where they are both nurtured and challenged. A positive start to life means that children can develop resilience and be better able to deal with problems, challenges and opportunities. It means that they are more likely to find a place in, and contribute to, a well functioning society.

In recognition of these considerations, three early childhood targets have been added to this updated version of the plan. Two have data sources that are available now. The Australian Early Development Index (AEDI) is a measure that is in the trial stage, but is included in anticipation of data becoming available to assess improvements in early child development.


The Adelaide Thinker in Residence program

This Adelaide Thinker in Residence was asked to focus on investing in the early years of child development. I accepted this invitation since early child development affects the health, wellbeing, competence of populations and is of great importance for South Australia, Australia, and other societies including Canada.

The Adelaide Thinkers in Residence program has had a number of distinguished individuals who have met with the community of South Australia and prepared reports on key issues facing this region in the 21st century. My work is complementary to the programs of other Thinkers.

The following are selected comments from a number of the reports of other Thinkers that are relevant to what we now know about early child and brain development and the future health, wellbeing and competence of individuals necessary for a sustainable, prosperous, equitable society with little social exclusion.

Herbert Girardet (2003) – Adelaide a Green City

‘Metropolitan Adelaide is a place of great prosperity, a city of parks, of trees, of remarkable architectural heritage, a city of culture, creativity, hospitality and a high quality of life. But it also has deep seated problems regarding sustainability. Concern about water has greatly raised the awareness of the need for change and innovation. Adelaide now needs to develop an overarching sustainability perspective and a targeted program for implementing relevant policies. This could also become a major intellectual asset for advising other cities on implementing sustainability principles.’ (page 8)

The capability of the population will influence what will be done. To help South Australia build the new economy, it is important that the Adelaide community is a very attractive centre for families to raise young children.


‘Economic growth of innovation intensive industries has now become interconnected with the challenge of identifying, nurturing, harnessing, developing, sustaining, attracting and retaining talented and creative people wherever they may be.’ (page 59)

A high quality early child development program that will help ensure that the quality and capability of the next generation will be very important for sustaining and growing innovation and help attract new families.

Dr. Marie Smith (2005) – Developing a Bioeconomy in South Australia

‘South Australia’s Strategic Plan highlights the need to increase the population to two million by 2050. The need to retain graduates and attract new graduates is important for growing the developing bioeconomy. The skills required will not focus solely on researchers – business, legal, marketing, innovation and management skills are just as important for overall success.’ (page 34)

A high quality capable population is important for success in this field.

Matt Adams, Ju Row Farr and Nick Tandavanitj (2004) – New Media, Art and a Creative Culture

‘Build thriving, multiple dialogues between the creative sectors and pedagogy. Encourage students from Year 10 onwards to discuss culture, articulate why they like or dislike certain works and appraise developments in creative practice.’ (page 14)

A strong new media, art, and creative culture is important for the attraction of families with young children to live in South Australia.


‘South Australia needs to harness the creative skills of its research and business community to work with governments and the regional Natural Resource Management Boards to develop water management strategies appropriate for a dry country in the 21st century. Taking this path will not only secure the future of the state by ensuring water is available, but it will also
provide opportunities to export these approaches to water management around the world.’ (page 10)

As in the other sectors, the health, wellbeing, competence, and capability of the population will influence how the state sets up strategies to ensure water is available.

Baroness Professor Susan Greenfield (2006) – Getting to the Future First

Susan Greenfield emphasised that science and technology are at the heart of prosperity in the 21st century in both a broad and specific sense. Broadly, we are shifting from the industrial age towards an economy based on the exponential growth in knowledge and technologies. The growing role of technology is reflected in economic performance.

Soon after arriving in Adelaide, Professor Greenfield’s agenda seemed very clear: to ensure that science was recognised as having the impact it does on the six objectives of the 2006 South Australia Strategic Plan.

She encouraged improved liaison between the three universities. Whilst research in South Australia is beginning to form under the ‘Cluster’ arrangement and scientists with shared interests are beginning to work together irrespective of their particular campus, clearly the universities will need to continue to work together closely to have a critical mass.

The South Australian Neuroscience Institute (SANI) was conceived in 2003, established by agreement of the three South Australian Universities in 2004 and launched in August of the same year during the first component of Professor Greenfield’s residency.

SANI comprises most neuroscientists in South Australia from the three universities and from other institutions and agencies including Commonwealth Scientific and Industrial Research Organisation (CSIRO), Defence Science and Technology Organisation (DSTO), hospitals, Bio Innovation SA, etc. Its members attract more than 10 million dollars in research funds. SANI is chaired by Professor Marcello Costa, Professor of Neuropsychology, School of Medicine, Flinders University. This integrated neuroscience program is of great importance for the development of a quality early child development program and the education and training of individuals working in the field of early child development.

SANI promotes the understanding of how the brain develops and functions and how this knowledge can help society increase the capability of its citizens. Its major activities aim to increase the cooperation between research institutions, education programs, relevant South Australian government departments, patient groups, and the general public within South Australia. Susan Greenfield’s work in South Australia was enormously important in setting an environment for my work ‘investing in the early years’.

South Australia and its institutions have huge potential to show the rest of the world how to enhance human development to meet the challenges of the 21st century.
This report could not have been prepared without many meetings with the diverse people in the different regions of South Australia. Individuals from the early childhood development community, individual from education, health, the post-secondary institutions, the business community, and the different sectors of government. I gave more than 50 presentations to the government institutions, community groups and the public during 14 weeks as the Adelaide Thinker in Residence. This was an extraordinary experience to learn how the Government of South Australia is working to close the gap between what we know and what we do about early child development and human development. South Australia has lessons for all English-speaking cultures.

All of the individuals and organisations I met with were a rich resource for my task. Below is a list of many of the people I met, and there would be many more whose names were not recorded. What is good and valuable in this report is a consequence of their contributions.
<table>
<thead>
<tr>
<th>John Alpers</th>
<th>Greg Crafter</th>
<th>Alana Girvin</th>
<th>Bill Larsen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kay Anastassiadis</td>
<td>David Craig</td>
<td>Loris Glass</td>
<td>Lynn Larsen</td>
</tr>
<tr>
<td>Fiona Arney</td>
<td>Julia Crane</td>
<td>Karen Glover</td>
<td>Angela Lawless</td>
</tr>
<tr>
<td>Valerie Aylesbury</td>
<td>Cathy Crossing</td>
<td>Anne Glover</td>
<td>April Lawless</td>
</tr>
<tr>
<td>Katrina Ball</td>
<td>Brian Cunningham</td>
<td>John Glover</td>
<td>Garry Le Duff</td>
</tr>
<tr>
<td>Joy Baluch</td>
<td>Sue Dahlenberg</td>
<td>Beppy Gollan</td>
<td>Cathy Leane</td>
</tr>
<tr>
<td>Susan Barclay</td>
<td>Ken Daniel</td>
<td>Helen Gray</td>
<td>Peter Lee</td>
</tr>
<tr>
<td>John Bastion</td>
<td>Leah De Zen</td>
<td>Adam Graycar</td>
<td>Helen Leo</td>
</tr>
<tr>
<td>Fran Baum</td>
<td>Bridget Dempsey</td>
<td>Jennene Greenhill</td>
<td>Adam Lewis</td>
</tr>
<tr>
<td>Nick Begakis</td>
<td>Joost den Hartog</td>
<td>Steven Griffiths</td>
<td>Martin Lindsell</td>
</tr>
<tr>
<td>Justin Beltby</td>
<td>Alexandra Diamond</td>
<td>Sharon Guscott</td>
<td>Pam Linke</td>
</tr>
<tr>
<td>Dick Blandy</td>
<td>Gerry Dillon</td>
<td>Andy Hagan</td>
<td>Jane Lomax-Smith</td>
</tr>
<tr>
<td>Andrew Blaskett</td>
<td>Michael Diorio</td>
<td>Jim Hallion</td>
<td>John Loyd</td>
</tr>
<tr>
<td>Anne Bosio</td>
<td>Karen Dixon</td>
<td>Michael Harbison</td>
<td>Dwight MacAulay</td>
</tr>
<tr>
<td>Jared Bowen</td>
<td>Iris Dobrinski</td>
<td>Lynne Harris</td>
<td>Colin MacDougall</td>
</tr>
<tr>
<td>Jenny Boyd</td>
<td>Tahnya Donaghy</td>
<td>Jaydenne Harvey</td>
<td>Colin MacMullin</td>
</tr>
<tr>
<td>Donald Bramwell</td>
<td>Alastair Dow</td>
<td>Peter Harvey</td>
<td>Jenny MacMullin</td>
</tr>
<tr>
<td>Max Brennan</td>
<td>Angela Duigan</td>
<td>Samara Haskard</td>
<td>Denise Maddigan</td>
</tr>
<tr>
<td>Marie Brennan</td>
<td>Beth Dunning</td>
<td>Viv Hazel</td>
<td>Shane Maddocks</td>
</tr>
<tr>
<td>Karl Brettig</td>
<td>Anne Edwards</td>
<td>Rebecca Heath</td>
<td>Pat Maher</td>
</tr>
<tr>
<td>Phil Brock</td>
<td>Kevin Eglington</td>
<td>Cathy Heinrich</td>
<td>Maria Makrides</td>
</tr>
<tr>
<td>Danny Broderick</td>
<td>Penelope Anne Eldridge</td>
<td>Allison Henry</td>
<td>Chris Marlin</td>
</tr>
<tr>
<td>Veronica Brodie</td>
<td>Kathy Eleutheriou</td>
<td>Basil Hetzel</td>
<td>Oliver Mayo</td>
</tr>
<tr>
<td>Mary Buckskin</td>
<td>Susannah Elliott</td>
<td>Di Hetzel</td>
<td>Jos Mazel</td>
</tr>
<tr>
<td>Peter Buckskin</td>
<td>Susan Ellershaw</td>
<td>John Hill</td>
<td>Warren McCann</td>
</tr>
<tr>
<td>Tracey Bunda</td>
<td>Marg Ellis</td>
<td>Susan Hill</td>
<td>Prue McEvoy</td>
</tr>
<tr>
<td>Brian Butler</td>
<td>Sue Emmett</td>
<td>Elizabeth Ho</td>
<td>Stephen McEwen</td>
</tr>
<tr>
<td>Paul Caica</td>
<td>David Engelhardt</td>
<td>Meredith Hodgson</td>
<td>Michelle McGeechie</td>
</tr>
<tr>
<td>Gillian Calvert</td>
<td>Deb Fairley</td>
<td>Polly Holmes</td>
<td>Chris McGowan</td>
</tr>
<tr>
<td>Trudi Case</td>
<td>Sarah Feljan</td>
<td>Allan Holmes</td>
<td>Andrea McGuffog</td>
</tr>
<tr>
<td>Shirl Chartrand</td>
<td>Julie Felus</td>
<td>Joanna Hughes</td>
<td>Alan McKinnon</td>
</tr>
<tr>
<td>Kathy Chisholm</td>
<td>Colleen Fitzpatrick</td>
<td>Malcolm Hyde</td>
<td>Robyn McLean</td>
</tr>
<tr>
<td>Chris Christensen</td>
<td>Lynda Forrest</td>
<td>Fran Hylton</td>
<td>Caroline McMillen</td>
</tr>
<tr>
<td>Ann Clancy</td>
<td>Sue Foster</td>
<td>Michael Innes</td>
<td>James McWha</td>
</tr>
<tr>
<td>Colleen Clark</td>
<td>Cathy France</td>
<td>Gul Izmir</td>
<td>Joanne Menadue</td>
</tr>
<tr>
<td>Sue Close</td>
<td>Andrew Francis</td>
<td>Pamela James-Martin</td>
<td>Jurgen Michaels</td>
</tr>
<tr>
<td>Cyril Coaby</td>
<td>Robert Freeman</td>
<td>Alan Johnson</td>
<td>Ray Michell</td>
</tr>
<tr>
<td>Andrew Collett</td>
<td>Gayle Gago</td>
<td>Kathryn Jordan</td>
<td>Rosemary Michell</td>
</tr>
<tr>
<td>Kay Colmer</td>
<td>Philip Gammage</td>
<td>Anne Jurisevic</td>
<td>Roslyn Miles</td>
</tr>
<tr>
<td>Patrick Conlon</td>
<td>Raymond Garrand</td>
<td>Marilyn Kingston</td>
<td>Jeannette Milgrom</td>
</tr>
<tr>
<td>Joan Cooper</td>
<td>Adair Garrett</td>
<td>Geoff Knight</td>
<td>Jillian Miller</td>
</tr>
<tr>
<td>Linda Cooper</td>
<td>Samara Garrett</td>
<td>Susan Kreig</td>
<td>Lauren Miller-Lewis</td>
</tr>
<tr>
<td>Marcello Costa</td>
<td>Joan Gilbert</td>
<td>Brenda Kuhr</td>
<td>Michael Milligan</td>
</tr>
<tr>
<td>Kate Costello</td>
<td>Adrienne Gillam</td>
<td>Karen Lamont</td>
<td>Nicky Mitgel</td>
</tr>
</tbody>
</table>
Lexie Mincham  Chris Robinson  Trish Tranfa
Gail Mondy  Phil Robinson  Faith Trent
Brendan Moran  Patricia Ann Rowe  Kelvin Trimper
Kim Morey  Nicola Roxon  Pauline Tuft
Colin Morgan  Vicci Rundle  Catherine Turnbull
Debbie Moyle  Robert Rush  Shani Tynan
Gerry Mulhearn  Sharon Russo  George Vaillant
Ted Mulligan  Stan Salagaras  Helen Van Eyk
Charlie Murray  Nerida Saunders  Sue Vardon
Phillip Mussared  Michael Sawyer  Pamela Vincent
Rod Nancarrow  Wendy Schiller  David Walker
Eric Neal  Hannah Schultz  Deb Walker
Peta Newbold  Dominique Schwartz  Jeff Walsh
Sue Nichols  Teresa Scott  John Walsh
Robert Norman  Chris Shakes  Fiona Ward
Lowitja O'Donoghue  Jan Shaw  Caroline Warner
Glyn O'Brien  Chris Sheedy  Terri Warren
Lewis O'Brien  Neil Shepherd  Jay Weatherill
Jan Oliver  Tony Sherbon  Chris West
Jenny Olsson  Tina Shettigara  Gavin Wheaton
Rick O'Shea  Clare Shuttleworth  Deirdre White
Stephanie Page  Veronica Sigley  Michael White
Kaye Parker  Peter Simmonds  Rosemary Whitten
Heather Parkes  Mark Sorgini  Victoria Whittington
Verity Patterson  Kathryn Souveretjus  Phil Widdas
Jan Patterson  Andrew Stanley  Laura Willows
Pat Pearson  Nicole Stasiak  Pam Winter
David Pegram  Rima Staugas  Jim Wright
Nancy Penna  Lynn Steven  Brenton Wright
Carol Perry  Lea Stevens  Patrick Wright
Deborah Phillips  Mark Stevens  Robyn Young
Carolyn Pickles  Nigel Stewart  Lyn Zeidler
David Pisoni  Simon Stretton
Julie Plush  Tom Stubbs
Barbara Pocock  Wilma Sullivan
Deborah Pontifex  Jo Sutherland-Shaw
Peter Popp  Anne Sved-Williams
Grace Portolesi  Richard Symonds
Ros Powrie  Peter Taylor
Kelvyn Prescott  Wendy Thiele
Shirley Prider  Roger Thomas
Jennifer Rankine  Gay Thompson
David Reynolds  Sherry Thompson
Tracy Ritchie  Margaret Thomton

A companion document to the Adelaide Thinker in Residence Report  |  87

Matt Adams, Ju Ro Farr and Nick Tandavanitj, September 2004, New media, art and a creative culture, Department of the Premier and Cabinet, South Australia

Professor Peter Cullen, September 2004, Water Challenges for South Australia in the 21st Century, Department of the Premier and Cabinet, South Australia

Herbert Girardet, July 2003, Adelaide a Green City, Department of the Premier and Cabinet, South Australia

Baroness Professor Susan Greenfield, January 2006, Getting to the Future First, Department of the Premier and Cabinet, South Australia

Charles Landry. December 2003, Rethinking Adelaide ‘capturing imagination’, Department of the Premier and Cabinet, South Australia

Dr Maire Smith, February 2005, Developing a Bioeconomy in South Australia, Department of the Premier and Cabinet, South Australia


Greenfield, Susan. 2006. Getting to the Future First. Department of the Premier and Cabinet, South Australia


National Longitudinal Survey of Children and Youth, Understanding the Early Years. Human Resources and Social Development Canada.


OECD, and Statistics Canada. 2000. Literacy in the Information Age: Final Report of the International Adult Literacy Survey. Paris: OECD. (Source for Figure 7.)


