

**PRIME MINISTER'S SCIENCE, ENGINEERING  
AND INNOVATION COUNCIL**

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**DEVELOPMENTAL HEALTH AND WELL BEING:  
AUSTRALIA'S FUTURE**

*Child Developmental Health and Well Being into the 21<sup>st</sup> Century*

**Preface**

Human development is determined by a complex interplay of genetic, biological, psychological and social influences.

Recent scientific advances in neuroendocrinology, neuroimmunology and imaging techniques have demonstrated the importance of early life experiences on brain development, health and social outcomes throughout life.

Overseas and Australian studies have identified early life interventions that are effective in improving health and social outcomes.

Measures of developmental health and well being of Australian children and young people demonstrate a significant deterioration in a number of key indicators. These patterns are similar to observations in other developed nations and have occurred at a time of rapid economic growth, technological change and evidence of social disruption. The cost burden of these adverse outcomes is enormous and increases with time. The only effective means (in terms of both social and economic costs) to address these problems is prevention. Reversal of these trends is essential for the continued cohesion of our social fabric and the wealth of the nation.

The integration of knowledge about the determinants of health and well being and the identification of interventions that are effective in promoting human development requires a strong interdisciplinary research effort. Incorporation of this knowledge into community action, corporate and Government policy and effective policy implementation mandates a strong partnership between Government, industry, the community, service providers and researchers.

This paper makes the case for such a partnership.

## Executive Summary

There have been dramatic social changes for families and communities over the last 30 years. In spite of Australia's increasing wealth and generally high level of education many indicators of developmental health and well being are showing adverse trends amongst children and adolescents. Changes which have occurred include markedly increased inequalities in health, educational and most other outcomes. This coincides with increasing family breakdown and blended families, undervaluing and neglect of children, changing patterns of women's work and child care, the pace of work and life generally, and in stress and unemployment.

Significantly rising rates are being observed for many serious costly health conditions and social problems including low birth weight, asthma, mental health morbidities, obesity, and juvenile crime. Some of these problems (such as asthma and suicide) have trebled over the last 30 years and are higher than at any time in Australia's history. These trends are observable across most affluent countries.

The aetiological pathways to these increasing problems are extremely complex. The elucidation of the code for the human genome and the explosion of genetic and biomedical research has added both complexity and exciting new opportunities for elucidating causes.

The concept of pathways, in which this complexity evaluates the broader social, behavioural, biological and genetic interactions, provides opportunities to address risks at key transition points on the developmental trajectory to poor outcomes. It demands a new and multidisciplinary approach

Australia has a rich collection of data which is available now to address many important research and policy questions that impact on developmental health across the spectrum of social science, medicine, genetics, psychology, economics and molecular biology.

Australia has a unique opportunity to utilise this valuable data resource to reconceptualise the area of developmental health, to build on past achievements and to discover new and comprehensive solutions framed around partnerships that link policy to research, policy questions to research questions and provides choice modelling for politicians across government portfolios.

Collaborative research which identifies effective interventions and policy implemented with cross sectorial support and effort *can* effect sustainable change. There have been spectacular Australian success stories in recent years such as the internationally acclaimed ground breaking achievements in reducing road trauma and transmission of HIV/AIDS.

It is recommended that government, industry, service providers and researchers establish a national pPartnership for the enhancement of early human development to develop, collaboratively, a coherent, strategic and dynamic national research agenda that will identify key priorities in informing our understanding of causal pathways and effective interventions such as the policies, programs and services that might be provided within various jurisdictions and by non-government agencies.

This will enrich our nation and safeguard the future of our children, enabling them to realise their full potential as healthy productive contributors to our collective wealth. It will also provide global leadership through the establishment of robust innovative alliances and effective dynamic linkages across government portfolios, sectors and jurisdictions and between government, industry, service providers and researchers.

Many other nations are currently struggling to address these issues. Australia is in a unique position because of its size, research and data base capacity, intellectual property resources and networks. It has a far greater capacity than most developed countries to identify and implement effective innovative strategic solutions at a national level across the spectrum of current challenges in developmental health and well being.

Australia's children are the future wealth and capacity of the nation. It is vital that action is taken to address current problems and prevent the perpetuation of these problems into future generations.

## **Recommendations**

That PMSEIC:

1. Acknowledge that Australia's children and young people are a valuable resource in themselves and represent the future wealth of the nation;
2. Recognise the rising prevalence of problems related to adverse environmental experiences during the developmental years, extending from before birth to adolescence, and the on going, long term poor outcomes in health, education, employment, crime, substance abuse and other poorer life chances;
3. Acknowledge that the burden and costs of these problems are so high that prevention must be the major solution;
4. Support the need to work collaboratively to establish an innovative research agenda to inform national policy and effective early intervention;
5. Recognise that whilst the problems of developmental health and well being are multidimensional, and cut across disciplines, portfolios and jurisdictions, a range of adverse outcomes will be avoided by common, integrated and thus more cost effective interventions supported by a whole of government approach; and

6. Promote effective linkages across government portfolios, sectors and jurisdictions and between government, industry, service providers and researchers to enhance national developmental health and well being.

To achieve this:

- A. Government, industry, service providers and research agencies together should establish a national research partnership to:
  - a. Develop an innovative strategic research agenda which builds on existing strengths to identify the main causal pathways underpinning adverse outcomes in developmental health and well being and identify options for early interventions;
  - b. Initiate new paradigms for multidisciplinary research, bringing together knowledge, capacity and methodologies from genetics, epidemiology, psychosocial and educational research areas;
  - c. Establish a major national data and information resource/capacity to capitalise on the new tools and methodologies, and to enable large nationally relevant policy questions to be readily addressed. This would build on and significantly expand Australia's acknowledged expertise and capacity in population research, putting us at the cutting edge internationally;
  - d. Use this new information to strategically model and forecast developmental outcomes in populations using Australia's social and demographic trends, and inform existing and emerging needs. This would make possible the assessment of the costs and benefits of alternative strategies for interventions, allowing the most cost effective decisions to be made to reduce the impact of adverse outcomes. This would add considerably to our strong intellectual property base whilst adding new dimensions through the use and novel uptake of innovative cutting edge research in areas such as bioinformatics;
  - e. In collaboration with relevant Federal Government departments and agencies, NHMRC and the ARC: identify the gaps in the existing research base and set priorities for the debate about the priorities for research in this area;
  - f. As part of this process to share knowledge, establish a clearing house to identify those interventions that are effective in enhancing developmental health; and
  - g. Monitor and evaluate research in this area on an ongoing basis, to ensure efficacy and cost effectiveness of interventions, set international

benchmarks on the conduct of research in this field, and to ensure its relevance and application to address Australian developmental health issues.

The Federal Government should:

- B set up a cross-portfolio high profile advisory council on developmental health and well being with a composition and role similar to the very successful Commonwealth HIV/AIDS Council;
- C in collaboration with other relevant bodies (e.g. National Child Protection Clearing House) begin a process of ensuring that interventions implemented in Australia for the enhancement of developmental health and well being are systematically identified and documented, and provide advice to the inter-portfolio council on the strengths, weaknesses, gaps and overlaps between these programs and make an annual set of recommendations to governments on those that are the most cost effective and efficacious forms of intervention; and
- D call upon the ARC, NHMRC and relevant government departments, as well as industry and other non-government sources to contribute part of their resources to a research priority in the area of developmental health and well being. The structure and functions of this fund should be similar to the HIV/AIDS model to ensure priority driven research is peer reviewed and funded.

## Background

### Developmental health and well being

Human development is determined by a complex interplay of genetic, biological, psychological and social influences. The pattern for healthy human development is predominantly set in early childhood. Health and equality of opportunity for children is the precursor of a healthy, competent population at all socio-economic levels. Without this, it will be difficult to sustain innovation and economic growth in the future, and to establish the basis for tolerant, democratic and sustainable societies.

Developmental health and well being is thus concerned with children and youth achieving their maximal competencies intellectually, physically and emotionally resulting from optimal environments in the formative years. It is also concerned with the avoidance of poor health, educational, behavioural and criminal outcomes and the resulting huge social and economic costs to government and society. It crosses the range of relevant sciences such as neuroscience, neurology, endocrinology, immunology, psychology, epidemiology, ethnology, as well as the new interdisciplinary fields such as behavioural genetics, and psychoimmunology.

Individuals and the physiological and psychological processes which influence their mental and physical health develop social systems. People influence and are influenced by their families, social networks, the organisations in which they participate, their communities and societies. Interventions to improve health or to influence health related behaviour can occur at any one or all of these levels. The theme of building resistance is at the cutting edge of contemporary international approaches to preventive measures and early interventions in developmental health.

#### ***Contribution of developmental health, human capital and education to an economically productive society***

The notion of investing in health as a means of ensuring access to a productive workforce has influenced economic planning for at least a century. Education was an important element in these models. The importance of investing in healthy well-educated human capital was stressed to increase productivity and entrepreneurship. Also underscored was the importance of the contribution of technological change to physiological improvements.

Sen (1999) recognized the central role of investing in people. The resulting higher income from higher productivity, reduced poverty and increased economic well-being justified better health, higher education levels, and improved nutrition as goals in themselves. They represent non-monetary aspects of the quality of life (of human development) that are valuable in and of themselves. The link between education, early childhood development and human development, is clearly documented by scientific evidence (Keating and Hertzman 1999). Good education fosters economic prosperity.

The association between adult health status and economic well-being is at least as strong as the association between education and economic well-being (Hertzman 1999; Smith 1999). Adults with better health, higher life expectancy, and better weight and height measures tend to have higher productivity, less absenteeism from work and higher incomes than their less fortunate counterparts.

Like education, the health status of a population is related to the economic growth of that population (Barro 1997; Pritchett and Summers 1996; World Health Organization 1998). Key examples in Africa are the economic (growth-reducing) effects of malaria and the epidemic of Acquired Immunodeficiency Syndrome (AIDS) (Bloom and Sachs 1998). Similar to the education pathway, the health pathway from early childhood development to human development and economic prosperity is clear. If increasing the wealth of a nation is an overall objective, beginning with the health of a newborn is a logical first step.

### ***Links between developmental health and education***

The importance of early childhood development for subsequent educational performance, and the role of education in economic and human development is well-known and is supported by the most extensive scientific evidence, accumulated from neuroscience, pediatrics, child development, education, sociology and economics. Ample evidence documents the importance of the early months and years of life for a child's physical, mental and social development (Cynader and Frost 1999; McCain and Mustard 1999; Young 1997). The rapid development of the brain during the early months and years is crucial, and newborns who receive proper care and stimulation will be readier to enter school on time and to learn.

Children participating in early childhood development programs providing psychosocial stimulation, nutritional supplementation and health care, and parental training in effective child care, show higher intelligence quotients, practical reasoning, eye and hand coordination, speech and reading readiness. Grade repetition and dropout rates are lower, performance at school is higher, and the probability that a child will progress to higher levels of education increases (Barnett 1995; Barnett 1998; Grantham-McGregor and others 1997; Karoly and others 1998; Schweinhart and others 1993).

Over the long term, these children benefit from earlier schooling, better schooling and more schooling, making them more productive and more 'successful' as adults. Being well educated is the best predictor of 'success' as an adult, regardless of how success is defined (for example as having a better job and higher income or increased and improved production at home). Achieving higher education is always associated with greater well-being (Haveman and Wolfe 1984; Psacharopoulos 1994).

*Table 1: Summary of Early Childhood Development (ECD) Benefits for Children, Adults and Society*

Benefits of ECD	Pathways Linking ECD to Human Development			
	Education	Health	Social Capital	Equality
For Children (Immediate)	Higher intelligence, improved practical reasoning, eye and hand coordination, hearing and speech; reading readiness; improved school performance; less grade repetition and dropout; increased schooling	Less morbidity, mortality, malnutrition, stunting, child abuse; better hygiene and health care	Higher self-concept; more socially adjusted; less aggressive; more cooperative; better behaviour in groups; increased acceptance of instructions	Reduced disadvantages of poverty; improved nutritional status, cognitive and social development and health
For Adults (Long-Term)	Higher productivity; increased success (better jobs, higher incomes); improved child care and family health; greater economic well-being	Improved height and weight; enhanced cognitive development; less infections and chronic diseases	Higher self-esteem; improved social competence, motivation, acceptance of norms and values; less delinquency and criminal behaviour	Equality of opportunity, education, health, and income
For Society	Greater social cohesion; less poverty and crime; lower fertility rates; increased adoption of new technologies; improved democratic processes; higher economic growth	Higher productivity; less absenteeism; higher incomes	Improved utilisation of social capital; enhanced social values	Reduced poverty and crime; better social health; increased social justice; higher sustainable economic growth

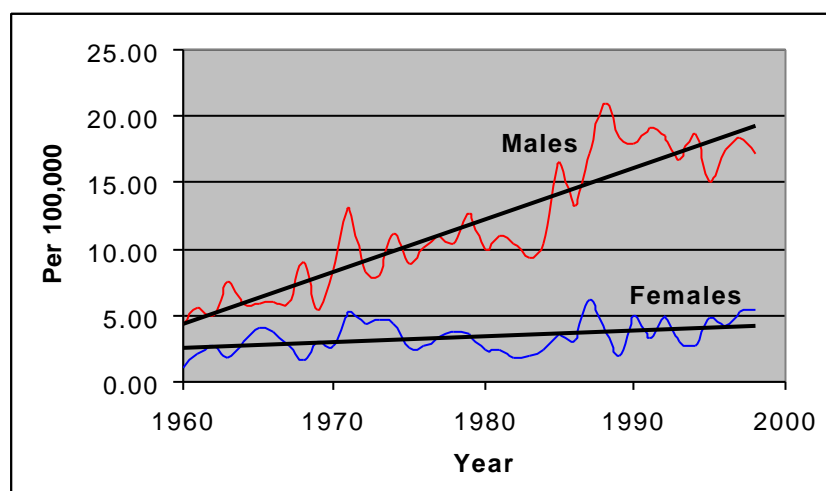
**Source:** The World Bank Conference *Investing in our Children's Future* Washington, April 10-11, 2000

## The Challenges

In spite of Australia's wealth and generally high level of education, many indicators of developmental health and well being are showing adverse trends amongst children and adolescents.

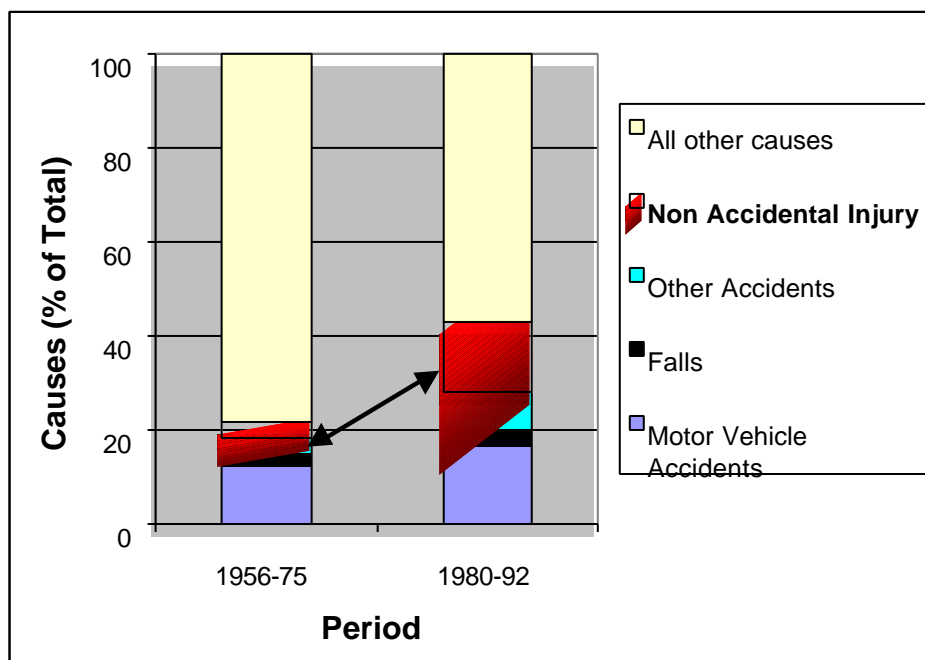
- The incidence of mental health morbidities have risen. Mental health problems including drug dependence are now the major burden of disease for Australian teenagers and young people. For children aged 4-17 years, approximately 520,000 children (15%) scored in the clinical range for somatic complaints, delinquent behaviour, attention problems and aggressive behaviour (*National Mental Health Strategy 2000*). Of people aged 18-24 years, 27% or approximately 730,000 young people were found to have a mental health disorder in 1997 (*Australia's Health 2000*). Rates of depressive disorders are three times higher for young females and the female rate for attempted suicide is greater for all ages despite the higher suicide rate for males. The problem of fatal and non-fatal suicidal behaviour – particularly among younger age groups – is now one of the most pressing social issues affecting Aboriginal communities.
- There is an alarming rise in incidence of youth suicide. Over the period 1970-1998 the suicide rate rose by 40% overall. The rate for young males has trebled since 1960 and was 4 times higher than the rate for young females in 1998 although females under 25 years have a higher rate of attempted suicide for (*Australia's Health 2000*). Deaths by suicide for both male and females is soon expected to exceed deaths by motor vehicle accidents. Over the past two decades young Aboriginal men have died through suicide at more than double the rate of their non-Aboriginal counterparts (Hillman *et al*, 2000).

Diagram 1: Suicides 15 –19 year olds 1960 – 1998 (ABS 2000)



- There has been an alarming increase in substance misuse over recent decades. Drug dependence and has risen sharply in recent years. The death rate from drug dependence in 1998 was almost 5 times the 1979 rate and accounted for 7.4% of youth deaths (*Australia's Health 2000*). In 1996, the proportion of boys who engage in hazardous drinking (more than 5 drinks in a row in the last two weeks) was at its highest level since 1983. Fifty percent of 17 year old girls report hazardous drinking. In 1996, cannabis use was at its highest level since 1983 at all ages among boys. Twenty percent of 16 year old boys and ten percent of 16 year old girls reported being regular cannabis users.
- There has been a dramatic increase in cases of permanent brain damage (cerebral palsy) due to child abuse (shaken baby syndrome) which accounted for 2-3% of postneonatally acquired cerebral palsy in the three earliest five-year periods between 1970 and 1985, rising to 10% in 1985-89 and 31% in 1990-94.

Diagram 2: Causes of Child Cerebral Palsy in Western Australia



(Stanley, Blair & Watson 2001)

- Reports of child sexual abuse have more than doubled over the last decade. There were 107,134 total notifications to child protection services in the year 1999/00 (AIHW 2001). The number of 'reported cases' in Australia (i.e. notifications requiring investigation) increased from 49,721 in 1990/91 to 76,954 in 1994/95. The total number of notifications increased from 91,734 in 1995/96 to 107,134 reports in 1999/00.

- There is a significant widening disparity in literacy levels among students in Australian primary and secondary schools particularly in the primary school years, and particularly for Indigenous students and male students. A national survey of literacy among students in Year 3 and Year 5 revealed that the top ten per cent of students are working about five year levels ahead of the bottom ten per cent (Masters & Forster, 1997). Nationally, 86.9% of year 3 students achieved the agreed minimum standard for reading. However there was a 5% gap between boys and girls performance. Overall, approximately one third of Indigenous students scored below the agreed minimum standard. Children from a higher socio-economic background were more likely to meet the literary standard than those from a low socio-economic background (approximately a 20% disparity in both years 3 and 5). Table 2 below sets out these results.

*Table 2: Results of 1996 Literacy Study – proportion meeting the standard (%)*

Selected Characteristics	Year 3	Year 5
Main sample (total)	73	71
Male	66	65
Female	77	76
English speaking background	73	72
Other than English speaking background	62	56
High socio-economic status	88	87
Medium SES	72	71
Low SES	62	47
Special Indigenous sample	19	23

(ABS 2000)

- The incidence of homelessness among young people is increasing. Chamberlain and MacKenzie (1998) estimate that across Australia almost 100,000 teenagers and young adults per year experience an episode of homelessness with 40,000 using a government-funded service for the homeless. Family homelessness is now a significant problem in Australia. The recent National Evaluation of the Supported Accommodation Assistance Program indicated that a quarter of all their clients are families. In addition, some 60,000 children accompanied a parent or parents to homeless services in 1996/97. Eighty per cent of these children are under 12 years of age (Swan 2000).
- Mortality rates for Indigenous children continues to be a major concern. For the States with reliable data, infant mortality rate averaged 12.5 deaths per 1000 live births (the highest report being 29.4 deaths per 1000 live births) in 1997 compared to the national rate of 5.3. During 1994/96 the estimated child death rate for Indigenous children was around 4.5 times higher than that of non-Indigenous children. (ABS Cat. No. 4119 1999 pp 95-96)

- Recent data reveals two alarming trends in juvenile crime. First there is evidence of an increased involvement by juveniles in offences against the person. Taking serious assault as an indicator, in 1973/74 there were 2.1 male adults arrested for every one juvenile. In 1993/4 this ratio had decreased to 1.2. This trend is even more dramatic for girls. In 1973/74 there were 3.4 female adults arrested for every one female juvenile, while in 1993-94, there were 1.9 girls arrested for every female adult. This increased involvement of young females is the second important change. In 1973/74 23.5 boys were arrested for assault for every girl arrested. By 1993/94 this ratio had dropped to 4.4. This fall in the ratio of male to female offenders was mirrored in all the selected offence categories. (National Crime Prevention (NCP) 1999).

*Table 3: Increases in Juvenile Crime*

<b>Offence</b>	<b>1991/92 (no. of incidences, juveniles, male and female)</b>	<b>1995/96 (no. of incidences, juveniles, male and female)</b>	<b>% increase</b>
Property Damage	5,823	7,084	22%
Serious Assault	1,138	1,556	37%
Common Assault	2,360	3,041	29%
Robbery	807	1,119	39%

- There has been a dramatic rise in the incidence of childhood asthma over the past few decades. In 1995/96 asthma was the most common cause of hospitalisation for children. One in four primary school children and one in seven teenagers suffer from asthma (ABS 2000).
- In the last decade hospitalisations for diabetes have more than quadrupled in Western Australia.

These data show that indicators of the developmental health and well being of our children are of concern. Some of these problems have trebled over the last 30 years and are higher than at any time in Australian history. These findings are consistent with those observed in other developed countries and trends are also increasingly recognised in the developing nations.

There is a paucity of data for financial costs for these adverse outcomes and research is urgently needed in order to gauge the extent of these problems and to accurately inform resource allocation and the most effective interventions. The most recent research in this field estimates that:

- The annual total economic cost for suicide and attempted suicide in Australia is \$459,786,000 (Raphael *et al* 1994);

- Total health system costs for mental disorders for the 15-24 age group was approximately \$114,000,000 for males and \$110,000,000 for females in 1993/94 (Mathers *et al* 1998);
- The estimated total economic costs of crime in Australia is over four percent of Gross Domestic Product, or around \$1,000 per person. (NCP 1999);
- Total health system costs for infectious and parasitic diseases for children 0-15 years was approximately \$236,000,000 in 1993-94 (Mathers *et al* 1998); and
- Total health system costs for diabetes was approximately \$372,000,000 in 1993/94 (Mathers *et al* 1998).

The cost burden of these adverse outcomes is enormous and increases over time. The only effective means (in terms of both social and economic costs) to address these problems is prevention. Reversal of these trends is essential for the continued cohesion of our social fabric and the wealth of the nation.

## The solutions

Today's social and environmental influences are far more powerful in child educational, health and welfare outcomes than are the interventions, drugs or other facilities we have at our disposal to manage their later consequences. The proven cost effective solutions to these problems are preventative measures. These solutions centre primarily around the accurate identification of causal pathways and application of effective early interventions which specifically can be applied to the total population or target people displaying early signs and symptoms of particular conditions or people considered to be at risk of developing particular conditions.

The solutions necessitate the application of population health approaches, and the recognition of the complex interplay of biological, psychological, genetic, social, environmental and economic factors on the individual and on the population. Most risk and protective factors for each of the challenges listed above derive from conditions in everyday lives of individuals and communities such as income and social status, physical environments.

The United States Committee on Health and Behaviour: Research Practice and Policy Report (2001) found that health and disease are determined by dynamic interactions among biological, psychological, behavioural and social factors, and that these interactions occur over time and throughout development. Cooperation and interaction of multiple disciplines are crucial for understanding how psychosocial and biological processes interact in health and disease, and how we can influence them. Psychosocial factors appear to influence health directly through biological mechanisms, and indirectly through an array of behaviours.

Most importantly the solutions require underpinning by effective strategic research which informs policy. Australia has access to a range of new scientific tools to address the wider issues in their entirety. These include well established but under utilised information-rich data bases, new ecological and psychosocial measures, innovative

analytical tools and new advances in molecular and genetic epidemiology. Australia has a unique opportunity to utilise these resources to consolidate a new approach to research in developmental health, to discover new and comprehensive solutions framed around partnerships that link policy to research, and policy questions to research questions; providing choice modelling for politicians across government portfolios.

### **The value of early intervention**

The crucial importance of the early years of life is now being recognised across a range of outcomes - health, educational, behavioural, and criminal. Research from a variety of disparate disciplines, such as neuroscience, developmental psychopathology, fetal physiology, and early childhood education theory, is confirming the powerful influence of early life experience to modify genetic influences and risks, either positively or negatively.

The significance of early experience as a contributor to later occurrence of delinquency and crime is well documented. (NCP 1999 p39). In one recent study (Weatherburn and Lind 1997) poverty, unemployment, sole parent families, lack of residential stability and crowded living conditions were all related to measures of abuse and neglect and to juvenile crime. Neglect and abuse were the strongest predictors of juvenile crime. The study concluded policies designed to reduce the level of economic stress or attenuate its effects and early intervention programs designed to reduce the risk of child abuse have an important role to play in crime prevention. (NCP 1999)

The findings of recent longitudinal studies, many of which were conducted in Australia, identify a range of risk factors for juvenile crime that lie in genetic and biological characters of the child, family characteristics, stressful life events and community or cultural factors. Child factors include prematurity, low birth weight, disability, low self esteem, hyperactivity/disruptive behaviour and chronic illness. Family factors include parental characteristics (depression, substance abuse, antisocial models), family environment (domestic violence, marital discord, long term parental unemployment), parenting style (poor supervision, discipline style, abuse, neglect, lack of warmth). School factors include school failure, deviant peer group, bullying, peer rejection, and inadequate behaviour management. Life event factors include divorce, family break up and death of a family member. Community and cultural factors include socio-economic disadvantage, housing conditions, neighbourhood violence and crime, cultural norms concerning violence, lack of support services, and social or cultural discrimination. (NCP 1999). Interestingly, many of these are risk factors for the spectrum of poor outcomes in developmental health

Thus pathways to problem outcomes in adolescence and adulthood are complex, interactive and multidimensional. They start early in life (sometimes prebirth), and involve all layers of an individual's social world. This complexity also implies that there are many opportunities for intervention to divert a child from an adverse pathway onto more adaptive outcomes. The research literature indicates that interventions are most effective if delivered early in a developmental pathway, and if they tackle more than one of the strands in the causal chain.

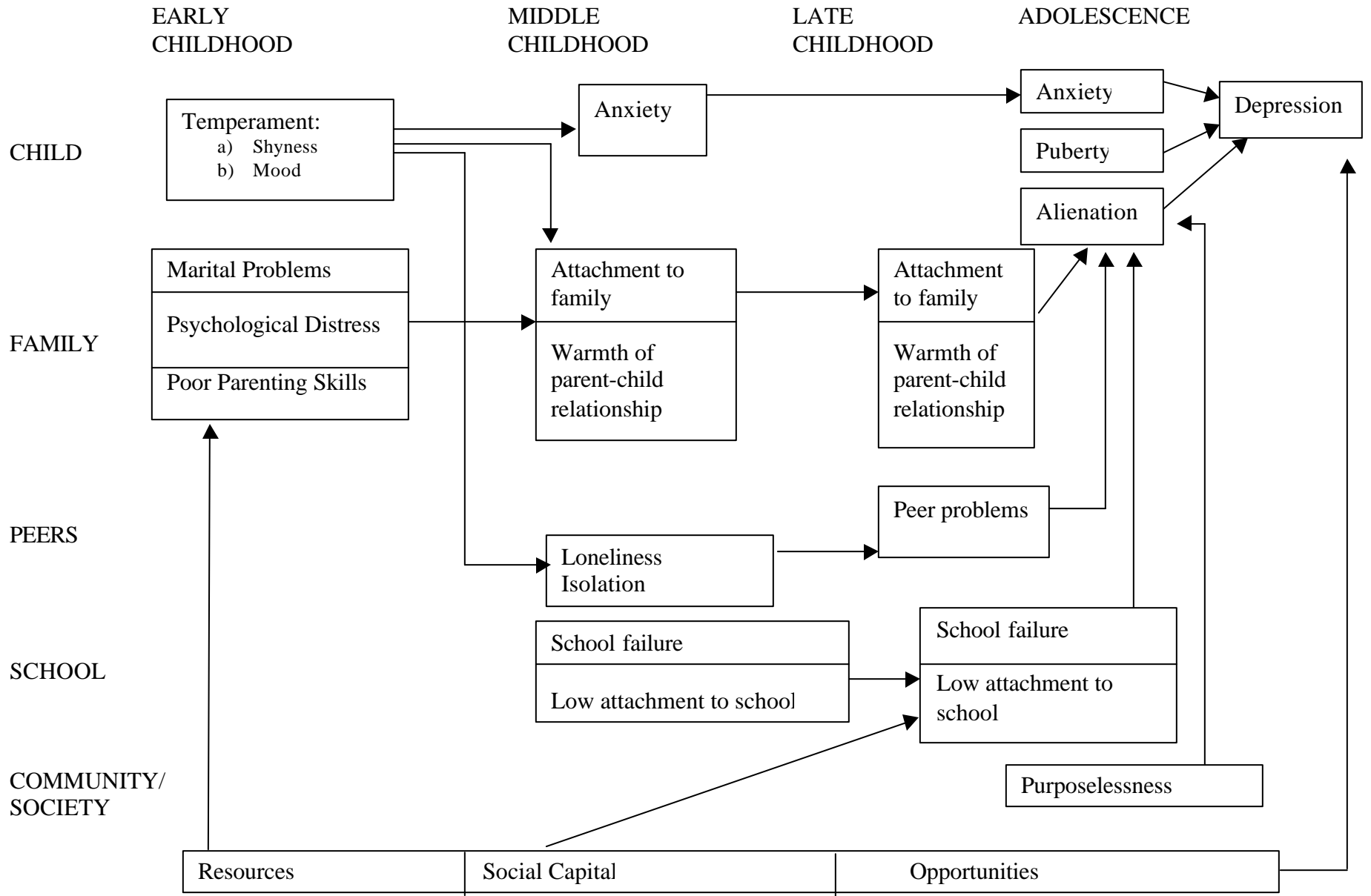
Diagram 3 illustrates some of the elements in a pathway to adolescent depression. Although it is highly complex, it is in fact a simplification, and illustrates only one of the multiple possible pathways to depression. It can be seen that intrinsic characteristics of the child that are reflected in temperamental traits, and are probably biologically based, constitute one element of risk. Along with these are factors in the child's family and broader social context. If these co-occur in ways that lead to parents having difficulty responding adaptively to their child's temperament, the stage is set for the child to progress along a pathway towards depression.

The fact that this pathway starts early in life and is so multifaceted opens opportunities for intervention. In infancy and early childhood, interventions directed at parents (for example, home visiting to help promote parental sensitivity and parent-child bonds) and those that reduce family stress through providing more general social and economic support to parents, can interrupt the early steps along the pathway. In middle childhood, those who have developed clinically significant anxiety problems can profit from individualised treatment, while interventions directed at the family and school have also been shown to be effective. Similarly, there are opportunities for intervention at the various levels later in the pathway, although as noted above, interventions earlier in pathways have been shown to be most clinically and cost effective.

The latest research in neuroscience has established there is a vast increase in the density and complexity of the network of (synaptic) connections in the brain cells over the first few years of life. This process of development largely reflects an interaction between genetic factors and environmental experiences to which all young humans are exposed. Neural development is adversely affected when children are deprived of exposure to these essential environmental triggers - such as when the developing fetus does not receive sufficient exposure to an essential nutrient like folic acid increasing the risks of neural tube defects like spina bifida (Bower and Stanley 1996), or where in the case of visual impairments like a congenital cataract, normal binocular vision fails to develop if the defect is not corrected in the early months of life, or where in extreme circumstances, such as the appalling orphanage conditions in parts of Europe during the Second World War, or more recently in Romania, when children were deprived of touch and other manifestations of caring, major impairments in the development of a various neural systems became evident.

There is also an emerging body of evidence showing that abusive or neglectful care in early life has an impact on the development of stress response systems orchestrated by the brain. For example, evening cortisol levels (reflecting stress) have been shown to be strongly positively correlated with the length of time adoptees from Romanian orphanages spent in these stressful environments before being adopted into Canadian homes. Moreover, whilst it has long been recognised that individuals sustaining abuse in early life are at increased risk for a variety of adverse mental health outcomes, such as mood and anxiety disorders and post-traumatic stress disorder, there is now evidence that this is accompanied by long-term alterations in neural stress response systems (Heim *et*

*Diagram 3: Pathway to Depression*



*This paper was prepared by an independent working group for PMSEIC. Its views are those of the group, not necessarily those of the Commonwealth Government.*

*al*, 2001). More recent medical imaging advances such as magnetic resonance imaging (MRI) have demonstrated evidence of structural deficits in brain anatomy in some adult survivors of early childhood abuse (Bremner *et al*, 1997). Further exploration in these areas is at the cutting edge of research.

Research has also established that brain development before age one is more rapid and extensive than was previously recognised. By the time a child reaches the age of 36 months, the neural network of the brain has been developed, depending largely on the stimulation and care that the child receives. It is estimated that half of all intellectual developmental potential is established by age four (McCain & Mustard 1999).

Changes in balance among neurotransmitters in the brain from the time of early development can influence behavioural responses to potentially stressful situations, can alter the perception of stimuli and are associated with anxiety and depression. Research on animals indicates that early life experiences strongly influence the body's capacity to deal with stress over the whole life span (allostatic load). For example poor maternal care is associated with increased behavioural and stress hormone reactivity in adult life.

The immune system is highly integrated with other physiological systems. It is sensitive to virtually every hormone, and sympathetic, parasympathetic and sensory nerves innervate the organs of the immune system. The nervous, endocrine and immune systems communicate bidirectionally through common hormones, neuropeptides, and cytokines. Stress induced activation of neuroendocrine pathways has been shown to modulate various physiological systems including the immune system. Stress induced modulation of the immune system has been linked to the expression of inflammatory, infectious and auto-immune diseases. (Committee on Health and Behaviour 2001).

Obesity provides an example of the crucial need for early intervention. Obesity in children is increasing among all sociodemographic groups. Preventing childhood obesity is instrumental in the prevention of heart disease and diabetes in adulthood. Since dietary habits are established in childhood, educating school aged children about nutrition has been demonstrated to assist in the prevention of adult diabetes and hypertension. (Committee on Health and Behaviour 2001).

Recent studies show that the links between health, nutrition and growth in the early years of life and one's health status as an adult are much more numerous and stronger than previously thought. Poor fetal and infant growth have been linked to blood pressure, respiratory function, schizophrenia, chronic bronchitis, acute appendicitis, asthma, Parkinson's disease, multiple sclerosis, chronic pulmonary disease, cardiovascular disease, coronary heart disease and stroke in adulthood. In subsequent years both childhood social and educational factors are strongly associated with physical and mental health outcomes in adult life (Wadsworth, M.E. and D.J. Kuh, 1997; Barker 1998; Ravelli 1999).

Thus, although an investment in basic health and nutritional services for young children can be justified by immediate health and anthropometric outcomes for children, the linkage to their health status as adults heightens the importance of the interventions, particularly the potential savings from effective preventative programs.

There is a growing body of evidence that good early interventions can simultaneously address a range of different conditions and problems resulting in improved outcomes across a range of health, educational, social areas.

The very successful *Strong Women, Strong Babies, Strong Culture Program* in Indigenous communities commenced in 1992 and originally involved three self selected communities<sup>1</sup>. It involves the training of community women workers (or Strong Women Workers, SWW) who participate in antenatal care and who educate women about dangers, prevention and protection in pregnancy. An evaluation of this program showed:

- A decline in the prevalence of low birthweight babies from 20.3% to 11.5%;
- An increase in mean birthweight
- An increase in maternal weight gain;
- A reduction in preterm births were found to account for about half of the increase in birthweight.

The enhancement of protective factors or ‘strengths’ (that is, the creation of resiliency), has become a key facet of strategies to prevent a variety of social ills, including child maltreatment. There has been government interest in further developing the concept of resilience and using it as the basis for Australian community-level interventions, and as a valued part of a policy of promoting family and community health and well being (Tomison & Wise 1999). A ‘strengths-based’ or ‘solution-focused’ approach to practice is based on the development of an effective collaborative relationship with children and their families (De Jong & Miller 1995). The underlying tenet of this perspective is that all families have strengths and capabilities. However, as Durrant notes, a ‘focus on strengths does not deny shortcomings – it suggests that focusing on the shortcomings is often not a helpful way in which to address them’ (Scott & O’Neill 1996:xiii).

Early intervention projects which have shown strong positive cost benefits.

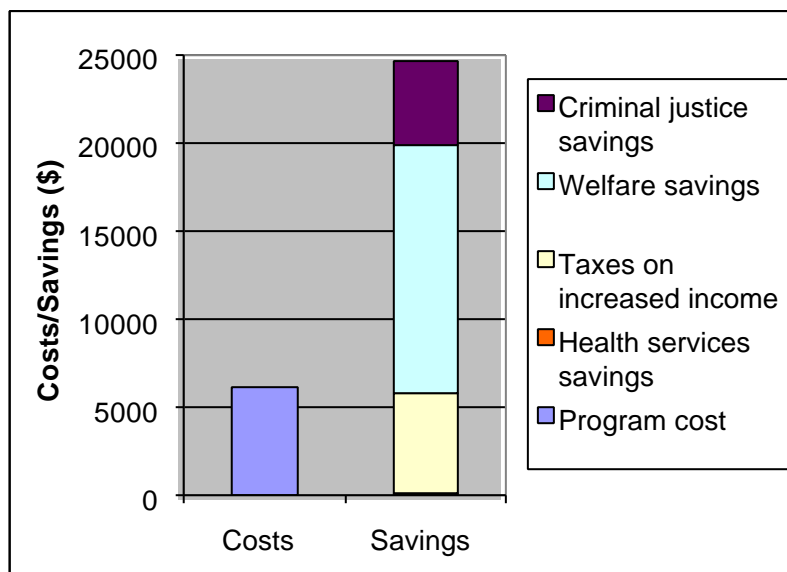
These include

- The Elmira project which comprised home visits to high risk inner city, American families resulted in a reduction of child abuse, decreased use of emergency medical services and increased school readiness. It was estimated to result in over US\$24,000 savings for every US\$6,000 invested (Olds *et al* 1997), and

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<sup>1</sup> Dorothy Mackerass, *Evaluation of the Strong Women, Strong Babys, Strong Culture Program*, Menzies Occasional Papers Issue no.2/98, Menzies School of Health Research, Northern Territory, Australia.

Diagram 4: Savings generated by the Elmira project



Source: Olds *et al* 1997

- The Perry Preschool Project, a small experimental program begun in the early 1960s in the United States, was designed to enable children to participate in an active approach to learning, facilitated by well-trained teachers. The graduates of the project have been followed until the age of 27 years and it has been found that over half of the 58 predominantly African-American, three to four year old children who participated in the project subsequently had better life outcomes as adults compared with a matched group of non-participants. Barnett (1993) was able to calculate that by the age of 27 years, for every dollar taxpayers spent on this preschool program, there was a subsequent saving of over seven dollars. The outcomes of the program included higher levels of school achievement and appropriate behaviour at primary school, lower levels of crime at 15 years of age, fewer arrests at 19 years of age, half the rate of arrests at 27 years of age and higher levels of income and home ownership

A number of studies that have identified social and economic benefits resulting from an investment in prevention of child abuse. For example:

- The U.S. General Accounting Office (1992) estimated that the cost in future lost productivity of severely abused children was between US\$658 million and US\$1.3 billion annually, based on the assumption that the children's impairments caused by the abuse would limit their potential earnings by just 5 to 10 per cent;
- The Michigan Children's Trust Fund (Caldwell 1992) compared the costs of an early intervention program which started prenatally and worked intensively with parents for the first year of a child's life, with the costs incurred when a child is

maltreated. The study concluded that offering early intervention to every family in the state was approximately one-twentieth of the costs associated with abuse or neglect;

- A South Australian study by McGurk and Hazel (1998) attempted to produce a valid account of the fiscal and economic expenditure on child abuse and neglect for the year 1995-96. It focused on the provision of child protection and related services, and with the incidence of child maltreatment conservatively estimated to be 5%. The authors conservatively estimated expenditure to be \$51.59 million. Further costs incurred as a consequence of responding to the after effects of incidents of maltreatment (including child deaths, disability, injury and impairment of subsequent parenting capacity) were calculated to be \$303.33 million, giving a total expenditure of \$354.92 million. *The authors concluded that South Australia was spending more on the consequences of child maltreatment than it earned from wine or wool exports, indicating there was great potential to create economic savings by investing in effective prevention initiatives.*

An overview of early intervention programs like Perry Preschool (Barnett 1993; Zigler & Styfco 1996), Head Start (Zigler & Styfco 1996), and the Elmira Prenatal/Early Infancy Project (Olds, Henderson, Chamberlin & Tatelbaum 1986a; Olds, Henderson, Tatelbaum & Chamberlin 1986b; Olds *et al.* 1997) have demonstrated some improvement in disadvantaged children's lives, and may reduce the number of 'at risk' or maltreating families who will require more intensive support in order to reach an adequate level of parenting and overall functioning. *Early intervention is therefore a vital, cost-effective component of any holistic approach to preventing social ills or promoting social competence* (Barnett 1993; Emens *et al.* 1996; Zigler & Styfco 1996).

The potential exists to address and overcome problems by well-designed early action. Well-executed and well-targeted early intervention programs are initiators of human development. They stimulate improvements in education, health, social capital and equality that have both immediate and long-term benefits for the children participating in the programs. Investments in such programs are in many ways investments in the future of a nation.

A broad program of research should build upon the power of these early pathways to develop effective interventions that might impact on a very broad range of competencies and outcomes in children. To understand the nature and pathways of environmental influences demands a true multidisciplinary approach with epidemiologists, sociologists, economists, psychologists and educationists working with clinical and biomedical researchers.

## More Challenges

The Wills Report (1999) pointed to the need for:

- An effective health and medical research sector built on high impact fundamental research, world class workforce and infrastructure;
- Priority driven research that contributes directly to population health and evidence based health care;
- An industry sector that mutually reinforces the research sector; and
- Increased public investment in a well managed research sector.

To date attempts to implement the recommendations in relation to priority driven research have not been successful despite recent structural and operational changes to the NHMRC and ARC and the deployment across sectors of significant resources to specific health and social initiatives.

The single greatest impediment to the uptake and implementation of the available tools and solutions are the silo structures that pervade across government, research, disciplines and effector arms at all levels. As a result governments have been unable to consistently base policy on evidence or to terminate ineffective, unsustainable programs while successful interventions are plagued by short term funding. Despite an increasing awareness and genuine efforts governments have found it extremely difficult to operate across jurisdictions and sectors. Subsequently there is not a coherent response to research findings, there are gaps and duplication in policy implementation, a lack of sustainability of interventions and an inability to effectively use resources.

Specifically the research effort has a number of obstacles. Although at the cutting edge of research into human development, funding for Australian work is undertaken by a number of different agencies and there is no cogent, transparent way in which this research is brought together comprehensively and effectively. The NHMRC funds research on developmental health issues and the ARC funds research in some aspects of developmental health and associated consequences in education, child care, psychosocial problems and aspects of youth culture and crime. Government departments also fund research through a variety of processes, including tenders and grants.

Both industry and the trade unions have failed to consider their wider responsibilities to the communities in which they operate and to take up the evidence that attention to occupational health and safety and the establishment of worker/family friendly workplaces results in increased profits and sustainability of industry.

There has been a failure by all groups to engage the community in a meaningful way in their pursuits despite the knowledge that this engagement is essential to success of most efforts. There is a strong need for mechanisms to bring all these disparate research

activities together to provide a comprehensive resource for effective intervention. Such a mechanism would also help to address the need for multidisciplinary research.

## Research into action

### Why a partnership?

What is now needed is a strategic alliance between research policy and practice to set the research agenda to investigate problems of joint concern that share common causal pathways and to implement interventions to achieve optimal and coordinated care across services. A national research partnership for the enhancement of early human development would develop collaboratively a coherent strategic and dynamic national research agenda to identify key priorities in informing our understanding of causal pathways and effective intervention.

The mission of the partnership would be to promote evidence-based decision-making at the policy, program, community and individuals level in all aspects related to human resource development over the life course from conception to adulthood. This will be achieved through the development and application of innovative modelling and forecasting capacities. The partnership will inform the broader areas of developmental health as these predict vital social and economic national interests.

### Functions

Functions of the partnership would include:

- Prioritising an intersectional and interprofessional agenda for population-based research into early human development and its consequences for developmental health and well-being throughout the life-cycle;
- Bringing together cross sectoral and cross institutional research groups to undertake collaborative research exploring emerging interface aspects of early human development (eg links between genes, biological changes and early environmental experiences);
- Promoting more effective use of existing data sets to describe patterns of problems, to refine hypotheses, and to inform the national policy agenda for families and children;
- Facilitating specific research initiatives such as undertaking a stocktake of existing data linkage initiatives and exploring the feasibility of establishing more extensive linkages between existing datasets;
- Ensuring the establishment of a clearing house to disseminate results of new research findings;
- Establishing a listserver, newsletter and website for promoting access to online materials and information resources;
- Dissemination of research results to broad audiences at national conferences and workshops and to various stakeholder groups; and

- Advocacy and fund-raising with government, business and philanthropy to underwrite research into the impact of early human development on developmental health and well-being throughout the life-cycle.

### *Feasibility*

Australia has a proven track record in the implementation of collaborative ventures underpinned by research and whole of government approaches to addressing urgent health challenges. There have been stunning successes.

Australia's comprehensive national approach to responding to HIV/AIDS has long been regarded as one of the best in the world. From the endorsement of the first National HIV/AIDS Strategy in 1989 through to the conclusion of the third National HIV/AIDS Strategy in 1999, Australia has recognised the need for coordinated action to combat HIV.

The number of new HIV infections in Australia has continued to fall, with the vast majority of cases still occurring through sexual contact between men. The annual incidence of HIV infection is estimated to have peaked in 1983-84 before declining sharply by the end of 1999. The annual number of AIDS diagnoses in Australia appears to have reached a peak in 1994 with an estimated 950 diagnoses and is estimated to have declined to 196 in 1999.

Professor RGA Feacham (1995) in the evaluation of the National HIV/AIDS Strategy commented:

*Australia is to be commended for the prompt and creative way in which it has responded to this new and special disease. Two features of this response have been of particular importance...first non-partisan political support which has allowed pragmatic and effective programs to operate; second the partnership which has harnessed the energies of those groups most affected by HIV, government at several levels and researchers and health professionals. Australia can be proud of its achievements... All this has been accomplished at reasonable cost.*

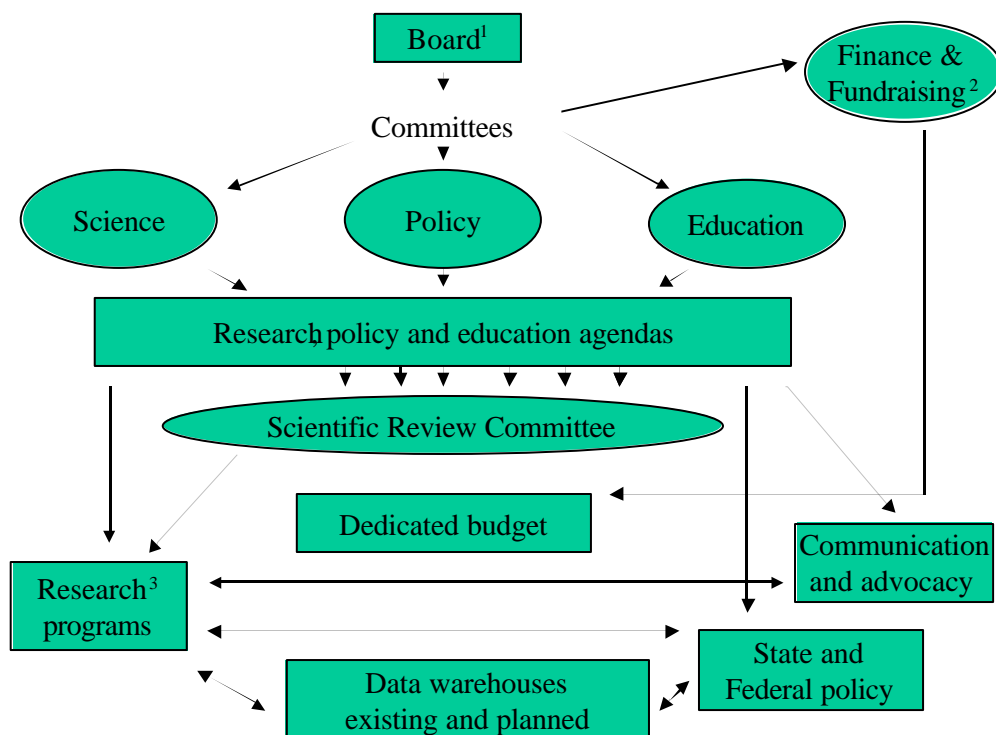
The dramatic reduction in morbidity and mortality due to road injury and trauma is another example. In Australia, the death rate from road traffic crashes declined from a peak of 30.4 per 100,000 people in 1970 to 11.1 per 100,000 in 1994. This decline has been achieved despite the fact that the amount of road travel has almost doubled in this time. In the early 1990s, there was a rapid improvement with a reduction of 31 per cent in road traffic deaths between 1989 and 1994. This decline occurred across all age groups, including young people, and for both sexes. The key to this achievement was intersectoral collaboration and infrastructural support.

A review commissioned by the NHMRC of six areas of success over the past 20 years found major success factors included:

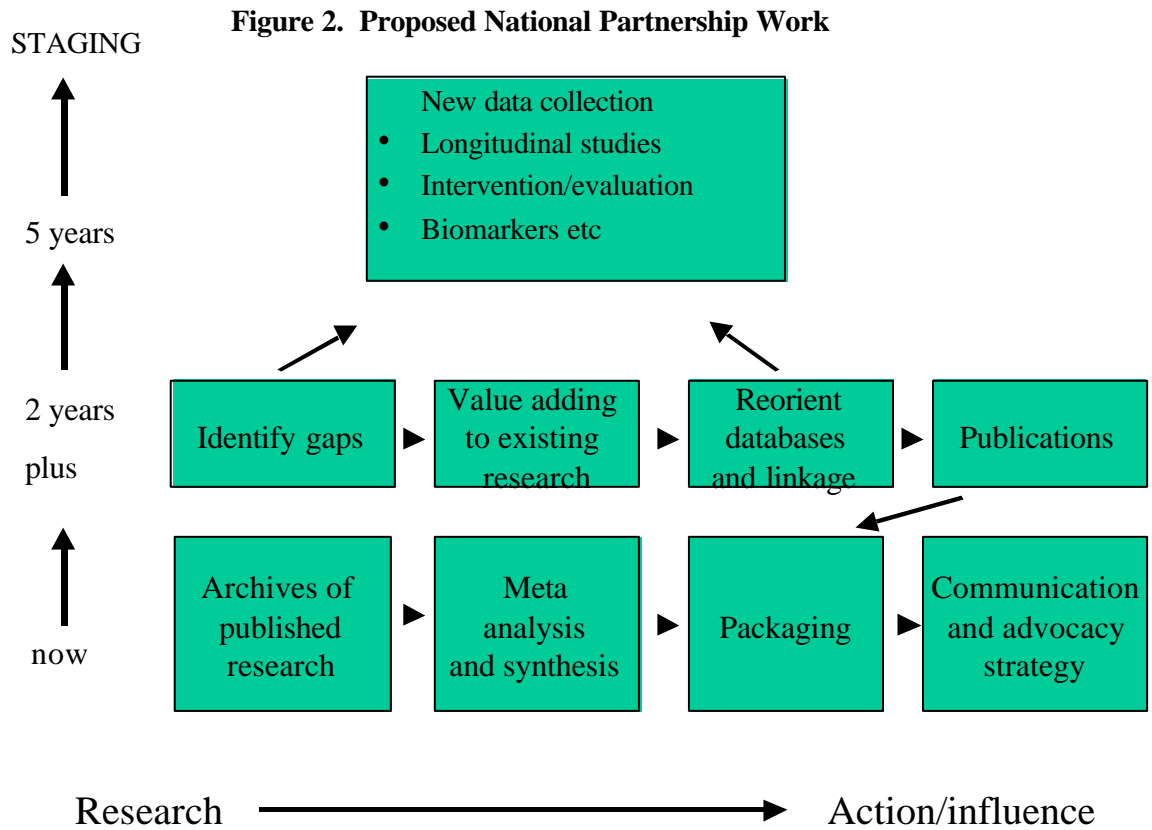
- Comprehensive range of strategies that address ‘causes’ and determinants of problems
- Work with and by other sectors
- Active contribution by the health sector
- Political commitment and clear directions over a generation
- Information about the nature and extent of the problem
- Quality of the research effort
- Workforce development and training

Figures 1 and 2 show a proposed structure based on the HIV/AIDS model, and how the partnership may link with Government, Industry and other stakeholders

**Figure 1. Proposed National Partnership Structure**



1. Company limited by guarantee - tax deductibility
2. Government, grants, philanthropy, corporate sponsors contracts
3. Priority areas RFPs, major national initiatives. See Figure 2.



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