Preface

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The chapter by Cathy Humphreys and Richard Vines begins with a quotation: ‘As the diameter of our knowledge increases, the circumference of our ignorance expands.’ The mission of the Australian Research Alliance for Children and Youth (ARACY) is to better integrate the developing knowledge about early child development and reduce ignorance in society. For ARACY, collaboration is the key to identifying and attacking the important and complex problems that have resisted solutions. They have developed this project in collaboration with their partner institutions, The Benevolent Society and the National Centre for Epidemiology and Population Health at The Australian National University.

This book, entitled Bridging the Know–Do Gap: Knowledge brokering to improve child wellbeing, is a good example of the effect of new knowledge expanding our understanding of human development and the effects of early development on health, learning and behaviour throughout the life cycle. The different sectors of society that are affected by this new knowledge have varying degrees of ignorance about the implications of the new knowledge.

There are a number of historical examples in the literature about the effects of new knowledge on our understanding of the human race and our societies. It took from Copernicus to Newton (more than 100 years) to overcome the belief that the Sun rotated around the Earth. The difficulty of introducing this new knowledge into Western culture was due in part to ignorance and the challenge of new knowledge to existing beliefs and religions. Another example of the translation of the new knowledge into public policy was the application of John Snow’s observations about the effect of the Broad Street pump on cholera in London. In this case, there was evidence that the water supply was causing the cholera epidemic but we did not know why. Because water from the pump appeared to affect the population, the new knowledge was, however—after some controversy—accepted and applied in communities to provide clean water supplies. Only later did we learn that the bacteria in the water were causing cholera. These two examples are among many that demonstrate the effects of new knowledge on human understanding of our planet, social environment, health and wellbeing.

In the twenty-first century, we face a similar challenge of new knowledge testing our present beliefs and understanding of how early human development affects
health, learning and behaviour throughout the life cycle. Until recently, we had a poor understanding of how early child development affects the architecture and function of the brain in early life and sets the neurobiological pathways that affect health, learning and behaviour throughout the life cycle.

Today we understand from work in the developmental neurobiological sciences that the architecture and function of the brain are largely set in early life (neonatal to age six) and that this stage affects the next stages of human development. We are now beginning to understand how this early period of development influences behaviour and learning, as well as the risk of coronary heart disease, high blood pressure, mental illness and many other problems. Many of the health problems will not emerge until adult life and it has been difficult for investigators to focus on how the early years of neurobiological development set pathways that affect health in later life. Our concepts of health and health care are based largely on studies of the health problems that occur in adult life, not how the risks are in fact set up in early development. This is a know–do gap.

Another example of the gap between our knowledge and what we do comes from studies of literacy. The primary belief until recently in education has been that schools and parents are crucial for the development of literacy and cognitive ability in young children. Today we know that the base for literacy development in the school system is significantly influenced by the development of the brain in the early period of human development. Despite this new knowledge, however, we still put great pressure on the school system to improve literacy rather than increasing our investment in early development.

In developed countries such as Canada and Australia, about 25 to 30 per cent of children entering compulsory education at age six demonstrate poor early development in terms of the architecture and function of the brain. The largest percentage of children showing poor early development is in the lowest socioeconomic class. About 40 per cent of the children in this class show poor early development, while 60 per cent demonstrate good development. About 12 per cent of children in the highest socioeconomic class show poor early development. Measures of early child development—when plotted against the socioeconomic background of the children—show a linear gradient. Although those in the lowest social class are the most affected by the social environment, 60 per cent of the children in the lowest social class still do well. Because of the size of the middle class, this finding demonstrates that the largest number of children with poor early development is in the middle class. Thus, although programs to improve early development for children in the lowest social class are important, targeting this population alone will miss children in the middle class and the higher socioeconomic class. These children would also benefit from making the new knowledge about early development available to all
families, communities and institutions concerned with the first stage of human development. This finding has implications for public policy in the sense that all programs to improve human development should be universal. This is another example of the know–do gap.

Human development can be broken down into several stages. The first stage is from conception to age six. The second stage is from age seven to age fourteen. The third stage is from age fourteen to age twenty. The fourth stage is adult life. Each of these stages affects the next stage of development. The Economist magazine has recently published a series of articles about the demand in society for talent to cope with the exponential growth in new knowledge and technologies (see, for example, Wooldridge 2006). They point out that building literate, pluralistic, stable democratic societies requires that if we are to continue our experiments in civilisation, societies will have to ensure equity in early development to have a talented adult population in the future.

Today we better understand how experience-based brain development in the early years of life sets neurological and biological pathways that affect health (physical and mental), literacy and learning, and behaviour throughout the life cycle. It is important to recognise that since all the neurons in an individual’s brain have the same DNA, there have to be biological pathways during early development that affect the function of the DNA in neurons. This makes it possible for neurons during early development to differentiate for their functions in vision, hearing, emotions and other neuron functions. The regulation of neuron function is influenced by epigenetics and micro-RNAs. Experience in early life affects neuron function in different parts of the brain. Identical twins have the same DNA in their neurons, but, because of these biological pathways that can alter the function of normal DNA, identical twins as adults can have a 20–30 per cent variance in behaviour. It appears that these processes, which affect normal neuron function, take place during the early period of development. In assessments of this neurobiological process, it has been demonstrated that there are qualitative differences at the different stages of development. There is something fundamentally different prenatally versus infancy versus childhood versus adulthood. We also know that higher levels of brain circuits depend on precise reliable information from lower levels in order to accomplish their function. Sensitive periods for development of lower-level circuits end early in life. The higher-level circuits remain plastic for a longer period.

This new knowledge about how stimulation in early life affects the architecture and function of the brain has ramifications for almost all academic disciplines. This new knowledge is obviously of enormous importance for the health sciences, education, economics, psychology, political science and other disciplines. One of the challenges in closing the gap between what we now know and what we do in regard to human development is that most adults working in health
care, education, economics, political science, and so on, do not yet have a common base of understanding of how experience-based brain development in the early years of life affects health, learning and behaviour. It is difficult for individuals brought up in the existing institutional and disciplinary structure of our universities to introduce into their work this new knowledge about neurobiological development in the early years. We have increased demands in the healthcare sector for more money for diagnostic and treatment services, but little demand for the support of early human development to prevent health problems in adult life and enhance talented individuals in adult life. In the case of mental health problems and addiction, in Canada, the cost to individuals and society is more than $100 billion per annum. The cost in Canadian society for the effects of antisocial behaviour (crime and violence) on individuals and society is also more than $100 billion per annum. Although the evidence is robust about these costs, it is difficult to apply them to prevention and enhancing the talent of the population to improve early human development. The cost of a universal program to improve early child development in Canada for all families with young children would be about $20–22 billion per annum. The political issue around this cost equation is that the benefits from improving early human development would not be manifest until adult life. It is therefore difficult for politicians to take steps to put in place universal high-quality early human development programs in their societies. The Scandinavian countries appear to be better able to do this than English-speaking cultures.

The chapters in this book bring out the difficulties of establishing the trans-disciplinary or interdisciplinary studies that better link the results from different disciplines to provide a more integrated picture of how the social environment gets under the skin to affect the neurobiological pathways that affect the health and wellbeing of populations. The chapters are all in keeping with the role of ARACY and its partners to identify and tackle important and complex problems that have resisted solutions in most societies. Further, the chapters make the point that these key problems can be addressed by sharing strategic thinking, research design and the findings. The significance of ARACY and its partners in this is that they represent new institutions that can achieve trans-disciplinary research and improve our understanding of early development in respect to health, learning and behaviour. The success of ARACY and its partners in doing this will reduce the risk of the exponential growth in new knowledge about human development increasing the circumference of our ignorance about early human development.
References and further reading


