

Centre for Community Child Health



CONSTRUCTING A NEW NARRATIVE OF OUR FIRST 1000 DAYS: Synthesising the evidence and framing the messages

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Abstract

The developmental period from conception to the end of the child's second year has become known as the first 1000 days, a catchphrase that has become the rallying point for a number of Australian and international initiatives. While some of these have a general focus, others are more narrowly focused on issues such as nutrition or on specific populations such as Aboriginal children. The reason for focusing on this specific period is the growing body of evidence which shows that experiences before and during this period can have life-long consequences for health and well-being.

This presentation will briefly review this evidence, focusing on three key concepts that are supported by the growing body of evidence regarding early development: developmental plasticity and the DOHaD hypothesis; social climate change and the 'mismatch' hypothesis; and ecological impacts on development and the social determinants of health and disease. Collectively, the evidence relating to these key concepts is transforming our understanding of how children develop and highlight the critical role played by exposures and experiences during the very earliest stages of development.

This new narrative has profound implications for public health, but unpacking the public health implications has proved challenging. Science does not speak for itself, but must be synthesised and interpreted. There is a real danger of overstating the nature and importance of the first 1000 days, and also of oversimplifying the messages. Competing values can also shape the ways in which the evidence is interpreted. The presentation will consider some of these challenges, and discuss implications for future action.

Introduction

The developmental period from conception to the end of the child's second year has become known as the first 1000 days, a catchphrase that has become the rallying point for a number of Australian and international initiatives. While some of these have a general focus, such as the work of a cross-parliamentary group in the UK Parliament (Leadsom, Field, Burstow & Lucas, 2013; WAVE Trust, 2013, 2015), others are more narrowly focused on issues such as nutrition (Save the Children, 2012; Thousand Days, 2016) or on specific populations such as Aboriginal children (Arabena et al., 2015; Arabena, Ritte & Panozzo, 2016).

While early childhood development is a well-researched area, there are several reasons why a new review of the evidence was warranted. First, research in this area is rapidly advancing, and our understanding of the specific mechanisms that impact upon development is becoming more and more detailed and nuanced. Second, the new research has revealed whole aspects of biological functioning that were not previously recognised as playing a role in development, such as telomere effects and the role of the microbiome. Third, the first 1000 days is the period of maximum developmental plasticity, and therefore the period with the greatest potential to affect health and wellbeing over the life course.

As a member of a partnership including Bupa and the Bupa Health Foundation, the Australian Research Alliance for Children and Youth (ARACY) and PricewaterhouseCoopers (PwC), my colleagues and I at the Centre for Community Child Health were commissioned to prepare a summary of what is known regarding the factors that shape development during first 1000 days. This paper (Moore, Arefadib, Deery and West, 2017) was intended to inform a national campaign about the importance of early childhood development, from conception to two years.

The findings from this evidence review are summarised briefly below, followed by a review of responses to the paper and to the first 1000 days agenda in general.

Evidence paper

Our synthesis of the evidence of the factors that impact on development during the first 1000 days drew upon evidence from a wide range of disciplines and practices, including biology, genetics, epigenetics, molecular biology, microbiology, immunology, neurology, medicine, developmental psychology, epidemiology, and sociology.

One of the key learnings was that the mind and brain and body are inextricably linked, and that it is not just the brain that is being shaped by early experiences. This extensive quote from the paper summarises this important insight:

In seeking to understand early development, there has been a tendency to focus on neurological development at the expense of other aspects of development. Thus, efforts to disseminate new research knowledge have used the metaphor of 'brain architecture' to convey the sense of the importance of early neurological development (National Scientific Council on the Developing Child, 2007), and discussed how positive early experiences build neuronal connections and adverse experiences disrupt them (National Scientific Council on the Developing Child, 2005, 2006). This way of framing early development reflects an underlying belief in the importance of the brain as the seat of personhood and learning.

However, as Moore (2014) has noted, 'framing brain development in terms of building neuronal connections and brain architecture fails to capture the fact that brain functioning is not purely

cognitive, that ‘learning’ is not purely conscious, that the brain is not purely skull-based, and that the brain is closely linked with other key bodily systems.’

First, the brain is not purely cognitive, but is also profoundly emotional (Davidson & Begley, 2012). Thus, our emotions directly influence the functions of the entire brain and body, from physiological regulation to abstract reasoning. In fact, emotion serves as a central organising process within the brain, and our ability to organise our emotions directly shapes the ability of the mind to integrate experience and adapt to future stress (Siegel, 2012).

Second, learning is not a purely conscious process. Much of our most important emotional and interpersonal learning during the first few years occurs before we have developed the neurological capacities for conscious awareness and memory (Cozolino, 2016; Siegel, 2012). Thus, many of the most important aspects of our lives are controlled by reflexes, behaviours, and emotions learned and organised outside our awareness.

Third, the brain is not just skull-based, but ‘embodied’, being shaped by messages from all over the body via the central and peripheral nervous systems. This embodied brain shapes and is shaped by both its external and internal environments (Barrett, 2011; Beilock, 2015; Claxton, 2015; Craig, 2015; Edelman, 2006; Johnson, 2006; Varela, Thompson & Rosch, 1991).

Finally, the brain is not a stand-alone bodily system, but is intricately connected to other major bodily systems, including the immune, endocrinal, metabolic, gastrointestinal, cardiovascular, enteric and musculoskeletal systems (Barrett, 2011; Beilock, 2015; Claxton, 2015; Damasio & Damasio, 2006; McFarlane, 2017; Mayer, 2016). These systems shape and are shaped by each other, and function as an integrated mind-brain-body system. This means that what is ‘learned’ in the prenatal and first two to three years of life affects not only the neurological system but also the other bodily systems to which the brain is connected, with potentially profound consequences over the life course (Moore, 2014a).

Evidence to support this intimate link between mind, brain and body continues to accumulate (Barrett, 2017; Damasio, 2018). For instance, the preeminent neuroscientist Antonio Damasio describes the relationship between mind, brain and body thus:

Mind and brain influence the body proper just as much as the body proper can influence the brain and mind. They are merely two aspects of the same being. Feelings and reason are involved in an inseparable, looping, reflective embrace. The embrace can favour one of the partners, feeling or reason, but it involves both. The making of minds – and of feelings in particular – is grounded on *interactions* of the nervous system and its organism. *Nervous systems make minds not by themselves but in cooperation with the rest of their own organisms.* (Damasio, 2018)

With this understanding in mind, our evidence review focused on three key bodies of evidence regarding early development:

- *developmental plasticity and the DOHaD hypothesis* – topics covered included developmental plasticity, genetics, epigenetics, synaptic pruning, telomere, the developmental origins of health and disease, preconception effects, and non-genetic intergenerational transmissions
- *social climate change and the ‘mismatch’ hypothesis* – topics covered included social climate change and the ‘Great Acceleration’, evolutionary mismatch resulting epidemics of non-communicable

diseases such as allergies and obesity, and the role of the microbiome and the idea of humans as 'superorganisms'

- *ecological impacts on development and the social determinants of health and disease* – topics covered included the social determinants of health and disease, the ubiquity of social gradients, the role of poverty, and Aboriginal health and wellbeing

The first of these bodies of evidence details the neurobiological changes that occur as result of exposures and experiences – how experience 'gets under the skin' – while the second and third bodies of evidence relate to the external sources of the exposures and experiences that are the direct cause of these changes.

Our review also looked at the evidence regarding the impact on development in the first 1000 days of a series of series of specific factors:

- *Child characteristics* – impact of children's temperamental biases, coupled with early life experiences, on development, especially for those who are differentially susceptible
- *Parental and family characteristics* – impact of quality of interpersonal relationships, family functioning (including family violence), and family structure on development
- *Community environments* – impact of community and social support networks on parent's caregiving capacities
- *Physical environments* – impact of the quality and security of housing, built environments, and access to natural environments on child development and family functioning
- *Environmental toxins* – impact of exposure to environmental toxins in pregnancy and infancy
- *Nutrition* – impact of maternal nutrition before and during pregnancy, and of child nutrition in infancy
- *Substance use and abuse* – impact of exposure to alcohol, smoking and drugs during pregnancy and infancy
- *Stress* – impact of maternal stress in pregnancy, and parental stress in infancy
- *Adverse childhood experiences* – cumulative impact of adverse early life experiences on later life outcomes

Collectively, the evidence relating to these key concepts is transforming our understanding of how children develop and highlight the critical role played by exposures and experiences during the very earliest stages of development.

Our evidence review also looked at what happens after the first 1000 days.

Long-term effects of early experiences and exposures

There are two key questions to be considered: what are the mechanisms guiding development and shaping health and wellbeing beyond the first 1000 days, and how long lasting are the effects of early experiences and exposures?

What are the mechanisms guiding development and shaping health and wellbeing beyond the first 1000 days? Beyond the first 1000 days, children's and young people's ongoing development and health are shaped by a combination of three processes:

- *Biological embedding* – the way in which biological development has been shaped by their earliest experiences and exposures
- *Accumulation effects* – the extent to which subsequent experiences and exposures are predominantly positive or negative
- *Developmental escalations of risk over time* – the extent to which negative experiences induce further negative experiences

Although they are distinguishable from one another, these pathways are not mutually exclusive.

The underlying message here is that development is not a simple process where by an experience or exposure at one point in time will lead directly to a developmental outcome at a later point. Development is always

- *contextual* – shaped by environmental experiences and exposures,
- *transactional* – the child both shapes and is shaped by the environment, and
- *multi-determined* – outcomes are the result of a combination of factors rather than any single factor

How long lasting are the effects of early experiences and exposures? While the first 1000 days is the period of greatest developmental plasticity, developmental plasticity does not end there, but continues to play a role in our ongoing development and functioning throughout our lives. Indeed, there is a second period of heightened developmental plasticity in adolescence (Patton et al., 2016).

These changes can be for better or worse: the effects of early adverse experiences can be ameliorated through exposure to safer, more responsive and more stimulating environments, but a positive start to life may be compromised if later social and physical environments are markedly less positive. Our ongoing developmental plasticity means that epigenetic changes can be modified, telomere loss restored, and brains rewired. However, the degree of plasticity is reduced – it takes stronger and more sustained. However, some biological changes may not be so reversible.

The prenatal biological sequence and timetable for some organ development is completed at birth and cannot be altered, so that any perturbations resulting from adverse exposures, infections or random mutations during pregnancy can leave lasting effects. Some of these changes have ‘sleeper’ effects, being detectable many decades after the precipitating experience while having little obvious impact on health and wellbeing during the intervening period environmental experiences to change us

Response to evidence paper

The First 1000 Days evidence paper (Moore et al., 2017) was released as an online document, and has generated considerable interest and a steady stream of requests for presentations and workshops.

What have we learned from these presentations? First, one hour is only sufficient to cover the core story of what is known about the general processes whereby experience becomes biologically embedded, what the long term effects are, and how we might begin to frame the implications – but is not sufficient to cover the specific factors that shape development. The material is so dense and contains so much new material that people find it difficult to begin thinking about the implications for policy and practice, at least on the basis of a first hearing.

Most people appear to respond in two ways – by personalising the story (thinking about how the processes described play out in their own lives), and by thinking of the implications for their own work (rather than the

wider systemic or social implications). Without a framework for exploring the implications, people have trouble seeing what they should be doing in the light of the evidence.

Critiques and objections

While the response to the paper itself and the presentations has been very positive, there have been some published critiques of the first 1000 days evidence and how it has been interpreted. These critiques or objections include the following.

- *Many children survive adverse early experiences, which means that such experiences do not necessarily determine subsequent development.*

Comment: The evidence summarised in the paper is general, not specific - it does not predict what happens at an individual level. Therefore there will always be individuals who experience adverse environments yet live long, healthy and productive lives. Such examples do not disprove the findings, but do make it harder for people to understand and accept them.

What determines development, biological and neurological, over time is the degree to which the environments to which the person is exposed remain the same. As James Heckman and colleagues have argued (Conti and Heckman, 2013; Cunha and Heckman, 2010), early investment is more cost effective, but positive long term outcomes require ongoing investment beyond the early years. One of the reasons why early experiences shape later development is that the environments that produced the original adaptations tend to remain unchanged; if we can change these environments in significant ways, then we can shift the children's developmental trajectories.

- *Claims about significance of the first 1000 days are oversimplified and/or greatly exaggerated.*

Comment: Those who make this claim (eg. Wastell & White, 2017; Gillies et al., 2017) do so in the UK context, focusing on a number of high profile reports and initiatives which do indeed make exaggerated claims about the nature and significance of the evidence. These claims are not, by and large, made by researchers themselves, but by those interpreting the evidence – the researchers are much more circumspect about making causal long-term claims about the early years. This highlights the need to be very careful about reporting what the evidence about early experiences and exposures means for life course development.

Another problem with this particular line of criticism is that it focuses on interpretations of the neurological evidence, and does not consider any of the evidence regarding the impact of early experiences and exposures on biological development and on health and well-being over the life course. This narrow focus on brain development is common in discussions of the first 1000 days. Our review of the evidence shows that the mind-brain-body-microbiome function as a deeply interconnected system, that what happens to any bodily system affects and is affected by what is happening in other bodily systems, and that the first 1000 days shape neurobiological development and functioning, not just brain development.

- *The first 1000 days evidence is being used to blame poor parents for failing their children, and to justify actions to correct these failings rather than recognising the contribution of impoverished environments*

Comment: This criticism relates to how the evidence is interpreted and translated into policy and practice – it is not a critique of the evidence itself. Such critiques (eg. Featherston et al., 2014; Gillies et al., 2017) have appeared in the UK in the wake of austerity economic policies, and seek to challenge a child

protection culture that has become ‘mired in muscular authoritarianism towards multiply deprived families’ (Featherstone et al., 2014).

This appears to be a valid concern, and highlights the need to frame the implications carefully so as to pre-empt any interpretations that primarily target vulnerable families. In the evidence paper, we offer several frameworks for thinking about the implications. One of these frameworks suggested that there are four courses of action that we can take: conduct more research, disseminate the first 1000 days message, improve services during the first 1000 days, and change the environment. The default response from governments and service providers is to seek improvements in services, but the message of our evidence review suggests that it is more important to change the environment, that is, to seek to improve the conditions under which families are raising young children. In the UK, the service option has been the preferred approach, and the impact of environmental conditions on family functioning and child development have been discounted – in fact, the austerity measures have actually worsened rather than improved the conditions under which families are raising young children.

- *Society has improved greatly as the result of social climate change (eg. people are living longer, healthier lives), so the picture presented in the paper is unbalanced.*

Comment: This view is championed by Pinker (2018) who documents a wide range of ways in which scientific and other advances have led to steady improvements in people’s lives. While Pinker’s evidence is persuasive, it applies to humanity as a whole, and ignores the personal. He also ignores the unintended side effects of various forms of progress – some resulting from our tendency to overshoot, some from incidental damage caused by new technologies, foods, living conditions etc. For instance, there is no mention of the epidemics of non-communicable diseases that are now the major focus of health services, nor the impact of environmental toxins on health and development. Nor is there any acknowledgement of the mismatch between the conditions we now live in and the conditions our bodies are evolutionarily designed to expect in order to develop and function well. Overshoots can, of course, be corrected in time, and science may well be able to find ways of preventing or undoing many of the toxic side effects of progress, thereby maintaining the steady improvements in universal living conditions and wellbeing. However, this can only happen if these side effects are recognised and addressed effectively.

What these critiques indicate is that it is dangerous to overstate or oversimplify the evidence, as this can lead to policies and practices that are not justified and not necessarily in the best interests of children and families. The implication is that we must be very careful about how the messages of the first 1000 days are framed, and what action should be taken to optimise development during this period. It also implies that this is not something that should be left to chance or left to others to do: we should undertake the framing of messages and unpacking the implications for action ourselves.

Key messages and implications

In framing the messages, the following key points should be kept in mind.

- Our first 1000 days story is not about determinism, either biological determinism (via genetics) or environmental determinism (via epigenetics / social determinants etc.). What happens in the first 1000 days *can* have lifelong consequences, but whether it does or not depends to a significant extent on subsequent experiences and exposures. We retain a measure of developmental plasticity throughout our lives, and are therefore capable of change, given the right circumstances.
- Much of the evidence regarding effects is correlational, not causal. While we now know much more about the processes by which experiences become biologically embedded, we do not know enough to be able to

predict or explain what happens to particular individuals - and we may never be able to do so - at an individual level, the dynamics may be so great that it becomes unknowable.

- We cannot protect children (or families) from adverse experiences, and indeed it may be important not to try and eliminate all such experiences. What we should be concerned about is exposure to *sustained* adverse experiences and environments. We should also take our cues for action from parents themselves, providing support when they feel they need it rather than trying to intervene in natural processes of adjustment and adaptation.
- Nor is it a story about blame - blaming our parents (particularly mothers), or ourselves – or capitalism or politicians. No one is to blame - we are all implicated, just as we are in the climate change story. Nor is any single person responsible - parents are not solely responsible for the welfare and upbringing of their children – we are collectively responsible for ensuring they have the conditions that enable them to care for their children as they (and we) would wish.
- Science does not speak for itself, but always has to be interpreted – our first 1000 days paper is only one way of interpreting of the evidence. This interpretation constitutes as story or narrative that heightens our awareness of the processes (biological and environmental) that shape development and wellbeing, but also tells us something about what we are as a species and who we are as a society.
- Unpacking the implications is not a task that should be left to experts and professionals exclusively – the first 1000 days story has implications for everyone in society, so we should all be provided with the basic information and given the chance to say what action should be taken. Allowing properly informed parents and young people to draw their own conclusions can be a more powerful way of producing change than providing them with expert recommendations.
- In framing the messages, we need to take account of all aspects of development – even the careful work undertaken by organisations such as the Frameworks Institute can lead to lopsided messages (eg. an overemphasis on brain development) if they are not working with a full understanding of all the biological processes underpinning development.

What is the best way of approaching the task of unpacking the implications of the first 1000 days evidence? In our evidence paper, we offered three complementary frameworks for considering the implications of the evidence.

The first framework focuses on three distinct developmental periods during the first 1000 days when actions to promote better outcomes can be taken: *preconception*, *pregnancy* and *infancy*. Actions at each of these levels need to be embedded in an intergenerational, cradle-to-cradle, life-course approach to promoting universal health and wellbeing (Halfon et al., 2018).

The second framework focuses on the major factors known to shape development during the first 1000 days and considers what actions can be taken to promote health in each area:

- *cellular health* – eg. the ‘Telomere manifesto’ (Blackburn & Eppel, 2017)
- *microbiome health* – eg. ensuring the early establishment of a healthy and diverse microbiome in infants
- *nutritional health* – eg. promoting more healthy food environments, and reforming the food industry
- *environmental health* – eg. reducing exposures to environmental toxins in physical environments, food, and consumer products

- *relational health* – eg. helping parents establish positive relationships with their infants, and ensuring that the parents themselves have positive social support networks

The third framework identified four courses of action that are feasible:

- invest more in biomedical research and treatment,
- disseminate the messages derived from the evidence,
- provide service-based interventions to promote effective parenting or to address specific problems, and
- change the environments in which families are raising young children.

There can be no question about the need to continue *investing in biomedical research and treatment*. However, researchers themselves caution that we should not expect any startling new breakthroughs any time soon. Our understanding of the immensely complex neurobiological processes underpinning developmental plasticity is still too limited to show us how we can safely intervene at the genetic, epigenetic or cellular levels.

In *framing public health messages*, there are at least three categories of messages to be developed: messages for general public, messages for professionals and practitioners, and messages for policy makers. In addition, there is obviously considerable scope for professional training, since even experienced practitioners are unlikely to have learned about this new evidence or its implications.

In considering how to *improve service-based interventions*, we can use the first of the frameworks listed above and consider what needs to be done to provide more effective services during the preconception, pregnancy and infancy periods.

In considering how to *change the environments in which families are raising young children*, our evidence paper suggested a number of environmental factors known to have an impact on family functioning and child development. These include reducing poverty, increasing housing security, building social networks, humanising community environments, and reducing exposure to environmental toxins.

None of these four courses of action on their own are likely to produce significant sustainable changes in outcomes during the first 1000 days, and there a strong case for arguing that we should be acting on all four fronts. The default approach has been to focus on improving services, but our first 1000 days analysis suggests that we should be focusing much more on changing the environments in which families are raising young children.

Validating and updating evidence

Further evidence regarding the first 1000 days continues to accumulate. There have been a number of books focusing on first 1000 days published since evidence paper was released. These include:

- Thurow (2017) – on nutrition in third world countries
- Karakochuk et al. (2017) – an edited book on the biology of early nutrition
- Biesalski et al. (2016) – an edited book on malnutrition in the first 1000 days
- Leach (2017) – an edited book on a range of aspects of early childhood development in the first 1000 days

Three of these books focus exclusively on nutrition and its effects during the first 1000 days. While the fourth book takes a wider perspective of the influences that shape development during the first 1000 days, it does not integrate these diverse contributions into a coherent synthesis or narrative. As noted earlier, other accounts and critiques of the first 1000 days tend to focus on brain development. Our account remains the only one so far to integrate evidence from a comprehensive range of sources and show how these shape both biological and neurological development over the life course.

In addition, we have accumulated over 150 pages of new evidence on topics covered in our paper, and more is being added daily. We do not have funding to process this volume of material thoroughly, so are simply 'parking' it in an organised fashion pending obtaining funding to support the ongoing updating of the research.

Another issue concerns the need to enlist a network of disciplinary experts to help validate and update the evidence. Our paper draws on a wide range of disciplines and bodies of knowledge, and it is important to ensure that our understating of the evidence in each area is valid and up-to-date. To ensure the accuracy of our work, it is essential that we build a network of specialists willing to focus on the first 1000 days in their own field. A dedicated website on the first 1000 days would greatly facilitate such networking and ongoing learning.

Among the many unanswered questions are the following:

- What aspects of biological development are fixed at birth and cannot be changed by subsequent experiences? (Prescott, 2015)
- Where are the earliest memories held and what form do they take? These memories are preconscious and prelinguistic, and therefore inaccessible to conscious retrieval, but are thought to exert a significant influence on our subsequent development.
- How does 'the body remember' (Rothschild, 2000, 2017) and 'the body keep score' (van der Kolk, 2014)? These are terms used by therapists studying post-traumatic stress disorder, and refer to the way in which bodily memories of trauma are dissociated from conscious memories.

Disseminating the evidence

As noted earlier, the original evidence paper has been widely circulated. CCCH has now followed this up with a Policy Brief (CCCH, 2017), summarising the findings. However, both these documents have been released as 'grey literature', that is, as freely downloadable documents that are directly accessible by policy makers and practitioners. We have not yet sought to publish a version in an academic journal where it would be subject to peer review, and therefore our interpretation of the evidence has not reached a wide academic audience. Since these are the people who conduct the research we have been synthesising, we need to redress this oversight and prepare a paper or papers for publication in a refereed journal.

Other ways of disseminating the evidence is to run workshops. To allow enough time to consider the implications of the evidence, these would need to be full day workshops, and should include a framework for considering the key messages and implications for policy and practice. It has been suggested that one of these could be held in each of the state capital cities. Some support funding for such a national roadshow would be needed.

Conclusions

What is the way forward for this first 1000 days initiative? This analysis of the current situation regarding the first 1000 days initiative suggests the following priorities:

- Establish a process for continuously or periodically updating the evidence
- Establish an expert reference group to ensure the accuracy of the interpretations in specific fields and to help keep the evidence updated
- Create a dedicated website to support the dissemination of emerging evidence, and networking among relevant experts
- Develop an evidence-informed discussion paper on the key messages and the implications for policy and practice
- Share the information with all those who most need to know, and help them identify the implications and decide what actions are needed to address them

Most (if not all) of these priorities are only achievable if further funding and resources are made available.

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