THE FIRST 1000 DAYS: WHY THEY MATTER AND WHAT THEY MEAN FOR US

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OUTLINE

• Why focus on the first 1000 days
• Relationship between mind, brain and body
• Biological embedding and the DOHaD hypothesis
• Social climate change and the mismatch hypothesis
• Social determinants of health and disease
• Specific factors shaping health and development
• Long-term implications of early experiences and exposures
• Implications for action
• Take away messages

WHY FOCUS ON THE FIRST 1000 DAYS?

• 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

WHY FOCUS ON THE FIRST 1000 DAYS (cont)

There is new evidence to support three key concepts regarding the earliest stages of development:
• Biological embedding and the developmental origins of health and disease (DOHaD)
• Social climate change and the ‘mismatch’ hypothesis
• Social determinants of health and disease.

Collectively, evidence relating to these key concepts transforms our understanding of how children develop and highlights the critical role of the very earliest stages of development – the first 1000 days.
RELATIONSHIP BETWEEN MIND, BRAIN AND BODY

• Recent accounts of early development have focused 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.
• This way of framing early development reflects an underlying belief in the importance of the brain as the seat of personhood and learning.
• However, this 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.

A MODEL OF THE HUMAN NERVOUS SYSTEM

MIND, BRAIN AND BODY (cont)

• First, the brain is not purely cognitive, but is also profoundly emotional: 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.
• 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.
• Thus, many of the most important aspects of our lives are controlled by reflexes, behaviours, and emotions learned and organised outside our awareness.

MIND, BRAIN AND BODY (cont)

• 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.
• Fourth, the brain is not a stand-alone bodily system, but is intricately connected to other major bodily systems, including the immune, endocirnal, metabolic, cardiovascular, and muscular and skeletal systems.
• These systems shape and are shaped by each other, and function as an integrated mind-brain-body system.
• This means is 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.
1. BIOLOGICAL EMBEDDING AND THE DEVELOPMENTAL ORIGINS OF HEALTH AND DISEASE (DOHaD) HYPOTHESIS

- Developmental plasticity
- Epigenetics, synaptic pruning, and telomere effects
- Role of the microbiome – humans as ‘superorganisms’
- The developmental origins of health and disease
- Intergenerational transmissions

DEVELOPMENTAL PLASTICITY

- One of the most significant features of human biology is our capacity to adapt to different social and physical environments: this capacity is known as developmental plasticity.
- While we retain some capacity to adapt throughout our lives, developmental plasticity is at its greatest in the first 1000 days or so of life, and is plays an important role in development from the moment of conception.
- This capacity to adapt makes the human species both versatile and vulnerable at the same time: the changes made might be adaptive for the immediate environment, but they can come with long-term costs, both psychologically and physically.

DEVELOPMENTAL PLASTICITY (cont)

- Adaptation involves a process known as biological embedding, underpinned by two central mechanisms:
  - epigenetics (whereby the ‘genes listen to the environment’)
  - synaptic pruning (whereby the ‘brain listens to the environment’)
- In both cases, developmental experiences and the social context in which they occur can become biologically embedded with lifelong impacts on health and other outcomes.
- Biological embedding also occurs at a cellular level through what are known as telomere effects.

GENETICS

- The two competing genome coding projects that took place in the 1900s revealed that the number of genes in humans were not of the order of 100,000 as previously estimated but as few as 20,000, less than some animal and even plant species.
- Very few characteristics are the product of a single gene – most are highly polygenic, that is, influenced by thousands of genes, each with tiny effects.
- Despite the dramatic lowering in the cost and speed of genomic analyses, the results of commercially available testing offer little meaningful predictive power.

GENETICS - ‘NATURE VS NURTURE’

- The Dependent Gene: The Fallacy of “Nature vs. Nurture”.
  Peter J. Richerson and Robert Boyd, Chicago University Press.
- Lifelines: Life Beyond the Gene.
  Steven Rose, Vintage.
- Genes and Behaviour.
  Michael Rutter, Blackwell Publishing.
NATURE VS NURTURE
• Genes always have their effect either in correlation with or in interaction with the environment – genes always filter their effects through the environment.
• It’s a case of nature via nurture, not nature versus nurture.
• Even if attributes are heritable, they can be modifiable – no matter what the heritability of a set of traits, they can develop very differently in different environments.
• Each individual’s history reflects an inseparable blend of how the environment, random events, and the person’s temperament (or genetic susceptibility) all contribute to the creation of experiences in which adaptation and learning recursively shape the development of the mind (Schore, 1997).

EPGENETICS
• Parents shape their children’s health and development through genetic transmission, but genes do not determine development or behaviour.
• The way that genes are ‘expressed’ depends upon their interaction with environmental factors: these interactions alter the expression or function of genes without altering their DNA sequence – these are known as epigenetic effects.
• Epigenetic changes may also be inherited, so that the experiences of mothers or even grandmothers can be transmitted across generations.
• Even the health and physiology of parents prior to conceiving a child can affect the child’s health and development.
• While these changes may, in time, be rectified, in the short term they contribute to non-genomic transmission of risk.

SOCIAL GENOMICS
• Nearly all human diseases are influenced by complex interactions between inherent genetic susceptibility and exposure to environmental factors (e.g. low socioeconomic status, social stress, conflict, isolation, racial discrimination, and air pollution).
• Social genomics is the field of research that examines why and how these different environmental factors and processes affect the activity of individual genes and the overall genome.
• By identifying genetic variations, the hope is that we can tailor environments to match a person’s particular needs or susceptibilities – extending the notion of personalised medicine to personalised policy (or personalised environments).

SOCIAL REGULATION OF HUMAN GENE EXPRESSION (Cole, 2014)
**ORCHIDS AND DANDELIONS**

- Certain variant genes can increase a person's susceptibility to depression, anxiety, attention deficit-hyperactivity disorder, antisocial, sociopathic, or violent behaviors.
- Differential susceptibility – dandelions and orchids (from the Swedish, orkidebarn means 'orchid child', maskrosbarn means 'dandelion child').
- While these 'bad' genes can create problems, they can also, in the right setting and the right environment, produce children who not only do better than before, but far exceed their peers.
- Orchid children are not failed dandelions; they are a different category of child, with special sensitivities and strengths, and need to be nurtured and taught in special ways.


**EPIGENETICS**

**SYNAPTIC PRUNING**

- The rapid expansion of synaptic connections between brain neurons that occurs after birth results in an overproduction of connections – those that are least used are progressively 'pruned' and removed from the network.
- The proximal or immediate environments in which young children spend their time play a fundamental role in deciding which synapses are 'pruned'.
- Children come out of the womb primed to engage with their environment and caregivers, and the parents are primed to engage with them.
- Learning starts from birth and learning and development are cumulative, with later development building upon earlier development.
- Children's early social experiences shape their developing neurological and biological systems for good or for ill.

**TELOMERE EFFECTS**

- Telomeres are protective caps at the end of chromosomes, like plastic tips at the end of shoelaces.
- They play a vital role in determining our health and longevity.
- Our telomeres shorten with each division of our cells – this occurs as a natural part of the aging process, but also in response to experiences.
- Shortened telomeres not only shape our health-span (how long we live a healthy life), but also our disease-span (how long we live with disease that interferes with our quality of life).


**TELOMERE EFFECTS (cont)**

- Telomeres develop epigenetically: they are shaped by our genes, but also respond to how we live – the foods we eat, our responses to emotional challenges, the amount of exercise we get, whether we were exposed to childhood stress, and even the level of trust and safety in the neighbourhood.
- For instance, separation from a father by death, incarceration, or parental separation and/or divorce is associated with shorter telomeres in his children.
- Cellular aging begins in the womb: telomere length can be directly transmitted from mother to child at the point of conception.
- Fortunately, telomere loss can be restored through exposure to positive environments, so the impact of early adverse experiences or inheritance can be counteracted.

**THE MICROBIOME AND US**

Mismatch diseases can also result from the impact that changed living conditions have had on the human microbiome.

Vast numbers of bacteria, viruses, and fungi (collectively known as the microbiome) live in and on the human body and play an important role in maintaining our health and wellbeing.

These microbes have coevolved with our species over millennia, and provide us with essential services in exchange for being housed and fed – in particular, it is the bacteria in our gut that play a critical role in our physical and even our mental health.

Any change in the abundance or composition or diversity of these micro-organisms can have significant health consequences.

Disturbances of the composition of the microbiome – known as dysbiosis – can take several forms: a loss of beneficial microbes, an expansion of harmful microbes, or a loss of overall microbial diversity.

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**THE BRAIN-GUT-MICROBIOME AXIS**

The brain, the gut, and the microbiome are in constant close communication, and function as parts of a single integrated system – the brain-gut-microbiome axis.

Traffic on the brain-gut-microbiome axis is two-way, so that our mental states can shape the composition of our gut bacteria, and our gut bacteria can in turn affect our moods, our choices, and our overall health.

The first 1000 days of life are particularly crucial in shaping the architecture of this axis: both the brain and the microbiome are still developing, and changes during this period tend to persist for life.

The enteric nervous system – from the oesophagus to the gastroentestinal tract – constitutes a largely independent "second brain".

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**TWO BRAINS IN ONE BODY**

(New Scientist, 2012)

The enteric nervous system in the gut, or ‘second brain’, shares many features with the brain in your head.

It can act autonomously and even influences behaviour by sending messages up the vagus nerve to the brain.

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**THE MICROBIOME IN THE FIRST 1000 DAYS**

Acquiring a full complement of microbiota in the first 1000 days is central to optimal health throughout the lifespan – this is known as the self-completion hypothesis.

There appears to be a narrow developmental window for effective ‘seeding’ surrounding birth, and the completion of the full microbiome over the next two and half to three years of life, which shapes the gut microbiome for a lifetime.

Factors that can compromise the completion of a full microbiome include antibiotic use during pregnancy, caesarean section births, formula feeding, poor nutrition, and excessive sanitation practices.
The infant microbiome is most vulnerable to environmental influences in early life.

Leah T. Stiemsma, and Karin B. Michels

Pediatrics

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DEVELOPMENTAL ORIGINS OF HEALTH AND DISEASE (DOHaD)

• Environmental exposures such as stress or undernutrition during critical periods of development can have long-term effects on chronic disease risk by 'programming' organs, tissues, or body system structures or functions
• Rather than being a passive passenger in the womb, the foetus actively responds to changes within the intrauterine environment, and makes adaptations based on the nutritional and hormonal signals that cross the placenta
• If the conditions are suboptimal, these adaptations can result in permanent alteration of the structure, physiology and metabolism of the offspring, laying a physiological basis for adult-onset disease, such as cardiovascular disease, type-2 diabetes, obesity and metabolic syndrome, and fertility
• As a result, adult conditions that were regarded solely as products of adult behavior and lifestyles are now seen as being linked to processes and experiences occurring decades before

DEVELOPMENTAL AND EVOLUTIONARY MISMATCHES

Developmental mismatches occur as a result of inappropriate developmental cues or a change in environment between plastic and later phases of life, or both

Evolutionary mismatches occur if there is a difference between the extant environment and that for which the fitness of the species had evolved to be best adapted

PRECONCEPTION EFFECTS

Babies are produced by contributions from both parents. More and more we are beginning to realise that such contributions go well beyond mere genes, with nurture, environment, and even the parents' own physiology and experiences shaping offspring and their preparedness for life ahead.

Science, 2014, 15th August

PRECONCEPTION EFFECTS

At fertilization, the egg and sperm endow the embryo a set of genes, the integrity of which is affected by the age and environmental exposures of both parents. Parental history and experiences also exert effects through epigenomic information not contained in the DNA sequence, including variations in sperm and egg cells.

Transgenerational epigenetic effects interact with conditions at conception to program the developmental trajectory of the embryo and fetus, ultimately affecting the lifetime health of the child.

This means we need to revise our notions of parenting, and recognise that biological parenting commences well before birth, even prior to conception.
ENVIRONMENTAL EFFECTS ON PATERNAL NONGENETIC CONTRIBUTIONS
(Lane, Robker and Robertson, 2014)

INTERGENERATIONAL TRANSMISSIONS
• Epigenetic changes may be inherited - the experiences of mothers or even grandmothers can be transmitted across generations and contribute to non-genomic transmission of disease risk
• When parents have been exposed to adverse experiences that have produced changes to their epigenome, these changes can be passed on to their children
• In effect, children receive genes that are in an active or ‘switched on’ state rather than a dormant or latent state.
• Thus, the long-term consequences of adverse environmental conditions during the first 1000 days may not be limited to one generation, but may lead to poor health in the generations to follow, even if these individuals develop in normal conditions themselves
• Environments are also transmitted across generations

2. SOCIAL CLIMATE CHANGE AND THE ‘MISMATCH’ HYPOTHESIS
• Social climate change and the ‘Great Acceleration’
• Evolutionary mismatch resulting epidemics of non-communicable diseases
• Mismatch conditions – allergies and obesity

THE ANTHROPOCENE
A planet transformed by humanity
www.anthropocene.info/en/home

SOCIAL CLIMATE CHANGE
• Over the last 60 or so years, developed nations have experienced dramatic societal changes as the result of a range of interconnected factors – economic, demographic, social and technological – at globalised, national and local levels.
• Dubbed the ‘Great Acceleration’, these changes are the result of the same factors that have contributed to planetary climate change and constitute a form of social climate change

The entire life experience of almost everyone now living has taken place within the eccentric historical moment of the Great Acceleration, during what is certainly the most anomalous and unrepresentative period in the 200,000-year-long history of relations between our species and the biosphere. (McNeill & Engelske, 2016)

SOCIAL CLIMATE CHANGE (cont)
Social climate change has had a number of effects:
• First, it has dramatically altered the conditions under which families are raising young children
• Second, it has altered the nature of the problems facing society and governments: they are now more likely to be complex or ‘wicked’ problems
• Third, it has also altered the health challenges we face: these now take the form of chronic non-communicable diseases rather than the acute conditions we previously faced
• Fourth, while most people have benefited greatly from the changes, the benefits have not been shared equally
• Fifth, while many of the changes have been highly beneficial, some have unintended side effects that are damaging for our health and wellbeing
MISMATCH - Evolution and modern environments

We have built a world that no longer fits our bodies. Our genes - selected through our evolution - and the many processes by which our development is tuned within the womb, limit our capacity to adapt to the modern urban lifestyle.

There is a mismatch. We are seeing the impact of this mismatch in the explosion of diabetes, heart disease and obesity. But it also has consequences in earlier puberty and old age.

HYPOTHESES NONINFECTIOUS MISMATCH DISEASES

Daniel Lieberman (2013): The Story of the Human Body

Physical
Psychological
Anxiety
Depression
Obeseotic-obsessive disorder
-Neurological
Alzheimer's disease
ADHD
Chronic fatigue syndrome
Multiple sclerosis
-Endocrinological
Diabetes (Type 2)
Metabolic syndrome
Fatty liver syndrome
-Immunological
Asthma
Allergies
Cardiovacular
Coronary heart disease
High blood pressure
-Endocrinological
Endometriosis
Polycystic ovarian syndrome
-Reproductive
Skin
Acne
Sleep
Apathy
Insomnia (chronic)
-Dietary
Eating disorders
Iodine deficiency
Scurvy
-Dental
Impacted wisdom teeth
Malocclusion

USE IT OR LOSE IT (Lieberman, 2013)

• Some mismatch diseases result from too much of a formerly rare stimulus (such as sugar), while others result from too little of a formerly common stimulus
• We evolved to ‘use it or lose it’; because bodies are not engineered but instead grow and evolve, your body expects and requires certain stresses when you’re maturing to develop appropriately
• Many mismatch diseases occur when growing bodies fail to experience as much stress as evolution geared them to expect
• Necessary stresses may be neurological, musculoskeletal, immunological, dietary, and metabolic
• We have created environments that deprive us of many of the necessary stresses during development
MISMATCH DISEASES IN THE FIRST 1000 DAYS
Two of the most common and earliest developing non-communicable diseases/conditions are allergies and obesity, both inflammatory conditions
• Allergies (and asthma) have increased dramatically in recent generations – while genetic factors influence susceptibility, they cannot explain this surge, and environmental factors must play a role.
• The first 1000 days is a critical time for immune development and allergy prevention
• During pregnancy, various maternal exposures are associated with changes in the pattern of foetal immune responses, including microbial exposure, dietary nutrients, and environmental pollutants
• In infancy, contributing factors include cleaner environments, declining exposure to infectious agents, modern diets and exposure to pollutants

MISMATCH DISEASES IN THE FIRST 1000 DAYS (cont)
• Obesity - patterns of weight gain, metabolism, and even the total numbers of fat cells in our bodies are determined in early life
• Prenatal influences on the development of childhood obesity include mother's smoking habits during pregnancy, mother's weight gain during pregnancy, and mother's blood sugar levels during pregnancy
• Postnatal factors during infancy that impact weight in later life: how rapidly an infant gains weight, initiation and length of breastfeeding, and the duration of infant sleep.
• Allergies and obesity shape each other: childhood obesity increases the risk of food allergies, while allergic inflammation impacts metabolism (and thereby increase the likelihood of obesity).

3. ECOLOGICAL IMPACTS ON DEVELOPMENT AND THE SOCIAL DETERMINANTS OF HEALTH AND DISEASE
• Social determinants of health and disease
• Social gradients
• The role of poverty
• Aboriginal health and wellbeing

THE SOCIAL DETERMINANTS OF HEALTH AND DISEASE
• Social determinants of health – our health and broader life outcomes are strongly shaped by the social, economic and environmental conditions into which we are born, grow, live, and age
• Social gradient effects in health and well-being – the lower one's social standing in life, the worse our health (and other) outcomes are likely to be
• Social gradients involve more than just disparities between the poor and the rich, but exist across the entire socioeconomic continuum: at any given point along the continuum, one is likely to experience inferior health outcomes to those above them
• These differences are independent of access to health care

The conditions in which people lead their lives ... are the main influences on their health.
Good conditions of daily life, the things that really count, are unequally distributed, much more so than is good for anything, whether for our children's future, for a just society, for the economy and, crucially, for health.
The result of unequal distribution of life chances is that health is unequally distributed.
Being at the wrong end of inequality is disempowering, it deprives people of control over their lives - their health is damaged as a result.
And the effect is graded – the greater the disadvantage the worse the health.
ROLE OF POVERTY

• Exposure to sustained poverty in the first 1000 days is associated with adverse health and social outcomes in later life, including physical health; social and emotional well-being; cognitive functioning; educational attainment and employment; and mortality

• While persistent poverty in the first 1000 days has a cumulative negative impact on development, prolonged poverty during later stages of life is less likely to have a significant impact on future life outcomes

• Relieving poverty (particularly in the first 1000 days) has been shown to increase birth weight and other outcomes, which can reduce the likelihood of negative outcomes in later life

ABORIGINAL HEALTH AND WELLBEING

• Aboriginal populations are disproportionally exposed to adverse social, economic and environmental conditions

• The social determinants of Aboriginal health and wellbeing not only include social status, employment, poverty, housing, and education, but also the experience of racism, and both first-hand and intergenerational trauma

• As a result, Aboriginal children have some of the poorest health and developmental outcomes in Australia

• Provided the necessary social conditions are in place, Aboriginal culture is a protective force for Aboriginal children, families and communities: greater attachment to traditional culture is associated with a range of improved outcomes for Aboriginal peoples

SPECIFIC FACTORS SHAPING HEALTH AND DEVELOPMENT

FACTORS SHAPING HEALTH & DEVELOPMENT

• 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

FACTORS SHAPING HEALTH & DEVELOPMENT (cont)

• 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

LONG-TERM IMPLICATIONS OF EARLY EXPERIENCES AND EXPOSURES
PATHWAYS TO LATER OUTCOMES

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. Instead, 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).

PATHWAYS TO LATER OUTCOMES (cont)

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.

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.
- 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 environmental experiences to change us.

IMPLICATIONS FOR ACTION

An ‘unhealthy’ start to life will reduce biological reserves, but this is then overlaid by maladaptive responses, and then by ongoing unhealthy behaviours. Some of this is impossible to regain: if we have fewer nephrons in our kidneys, if we have fewer islet cells in the pancreas, if our peak bone density is low, and if we have fewer neuronal synapses in our brain, our ‘reserve’ will be lower. We will cope less well with the age-related decline in all of these tissues. And we will be less resilient to challenges.

Then, superimpose the added maladaptive metabolic responses that underlie conditions such as obesity and metabolic syndrome. Once these become established, they are very hard to change.
A LIFE-COURSE APPROACH
There are three distinct developmental periods during the first 1000 days when actions to promote better outcomes can be taken:
• Preconception – eg. providing preconception and interconception care
• Pregnancy – eg. extending antenatal care to include greater emphasis on maternal nutrition, safety and mental health
• Infancy – eg. building stronger support networks and support services for parents of infants
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

PROMOTING HEALTH AND DEVELOPMENT
There are a number of specific aspects of health and development where we can act to improve outcomes:
• promoting cellular health – eg. the ‘Telomere manifesto’ (Blackburn & Eppel, 2017)
• promoting microbiome health – eg. ensuring the early establishment of a healthy and diverse microbiome in infants
• promoting nutritional health – eg. promoting more healthy food environments, and reforming the food industry
• promoting environmental health – eg. reducing exposures to environmental toxins in physical environments, food, and consumer products
• promoting relational health – eg. helping parents establish positive relationships with their infants, and ensuring that the parents themselves have positive social support networks

THE TELOMERE MANIFESTO
(Blackburn and Eppel, 2017)
Mind your telomeres
• Evaluate sources of persistent, intense stress. What can you change?
• Transform a threat to a challenge appraisal
• Become more self-compassionate and compassionate to others
• Take up a restorative activity
• Practice thought awareness and mindful attention. Awareness opens doors to well-being
Maintain your telomeres
• Be active
• Develop a sleep ritual for more restorative longer sleep
• Eat mindfully to reduce overeating and ride out cravings
• Choose telomere-healthy foods – whole foods, omega-3s. Skip the bacon.

Connect your telomeres
• Make room for connection: disconnect from screens for part of the day.
• Cultivate a few good, close relationships
• Provide children quality attention and the right amount of ‘good stress’
• Cultivate your neighbourhood social capital. Help strangers
• Seek green. Spend time in nature
• Mindful attention to other people allows connections to bloom. Attention is your gift to give

Create telomere health in your community and the world
• Improve prenatal care
• Protect children from violence and other traumas that damage telomeres
• Reduce inequality
• Clean up local and global toxins
• Improve food policies so that everyone has access to fresh healthy affordable food

FIVE COURSES OF ACTION
1. Let natural selection sort the problem out
2. Invest more in biomedical research and treatment
3. Educate and empower
4. Change the environment
A fifth course of action is to improve provision of services – provide universal service to promote effective parenting and targeted service-based interventions to address specific problems
Through fast-paced natural selection, creatures in cities and suburbs are genetically evolving to deal with the omnipresence of humans.


**COURSES OF ACTION (cont)**

**Educate and empower**
- Provide people with useful, credible information about the factors that impact on early child development and wellbeing, and what they need to do to optimise health and wellbeing in their offspring.
- Provide training to service providers on the first 1000 days.

**Improve services**
- This is the default approach adopted by governments and service providers, and will continue to play an important role in ensuring the health and wellbeing of children and families.
- However, relying solely on targeted health and other services has not been sufficient to make a significant difference to the complex health problems that are prevalent today.

**Change the environment**
- Since all diseases result from gene-environment interactions, and we cannot re-engineer our genes, the most effective way to prevent mismatch diseases is to re-engineer our environments.
- We need to address the upstream ‘causes of the causes’: if we address only the superficial ‘causes’ of non-communicable diseases (such as bad nutrition, smoking and inactivity) without addressing the wider ‘causes of the causes’ (the social, cultural and economic determinants of health), we will fail to achieve any sustained change in outcomes.
- A true prevention approach addresses the underlying causes of problems and seeks to improve the conditions under which families are raising young children.

**COURSES OF ACTION (cont)**

**CAVEATS AND CONCLUSIONS**

**Caveats**
- Science does not speak for itself, but always has be interpreted – this paper is only one way of interpreting of the evidence.
- We must beware of ‘pragmatic reductionism’ – in seeking to frame the evidence for the benefits of policy-makers and practitioners, there is a danger that we might reduce the evidence too far, presenting as proven findings that are still being debated - the science is never settled, and our narrative is therefore necessarily provisional, not definitive.
- We must beware of determinism and blame - developmental outcomes are not directly caused by the actions of any biological, environmental or human agent.
- The interpretation of the findings that we have produced could be used to justify a wide range of policies and actions – deciding amongst them is a matter of values and ethics, not science.

**TAKE AWAY MESSAGES**
- The first 1000 days is the period of greatest developmental plasticity, and changes made during this period can have life-long implications.
- These changes affect our biological as well as our neurological development.
- We retain a degree of plasticity throughout our lives, so it is always possible to counteract the effects of early adverse experiences by providing more positive and nurturing later environments.
- We must be careful not to oversimplify the messages from this research – the processes involved are very complicated and there is still much we are uncertain about, so we must avoid presenting as proven findings that are still being debated.
- We must also be careful not to blame parents, and mothers in particular – it’s the whole of society that needs to take action, not just parents.
CONCLUDING COMMENTS

• The dramatic changes that have occurred in our societies over the last half a century have affected the conditions under which families are raising young children, and therefore children's developmental and health outcomes.

• While some of these changes are for the better, not all of the benefits have been equally distributed, and some of the changes appear not to be beneficial at all.

• Our task is to understand the mechanisms that underpin development, learn how these can be disrupted by adverse experiences and exposures, and identify the environmental changes that are having these adverse effects so we can address them.

• Our First Thousand Days evidence paper is a progress report on where we have got to with that task.