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 TRANSFORMING AUSTRALIA FOR OUR CHILDREN'S FUTURE:  
 MAKING PREVENTION WORK  
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**SOCIAL CLIMATE CHANGE AND CHILDREN:  
 CONSEQUENCES, CAUSES AND CURES**

**Tim Moore**

Centre for Community Child Health  
 The Royal Children's Hospital



**OUTLINE**

- Climate change and social climate change
- Consequences – impact on child outcomes
- Causes – factors contributing to worsening outcomes
- Causes – child development and developmental pathways
- Cures – implications for action
- Conclusions

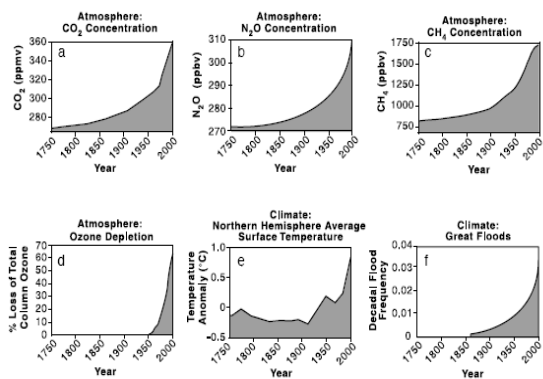
**CLIMATE CHANGE**



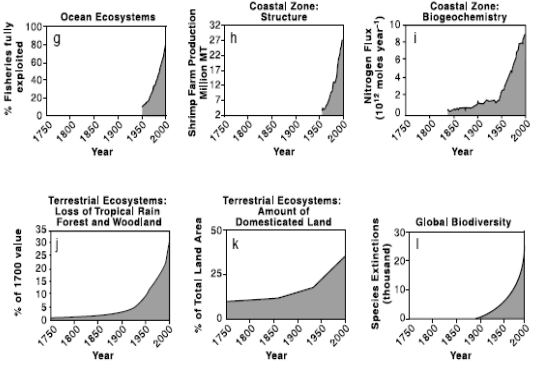
**WORSENING CLIMATE OUTCOMES**

- A profound transformation of Earth's environment is now apparent, owing not to the great forces of nature or to extraterrestrial sources but to the numbers and activities of people - the phenomenon of global change.
- Begun centuries ago, this transformation has undergone a profound acceleration during the second half of the 20th century.
- The evidence that these changes are affecting the basic functioning of the Earth System, particularly the climate, grows stronger every year
- The Earth is currently operating in a 'no-analogue' state: in terms of key environmental parameters, the Earth System has recently moved well outside the range of the natural variability exhibited over at least the last half million years.

*Steffen et al (2004)*



Steffen et al. (2004)



Steffen et al. (2004)

### WORSENING CLIMATIC OUTCOMES: THREE KEY QUESTIONS

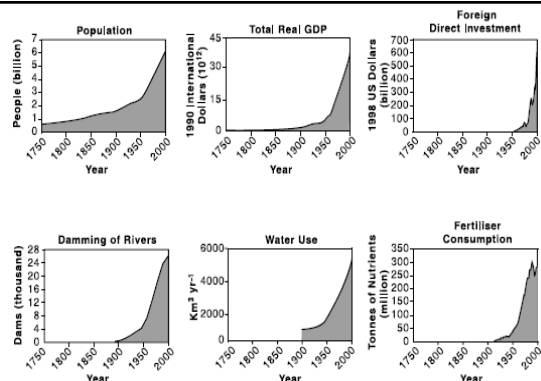
- **Is it really happening?** Are there significant changes occurring in a variety of indicators of global environmental health?
- **If so, did we do it?** Are these changes the result of human activity?
- **If so, what do we need to do now?** What action can we take to prevent long-lasting damage to the global environment?

### SOCIAL CLIMATE CHANGE

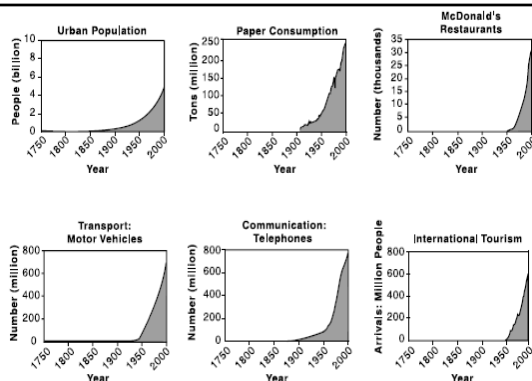


### SOCIAL CLIMATE CHANGE

- The same factors that have contributed to climate change have also dramatically altered human societies and the conditions under which families are raising young children
- These changes have occurred over the last fifty years and have been so rapid, dramatic and unprecedented as to constitute a form of social climate change paralleling environmental climate change
- While the impact of social climate change on child development and family functioning does not appear to be as dramatic as the impact of climate change on the health of the earth, that may be because we have not fully understood what is happening



Steffen et al. (2004)



Steffen et al. (2004)

### SOCIAL CLIMATE CHANGE: THREE KEY QUESTIONS

- **Is it really happening?** Are the same worsening health and developmental outcomes evident in all developed nations?
- **If so, did we do it?** What are the causal pathways leading to these outcomes and are they the result of various aspects of the social changes that have occurred over the last half century?
- **If they are, what should we do to redress or offset them?**

## NATURE AND EXTENT OF WORSENING DEVELOPMENTAL OUTCOMES



## CONCERN ABOUT WORSENING DEVELOPMENTAL OUTCOMES

- *Mental health* - eg. depression, suicide, drug dependence
- *Physical health* - eg. asthma, obesity, diabetes, heart disease
- *Academic achievement* - eg. literacy levels, retention rates, educational outcomes
- *Social adjustment* - eg. employment, juvenile crime

## WORSENING DEVELOPMENTAL OUTCOMES

- The rates of all these developmental outcomes have risen or are unacceptably high
- The developmental pathways that lead to each of these outcomes can be traced back to early childhood
- All the poor developmental outcomes identified have associated social and financial costs that cumulatively represent a considerable drain on societal resources
- These worsening outcomes represent an *unintended* consequences of other changes and policies which in other respects have been generally successful

## WORSENING DEVELOPMENTAL OUTCOMES (cont)

- These worsening outcomes are ubiquitous: every index of development and functioning appears to be affected
- They occur in every developed nation, and also appear in developing nations as they acquire Western lifestyles and levels of prosperity
- They are 'disorders of the bioenvironmental interface' (Palfrey et al, 2005) rather than conditions with separate or singular causes
- There is the puzzle as to why this should be happening at all, given the general improvements in prosperity over the past few decades - this phenomenon has been dubbed 'modernity's paradox':

## 'Modernity's paradox'

A puzzling paradox confronts observers of modern society. We are witnesses to a dramatic expansion of market-based economies whose capacity for wealth generation is awesome in comparison to both the distant and the recent past. At the same time, there is a growing perception of substantial threats to the health and well-being of today's children and youth in the very societies that benefit most from this abundance.

Keating & Hertzman (1999)

## FACTORS CONTRIBUTING TO WORSENING OUTCOMES



## ENVIRONMENTAL EFFECTS

You cannot treat 'the environment' as separate from humans (SEHN, 2007). In fact, human health depends upon three 'environments':

- **The natural environment** (air, water, soil, flora and fauna)
- **The built environment** (roads, power plants, suburban sprawl, chemicals, etc.)
- **The social environment** (relationships of trust, mutual respect, and friendship but also poverty, racism and white privilege, sexism, homophobia, insecurity, the sense that life is out of control, and so on).

## FACTORS CONTRIBUTING TO WORSENING HEALTH AND DEVELOPMENTAL OUTCOMES

### Natural environmental factors

1. Environmental change
2. Climate change

### Built environmental factors

3. Environmental toxins
4. Changes in urban environments
5. Changes to living environments
6. Changes in food consumption
7. Changes in food production
8. Medication and vaccinations

## FACTORS CONTRIBUTING TO WORSENING HEALTH AND DEVELOPMENTAL OUTCOMES

### Social environmental factors

9. Economic and social changes
10. Epidemiological transition
11. Social inequities
12. Changes in social values and priorities
13. Changes in social environments
14. Changes in levels of stimulation
15. Changes in the nature and content of media
16. The pace of change itself

## 1. ENVIRONMENTAL CHANGE

- The ongoing degradation of Earth's ecosystems - land degradation, ozone depletion, temperature increases etc. – has potentially disastrous results for human health
- These could result in food shortages, new and intensified disease patterns, rising seas, mass refugee problems, and cancers, blindness, and immune suppression from increased ultraviolet radiation
- Although global warming and resultant climate change pose serious risks to human health, global warming is only one of a nested series of threats to the health of humankind
- These threats, acting synergistically, stress the ecological and social foundations upon which humanity relies for air to breathe, water to drink, food to eat, and disposal of waste

## 2. CLIMATE CHANGE

- Climate change poses direct and indirect risks to health:
  - Direct risks include physical injury because of more frequent events such as bushfire, and increased heat-related death and disease.
  - Indirect risks include more infectious diseases transmitted through vectors such as insects, and mental and physical health difficulties that typically follow social and economic disruption and dislocation such as drought.
- The diversity of health risks from climate change presents a direct challenge to the health sector – including acute health-care and the public health system.
- Many health-protecting activities will need to be undertaken by other sectors of government and industry, as well as by individuals and communities.

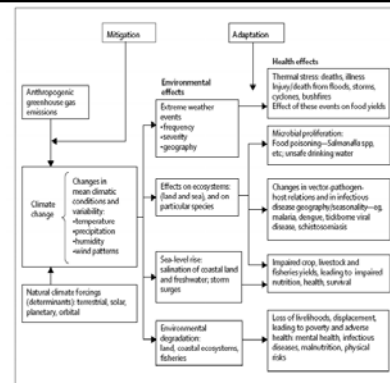


Figure 1. Schematic summary of main pathways by which climate change affects population health. Mitigation refers to true primary prevention (reducing greenhouse gas emissions). Adaptation (a form of late primary prevention) entails interventions to lessen adverse health effects.

McMichael, Woodruff & Hales (2006)

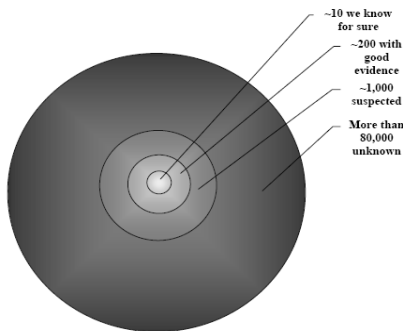
### 3. ENVIRONMENTAL TOXINS

- Exposure to toxins prenatally or early in life can have a devastating and lifelong effect on the developing architecture of the brain.
- Exposures to many chemicals have much more severe consequences for embryos, fetuses, and young children, whose brains are still developing, than for adults.
- Substances that can have a truly poisonous effect on the brain can be found in environmental chemicals such as lead and mercury, in recreational drugs such as alcohol, nicotine, and cocaine, and in prescription medications, such as some acne treatments.
- Even very low doses of some biologically active contaminants can alter gene expression important to learning and developmental function.

### ENVIRONMENTAL TOXINS (cont)

- We are regularly exposed to many toxic chemicals and carry them in our bodies, as evidenced by samples of human blood, breath, hair, tissue, and body fluids.
- Most of our exposures to these chemicals are not from sources traditionally regulated, such as remote waste sites and factories. Rather, the primary sources are close to us: within our indoor environments, and the personal activities, products, and materials inside those environments.
- The sources of these pollutants are largely unregulated – meaning that our environmental regulations, designed to protect and promote human health, are missing major sources of health risks.

#### What we don't know about chemicals



Collaborative on Health and the Environment (2007)

### 4. CHANGES IN URBAN ENVIRONMENTS

- Reduced access to parks and safe places for children to play
- Reduced access to green spaces and natural environments
- Increased road traffic at expense of pedestrian safety and comfort
- Increased safety fears results in children doing less walking and riding to school and other places, and less risk-taking in general

### 5. CHANGES TO LIVING ENVIRONMENTS

- Many allergies and immune deficiency conditions have doubled, tripled or even quadrupled in the last few decades
- Immune deficiency conditions that have increased include asthma; hay fever and other common allergic reactions, such as eczema; and food allergies.
- Others that appear to be on the increase include lupus, multiple sclerosis and other afflictions caused by misfiring immune systems.
- The cause remains the focus of intense debate and study, but some researchers suspect the concurrent trends all may have a common explanation rooted in aspects of modern living

### CHANGES TO LIVING ENVIRONMENTS (cont)

- According to the 'hygiene hypothesis', one contributing factor is growing up in increasingly sterile homes
- Decreased exposure to viral infections in early childhood, partly as a result of multiple immunizations or cleaner environments, may provide less or less normal stimulation of the immune system, with more susceptibility to allergies in later years.
- Other contributing factors include changes in diet, air pollution, and possibly even obesity and increasingly sedentary lifestyles.

## 6. CHANGES IN FOOD CONSUMPTION

- Children's patterns of food consumption – what they eat and drink, how much they eat and drink, and under what circumstances – have altered dramatically over the last few decades.
- The quality of neighbourhood food environments plays a part: people who live near an abundance of fast-food restaurants and convenience stores compared to grocery stores and fresh produce vendors have a significantly higher prevalence of obesity and diabetes.
- The highest rates of obesity and diabetes are among people who live in lower-income communities which have worse food environments.

## CHANGES IN FOOD CONSUMPTION (cont)

- The ultimate incarnation of modern agricultural policies is the fast food meal, featuring low-quality carbohydrates and fats, few essential nutrients, little fibre, high energy density, and poor satiety value
- These meals are very cheap, but promote over-consumption, markedly increasing risk for obesity and its complications.

## 7. CHANGES IN FOOD PRODUCTION

- Within developed nations over the past few decades, there have been significant changes in food production and in the composition of basic foods - these include increases in the amount of refined sugar in foods
- There have also been increases in various food additives, such as food colourings
- Artificial colours or a sodium benzoate preservative (or both) in the diet produce increased hyperactivity in otherwise normal children

## 8. MEDICATION AND VACCINATIONS

- Debates about the medication of children with ADHD and behavioural regulation problems
- Debates about the link between autism and the measles-mumps-rubella (MMR) vaccine and autism

## 9. ECONOMIC AND SOCIAL CHANGE

Over the past few decades, there have been significant changes in developed nations throughout the world:

- Adoption of free market economic policies – the globalisation of commerce
- Concurrent rise in general prosperity – dramatic increases over the last few decades
- Reduction in government control over market and in government responsibility for provision of public services
- Fall in birth rates – an international phenomenon
- Increase in life expectancy – from 45 to 75 years over the course of the 20<sup>th</sup> century
- Increased movement of people between countries, leading to more diverse societies
- Globalisation of ideas and culture – world wide web

## LOCAL CHANGES

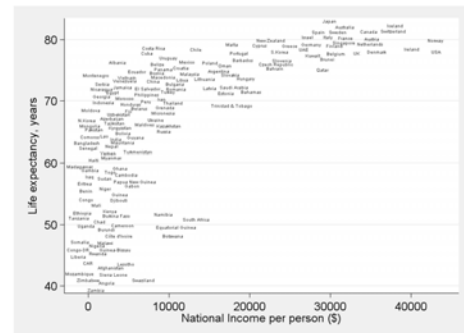
- There have been significant changes in Australia's demographic make-up – eg. a drop in the birth rate, a decrease in proportion of children in society
- There have been dramatic changes in employment opportunities and conditions – more women working, a shift from fulltime to part-time work, more casual positions, longer working hours, increased inequality in the distribution of pay
- Changes in the cost of housing as a proportion of income – Australia now has one of the highest rates in the developed world
- Changes in social mobility, with consequent weakening of the social infrastructure

## 10. EPIDEMIOLOGICAL TRANSITION

One explanation of 'modernity's paradox' lies in what is known as the **epidemiological transition** (Wilkinson, 2005):

- Social and psychological factors loom large among the determinants of health in the developed countries because the long history of rising living standards has drastically reduced the direct effects of material privation.
- As infectious diseases declined, many of the so-called diseases of affluence (eg. heart disease) reversed their social class distribution to become more common among poor in affluent societies.
- Health in societies that have gone through the epidemiological transition ceases to be as responsive to further rises in material living standards: once you have enough of everything, it doesn't help to have much more.

Income per head and life-expectancy: rich & poor countries



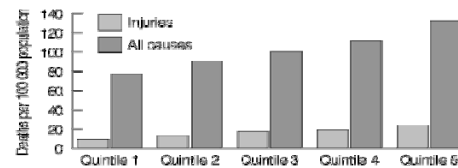
Source: Wilkinson & Pickett, *The Spirit Level* (2009)

www.equalitytrust.org.uk

## 11. SOCIAL INEQUITIES

- As prosperity has increased, there have been widening gaps between the rich and the poor in most developed nations
- These gaps, rather than poverty itself, are associated with poorer health and social outcomes
- Social gradient effects operate such that health and social problems progressively worsen the lower people are on the socioeconomic scale
- Within each of the developed countries, average life expectancy is five, 10, or even 15 years shorter for people living in the poorest areas compared to those in the richest.

CHILDHOOD MORTALITY RATES AND SOCIOECONOMIC STATUS IN AUSTRALIA



Age-standardised mortality rates for children aged 0-14 years, all causes and injury mortality, 1998-2000.

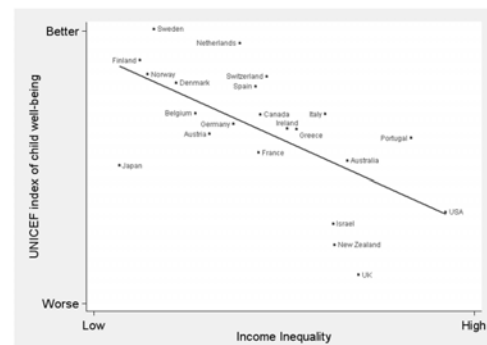
Quintile 1 = least disadvantaged; quintile 5 = most disadvantaged

Draper, Turrell and Oldenburg (2004)

## THE IMPACT OF INEQUALITY

- Psychosocial factors affect health through the extent to which they cause frequent or recurrent stress.
- Chronic stress affects numerous physiological systems, including the cardiovascular and immune systems, increasing our vulnerability to a very wide range of diseases and health conditions.
- According to Wilkinson (2005), there are three psychosocial risk factors which play a major role in triggering biological stress responses: **low social status**, **poor social affiliations**, and **early childhood experiences**.
- According to Marmot (2004), there are two key psychosocial risk factors: **control over our lives**, and **opportunities for full social participation**.

Child Well-being is Better in More Equal Rich Countries



Source: Wilkinson & Pickett, *The Spirit Level* (2009)

www.equalitytrust.org.uk

## 12. CHANGES IN SOCIAL VALUES AND PRIORITIES

- 'Affluenza' - the grip of consumerism (Hamilton and Denniss, 2005; James, 2007)
- The tenuous relationship between prosperity and happiness (Eckersley, 2005)
- The search for meaning in a materialist world (McKay, 2007)

## 13. CHANGES IN SOCIAL ENVIRONMENTS

- Partial erosion of traditional family and neighbourhood support networks, due to factors such as increased family mobility and the search for affordable housing
- Increase in the number of parents whose own experiences of being parented were compromised, and who therefore have difficulty parenting their own children
- All these factors have contributed to an increase in the number of families with complex needs

## CHANGES IN FAMILIES

Families have become more diverse culturally and ethnically and more varied in their structure:

- families are smaller (but houses are bigger), and extended families are also smaller
- mother's age at first birth is increasing as is childlessness
- there are more single parents, more blended families, more shared custody arrangements, and more same sex couple families

These changes have important consequences:

- Children are growing up with fewer siblings, as well as smaller extended families, and see fewer examples of parenting as they grow up
- Children have fewer experiences of caring for younger children and being cared for by older children

## CHANGES IN FAMILY CIRCUMSTANCES

The circumstances in which families are raising young children have also changed:

- more parents are working
- more mothers with babies are working
- more parents are doing shift work and working non-standard hours
- more parents are working longer hours
- more families are jobless
- more children are being raised in poverty

## 14. CHANGES IN LEVELS OF STIMULATION

- Our hyper-mobile, cyber-centric, attention-deficient lifestyle is eroding our capacity for deep attention (Hallowell, 2006; Jackson, 2008)
- Multitasking - the simultaneous use of several different media - has become endemic and this is adversely affecting how we learn, contributes to the release of stress hormones and adrenaline, which can cause long-term health problems, and contributes to the loss of short-term memory (Rosen, 2008)
- New technologies are leading to changes in behaviour and environment that create the biggest physical changes in the brain since the Neanderthals 100,000 years ago, producing changes in behaviour and thought patterns that amount to nothing less than a different type of person (Greenfield, 2008)

## 15. CHANGES IN FORM AND CONTENT OF MEDIA AND ADVERTISING

- Children under six are now spending more time connected to electronic media than reading books
- Impact on prolonged exposure to electronic games and TV on physical activity, hence contributing to health problems and obesity
- Impact of TV advertising on eating behaviours, identity formation, development of values etc.
- Impact of media violence on development

### THE ACCELERATING SPEED OF CHANGE

- Somewhere in the first half of 2008, half the population of the planet became mobile telephone subscribers.
- In a decade's time we've gone from half the world having never made a telephone call to half the world owning their own mobile.
- It took nearly a decade to get to the first billion, four years to the second, eighteen months to the third, and—sometime during 2011—over five billion of us will be connected.
- Mobile handsets will soon be in the hands of everyone except the billion and a half extremely poor.

*Pesce (2008)*

## CHILD DEVELOPMENT AND DEVELOPMENTAL PATHWAYS: OPENING THE BLACK BOX

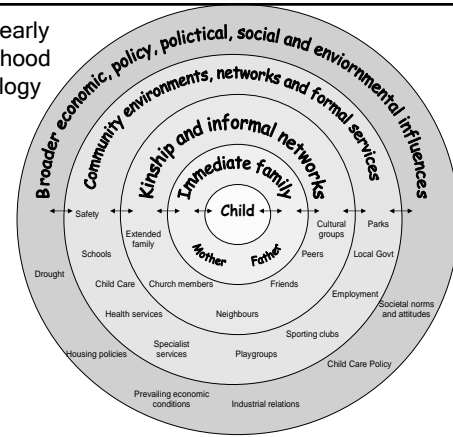


### MODELS OF CHILD DEVELOPMENT

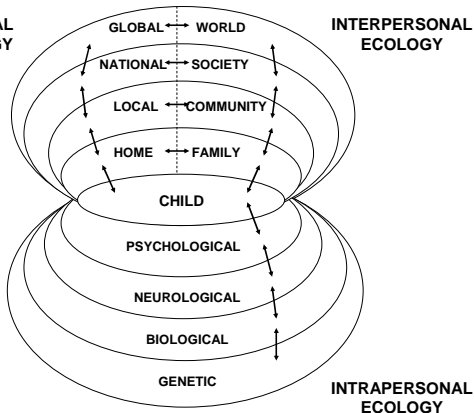
As Nelson (2007) points out, there is such a proliferation of theoretical views about child development that

'...there is no overarching conception that has won the minds of those who study development of psychological processes, nor is there a small set of strongly competing views.'

The early childhood ecology

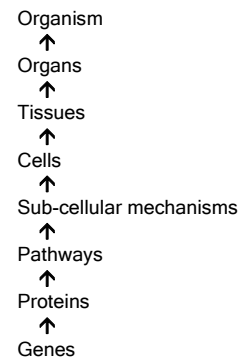


PHYSICAL ECOLOGY



### THE REDUCTIONIST CAUSAL CHAIN

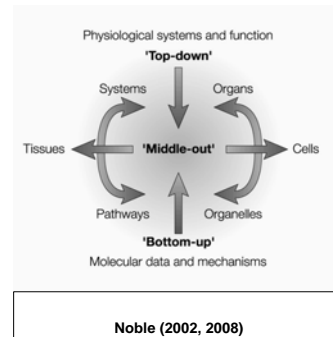
- According to Noble (2008), the reductionist view of genes and their function sees them as the origins or causes of life – the phenotype as 'created by' the genotype
- In this model, the causal chain is a one-way system from the genes to the organism
- The assumption is that if we know all about the lowest-level elements – the genes and proteins – then we would know everything about the organism



### INTEGRATIONIST MODELS

- **Emergent complexity:** 'science has now moved from an Age of Reductionism to an Age of Emergence, a time when the search for ultimate causes of things shifts from the behaviour of parts to the behaviour of the collective' (Laughlin, 2007)
- **Systems biology:** 'At each level of the organism, its various components are embedded in an integrated network or system. Each such system has its own logic. It is not possible to understand that logic merely by investigating the properties of the system's components.' (Noble, 2008)
- **Dynamic systems theory:** novel structures of ever-increasing complexity can emerge from the natural interactions among components even in relatively simple physical systems (Fogel et al, 2008; Lickliter, 2008)

### TOP-DOWN, BOTTOM-UP AND MIDDLE-OUT



### DEVELOPMENTAL PATHWAYS

There are three ways in which exposure to both beneficial and adverse circumstances over the life course contribute to each person's unique life exposure trajectory, which will manifest as different expressions of health and well-being:

- **Latency:** There are relationships between an exposure at one point in the life course and the probability of health expressions years or decades later, irrespective of intervening experience.
- **Cumulative:** Cumulative refers to multiple exposures over the life course whose effects on health combine.
- **Pathways:** These represent dependent sequences of exposures in which exposure at one stage of the life course influences the probability of other exposures later in the life course.

Hertzman and Power (2003)

### PRENATAL ADAPTATIONS: The Barker hypothesis

- During development fetuses respond to adverse conditions, mainly severe undernutrition, by favoring the metabolic demands of the growing brain/CNS and heart at the expense of other tissues
- The long-term consequences of this response are that the fetus is protected from death, is live-born, but has a low birth weight and is more prone to diseases later in life.
- Low birth weight (LBW), small for gestation age (SGA), frank intra-uterine growth retardation (IUGR) or clinically abnormal thinness at birth strongly predicts the subsequent occurrence of hypertension, hyperlipidemia, insulin resistance, type 2 diabetes, ischemic heart disease, breast or prostate cancer in adult life.
- Fetuses that are clinically malnourished during the first trimester are three times more likely to be obese as adults.

### EVOLUTIONARY MISMATCH

- We have built a world that no longer fits our bodies (Gibson, 2009; Gluckman and Hanson, 2006)
- 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.

### EPIGENETIC INHERITANCE

- Behavioural development is usually thought to result from the interplay among genetic inheritance, congenital characteristics, cultural contexts, and parental practices as they directly impact the individual
- There is another contributor - epigenetic inheritance, which is the transmission to offspring of parental phenotypic responses to environmental challenges - even when the young do not experience the challenges themselves.
- Genetic inheritance is not altered, gene expression is - organismic pathways for such transmission exist.
- Maternal stress during the latter half of a daughter's gestation may affect not only the daughter's but also grand-offspring's physical growth



### COMMON FACTORS

- Climate change will itself lead to social problems – prompted by the battle for diminishing resources and the inclination of the more rich and powerful to take more of these, thereby exacerbating the tensions and toxic effects of social inequalities.
- However, social problems also as a direct result of the same forces that produce the climate changes.
- There are two main underlying factors – **population growth** and **industrial free-market economies** (Speth, 2008)

### IMPLICATIONS AND CONCLUSIONS



The rising tide of 21st century public health problems, such as obesity, cardiovascular disease and depression, are different to past problems that could be directly attributed to infectious agents, toxic chemicals, poor industrial design and a lack of effective environmental management.

The new diseases of urban living arise more from the complex way we now live, eat, travel, build, play and work in urban environments, rather than from any single agency.

Our health is now an expression of a complex web of interactions that have not been previously faced during human evolution and these interactions are more subtle and indirect in their action.

Kearns, Beaty & Barnett (2007)

### HYPOTHESES

- As the unintended consequence of recent dramatic social and environmental changes, children are experiencing worsening health and developmental outcomes
- These changes parallel and arise from the same factors that produce global climate change and constitute a form of 'social climate change'
- Poor child developmental outcomes are the result of a process of biopsychosocial accumulation whereby children are subjected over time to a range of toxic biopsychosocial experiences at a faster rate than their body and mind can process effectively
- These accumulation processes have their effects via a limited number of biopsychosocial pathways

### ANSWERING THE THREE KEY QUESTIONS

- **Is it really happening?** We need a collaborative international epidemiological effort to establish exactly what developmental outcomes are common to all developed nations
- **What are the causal pathways?** We need a collaborative interdisciplinary effort to understand the developmental pathways that lead to poor outcomes.
- **What should we do?** We need collaborative whole-of-government efforts to address the causal pathways.

### Dr. Tim Moore

Senior Research Fellow

Centre for Community Child Health,  
Murdoch Childrens Research Institute,  
The Royal Children's Hospital,  
Flemington Road, Parkville,  
Victoria, Australia 3052

Phone: +61-3-9345 5040  
Fax: +61-3-9345 5900  
Email: [tim.moore@mcri.edu.au](mailto:tim.moore@mcri.edu.au)  
Websites: [www.rch.org.au/ccch](http://www.rch.org.au/ccch)  
[www.econnections.com.au](http://www.econnections.com.au)

