



Addressing and Mitigating Vulnerability Across the Life Cycle: The Case for Investing in Early Childhood

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ABSTRACT

Our current understanding of the neurobiology of early childhood is that the development of the brain's architecture and function in early life affects health, learning and behaviour until we die. This means that what is done or not done in early childhood has long-term ramifications for both individuals and societies. The first few years of a child's life have a multiplier effect for society. Children who are well nurtured during this period tend to do better in school and stand a better chance of developing the skills required to compete in the global economy. Thus, investing in young children is an integral part of human and economic development.

Early human development is a powerful equalizer, as investments in early childhood yield significant long-term benefits that narrow the gap between high- and low-income families. Helping young children from disadvantaged or poor families has the highest potential returns of any educational policy. Nobel laureate James Heckman (2006) notes that investing in disadvantaged young children "...is a rare public policy initiative that promotes fairness and social justice and at the same time promotes productivity in the economy and in society at large." The World Health Organization (WHO) Commission on Social Determinants of Health (2008) states that closing the inequity gap in one generation is doable, provided we start with a more comprehensive approach to the early years in life—that is, "equity from the start."

Clearly, it is more equitable and cost effective to invest in early childhood development programmes, which can enhance children's potential, than it is to pay far more later to try to remediate what could have been prevented.

Introduction

"Poverty is not being able to go to school, not knowing how to read, not being able to speak properly. Poverty is not having a job, is fear for the future, living one day at a time. Poverty is powerlessness, lack of representation and freedom" (World Bank 2004).

Children who are born poor, live in unsanitary conditions, receive little mental stimulation or nurturing, and experience poor nutrition in their first years are far more likely than their richer peers to grow up stunted in body and mind. These children tend to do poorly in class, repeat grades and drop out of school at high rates. In the workplace, they are able to perform only unskilled jobs and earn the lowest wages. When they have children, a cycle of inherited poverty begins—and is repeated across generations.

This paper aims to make the case for investing in early childhood and embracing a ‘pre-distributive’ social policy that improves human development and the formation of human capabilities. It describes:

- Evidence of the impact of early vulnerabilities on children’s lifelong capabilities
 - Advances in the theory of early child development (ECD)
 - A dynamic model of the life cycle linking early development with health, behaviour, education and socio-economic outcomes
 - Empirical data from population studies and neuroscience research
- Experiences with and implications of ECD programmes and policies
 - Lessons learned in different countries and contexts
 - Elements of successful policies
- An agenda for the next 15 years
 - Four main tasks
 - Essential building blocks for universal ECD programmes

Perspective—poverty and inequality in early childhood

Poverty and negative human development outcomes go hand in hand. Poverty is a ‘catch-all’ measure for many deprivations that hurt children in the immediate and long term. Poor children are worse off in education, health and nutrition outcomes compared with those who are not poor. And poverty strongly correlates with short-, medium-, and long-term negative outcomes, such as higher infant mortality rates and malnutrition, lower school enrolment and achievement, the prevalence of infectious and chronic diseases in childhood and adulthood, higher unemployment rates, more criminal behaviour and many other undesirable social consequences. For those who are poor, weak human development outcomes are associated with limited access to and use of services, which are often of low quality even if they are available. Often, poor families do not have the resources to pay the ‘opportunity cost’ of sending their children to school. In sum, poverty significantly reduces a child’s chances in life to achieve his or her innate potential.

MULTIDIMENSIONAL RISKS ASSOCIATED WITH POVERTY IN CHILDHOOD

There are 559 million children under age five in developing countries. Of these, 126 million are living in absolute poverty, and approximately 156 million are stunted (Engle et al. 2007). In young children, stunting is caused by undernutrition and infection, not genetic differences. The poverty they experience is associated with inadequate food, and poor sanitation and hygiene—which lead to increased infections and stunting. In children, undernutrition contributes to 35 percent of all deaths resulting from measles, malaria, pneumonia and diarrhoea. Intrauterine growth restriction accounts for the largest percentage of deaths in children under age five that are attributed to stunting and severe wasting (Black et al. 2008). For children who do survive, poverty and undernutrition during pre-school years account for the loss of more than two grades in school, and when they become adults, a more than 30 percent loss in income (Engle et al. 2007).

Poverty is also associated with low maternal education, increased maternal stress and depression, and higher levels of stressful conditions linked to violence, poor housing and lack of overall services (Bhutta 2002). Risk factors related to poverty frequently occur together, and children's developmental deficit increases with a greater number of risk factors (Engle et al. 2007, 2011). Further, children's deficits in development are often seen in infancy and increase with age (Alderman and Engle 2008, Armecin et al. 2006, Rao and Sharma 2004). The longer one's exposure is to harsh conditions or deprivations, the greater the burden on the body's stress response system (i.e., allostatic load¹), which results in illness, disability, impaired learning and social maladjustment (McEwen 2008).

Walker et al. (2011b) and Wachs and Rahman (2013) have summarized the interplay of risks and protective factors in early child development. Many of the risks they cite are associated with poverty. Risk factors are often linked, and children living in poverty have higher exposure to cumulative risks. Whether these factors pose risks, or offer protection and build resilience depends in part on the age of the child, the dosage (number and intensity), and the interplay between them.

Risk factors that compromise children's cognitive and non-cognitive development can be clustered into three groups. They may be bio-ecological, such as nutritional deficiencies (iron, iodine), stunting, intrauterine growth restriction, parasitic infections, exposure to environmental toxins or HIV infection. They can be contextual, including inadequate stimulation and opportunities for learning, exposure to violence, insensitive parenting, maternal depression, institutionalization,

¹ McEwen (2008) uses the terms allostasis and allostatic load to describe the effects of stress stimuli on the brain's stress pathway. The process is a dynamic, regulatory one that maintains balance during individuals' exposure to physical and behavioural stressors. When the allostatic load is excessive or prolonged, it leads to 'wear and tear' on biological systems, tissues and organs, and results in mental and physical disease.

etc.. They may also involve individual characteristics of the child, for example, pre-existing vulnerabilities such as mental, physical or sensorimotor disabilities.

Protective characteristics can be clustered into similar categories. They, too, may be bio-ecological, such as breastfeeding, or pre- and postnatal micro- and macronutrient supplementation; contextual, including stimulating or supportive parent-child interaction, higher language stimulation in the home or higher maternal education; or individual factors.

The interplay of risk and protective factors needs to be understood in tandem with the timing and accumulation of risks, and the hierarchically linked pathways from proximal influences, namely individual and family characteristics, to distal influences that may be cultural or economic. This understanding can lead to better designed and more cost-effective strategies to promote ECD (Wachs and Rahman 2013).

INEQUALITY AND POVERTY

A child's development is highly influenced by the quality of his or her environment. Children's vulnerability exists in every socio-economic strata. Those in the lowest levels are proportionally more likely to be vulnerable than those in higher levels.

Poverty is associated with limited access to social services. In a summary of all available studies on the extent to which publicly financed health and education services reach different economic groups, Filmer (2003) showed that the highest income quintiles received a 25 percent share of total government expenditures, whereas the lowest income quintiles received 15 percent. An analysis of 45 Demographic and Health Surveys (DHS) (Gwatkin et al. 2000) showed that even primary care services, which tend to focus on infectious diseases and maternal and child health issues prevalent among disadvantaged groups, and that are often given in the name of equity (e.g., oral rehydration, attended delivery, child immunization) are more likely to be captured by those who are well-off than those who are poor.

With regard to health outcomes, lower economic status correlates with higher under-five mortality rates. The DHS surveys showed that in four of six world regions (East Asia and the Pacific, Latin America and the Caribbean, the Middle East and North Africa, and Sub-Saharan Africa), the under-five mortality rate was more than twice as high for those who were poorest than for those who were least poor (Gwatkin et al. 2000). Coverage of basic maternal and child health services has the opposite pattern, however. Among higher income groups, coverage was approximately two-thirds higher than for the poorest groups (Gwatkin, Wagstaff and Yasbeck 2005).

A key to overcoming the inequities in social and health services is to remove barriers to access and promote a strategy of proportionate universality. The latter concept was introduced by Sir Michael Marmot (Marmot Review Team 2010) and is discussed below in the section on an “Agenda for the Next 15 Years.”

LOOKING BACK TO THE FUTURE: THE IMPORTANCE OF ECD

ECD relates to human development—a fact recognized for more than 30 years across the development community. In 1980, the authors of the *World Development Report* (World Bank 1980) argued that improved health and education of the poor were not only important in their own right, but also promote economic growth. Beginning in the 1980s, and with the support of United Nations organizations, countries implemented many child survival initiatives. These have resulted in systematic and scaled-up control of diarrhoea, immunization, and improved nutrition, water and sanitation, as well as a global decline in under-five mortality rates—all important factors in ECD.

The 1990 *World Development Report* (World Bank 1990) charted the previous decade’s progress in reducing poverty and growing economies. That same year, the United Nations Development Programme (UNDP) launched its first *Human Development Report* (UNDP 1990), which proposed a multidimensional framework for human development that included education, health (and nutrition), social development and growth at the scale of a nation.

These two reports put people back at the centre of the economic development process.

The *World Development Report 1990* proposed strategies of poverty reduction as underpinning social sector policies (health and education) to improve human capital. The strategies were the provision of basic social services to poor people, basic health care, family planning, nutrition and primary education—to complement policies promoting productive use of labour (the ‘poor people’s asset’) (World Bank 1990).

The 1990 *Human Development Report* emphasized that human development concerns more than the formation of human capabilities (i.e., improvement of health or knowledge); it also concerns the use of capabilities for work, leisure, or political or cultural activities (UNDP 1990). The report also introduced a new way to measure human development—the Human Development Index,² a measure

² The Human Development Index ranges from 0 to 1. It combines three indices for life expectancy, education (adult literacy rate, and the percentage of school-aged children enrolled in primary, secondary and tertiary school) and gross domestic product (GDP) in purchasing power parity (PPP) US dollars. Countries ranking above 0.8 have a high human development score; those between 0.5 and 0.79 a medium one; and those between 0.0 and 0.49 a low one.

of social and economic status to compare regions and countries in terms of how economic growth translates or fails to translate into human development.

In September 2000, 147 heads of state and government, and subsequently 189 nations in total, signed the Millennium Declaration. This compact emphasized synergies among the many aspects of human development, and placed high priority on a cluster of health and education policies that are needed for countries to break the ‘trap’ of poverty. The declaration noted that initiatives in education, health, nutrition, water and sanitation are complementary, and that investment in any one contributes to a better outcome in others. Subsequently, the eight Millennium Development Goals (MDGs) were used to track progress (see Box 1); they included 16 targets and 46 indicators. Several of the goals address child-related aspects of health and education.

Box 1: Millennium Development Goals

1. Eradicate extreme poverty and hunger
2. Achieve universal primary education
3. Promote gender equality and empower women
4. Reduce child mortality
5. Improve maternal health
6. Combat HIV/AIDS, malaria and other diseases
7. Ensure environmental sustainability
8. Develop a global partnership for development

The progress towards achieving the fourth MDG, on reducing child mortality, has been significant and steady. Policies in many nations have given priority to reducing under-five mortality by two-thirds, including by focusing on applying technical interventions that address the causes of child mortality, such as malnutrition, infectious and parasitic diseases, and lack of immunization. Traditional public health measures have been identified to combat malnutrition and infectious diseases, starting, for example, by expanding access to reproductive health care and nutrition interventions for mothers and children. The measures have included exclusive breastfeeding for infants in their first four to six months, micronutrient supplementation (vitamin A, iron, zinc and iodine), attention to mothers’ health before and during pregnancy, oral rehydration, increased access to clean water and sanitation, and renewed and enhanced efforts to improve immunization and surveillance. Yet despite these efforts, 6.9 million children still die each year from preventable causes, down from 12 million in 1990. Most of these children are in sub-Saharan Africa and South Asia (UNICEF et al. 2012).

In a similar fashion, the education sector has pursued the Education for All initiative and the second MDG, on universal primary education, by focusing primarily on getting children to school. As a result, progress has been made in increasing children’s enrolment, but there is a crisis unfolding

related to learning. Some 70 million children, down from 100 million children in 2000, are still not entering primary school, but a large proportion of the 615 million children who are in school in developing countries, and who comprise 89 percent of the 694 million schoolchildren worldwide, are performing poorly in literacy, numeracy and essential life skills (Gove and Cvelich 2010, van der Gaag and Adams 2010).

The MDG compact galvanized the global community to focus on poverty reduction and to mobilize resources from development organizations and countries. Since 2000, a number of international development agencies have specifically addressed the importance of ECD through their respective lenses or mandates. The World Bank and regional development banks, such as the Inter-American Development Bank and the Asian Development Bank, are primary supporters of ECD programmes in their development lending portfolios. Other agencies such as the United Nations Children's Fund (UNICEF), with its perspective on child rights; the United Nations Educational, Scientific and Cultural Organization (UNESCO), with its Education for All initiative; and bilateral donor agencies participating in the Global Partnership for Education are working on ECD with counterpart in-country agencies through advocacy, monitoring and technical assistance.

In 2002, the United Nations General Assembly endorsed a new agenda, A World Fit for Children. This expanded its commitment to early childhood policies that enhance children's physical, social, emotional, spiritual and cognitive development (United Nations General Assembly 2002). The WHO, in its *Social Determinants of Health* report (WHO Commission on Social Determinants of Health 2008), set forth healthy early development as a powerful equalizer—in other words, “equity from the start.” A number of United Nations agencies have devoted reports to ECD and identified challenges that countries face. In a recent commentary in *The Lancet*, Chen (2013) calls for expanding child survival initiatives to include child development as global leaders prepare for the post-MDG development agenda, and for renewing commitment for the WHO to place “early child development as an area of work critical to a life course approach to human development.”

In addition to these global, multilateral initiatives to reduce poverty by promoting ECD, several regional initiatives are noteworthy. During the Consulta de San José 2007, which was modelled after the Copenhagen Consensus, an expert panel of nine distinguished economists gave first priority to ECD programmes as a solution to addressing poverty in Latin America and the Caribbean. More recently, the Commission on the Measurement of Economic Performance and Social Progress stated that “the time is ripe for our measurement system to shift emphasis from measuring economic production to measuring people's well-being in a context of sustainability” (Stieglitz, Sen and Fitoussi 2009). Despite these initiatives, however, more than 200 million children under age five are still not developing their full potential because they live in poverty and are undernourished (Engle et al. 2007). What can we do about that?

POLICIES DO MATTER

Over the past few decades, social sector policies have become increasingly prominent as a core element in strategies to promote economic growth and human development. These social policies have been based on extensive analyses and correlations of population characteristics, which include individual or aggregate income levels, as well as the evaluation and assessment of the impact of interventions. This research, which has included comparisons across poverty levels and country profiles, has in turn been helpful in identifying policies and programmes that are successful in assuring children's welfare and addressing poverty.

These social policies, however, are fragmented, emphasizing only one problem at a time, and often remedial in nature (Heckman 2013). For example, policies intended to improve poor health focus on providing more doctors or clinics; those addressing low school enrolment stress building more schools, adding more teachers or distributing more textbooks; and those to reduce inequality focus on giving cash transfers. Heckman (2007a) remarks, "Too often, government officials design programs for children as if they lived their lives in silos, as if each stage of a child's life were independent of the other, unconnected to what came before or what lies ahead. It's time for policymakers now to look beyond silos, to begin recognizing that consistent, cost-effective investment in children and youths can pay for itself."

The evidence: ECD has lifelong impacts

Evidence of the impact of early vulnerabilities on children's lifelong capabilities continues to unfold. Theoretical advances in understanding the implications of ECD are supported by empirical data and studies accumulating in many studies across multiple disciplines, such as neuroscience, social and behavioural science, and economics. With this underpinning, researchers are constructing dynamic models of the life cycle that associate children's cognitive development with their socio-economic status, and physical and mental well-being.

THE LINK BETWEEN ECD AND ECONOMIC AND HUMAN DEVELOPMENT: THEORETICAL ADVANCES

Investing in people—in their human capabilities—is now widely recognized as the driver of economic growth. Early approaches to development based on mathematical planning models have been replaced by development models recognizing that people are both the means and the ultimate end of development (van der Gaag 2002). The works of Tinbergen, Schultz, Fogel, Sen and Heckman—all Nobel laureates in economics—have contributed to these more recent models. They emphasize the importance of investing in (young) people as a central means of fostering economic development.

Through the work of Fogel, who received the 1993 Nobel, and others, we now better understand that the competence and coping skills of a population have a major effect on economic development. Fogel emphasized ‘people development’, and he underscored the importance of technological change to physiological improvements. He concluded that the quality of children's early development (e.g., nutrition) has a significant effect on the quality of populations and a ‘long reach’ that influences health outcomes in adult life.

Sen, the 1998 Nobel recipient, stresses that the capabilities that adults enjoy are deeply conditioned by their experiences as children. He has noted that investing in education and other childhood opportunities can enhance future capabilities in many ways by developing skills for living a good life, increasing self-confidence, and contributing to adult abilities to earn a living and be economically productive. Sen expands this concept further to emphasize that individual freedom—that is, freedom from hunger, disease, ignorance and all forms of deprivation, be they poverty, political or economic—is the ultimate goal of economic life.

HUMAN CAPABILITY: COGNITIVE AND NON-COGNITIVE SKILLS

Traditional theories of human capital utilize a life cycle model that links investment in human capacity (e.g., education) to increased productivity in the labour market, which, in turn, leads to higher wages and economic growth (van der Gaag 2002). This emphasis skews the focus to cognitive skills, with the assumption that they lead to better school performance and higher levels of educational achievement (Hanuschek and Woessmann 2007).

Heckman, who received the 2000 Nobel in economics, makes a compelling case for children's early years as critical to the formation of skills and capabilities, and as important causal determinants of life cycle outcomes. He argues that the accumulation of human capital is a dynamic life cycle process, and that skills beget skills in a synergistic way (Heckman 1999). He points out that current policies on education and job training are misconceived, as they tend to focus on cognitive skills, measured by achievement on IQ tests, and neglect the critical importance of social skills, self-discipline, motivation and other ‘soft skills’ known to determine success in life. Heckman (2005) also points out that assuming that abilities are fixed at early ages is erroneous. Research shows, instead, that abilities are multiple, both cognitive and non-cognitive; that they are developed in a variety of learning situations; and that early ability fosters further learning.

Heckman and others (Cunha and Heckman 2007, 2008, 2009; Cunha, Heckman and Schennach 2010; Cunha et al. 2006; Heckman 2007a, 2007b, 2008a; Heckman and Masterov 2007) emphasize that any effective strategy for promoting human development must acknowledge the following concepts:

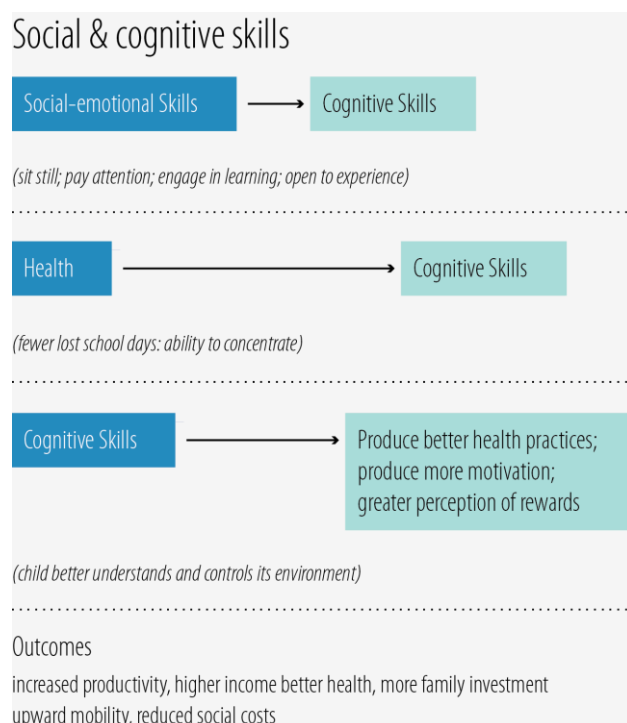
1. The powerful role of family life and children's early years in shaping adult capabilities. Family factors in the early years play crucial roles in creating differences in cognitive and non-cognitive abilities. Differences in these abilities across children from diverse families appear early and persist. Family quality contributes to the formation of both sets of skills, which determine success in school. The Coleman Report (Coleman 1966) and other studies (Radford et al. 2010) show that family, rather than schooling, is the major source of inequality in student performance. Evidence indicates that gaps in children's skills widen with age. Whereas cognitive abilities are fairly stable after age seven or eight, non-cognitive abilities can be improved until the late teenage years.
2. Heckman (2005) notes that, by third grade, gaps in test scores across socio-economic levels are stable by age—a finding that suggests that schooling or school quality has little effect on reducing them. Heckman (2013) concludes that capabilities are not fixed at birth or solely genetically determined, but are causally affected by parents' investment in their children, and that a "proper measurement of disadvantage is the quality of parenting, attachment, consistency, and supervision, and not income per se."
3. Multiple capabilities shape the ability of individuals to function in society. Having a core set of cognitive and non-cognitive capabilities promotes success in many aspects of life. Interventions in early childhood have the greatest impact in promoting essential, non-cognitive skills.
4. The formation of capabilities is synergistic, as one capability enhances another. Cognitive and non-cognitive skills interact dynamically to shape the evolution of subsequent capabilities. The development of children's cognitive and non-cognitive skills—such as conscientiousness, self-regulation, motivation, time preference, far-sightedness—reflects investments in human capital made by parents and children (Conti and Heckman 2010). Enriching the early environments of disadvantaged children can improve child outcomes and affect both types of skills.

A SYNERGY OF COMPETENCIES: HEALTH, SOCIAL, EMOTIONAL AND COGNITIVE

Studies of skill formation show that returns on investments in schooling are higher for persons with higher abilities when these abilities are formed earlier (Heckman 2008a). Moreover, cognitive, social and emotional capabilities, which are pre-requisites for economic productivity in adulthood and are

influenced by early experiences, enhance each other. Figure 1 depicts this synergy, which includes health.

Figure 1: Synergy of Social-Emotional and Cognitive Skills and Health for Adult Outcomes



Source: Heckman 2013.

For example, development of cognitive skills affects performance on achievement tests, which in turn influences labour outcomes. Externalized behaviours, such as aggression, or antisocial or rule-breaking acts, influence crime and labour outcomes. Academic motivation boosts education outcomes, and predicts decreased drug and alcohol use, which are both associated with crime. And enhanced personality traits promote learning, which in turn boosts achievement test scores (Cunha and Heckman 2008). This last finding is consistent with studies that show that 30 percent to 40 percent of the variance in achievement test scores is due to personality traits, not IQ (Cunha and Heckman 2007).

The workforce of the 21st century needs to have competencies that are more than cognitive ability. Non-cognitive factors such as interpersonal, communication and socio-emotional abilities; physical and mental health; and perseverance, attention, motivation and self-confidence are all important capabilities for working—and succeeding—in the global market economy (Cunha and Heckman 2007, 2008, 2009; Cunha et al. 2006). Social sector policies should incorporate this understanding of the dynamics of skill formation over the life cycle, and of the importance of children's early years for overcoming inequalities and producing marketable skills for the workforce.

EMPIRICAL EVIDENCE: POPULATION DATA

Data from longitudinal and other population-based studies support the concepts of a progressive life cycle of development that begins even before birth, accelerates during early childhood and is highly dependent on family environment. Gaps widen early, adversity links with poor outcomes, multiple environmental factors can be positive or negative, and there is a gradient of effects across income levels.

GAPS IN CAPABILITY WIDEN EARLY, BEFORE CHILDREN ENTER SCHOOL

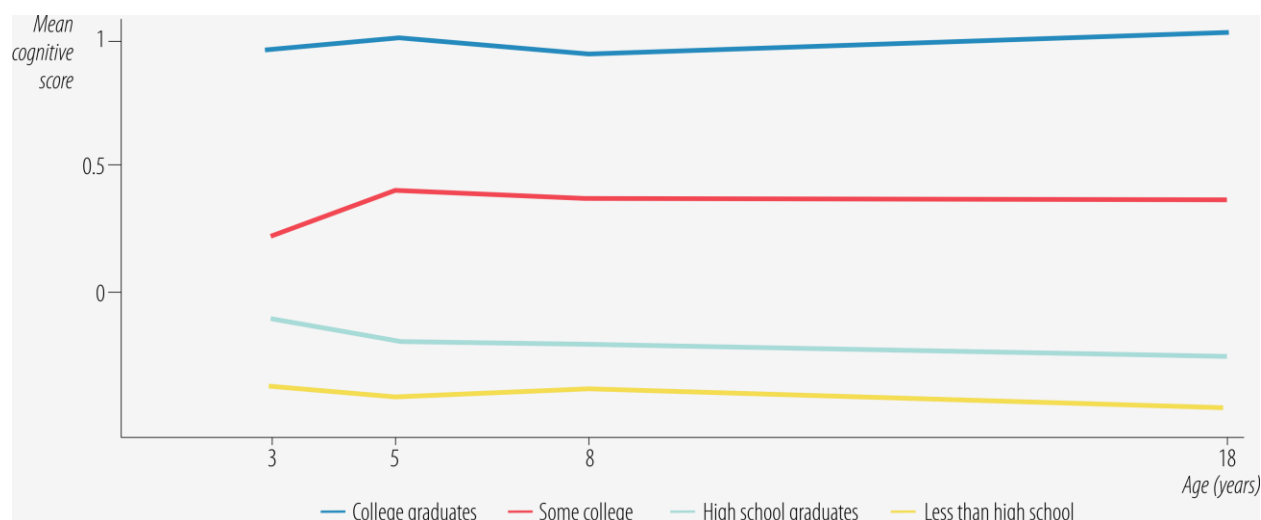
Inequalities in child development emerge systematically, and correlate with parents' education and income. Economists estimate that conditions experienced before age 18 contribute to approximately 50 percent of inequality in lifetime earnings (Heckman 2013).

Gaps in skills between advantaged and disadvantaged individuals open early in the lives of children. In their study of vocabulary differences among children in the United States, Hart and Risley (1995) showed that word accumulation, or vocabulary, begins very early in life. They note that by 36 months of age, the verbal skills of children from different socio-economic backgrounds vary markedly, and that the differences or trajectories for verbal skills are still present at nine years of age. Carneiro and Heckman (2003) found differences in cognitive skills that correlated with socio-economic class as early as age six. Cunha and Heckman (2007), using data from the United States National Longitudinal Survey of Youth's math test, administered at ages 6, 8, 10 and 12 years for children from different socio-economic groups, found substantial gaps between income groups. These socio-economic gradients in outcomes persisted and widened over time.

The relationship between inequality and ECD is dynamic and feeds on itself. Research shows that the quality of schooling, pupil-teacher ratios, and teachers' salaries play only a small role in accounting for gaps in equality and their widening or narrowing (Heckman 2008a). Mothers' level of education is a key factor in the emergence of inequality among young children. Figure 2 illustrates the effect of maternal education on children's mean cognitive scores over time.

A few studies in developing countries affirm the link between socio-economic status and cognitive development (Naudeau et al. 2011). A study in Ecuador (Paxson and Schady 2007) shows that household wealth and parental education are associated with higher scores on tests of receptive language, and that gaps are larger among older children (figure 3).

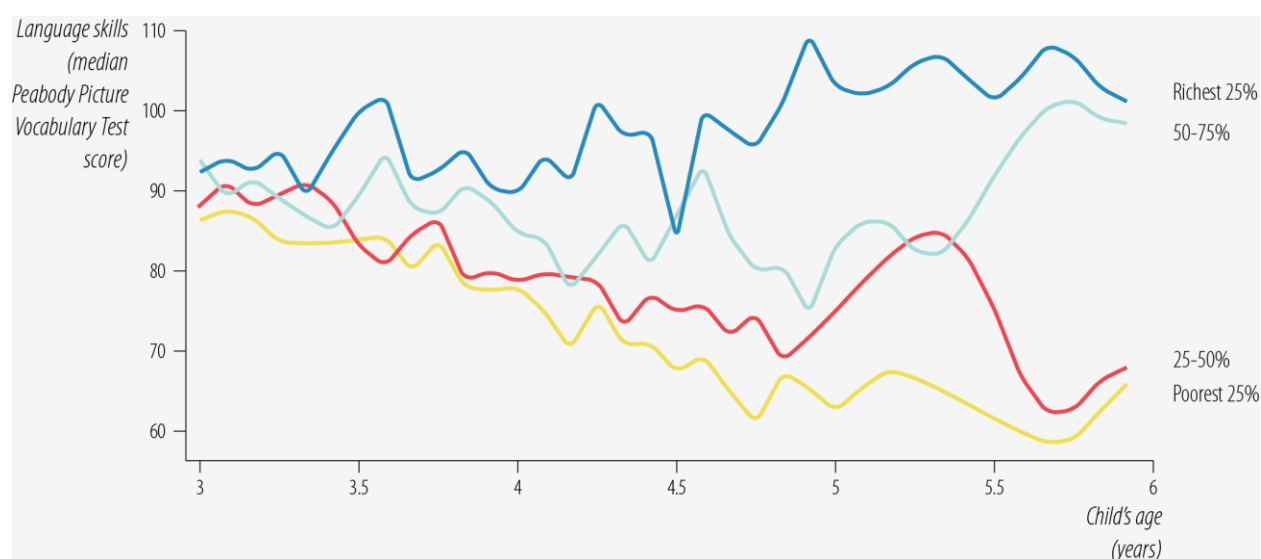
Figure 2: Trends in cognitive scores by children's age and mothers' education, United States Infant Health and Development Program



Source: Heckman 2013.

Data source: McCormick et al. 2006.

Figure 3: Vocabulary scores by socio-economic quartiles in 36- to 72-month-old children in Ecuador



Source: Paxson and Schady 2007.

TIMING AND DOSAGE OF ADVERSITY IN EARLY CHILDHOOD LINK WITH LATER OUTCOMES

Adverse early experiences are key predictors and causes of life-course trajectories in health, learning and behaviour. For example, low birthweight or sub-nutrition in utero is linked with metabolic diseases later in life, and neglect or abuse is associated with coronary heart disease, substance abuse, depression or anxiety in adulthood.

Hertzman (1999, 2001), Halfon and Hochstein (2002), and Wachs and Rahman (2013) have suggested that the development of health is determined not just by the cumulative impact of risk and protective factors, but also by the timing of exposures. In his recent publication, *No Small Matter*, Alderman (2011) summarizes cases of economic shock (e.g., economic crises, epidemics, famines, conflicts) that can have a strong impact on the life of a child whose gestation occurs during that time. He notes that droughts or similar shocks during a child's first two years affect his or her nutritional status.

ENVIRONMENTAL FACTORS ARE MULTIPLE, INTERACTIVE, AND MAY BE POSITIVE OR NEGATIVE

All social, environmental and economic factors influence early human development. They include income and social class, food intake and nutrition, health care, and physical aspects of public health such as housing, water and sanitation. Both negative and positive factors 'feed' the development of core competencies, beginning even before birth. Each child's growth reflects not so much genetic differences, but cumulative biological and social variables, such as the socio-economic environment, mother's level of education, household environment and socio-economic status. As emphasized, poverty is of course a primary adverse factor compromising children's early brain development. Poverty is much more than income alone, as is reflected in the use of socio-economic status, which as a measure of poverty offers a more sufficient construct than income for capturing the many factors associated with poverty. The impact of these and other poverty-related risk factors is greater in early rather than late childhood (Duncan and Brooks-Gunn 1997).

Both negative and positive factors 'feed' the development of neural pathways underlying the development of children's core competencies, beginning even before birth and continuing onward. Each child's growth reflects not so much genetic differences, but rather, the cumulative effects of biological and social variables, such as the social and economic environment in which a child is born, the mother's level of education, the household environment and so on.

Nutrition is a critical factor beginning in early development. Both the quantity and quality of infants' nutrition have important effects on their growth. Feeding practices and weaning of infants affect their weight, morbidity and mortality. Studies show that sub-optimal breastfeeding and non-exclusive breastfeeding in the first six months of life account for 10 percent of the burden of disease in children under five years old (Black et al. 2008).

Other environmental factors such as social unrest, personal or ritual lifestyles, and dietary practices also influence a child's growth. The reports of an association between reduced birthweight and restricted dietary intake are mixed, with some researchers reporting an association during, for example, Ramadan (Awwad et al. 2012) and the Dutch famine of 1944-1945 (Lumey 1992), while others report no association (Moradi 2010).

GRADIENT OF EFFECTS

Vulnerabilities among children are found in all socio-economic groups, but not equally. Population-based research indicates a gradient of effects when vulnerability is plotted against socio-economic status. Children in low groups are more likely to have poor outcomes compared to those in high groups (WHO Commission on Social Determinants of Health 2008; McCain, Mustard and Shanker 2007). These findings illustrate the links among well-being, socio-economic settings and resource distributions. When they are plotted on a graph, the slope of the gradient effect reflects the extent of inequality among outcomes that can be attributed to socio-economic status. A steep gradient indicates greater inequality, and a flat gradient less inequality. Studies in both developed and developing countries show socio-economic gradients in children's health and education outcomes before they enter school (Case, Fertig and Paxson 2005).

Beginning early in life, children and families in poverty sustain higher rates of morbidities such as low birthweight (Blumenshine et al. 2010), injury (Boyce 1996), infectious disease, and developmental disorders and poor academic outcomes (Msall et al. 1998). In communities, low socio-economic status is associated with higher levels of family stress, violence, instability and unpredictable events. Parents are less responsive to their children and discipline them in harsher ways. Children are read to less frequently, and have more limited access to books or other reading resources. Low-income parents are also less involved in their children's activities or interactions. Living in low-income neighbourhoods, they have less access to water and sanitation services, and their housing may be debilitated and crowded (Marmot Review Team 2010).

Multiple environmental risk factors have multiple effects on children's development and health status along their life course and into adulthood. These often play out as coronary heart disease, mental illness and immune-mediated diseases (Anda et al. 2006).

THE SCIENCE OF BRAIN DEVELOPMENT IN EARLY CHILDHOOD

During the past two decades, there has been a convergence of findings in developmental neurobiology and psychology, population health, social science and economics. This has resulted in a phenomenal advance in understanding of the long reach of ECD. Scientific research across many disciplines shows without a doubt that events in early life link with the development of the brain's circuitry; dynamic gene-environment interactions; programming of the body's immune, neurological and endocrine systems; life trajectories of human development; and occurrence of chronic diseases in adulthood (Shonkoff and Phillips 2000; McCain, Mustard and McCuaig 2011; Shonkoff et al. 2012).

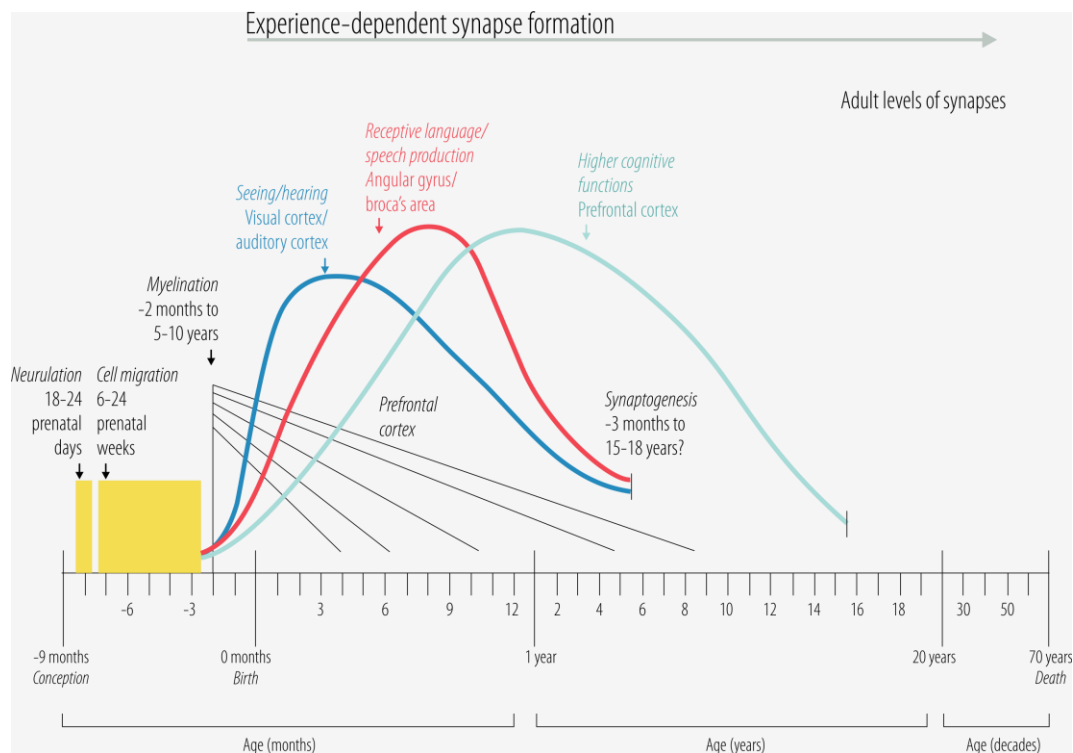
The following four key concepts summarize what we now know about ECD:

1. Both the architecture of skills (e.g., coping abilities, cognitive and non-cognitive competencies, health) and the process of skill formation are strongly influenced by neural circuits that develop as a result of dynamic interactions between genes and early life environments and experiences.
2. The development of neural pathways and the mastery of skills follow hierarchical rules in a sequence of events from the bottom up, such that later attainment is built upon earlier foundations.
3. Cognitive, social, emotional and language competencies are interdependent. All are shaped by early experiences, and all contribute to the formation of lifelong capabilities.
4. Adaptation continues throughout life. Capabilities are formed in predictable sequences during sensitive periods when the development of specific neural circuits is most plastic and receptive to environmental influences.

This understanding has far-reaching implications. Clearly, it is much less costly to society to get things right the first time than to try to fix them later (Knudsen et al. 2006, Shonkoff et al. 2012).

Even though the most rapid and dramatic period of brain growth takes place during the early years of life, maturation continues throughout childhood and into adulthood (Rutter 2011). Rutter (ibid.) notes that despite sensitive periods or age-related differences that influence risk and risk protection, no single age period has a ‘monopoly on risks’, and there is no age beyond which it is generally too late to intervene. But what are the costs of later intervention?

Figure 4 depicts in detail the development of the brain’s structure and function over time, from conception to death. The formation of synapses (connections) in the brain is experience-dependent, and synaptogenesis (onset of synapse formation) begins prenatally. Development of the senses, language and speech, and higher cognitive functions occurs sequentially and is especially critical during peak sensitive periods, as noted in the figure.

Figure 4: Development of the brain's structure and function

Source: Thompson and Nelson 2001. Slide provided by Heckman.

NEURAL PATHWAYS IN THE BRAIN

The brain's neural circuits and pathways are formed to carry out specific functions. They connect and mature during the prenatal and early childhood periods, and into middle childhood and adolescence. Simple circuits are built first, followed by more complex ones. For example, development of the sensing pathways for vision, hearing, touch, smell and taste begins before birth and wanes by age four. These sensory systems bring in information that children need for subsequent development. Development of the limbic system and stress pathway also begins before birth and continues into early childhood. The limbic system manages responses to challenges, and the stress pathway, which is the neural network that operates between the limbic system and the adrenal glands and prefrontal cortex, determines how people respond and adapt to daily experiences, and new challenges and situations.

GENE-ENVIRONMENT INTERACTIONS

Early human development is an intricate and dynamic interaction between nature and nurture—that is, genes and the environment. Genes 'listen' to the environment, and the environment 'adapts' the genetic blueprint. In early life, nurturance, stimulation and nutrition begin at gestation. The environment of the foetus—comprising the mothers' health, well-being, level of stress, and food and

drug intake—interacts with genetic predispositions to sculpt the architecture of the brain and neural pathways, which influence learning, behaviour, and physical and mental health for life.

The environment modifies the expression of genes, such as gene variants and phenotypes, and can turn genes on and off through the epigenetic process. In this, experiences leave a chemical signature, or epigenetic mark, that sits atop genes and can determine whether and how genes are switched on and off. Epigenetic mechanisms alter genetic expression without changing the DNA sequence; many of these changes are temporary, but others seem to be enduring. Hence, a DNA blueprint carries a personalized signature.

Twin studies illustrate the effect of gene-environment interactions. Identical twins, who have the same DNA or genotype, can exhibit different gene expressions or phenotypes, as each twin will not have the same experience as the other in early life. Likewise, non-identical twins, who have different genes, but are exposed to the same environment, will exhibit different gene expressions (McCain, Mustard and McCuaig 2011). In other words, the environment can affect individuals differently depending on their genetic endowment, and the same genetic endowment produces different outcomes depending upon the environment (Hertzman and Boyce 2010).

EFFECTS OF POOR NURTURING ON STRESS PATHWAYS

Children begin life ready for relationships that drive early brain development. An infant is primed to be interested in faces and to initiate non-verbal communication with others. When we respond to an infant's gaze, smile or babbling, we set up a chain of back-and-forth exchanges that affect the wiring and sculpting of the child's limbic pathways.

Animal studies illustrate how early experience shapes the architecture of the brain's neural circuits involved in stress response and coping. Meaney and colleagues' seminal studies in rats helped explain how mammals respond to environmental stimuli. Rat pups that are poorly nurtured at birth and during infancy—the mothers do not adequately lick or groom them—have abnormal responses to stress in adulthood, such as an increased likelihood of addiction (Meaney and Szyf 2005). The mothers' reduced licking and grooming raises cortisol levels in the rat pups' brains.

This research demonstrates how touch in early life influences how stress pathways function in later life. The early rearing conditions of the rats permanently affect their brain circuits—in other words, the limbic system, hypothalamus-pituitary-adrenal (HPA) pathway and autonomic nervous system—and their biological responses to stress throughout life. The effects are wide-ranging and influence temperament, behaviour, learning, memory, metabolism and reproduction.

STIMULATION AND LANGUAGE DEVELOPMENT

In humans, face-to-face interactions of newborns and infants with adults are critical for development of language. As shown in figure 4, the development of neural pathways for language begins even before birth and sets the stage for the growth of higher cognitive functions, which continues into adolescence. Neural pathways related to language depend on the development of neural pathways for vision and sound, and follow the development of neural pathways for stress responses and coping.

At approximately seven months’ gestation, the brain’s sensory pathways for hearing are active and become sensitive to the rhythmic qualities of the particular language spoken at home. During the first six to seven months after birth, babies gurgle and babble—they make the same babbling sounds regardless of a family’s language. Scientists at the University of British Columbia, Canada, have noted that babies who are regularly exposed to two languages before birth can distinguish them after birth (McCain, Mustard and McCuaig 2011).

Early exposure to language at home predicts the size of children’s vocabulary and their later verbal and literacy skills. In a study of children in the United States, Hart and Risley (1995) showed that by the time children were three years old, parents in low-income circumstances used fewer different words in their cumulative monthly vocabularies than parents of children in the most economically advantaged families.

Box 2 shows the variability of children’s early exposure to language in relation to family status and income. This evidence highlights the importance of good parent-child interactions and stimulation, especially for children in poorer socio-economic settings, and the major role that families and communities have beyond just transmitting genes. The quality of children’s early home environments is predictive of their success in life.

Box 2: Meaningful differences: 30 million more words

<i>Cumulative vocabulary experiences</i>		
<u>Family status</u>	<u>Words heard per hour</u>	<u>Words heard in three years</u>
Welfare	616	13 million
Working class	1,251	26 million
Professional	2,153	45 million
<i>Cumulative vocabulary at age three</i>		
Children from welfare families		500 words
Children from working-class families		700 words
Children from professional families		1,100 words
<i>Source: Hart and Risley 1995.</i>		

EARLY ADVERSITY INFLUENCES LATER COGNITIVE AND NON-COGNITIVE DEVELOPMENT

Research from human and animal studies applying a wide array of tools in genetics, molecular biology, genomics and brain imaging confirms that significant exposure to adversity, especially when sustained in early childhood and within a family environment of poverty and deprivation, can alter the structure and function of the brain's circuitry and related neurological pathways to negatively affect health (mental and physical), learning and behaviour for the life course.

Among pregnant women, low socio-economic status increases the likelihood of premature birth and foetal growth retardation, which may be explained, as noted, by high stress, higher rates of infection, and poor or inadequate nutrition. All of these factors increase cortisol levels in the mother and the foetus, which can reduce foetal growth and trigger prematurity. These findings are consistent with studies in other primates (rhesus monkeys) that show that foetal exposure to increased cortisol reduces the hippocampal volume of adults, and that the offspring of stressed mothers have lower birthweights, impaired neuromotor development, attention deficits and emotional dysregulation across the lifespan.

Neuroscience research utilizing electroencephalograms and functional magnetic resonance imaging is also identifying the underlying affective and cognitive systems influenced by socio-economic status (Hackman, Farah and Meaney 2012). A better understanding of the mechanisms of this influence will enable researchers to design more specific interventions to prevent and remediate the effects of a low status in childhood (Shonkoff, Boyce and McEwen 2009; Hackman, Farah and Meaney 2012).

For example, low postnatal socio-economic status is associated with greater depression in parents; compromised parent-child interactions, such as parents' use of harsh and inconsistent discipline, less sensitivity to their child's needs and reduced verbal communication; and insecure attachment of the child to the primary caregiver (Hackman, Farah and Meaney 2012). Hackman, Farah and Meaney (ibid.) cite studies concluding that the quality of parenting not only correlates with a child's current emotional and behaviour patterns, but also predicts the child's future patterns. Further, the effect of socio-economic status on children's emotional and cognitive development occurs along a gradient according to parents' education or income. The development of children whose parents are in the lowest quintiles of income, socio-economic status or education is most negatively affected, compared with children whose families are in the highest quintiles (Hackman, Farah and Meaney 2012).

Socio-economic status affects some neurobiological systems more than others. Hart and Risley (1995) and other researchers have found that it has the largest effect on language processing and moderate effects on executive function, such as working memory and cognitive control. Hackman, Farah and Meaney (2012) point out that it is positively correlated with the left part of the brain (left

inferior frontal gyrus), which is activated during a language task, and that children with low socioeconomic status exhibit decreased specialization of the language function in the left hemisphere. Moreover, the researchers have evidence of differences in the neural processing of emotion, an executive function, as well as cognitive and affective processes. They note that impairment in executive function is linked with less success in school performance.

EARLY ADVERSITY ALSO PREDICTS POOR MENTAL, BEHAVIOURAL AND PHYSICAL HEALTH OUTCOMES

Numerous prospective, longitudinal studies conducted in developed countries illustrate that the severity of early life experiences, such as socio-economic deprivation, disruptive caregiving or harsh parenting, predict difficulties in adult life. Among these studies are the 1958 British Cohort Study and the Avon Longitudinal Study of Parents and Children in the United Kingdom, the National Collaborative Perinatal Project and the Kauai Longitudinal Study in the United States, and the Quebec Longitudinal Study of Child Development. All have contributed to a better understanding of the gene-by-environment interaction described by Hertzman and Boyce (2010).

The New Zealand Dunedin Multidisciplinary Health and Development birth cohort study, in particular, conducted by Caspi and colleagues, illustrates how exposure to adversity in childhood predicts poor mental health, such as risk for depression and substance use. The researchers (Caspi et al. 2003, 2010) showed that adverse conditions in early life, such as neglect or abuse, led to an increased risk of depression in adults with the short allele for the serotonin transporter gene. Those with the short allele reared in good, caring environments were not at increased risk; those with the long allele brought up in adverse environments were also resilient.

Danese et al. (2007) have shown links between childhood stressors, such as maltreatment, and dysregulation of the immune system. Other long-term health effects of adversities experienced by young children have been well documented and continue to be explored.

Kaiser-Permanente's Adverse Early Childhood Experience Study is a retrospective, longitudinal study in which 17,000 members of Kaiser-Permanente's health maintenance organization were surveyed about their history of adverse experiences before the age of 18. The conditions included physical and sexual abuse, emotional neglect, parental divorce and loss, domestic violence, and exposure to family members who had a history of drug and alcohol abuse, mental illness and/or crime. The survey showed that young children exposed to traumatic or abusive childhood events were predisposed as adults to a range of health problems that included coronary artery disease, high blood pressure, type 2 diabetes, obesity, cancer, and mental and behavioural problems such as depression, alcoholism, smoking and substance abuse (Anda et al. 2006, Felitti et al. 1998, Hertzman and Boyce 2010).

Violence and neglect have a severe impact on early brain development. A study of children caught in the Israeli-Palestinian conflict showed that those in the Gaza strip had three times the rate of emotional and behavioural problems of middle-class children in Canada (McCain, Mustard and Shanker 2007; Miller 2000). Other extreme events such as epidemics (HIV and AIDS) and orphanhood also have negative and long-term effects (Walque 2011).

Children raised in institutions may suffer profound deprivation that damages brain development (Nelson et al. 2009). These children tend to have lower IQs, stunted growth and behavioural problems. The longer their institutional deprivation is, the more pronounced their negative outcomes. Rutter (2011) reports data showing that children who left an orphanage when they were younger than six months old had no detectable sequelae, but two-fifths of children adopted after that age had deficits. He concludes that profound institutional deprivation has lasting effects, including a marked increase in deficits among children after the second half of the first year of their life. He notes that deprivation affected children's physical growth even among those who did not experience sub-nutrition, and the behavioural sequelae tended to be disinhibited attachment or quasi-autistic features, rather than more usual forms of emotional disturbance or disruptive behaviour. Nevertheless, Rutter (*ibid.*) found that there was considerable heterogeneity in outcomes even among children who experienced the most prolonged deprivation.

The neurobiology of children in all these situations needs to be better understood, as the adversities they experience have lasting effects on their mental, behavioural and physical outcomes well into adulthood—and the costs to individuals and society are huge.

WHAT MONEY CAN'T BUY—PARENTING

Longitudinal follow-up of interventions in early childhood have made it clear that parenting—in other words, adult-child interaction—in the early years is the essential stimulation for brain development, a finding that is supported by research on animals in developmental biology. The interactions studied include back-and-forth communications with caregivers, vocalization, gestures, facial expressions and body movements. They may be warm expressions by mothers, physical contact and play, visual mutuality and/or vocal exchanges, and mothers' responses to infants in timely and appropriate ways (Bornstein et al. 2008). In more recent work, Anand and Roope (2013) show how the frequency of involvement in activities with parents is connected to the development of children's capabilities, notably speech, social and everyday motor skills. Their results suggest particular connections between related activities and capabilities (for example, between visiting other families and the development of social skills) and the significance of arts-related activities (particularly involvement in arts and crafts or singing).

Parents' communication with their children and their sensitivity to children's emotional needs mediate the effects of low socio-economic status on cognitive and socio-emotional development

(NICHD 2006). Two domains of positive caregiving described by Bornstein and Putnick (2012) are cognitive and socio-emotional. Cognitive caregiving consists of strategies that parents use to stimulate their children by providing opportunities for them to learn through practices such as reading, telling stories, naming, counting and drawing. Socio-emotional caregiving includes activities that engage children in interpersonal interactions such as playing and singing.

Caregiving features that might contribute to biological processes, in other words, turning genes on or off, have the following properties: They are present very early in life when the mother-infant dyad is closest; they happen frequently, as in many times a day; and they are iterative and repetitive, occurring more or less the same way each time. Research shows that in order for caregiving behaviour to change biological systems, it must happen through repeated small influences over time, rather than one large impact at a single point in time (Barr 2011).

INTERGENERATIONAL TRANSMISSION OF POOR PARENTING

Toxic stress in early childhood can create a vicious cycle that renders children more sensitive to stressful experiences later in life. Adverse experiences in early childhood significantly increase the risk of mental health problems such as post-traumatic stress disorder, depression, substance abuse and other addictions. Neuroscience research shows that children who are maltreated may have problems regulating their emotions.

These and other adversities in early childhood may result in lowered stress tolerance and heightened stress reactivity in adulthood. Children with these experiences may become adults with poor parenting skills. Because poor parenting is transmitted intergenerationally, interventions in early childhood that focus on at-risk children should include services for their parents. Parents need to understand their own responses to their parenting role, and the needs of their infants and young children (Mayes 2010).

Early childhood interventions: programmes and policies

ECD programmes by their nature incorporate and link health-promoting measures such as good nutrition and immunization with nurturance, participation, care, stimulation and protection. They thus offer the best prospect for sustained, lifelong improvements in children's physical, social, emotional, language and cognitive development. Quality programmes address key issues such as breastfeeding, monitoring of children's development, early childhood care and education, nutrition, parenting, and strengthening of community or institutional capacity through training and awareness.

The lasting impact of ECD interventions for children from birth to six years of age is well demonstrated worldwide. Whether interventions are formal or non-formal, when they are of high

quality, they promote competencies and skills that enable children to become adults who participate more fully and actively in society and the workforce (Knudsen et al. 2006). The competencies and skills that are gained are not limited to the cognitive domain. They also include physical, social and emotional skills, defined as attentiveness, perseverance, impulse control and sociability. Interdisciplinary literature on ECD consistently shows that traits formed early in life, such as cognition, personality and health, promote lifelong healthy behaviours, and determine future success in school and the workforce.

A primary channel through which early interventions operate is enhancement of non-cognitive skills (Cunha and Heckman 2009). Evaluations of two of the most-researched interventions—the Perry Preschool Project, at 40 years, and the Abecedarian Project, at 30 years—demonstrate the importance of the non-cognitive effects of ECD interventions. Both boosted children’s socio-emotional outcomes and skills more than their IQs. In the former programme, children experienced an increase in IQ, but it did not persist beyond age 10, although other positive outcomes did, including health and behavioural competencies. In the latter programme, the children, as adults, exhibited lasting effects on IQ in addition to improved parenting and child attachment skills, lower prevalence of behavioural risk factors (smoking, alcohol), better health outcomes (lower blood pressure, decreased likelihood of being overweight) and higher levels of mental well-being (Campbell et al. 2012, Heckman et al. 2009).

ECD INTERVENTIONS CAN REDUCE INEQUALITY

Experiences show that an enriched early environment for disadvantaged children yields causal effects on later outcomes. Investments in ECD programmes for disadvantaged children from birth to six years of age can reduce achievement gaps and needs for special education, increase the likelihood of healthier lifestyles, and reduce crime and other social costs. The returns to investing in quality programmes ranges from 7 percent to 10 percent per year of intervention (Heckman et al. 2009). The cost is small compared to the benefit societies can gain from less inequality.

Worldwide, ECD programmes make multiple contributions to reducing inequality. Assessments from low- and middle-income countries (Engle et al. 2007, 2011; Walker 2011) and a meta-analysis of studies outside the United States (Nores and Barnett 2010) show findings consistent with research in the United States. Evidence indicates that the impact of ECD programmes on children’s cognitive and socio-emotional development is greater in interventions with education or cognitive stimulation, compared with those composed only of nutrition or financial assistance, and that the size of the positive effects is large (Barnett and Nores 2012, Nores and Barnett 2010).

The data also show that average effect size for outcomes is comparable across major domains (cognition, social development, health, schooling), and that the effect size is smaller, but still

positive, in interventions offering comprehensive services. Barnett and Nores (2012) suggest that the latter finding may indicate a dilution in educational effectiveness by trying to do too much. Baker-Henningham and Lopez-Boo (2010) reviewed ECD interventions in low-income countries, finding that they had a positive impact on cognitive, socio-emotional and nutritional development, as well as schooling outcomes.

KEY COMPONENTS OF ECD PROGRAMMES

Although ECD programmes come in many different sizes and shapes that reflect the settings and resources of the communities they serve, key components include nutrition, health, stimulation, parent education, child care and protection. In launching or scaling up large, national programmes, four ingredients deserve special consideration: parent education and training, income support, nutrition, and nutrition combined with stimulation. Some evidence on these aspects is summarized below.

PARENT EDUCATION AND TRAINING

ECD programmes have great value in supporting parents by educating them on basic concepts, and training them on tools and strategies to enhance their own children's development. The aim of parenting interventions is to improve adult-child interactions by promoting parents' responsive interaction and attachment with infants and young children. Parenting interventions may be accomplished through home visits, primary health care visits, group sessions with caregivers, or a combination of group sessions and home visits, which are often offered with nutritional services.

Parenting interventions have positive effects on children's cognitive and social development (Engle et al. 2011). Having a defined curriculum and messages is essential to their effectiveness. The effects of information-based, parent-only interventions are small, whereas programmes that include systematic training for workers, a structured and evidenced-based curriculum, and opportunities for parents to practice with children and obtain feedback are most effective (*ibid.*). More frequent contact between workers and parents also improves results. Impacts are larger for more disadvantaged populations—a finding supported by all studies (Nores and Barnett 2010).

A question that arises when designing parenting interventions is: Should professionals or para-professionals provide home visits? A conclusion reached in evaluations of home visit interventions is that they can be successfully implemented by para-professionals with primary or secondary education (Engle et al. 2011). Another question is: What should the frequency of visits be? Powell and Grantham-McGregor (1989, also cited in Walker 2011) conclude that the benefit from fortnightly visits was less than half that of weekly visits, and that monthly visits did not have benefits (Walker 2011).

Given the intense requirements for home visits, alternative approaches such as counselling mothers at clinics have also been used. One example is the Care for Development module of the Integrated Management of Childhood Illness Intervention developed by WHO and UNICEF, where health professionals counsel parents during health visits on how to promote their children's early development. There have been only a few evaluations of this option, however, and its effectiveness has not yet been established (Walker 2011).

INCOME SUPPORT POLICIES

Some countries are providing income support for parents to enable them to enhance their children's early development. Duncan et al. (2012) have explored the timing and size of the effects of income support. After controlling for differences in parents' characteristics and income later in childhood, the researchers found that a rise in parents' annual income between a child's birth and age five was associated with increased years of schooling (by eight-tenths of a year), whereas the effects of added income during the years of middle childhood were not significant. The earlier support also was associated with adults' increased earnings later (Duncan et al. 1998, Duncan 2012), whereas additional income when children were in later childhood and adolescence appeared to be less important (Duncan, Ziol-Guest and Kalil 2010).

Beyond positive effects on schooling, income support has long-term health benefits for children. Ziol-Guest, Duncan and Kalil (2011) show that parents' added income during the prenatal and birth years correlates with a reduced likelihood of obesity, high blood pressure and arthritis when the children become adults. A study of the effects of the United States' Earned Income Tax Credit showed that an increase in the size of the benefit for mothers with two or more children resulted not only in better test scores for the latter, but also in better health for the former (e.g., reduced biomarkers of risk such as diastolic blood pressure and C-reactive protein) as well as improved mental health (as self-reported), compared with mothers who received benefits and had one child (Evans and Garthwaite 2010).

Brazil and Mexico have pioneered conditional cash transfer programmes since the mid-1990s. These have now been implemented in all countries in Latin America, and in some countries in Africa (Malawi and South Africa), East Asia (Indonesia), South Asia (Bangladesh), the Middle East and North Africa (Morocco and Yemen), and Europe and Central Asia (the former Yugoslav Republic of Macedonia and Turkey). Most programmes target families with young children from birth to age six. They reach disadvantaged young children by transferring cash to poor families, and, in some cases, conditioning the transfer on family participation in services such as health check-ups, growth monitoring, nutrition and parenting education.

Evaluations of the programmes are emerging, and the evidence promisingly suggests that they have positive effects on young children's developmental outcomes. Evaluation of Mexico's

PROGRESA initiative shows it had some impact, increasing the height of children aged 12 to 36 months (Behrman and Hoddinott 2004). An evaluation of Colombia's Familias en Acción intervention, which is similar to PROGRESA, shows it supported an increase in the height of children from birth to age two, but had a limited effect on older children (Attanasio et al. 2005, Attanasio and Vera-Hernandez 2004).

NUTRITION

Nutrition is essential to ECD. The effects of malnutrition or undernutrition during pregnancy and early childhood are well known. These last throughout life, and interrelate with health, education and social protection. Studies show, for example, that very small babies have a greater risk of hypertension, coronary artery disease and diabetes in later life (Barker 1994, 1995; Barker, Gluckman and Godfrey et al. 1993; Rutter 2011).

Poor nutrition in early life may directly harm an individual's long-term outcomes by altering the body's developmental trajectory. Emerging evidence indicates critical periods of development in early life (in utero) that 'programme' the body's long-term survival outcomes. Sub-nutrition in early life leads to developmental programming that is adapted to poor diets, such that an individual's body is maladapted for more affluent diets later in life. The foetus and then the child may take cues from the current environment to 'predict' the type of environment it expects to face in the long run, and, in some cases, adapts its biological metabolism to better thrive accordingly (Gluckman and Hanson 2004). A problem arises when the predicted and actual later environments substantially differ—for example, instead of the shortage of food the foetus experienced, the infant encounters an abundance of food. This mismatch increases the likelihood that an individual will someday develop high blood pressure, type 2 diabetes, obesity and cardiovascular disease—a pattern referred to as the Barker hypothesis or 'thrifty phenotype' (Barker 1994).

The timing of nutritional deprivation also makes a difference. Painter, Roseboom and Blecker (2005) found that infants had lower birthweights if exposed to famine during the mother's third trimester. This finding suggests that there is a critical period early in the postnatal period when programming continues to occur and intervention could be beneficial. Subsequent studies (Black et al. 2008) show that this period or window of opportunity for improving nutrition is during the first 1,000 days after birth, after which the prenatal effects of sub-nutrition may be irreversible. Findings from Jamaica suggest that prevention of undernutrition by supplementation during pregnancy and from birth on is more effective than trying to reverse the effects with food supplementation at later ages (Walker et al. 2005).

SYNERGISTIC EFFECTS OF NUTRITION WITH STIMULATION

The combination of nutrition and stimulation in ECD interventions yields synergistic effects. The Jamaica programme—which included four groups that separately received nutrition supplementation, stimulation, stimulation plus a nutrition supplement or no intervention—demonstrates the synergistic effects of nutrition and stimulation on children’s developmental outcomes, and, most importantly, the sustained long-term impacts (Grantham-McGregor et al. 1997; Powell et al. 2004; Walker et al. 2005; Walker, Chang et al. 2011a). Stimulation was fostered through parenting education, a core element delivered in weekly one-hour home visits by trained community health workers for two years (Powell and Grantham McGregor 1989).

A follow-up evaluation of the Jamaica study 20 years later showed the persistent impacts of stimulation on children’s schooling and later productivity (i.e., higher earnings) compared with providing only supplementation (Gertler et al. 2012). In contrast, other rigorous studies, for example, in Bolivia, Colombia and Guatemala, show that nutrition alone or in combination with early child-care and education services has positive effects (Barnett and Nores 2012).

In any case, evidence for the importance of nutrition in ECD interventions is solid. Translating this knowledge into policy and practice continues to be a challenge, however. The design of nutrition interventions and messages needs to be mindful of the ‘adaptation concept’ (the Barker hypothesis) so as not to overcompensate for prenatal or early postnatal sub-nutrition.

LESSONS LEARNED FROM IMPLEMENTATION: LARGE-SCALE ECD PROGRAMMES

Many lessons continue to be learned from ECD programmes and policies around the world. Summarized below are examples of large-scale programmes successfully implemented in low- and middle-income countries, as well as developed countries. They range from home- and centre-based day care to community-based active learning, expanded conditional cash transfers and a nutrition-plus ECD innovation. Supported by national governments, the private sector and communities, they were built on lessons learned elsewhere or from scaling up effective local projects. Each continues to yield lessons on ECD for particular countries, and on launching and adapting large-scale interventions in other settings.

THE LESSONS: A SAMPLING OF COUNTRIES AND PROGRAMMES

The following ECD innovations are described:

- A nutrition-plus ECD programme in China;
- Expanded conditional cash transfer programmes in Latin America and elsewhere;

- The national scaling up of an ECD project in the Philippines;
- Home-based nutrition and child care in Colombia;
- Home-based day care in Bolivia;
- A continuum of pre- and postnatal care in Cuba;
- Community-based active learning in Africa;
- The Step by Step effort in Eastern Europe; and
- Parental leave policies in Organization for Economic Cooperation and Development (OECD) countries.

Nutrition-plus ECD innovation in China

In 2012, the Government of China launched the National Nutrition Intervention Programme. It provides universal, free nutritional supplements to all children between the ages of 6 and 24 months in poverty-stricken counties eligible for national poverty alleviation strategies. The Government intends to introduce an enriched caregiving approach, which includes parenting education. A ‘nutrition-plus’ innovation will build on lessons learned from Jamaica’s ECD intervention, which demonstrated the important synergy between parenting education and nutrition (Gertler et al. 2012).

Despite China’s rapid growth, the country faces growing inequality, which poses a serious threat to human development and social cohesion. In 2011, when China’s GDP per capita reached US \$5,445, some 128 million people, approximately 10 percent of the population, still lived on less than \$1 a day. Approximately 20 percent of these people are children under six years old—a proportion higher than in the general population. The inequality in China is most striking between rural and urban areas, with urban income on average more than 3.3 times higher than rural income. There are deep disparities between the industrial and coastal region; the land-locked, agricultural central region; and the arid, mountainous western region that is home to most of China’s 54 ethnic minorities. Provision of and access to services across diverse terrains is difficult.

Among rural children, malnutrition rates are approximately three to four times those of urban children. Malnutrition is more acute after six months of age, when babies are weaned from breastfeeding. Severe malnutrition in children under five years old is concentrated mostly in contiguous mountain areas in the western and central regions. In poor rural areas of China in 2010, 20 percent of children under five years old were stunted, and 30 percent of children under two years old were anaemic (Wu, Young and Cai 2012).

When China launched the National Nutrition Intervention Programme, the central Government allocated RMB100 million (\$16 million) to cover an initial 100 counties and a second batch of 100 counties in 2013. By 2015, the programme will cover all 699 poverty-stricken counties, which account for approximately one-fourth of all counties.

In the initial 100 counties, some 274,000 children are eligible for the programme. Their primary

caregivers receive free nutritional packages for complementary feeding and are expected to feed each child one package per day for a year. The packages, which contain soy powder and nine micronutrients, are produced by the private sector and distributed through local health clinics. Eventually, the programme will reach millions of children each year in targeted counties.

Conditional cash transfer in Latin America and Cambodia

The governments of Brazil, Cambodia, Ecuador, Mexico and Nicaragua use conditional cash transfers to improve ECD. Impacts and lessons learned vary, but overall outcomes are positive for children and families. Fiszbein and Schady (2009) reported that use of health services and coverage of immunization increased in some countries, but no improvement was seen in children's health or nutritional status. More recent studies support a general finding of positive outcomes.

Brazil's Bolsa Familia programme was launched in 2003 to transfer cash to poor households—with an income below \$70 per month—willing to comply with conditions related to health and education, such as child immunization. The transfers range from \$18 to \$175 per month, depending on family income and composition.

A nationwide analysis of the programme was recently published (Rasella et al. 2013), covering 50 percent of Brazil's municipalities. Researchers assessed impacts on the under-five mortality rate for selected causes associated with poverty, namely, malnutrition, diarrhoea and lower respiratory infections. The results showed that as programme coverage increased, the rate decreased by 17 percent between 2004 and 2009. The data indicated that the cash transfer condition of child immunization was an important factor, in addition to the increase in families' incomes, which enabled them to augment purchases of food and health-related goods.

Based on this analysis and emerging evidence supporting conditional cash transfers, the Government launched the Brazil Carinhoso programme in 2012. It targets 2 million families with at least one child under six years old, building on Bolsa Familia and another effort, the Plano Brasil Sem Miséria. It raises the cash transfer to families with at least one child under six years old to around \$30 monthly, the minimum wage—an amount that could reduce the number of Brazilian families living in extreme poverty by 17.2 million or 40 percent. Integrated with the national unified health system, the programme aims to provide vitamin A and iron supplements and asthma medication for free, and offer additional spaces for child care.

An ongoing assessment of this programme could address many remaining questions, such as: Who benefits most? At what age? And what is the transfer threshold to elicit ECD effects?

Other recent studies have evaluated conditional cash transfer programmes in Ecuador (Bono de Desarrollo Humano), Nicaragua (Atención a Crisis) and Mexico (Oportunidades). For Mexico, Fernald, Gertler and Neufeld (2006) report positive ECD outcomes. The authors of the studies in Ecuador (Paxson and Schady 2010) and Nicaragua (Macours, Schady and Vakis 2008) found that parents' behaviours and attitudes were positive, and that participating children received nutrition-rich food and stimulation at home. The Nicaragua study attributed these changes to social campaigns and information. Neither programme included use of health care as a condition for the cash transfer.

It makes sense for conditional cash transfer programmes to target families with young children,

since maximal benefits come when children age and go to primary school. In Mexico and Cambodia, programmes linked to education resulted in improved school attendance, although not better learning outcomes (Behrman, Parker and Todd 2005). Further, targeting programmes to families with young children can free older siblings, in particular girls, from child-care chores and increase their attendance in school (Naudeau et al. 2011).

Home-based day care in Colombia

In the late 1970s, the Colombian Government passed legislation to establish a home day-care programme, Hogares Comunitarios de Bienestar Familiar. It included a new nutrition intervention for poor families. The objectives were to improve the nutritional status of poor children, and to provide child care in order to foster women's participation in the labour force. The programme, operated by the Instituto Colombiano de Bienestar Familiar (ICBF), provides training and support for *madres comunitarias* (community mothers) in poor neighbourhoods and localities. Households that fall in SISBEN³ levels one to three are eligible to participate.

The programme encourages eligible parents with children under the age of six to form a parents' association. It elects a *madre comunitaria* who, assisted by a trained helper, is responsible for caring for up to 15 children from the neighbourhood. Each family pays a small monthly fee to cover the *madre comunitaria*'s salary. The parents' association receives funds from the Government to purchase food from a regional menu and a nutritional beverage (*bienestarina*) delivered weekly to the house of the *madre comunitaria*. Children are fed three times a day with food accounting for approximately 70 percent of their daily caloric intake.

The programme is financed by a 3 percent payroll tax that produces substantial revenues and reduces risks of potential budget cuts during fiscal adjustments. It is now the largest welfare programme in the country, serving approximately 80,000 *hogares comunitarios* (community homes) and more than 1 million children. The annual cost is approximately \$250 million, or almost 0.2 percent of GDP (Attanasio and Vera-Hernandez 2004).

The turnover rate for community homes is approximately 15 percent a year. Eligible families who move into a neighbourhood usually can register their children in an existing community home. Setting up a new one in sparsely populated areas is more difficult, as the ICBF requires them to have a minimum of 12 to 15 children.

An evaluation showed that the programme has had positive effects (ibid.). By the time children were six years old, both girls and boys were taller than children who did not participate. When they were 13 to 17 years old, they were more likely to be in school and to have advanced a grade. In addition, employment rates among mothers have improved. Consistent with findings from other ECD interventions, the most disadvantaged children seem to benefit the most.

³ SISBEN is an index based on variables related to poverty. Information on the variables is collected periodically. In general, only households belonging to levels one and two (out of six levels) are eligible for welfare programmes.

A political economy lesson can be drawn from the experience in Colombia. When designing an ECD programme, consideration should be given to creating groups, in this case the ICBF, to champion it. Mothers and children have little political clout, but the ICBF had independent resources and a permanent bureaucracy, which enabled it to defend its own programme (Urrutia 2003).

The Government is considering conditional cash transfer alternatives, with the aim of abolishing home child care under Hogares Comunitarios de Bienestar Familiar. The evaluation may provide information to guide policy changes and decision-making.

Scaling up ECD to a national programme in the Philippines

The scaling up of ECD projects in the Philippines is an excellent example of how research can inform policy. In 1999, the Government of the Philippines launched a five-year ECD initiative in three southern regions encompassing 2.2 million households. In 2002, the project became part of a broader government programme formally mandated by the Early Childhood Care and Development Act (Republic Act 8980). The overarching goal is to improve the survival and developmental potential of children, particularly those most vulnerable and disadvantaged, by the following actions (Armecin et al. 2006):

- Minimizing health risks to very young children;
- Contributing to the knowledge of parents and the community about child development, and encouraging their active involvement;
- Advocating for child-friendly policies and legislation;
- Improving the ability and attitude of child-related service providers; and
- Mobilizing resources and establishing viable financing mechanisms for ECD projects.

In a longitudinal study, Armecin et al. (ibid.) collected data over three years on approximately 6,700 children residing in randomly selected households in regions that did or did not participate in the programme (participation was not randomly assigned). The researchers used differences-in-differences estimation propensity score-matching techniques to evaluate impacts while controlling for a variety of observed characteristics, measured at municipality, household and child levels, as well as unobserved, fixed characteristics, such as child health and home environment. They measured intention to treat, or the effect of having the programme for all children in a given age range in a community, whether or not all children accessed it.

The researchers found that the programme had positive effects on children's development along a range of outcomes, including cognitive, motor, language and social development, as well as short-term nutritional status. Children in treatment areas showed substantial improvement in the seven domains of child development, compared with children in the control areas. The study also revealed that larger impacts resulted from participation in the programme beyond 12 months, and that effects were greater for children under four years old at the time of the last survey. Z-scores for two- and three-year-old children were higher by 0.5–1.8 standard deviations for motor and language development.

Modelling Colombia's programme in Bolivia

Bolivia's Integrated Child Development programme is another example of a home-based initiative, in this case serving poor children in urban areas. Modeled after Colombia's Hogares Comunitarios de Bienestar Familiar programme, it provides care for children ages six months to six years in the homes of neighbourhood women. Up to 15 children are attended by two to three caregivers, who receive training in child development.

An evaluation showed that the programme benefited children who had been in it for 13 to 18 months, compared with those who enrolled for 1 month or less, in all dimensions of development. The increase in scores ranged from 3 percent to 10 percent, and reflected the child's age when he or she entered the programme (Behrman, Cheng and Todd 2004).

Prioritizing a continuum of pre- and postnatal care in Cuba

Cuba consistently does better in ECD than other Latin American countries, even though it is poor. It has the lowest infant and under-five mortality rates, and the highest life expectancy. Its grade-four language scores are also highest (Tinajero and Mustard unpublished). These achievements primarily result from the high priority the Government gives to maternal and child health.

Importantly for ECD, there is an explicit continuum of care for pregnant women, infants and children. Cuba was the first nation in the western hemisphere to implement maternity leave in 1963, providing 12 weeks of fully paid leave. Pregnant women today receive 18 weeks at full pay, plus an additional 40 weeks at 60 percent of their pay while their job is held for them.

Polyclinics are universally available for pregnant women and mothers with young children. Prenatal nutrition is prioritized in pre- and postnatal health care. This care is coordinated with the Educa su Hijo pre-primary programme, which links seamlessly to primary education. To support working parents, the Government assures access to full-day programmes for most Cuban pre-schoolers aged one to five. These are coupled with home visits for children up to two years old, and non-formal play groups for children aged two to four (McCain, Mustard and Shanker 2007).

Community-based partnerships in East Africa

Beginning in the 1980s, the Aga Khan Foundation set up and supported expansion of its Madrasa Program in Kenya, Tanzania and Uganda. The programme consists of community-based pre-schools taught by local women and targeted to Muslim children from poor socio-economic backgrounds. The pre-schools use culturally appropriate curricula that encourage active learning, based on the Perry Preschool Project curriculum developed by the HighScope Educational Research Foundation.

An evaluation showed that children attending the pre-schools performed better than children who stayed home or attended other local pre-schools (Aga Khan Foundation 2008). Lessons learned from more than 25 years of implementation include the following: Involve communities in coming together to participate and decide where and how to set up pre-schools; strive for community ownership and self-sufficiency, but foster a large network of support; utilize an active learning approach, and draw from local cultures and values; build on the population's spiritual philosophy;

foster motivation and mutual accountability; provide for systematic training; and develop a comprehensive system for monitoring, evaluation, reflection and feedback (ibid.).

Step by Step in Eastern Europe

The Open Society Institute launched the Step by Step Program in 1994 in countries of Central and Eastern Europe and the former Soviet Union. The programme guided and influenced early education policy reforms for children and their families. It has since been established as a membership organization—the International Step by Step Association (ISSA)—that connects ECD professionals and organizations across the globe.

ECD programmes promulgated by the association comprise training caregivers, teachers, school administrators, parents and educational authorities at local, regional and national levels. The ISSA Pedagogical Standards is a tool based on principles of child-centred teaching. It helps define quality teaching practices and classroom environments, and supports teachers' self-assessment, mentoring and certification within the network.

ISSA also focuses on disability and education for social justice for children with disabilities among ethnic minorities or living in remote areas or in poverty. The disability programme provides training to a variety of audiences and enhances teachers' capacities to mainstream children with disabilities (The Consultative Group on Early Childhood Care and Development 2007).

Parental leave policies in OECD countries

ECD policies in developed countries provide many lessons, particularly those that concern parental leave for infants and very young children. These policies have overall positive effects on children.

In a review of parental leave policies in 18 OECD countries, Tanaka (2005) found that longer periods of paid parental leave are associated with reductions in infant mortality and low birthweight, but that unpaid leave has no significant effect on infant mortality. Berger, Hill and Waldfogel (2005) found that infants whose mothers stay home longer during the first year of life receive more preventive health care and immunization coverage, and the mothers are more likely to breastfeed longer. Research is more limited on the effects of paternal leave, but available evidence shows that when fathers take longer leaves, they are more likely to be involved in the care of their infants (Tanaka and Waldfogel 2007).

Parental leave policies vary widely among OECD countries. They range from allowing no paid leave, to supporting 12 weeks as in the United States, to providing more than two years of combined maternal and paternal leave in 10 countries. Details are available at www.oecd.org.

In most developing countries, maternity leave may exist legally, but paid leave may or may not be available even to mothers in the formal workforce. In Africa, the typical legal maternity leave is 12 to 14 weeks. More than half the countries with available data (23 out of 44) offer less than 14 weeks of paid leave as required by the International Labor Organization's 2000 Maternity Protection Convention.

FROM LESSONS LEARNED TO A UNIFIED STRATEGY OF HUMAN DEVELOPMENT

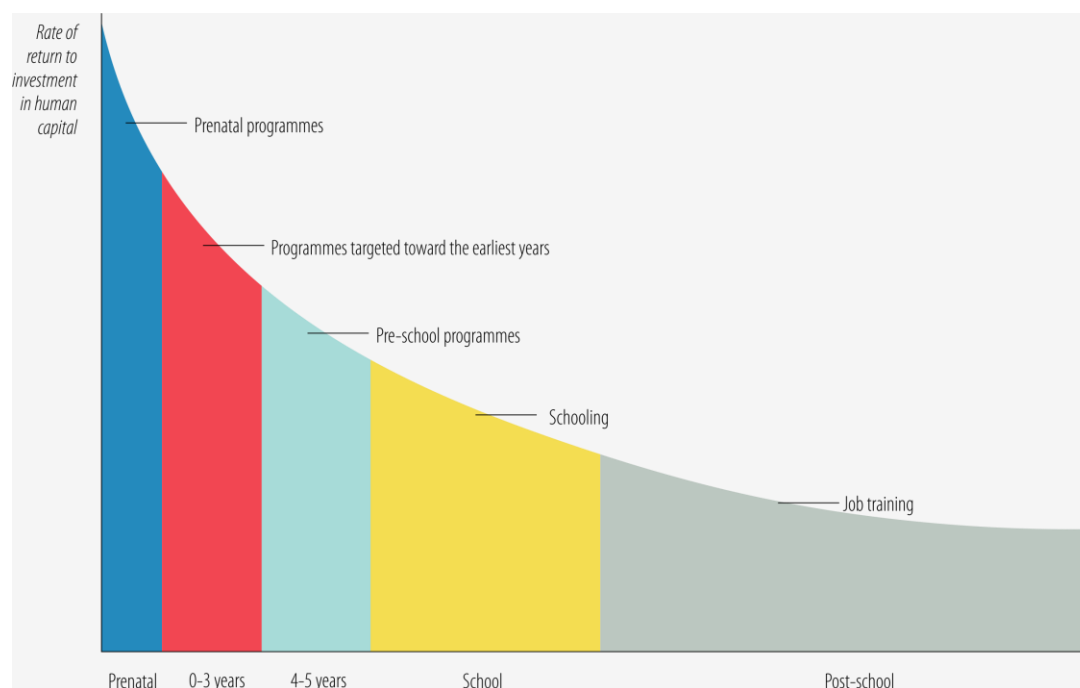
What needs to be done to make sure that today's poor children are not tomorrow's parents of poor children? ECD interventions are fundamentally about providing all children the chance to enter the 'game of life' with a fair chance to win—in other words, with the proper equipment and training to ensure that competition is fair. A level playing field established at age six may already be unfair for children who are malnourished and never had a book read to them. Ideally, parents will ensure that their children get fair chances for schooling and jobs by investing their time, energy and resources early. But if they cannot or do not fulfil this responsibility, it is in society's interest to help. Otherwise, there will be too few players for the 'local league' to compete in today's global marketplace.

How do we create equal opportunity? Because the poor lack productive assets, market reforms will not necessarily help them. Conventional reforms need to be supplemented with aggressive policies and programmes that increase the assets of poor people and ensure that they can exploit new market opportunities. That means, among other things, putting a premium on interventions in early childhood. The poorer families are and the more unequal society is, the greater the rationale for nations to channel taxes and other public resources towards ECD programmes.

Based on new understanding of the dynamics of capabilities formation before a child enters school, a unified approach using a strategy of human development (as argued by Heckman 2013) would reframe policies to prevent problems via pre-distribution rather than to remediate them through redistribution. While it is possible to remediate rather than to intervene early, it is also much more costly.

Front-loading investments in the early years follows the logic depicted in figure 5 (Cunha and Heckman 2007). The advantages gained are best sustained when they are followed by continued high-quality learning experiences. The technology of skill formation described by Cunha and Heckman (ibid.) and Heckman (2007b) shows that returns on school investment are higher for persons with higher ability, where ability is formed in the early years. Owing to dynamic synergy, early investment must be followed by later investment if maximum value is to be realized (Heckman 2008b).

Adoption of this unified strategy of human development would increase focus on the early part of the lifespan—when the impact on long-term health, learning and behaviour is most intense and brain development is most plastic—and thereby ensure that interventions exact greater returns on investment. This strategy recognizes that both cognitive and non-cognitive skills are important determinants of life outcomes, and that gaps in these abilities open up early across all socio-economic groups, especially for children who are most disadvantaged.

Figure 5: Returns to a unit dollar invested at different ages

Source: Heckman 2008.

AN UNFINISHED AGENDA

The world has seen greater progress over the past generation than at any other time in history. Life expectancy has risen more over the past 40 years than in the past 4,000 years. The communications revolution promises universal access to knowledge, and 6 billion people live in a globally connected market economy.

THE REACH OF POVERTY—CHILDREN IN LOW- AND MIDDLE-INCOME COUNTRIES

Nonetheless, today, 100 million more people live in poverty than a decade ago; many are children. Most children born into poverty are malnourished and neglected—and thus less likely to reach their potential even before they enter primary school.

Approximately 73 million primary-school-aged children worldwide are not even in school, down from 100 million in 2000. Another 150 million children start primary school, but drop out before they complete four years of education. (Figures for children who are enrolled, but do not attend regularly, are not available). Children in the least developed countries bear the brunt, for nearly half of them have no access to primary education.

Equally troubling are the data on learning outcomes. In numerous countries, children who are in school fail to acquire the most basic skills. For example, Gove and Cvelich (2010) report that 9 out

of 10 students in grade two in Mali could not read a single word in connected text. In Kenya, 14 percent of students in grade three were non-readers of English. In two regions in Uganda, 70 percent of students in grade two could not read a single word in English; more than 80 percent could not read in the indigenous language, Lango. Approximately half of grade-three students were unable to read one word in their respective languages.

Emerging middle-income economies, such as China, Brazil and India, still have deep pockets of poverty in rural or remote regions, as well as inner cities, despite concerted efforts and progress in addressing poverty. The socio-economic inequalities tagged to this poverty are associated with risk factors affecting children's development. Data from UNICEF's Multiple Indicator Cluster Survey (MICS) 3, as reported in the 2011 series in *The Lancet* (Engle et al. 2011; Walker, Wachs et al. 2011) illustrate a distinct gradient in pre-school attendance from the lowest income quintiles to the richest income quintiles by region. Within countries, the difference in pre-school attendance between the highest and lowest income quintiles is large, as much as twofold in some countries (e.g., El Salvador and Nicaragua). Differences in children's language development between the lowest and highest income quintiles also are significant.

The reach of poverty is particularly relevant where a large and growing proportion of the population is young. In 2007, for example, the Middle East and North Africa region had a population younger than the global average, with 100 million children and youth under age 14. The proportion of the population under age 15 varied from 25 percent in Tunisia to 45 percent in the State of Palestine and 44 percent in Yemen (World Bank 2008).

THE CHALLENGE OF DEMOGRAPHICS

The United Nations (2010) estimates that over the next 15 years, the world's population will increase by an estimated 3 billion. More than 85 percent of this growth will be in developing countries; a large share of it will be in poor, less developed countries. An even larger share will be in the least developed countries, where populations are expected to double, from 871 million in 2010 to 1.7 billion in 2025; children and youth under age 14 are predicted to comprise 46 percent of the total. The 10 countries forecast to have the youngest populations are in Africa: Burkina Faso, Chad, Malawi, Mali, Niger, Nigeria, Somalia, Tanzania, Uganda and Zambia.

The youth 'bulge' is already a common phenomenon in many developing countries, especially less developed ones. United Nations data (ibid.) indicate that the Middle East and North Africa region continues to have a higher proportion of youth than the global average. In sub-Saharan and North Africa, 40 percent of the population is under age 15, and nearly 70 percent is under age 30. Within the next decade, youth aged 15 to 29 years may comprise 28 percent of Africa's total population. In some 'fragile' countries, such as Angola, the Democratic Republic of the Congo and

Somalia, almost three-fourths of the population is under age 30, and the large proportion of youth aged 15 to 29 years will persist for decades to come.

Unemployment among young people is a major concern. Although unemployment rates are naturally higher for young people, given their limited work experience, these rates are over 20 percent in the Middle East and North Africa, and Europe and Central Asia (ibid.). In today's global knowledge economy, markets have a high demand for workers with skills very different from those in traditional blue-collar jobs. Countries must not only create more jobs, but also, and more importantly, enhance the employability of their young people.

Traditional methods of remediation after schooling are costly and often ineffective, Heckman (2013) shows, for example, that remediation efforts such as public job training or adult literacy programmes to boost the skills of disadvantaged youth have low returns compared with early childhood initiatives. A better choice is early interventions that reduce inequality by promoting schooling. Heckman (ibid.) notes that school readiness, or creating capabilities that promote schooling, is just as important as schooling itself for producing positive life outcomes such as increased productivity, higher income, better health and higher upward mobility.

An agenda for the next 15 years

In looking beyond the development goals set for 2015 and on to 2030, the fate of the world's young children must be at the forefront of discussions. Four main tasks are to:

- Redirect social policies to focus on young children from birth to age six;
- Expand public health models to incorporate the science of ECD;
- Assess ECD outcomes and link these to programme and policy data; and
- Communicate the importance of young children's healthy brain development for populations' well-being and competence.

REDIRECT SOCIAL POLICIES TO FOCUS ON CHILDREN FROM BIRTH TO AGE SIX

Social policies need to be redirected to the malleable, early years of life if we are to successfully reduce inequality and promote productivity by producing effective people (Heckman 2013). This redirection of policy is beyond the purview of any single government ministry. Rather, and ideally, governments will establish ministries of human development that would integrate health, education, family and social protection services for children and families horizontally and longitudinally over

the lifespan. Health, education, family and social protection ministries would each have a role, and the objective would be to link evidence-based programmes that support children and families, and enable them to withstand stressors that emerge during children's early years.

Specific actions are needed to:

- Stimulate national decision-making that emphasizes ECD as the first step in poverty reduction and human capital formation. To do so, gain better understanding of governance at the macro level and the 'rules of the game'—laws, attitudes social structures, etc.. Apply this understanding to the design and implementation of social policies directed to ECD.
- Strengthen the professional development of ECD researchers and practitioners.
- Acquire a better understanding of the minimal ingredients of quality interventions. Identify what does and does not work in designing and scaling up cost-effective options for ECD. Consider ECD stakeholders (e.g., non-governmental organizations, civil society and other institutions) and settings (e.g., homes, clinics, schools and communities) to enhance the contextual and cultural sensitivity of ECD programmes.
- Focus on targeted programmes for children at most risk. Consider adopting the concept of proportionate universality (Boivin and Hertzman 2012, Marmot Review Team 2010) to reach the largest overall proportion of those at risk. Proportionate universality is defined as "programs, services, and policies that are universal, but with a scale and intensity that is proportionate to the level of disadvantage" (Human Early Learning Partnership 2011).

Traditionally, the debate has been whether to emphasize reaching children at the lowest socio-economic levels or providing universal programmes. Experiences show that neither approach is, in itself, sufficient for flattening the social gradient. The key to reducing vulnerability in children's early years is investment in a universal platform of support and services accompanied by additional targeted interventions for the highly vulnerable, including those in low socio-economic ranges and disadvantaged geographical areas (Human Early Learning Partnership 2011, Marmot Review Team 2010).

EXPAND PUBLIC HEALTH MODELS TO INCORPORATE THE SCIENCE OF ECD

The current knowledge base driving the child survival agenda is grounded in public health measures such as nutrition, clean water, sanitation, basic medical care, the Expanded Programme on Immunization, early and exclusive breastfeeding, oral rehydration, micronutrients (e.g., vitamin A and folate), insecticide-treated bed nets and prevention of HIV infection. A new appreciation for social interventions to mitigate material deprivation and bolster adult protective interactions—such

as cash transfers, parenting support and centre-based ECD service—has enhanced existing strategies of child survival and development.

The impact of these interventions, however, remains limited in time and space. Much more can be done by adopting broadly integrative approaches that provide an enduring continuum of care for mothers and their children, beginning prenatally and continuing on to primary school and even beyond. It is now time to expand beyond traditional public health models, and to identify and incorporate innovations based on the science of ECD. By doing so, the value of traditional models and social interventions could be more fully realized.

We need to expanded access to ECD programmes, both formal and non-formal, and coordinate programmes to ensure that mothers and children receive a continuum of care, from the prenatal to the postnatal periods. We need to target both mothers and children, and address in an integrated way their nutrition, health and parent-child interactions. More could be done to assure the psychosocial well-being of mothers and children, and to educate and support parents in their roles. Other key priorities are to deliver services to children (e.g., related to breastfeeding, nutrition, stimulation, essential health care and immunizations), develop the ECD capacities of caregivers and teachers, and raise public awareness of ECD knowledge and practices through the media.

Specific actions for key ministries are:

- **Ministry of health:** Health workers need to broaden their skills from child survival to ECD. They need to appreciate and understand that risk factors in early childhood have a long-term impact into adulthood, and that the timing of these has critical effects on children's development and health outcomes.
- **Ministry of education:** The education paradigm needs to shift from education per se to learning, and the concept of education needs to expand to include both cognitive and non-cognitive skills. Education needs to be realigned as a continuum from early education to basic education in which the focus is on learning outcomes, not outputs such as primary school completion. Pre-school or pre-kindergarten must not be viewed as a downward extension of basic education or as a 'catch-up' for drills centred on literacy or numeracy to prepare children for school. ECD curricula are specific to very young children, and address both cognitive and non-cognitive skills as essential competencies acquired in early years as the foundation for lifelong learning. ECD educators need to be trained in these curricula, and to understand that adults' sensitivity and responsiveness are essential ingredients of quality early childhood education.
- **Ministry of social protection or family support:** In their welfare programmes, social protection

agencies need to understand that the timing of interventions matters. Therefore, to improve children's outcomes, they must target cash transfers (conditional or unconditional) to the very young and their parents.

ASSESS CHILDREN'S OUTCOMES AND LINK THESE TO PROGRAMME AND POLICY DATA

Children's well-being depends on opportunities and experiences during early childhood. To enhance children's chances and the quality of human capital formation, communities and countries must move beyond small-scale research evaluations and develop comprehensive data.

Specific actions are needed to:

- Measure children's outcomes in early childhood at the population level;
- Collect national data on ECD programmes systematically and comparatively;
- Develop a population-based, multinational database of children's outcomes, with and without ECD interventions;
- Link data on children's outcomes with programme and policy data; and
- Continue research to enhance the effectiveness and efficiency of ECD interventions.

As development agencies organizations prepare their post-2015 plans, a consensus is emerging among them and non-governmental organizations on the importance of a population-based measure of children's development from birth to age eight. Multiple agencies have undertaken various recent initiatives and are working together toward this end. For example:

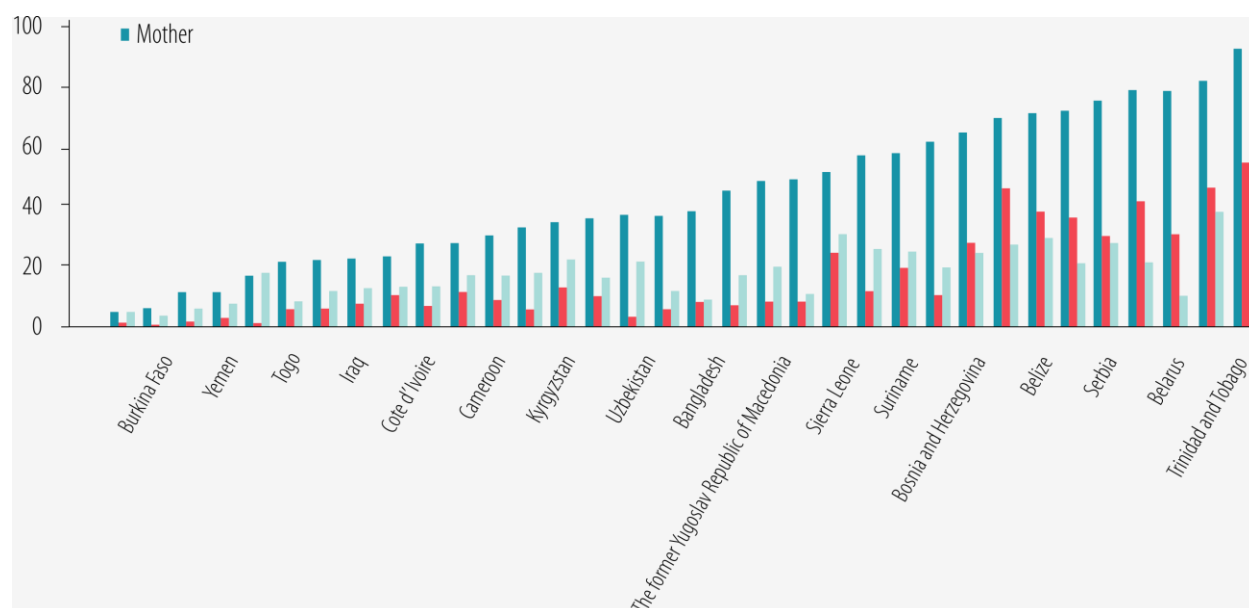
- UNESCO's Holistic ECD Index (HECDI) is intended to guide countries in how to measure ECD with 25 to 30 indicators of health, social protection, nutrition, poverty and parenting education.
- The Brookings Institution's Learning Metrics Task Force aims to measure children's learning outcomes from early childhood education interventions to post-primary school.
- The WHO is identifying indicators for tracking ECD, and developing a framework for measurement from birth to age eight that begins with a review of outcomes from birth to age three.
- The Asia-Pacific Regional Network for Early Childhood has compiled indicators by country.

- In Latin America and the Caribbean, the Inter-American Development Bank is supporting the design and piloting of a population-based, multidimensional measure of children's outcomes (cognitive, language, socio-emotional and motor), and their environment and mother-child interactions at 24 to 59 months.
- In Eastern and Central Europe, UNICEF's MONEE project is collecting data on children's health, development and education.
- The UNESCO Institute for Statistics is collecting education data (including pre-primary data) in aggregate form from official national administrative sources of all Member States.
- UNICEF has been conducting the MICS in cycles of three to five years. With more than 100 indicators related to health, nutrition, education and ECD, this survey is the main source of data for monitoring progress towards the MDGs. Family background indicators include education, wealth, language and ethnicity.

Specific ECD indicators were introduced for the first time in MICS3. They include protective factors, such as support for learning, books and play things, as well as risks, such as inadequate care and violent discipline. The indicators are included in a module on home environment and mothers' access to basic services—for example, attendance in early childhood education, antenatal care, skilled attendance at delivery and birth registration. MICS3 provides valuable data on caregiving practices across countries. It reveals wide disparities by income in terms of risks, including violence and neglect, and protective factors, such as reading and storytelling, both of which are important determinants of child development. Figures 6, 7 and 8 illustrate the value of having national comparative data on caregiving practices. Data presented were obtained in MICS3 for children in less- and least developed countries.

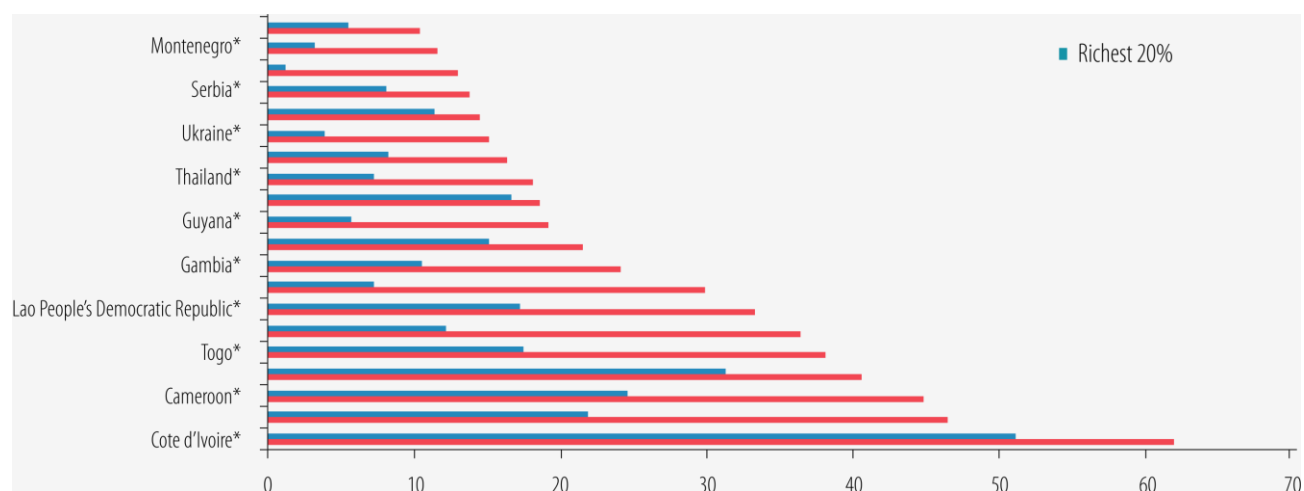
MICS4, the latest survey in the MICS series, incorporates an ECD index of 10 items, in addition to the module on home environment and access to services. Additional MICS3 ECD data for 27 countries was recently issued and is being analysed.

Figure 6: percentage of children from birth to 59 months whose mother, father or other adult household member engaged them in four or more activities to promote learning and school readiness in the past three days, from 38 countries with available data



Source: MICS3, UNICEF 2013.

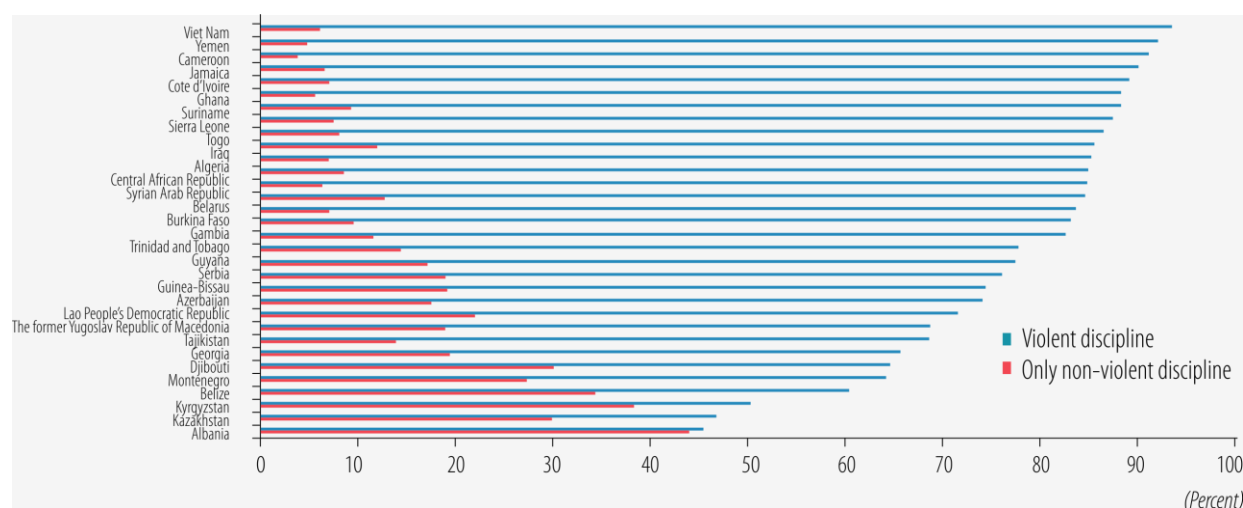
Figure 7: Percentage of children from birth to 59 months left alone or in the care of another child younger than 10 years of age during the past week, by household wealth, from 20 countries with a statistically significant difference



Note: The analysis included 22 countries. Belize and Uzbekistan did not show a statistically significant difference.

* $p \leq 0.01$ (statistically significant at the 1 percent level). Source: MICS3, UNICEF 2013.

Figure 8: Percentage of children ages two to four years who experienced any violent discipline (physical punishment and/or psychological aggression), and percentage who experienced only non-violent discipline in the past month, in 32 countries with available data



Note: Data for Kazakhstan refer to children ages three to four years. Source: MICS3, UNICEF 2013.

While the figures underline the value of MICS3 data, there is still an overriding need for systematic, population-based data on all children's outcomes at school entry. Currently, neither public health nor education systems have these or measures for obtaining them.

In public health, children's health and well-being are still largely measured by negative outcomes, such as low birthweight, infant mortality or under-five mortality, instead of by positive outcomes, such as well-being and competence. In education, measures focus primarily on children's access to and failure in school. Learning outcomes are often measured too late, near the end of compulsory basic education, as is done in international assessments of literacy in reading, mathematics and science.⁴

Assessment tools and measures of children's early outcomes must encompass the whole child. They must be multidimensional, not unidimensional reflections of cognitive, social or emotional development, and applied to groups of children, not to individuals. These benchmarks are crucial for informing policy makers about the need for and effectiveness of ECD interventions, and the 'where, what and how' for scaling them up to national levels, as well as for attaining some level of universality, accountability and comparability within and among countries.

⁴ See, for example, the Progress in International Reading Literacy Study (PIRLS), the Programme for International Study Assessment (PISA) and the Trends in International Mathematics and Science Study (TIMSS).

Simple, whole-child assessments of development that address both cognitive and non-cognitive competencies for children under age five do exist. Two instruments are:

- The Early Development Instrument, which has been used over the past decade in approximately 20 high-, middle- and low-income countries. It is a quick assessment tool for measuring the school readiness of children aged four and five. It includes 100 items across five domains: physical health and well-being, social competence, emotional maturity, language and cognitive development, and general knowledge and communication skills. The data provide a ‘snapshot’ of how well (or not) children are developing.
- The Index of Early Human Capability, intended to capture key aspects of development among children aged three to five—cognitive, non-cognitive and physical health—that predict future human capability. The index is being designed in Australia, drawing from existing international longitudinal studies, and will be piloted in Australia, China, the Pacific Islands, Pakistan and Kazakhstan. It will not test developmental milestones, but instead place children on a spectrum of development to determine if they are thriving or doing poorly. Such an index is long overdue and will yield data important for epidemiology, economics, population and global health, and human development.

As the focus on child survival shifts to child development, countries need to be encouraged to assess progress during the early years of childhood. Learning begins at birth, and children’s development of cognitive and non-cognitive skills during their first years of life should be the cornerstone of each country’s strategy for assessing its children’s well-being and learning outcomes.

UNICEF is best positioned to take the lead in promoting and scaling up these assessment strategies. It is the primary multilateral organization addressing the needs of children from birth to age eight, and has an active presence around the world. In addition, it has already incorporated ECD modules into the MICS3.

UNDP has a role to play as well, since its Human Development Index has become a benchmark by which countries can compare progress. Development of a public database on early child (or human) development would be a natural extension of this effort.

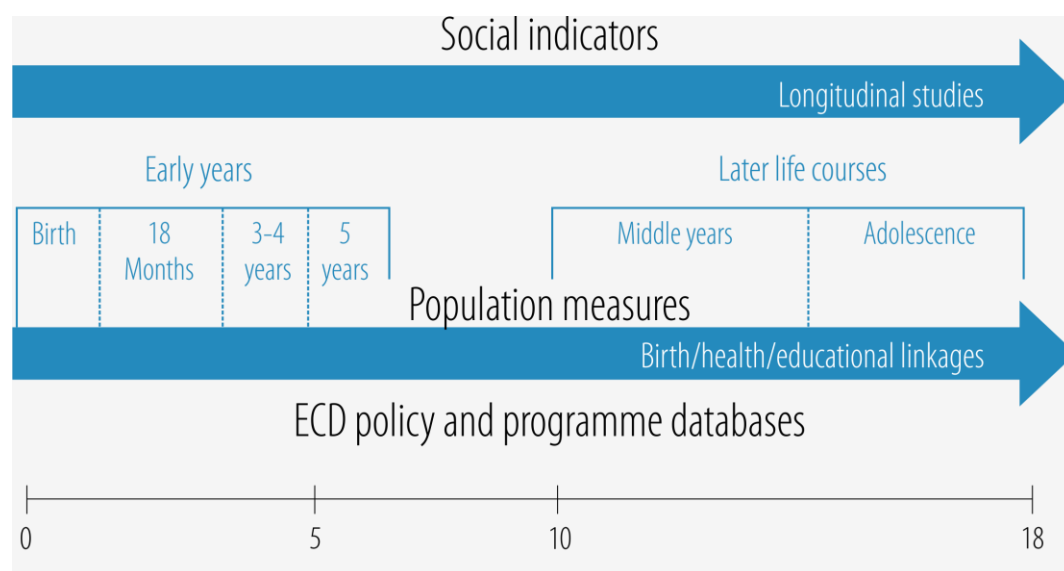
CONNECTING THE DOTS—LINKING DATA ALONG THE LIFE COURSE

Systematic collection and analysis of data on early human development would be an important contribution to devising a continuum of measures along the life course for assessing and monitoring countries’ progress toward equitable development. Potential approaches include population-based surveys at different ages, longitudinal studies and routine collection of data on social indicators.

Canada, for example, is piloting use of population-based surveys at birth, 18 months, age five, and grade four. Canada and the United Kingdom are conducting longitudinal surveys of child development, using representative samples of populations of children and their families. This approach is more costly per child than population-based surveys, but it is better suited for studying children's individual developmental trajectories, and the personal, family and environmental determinants.

In the social indicators approach, data are routinely collected from a variety of sources. When combined and repeated in time and place, these data provide national (or regional) snapshots that are useful for following trends. To monitor ECD, a snapshot index could include data on the determinants of child development (e.g., the percentage of families with children living below the poverty line and the number of hours per year parents are in the labour force), investments in early childhood and outcomes (i.e., children's learning and development) (Hertzman, Clinton and Lynk 2011). Countries could benefit greatly by adopting and integrating all three approaches into an ECD data system. Figure 9 depicts linking ECD data with programme and policy data.

Figure 9: An ECD data system



Source: Boivin 2013.

Currently, no country collects systematic data on the existence, operation or cost of ECD programmes, and impacts along the life course that could be linked with data on children's outcomes. Australia is an exception in that every three years it collects data on children's developmental outcomes using an adapted form of the Early Development Instrument (Australian Government 2013).

Systematic, population-based, multinational data on child development in developing countries is necessary to provide a snapshot of current trends and identify where children are most at risk. With this information, decision makers would be better informed and able to leverage ECD policies at regional and national levels, as well as globally. Systematic data also would provide continuing information on which ECD programmes are successful or not, how interventions can be made more effective and efficient, and why some countries have been able to scale up quality ECD programmes.

COMMUNICATE THE IMPORTANCE OF ECD FOR POPULATIONS' COMPETENCE AND WELL-BEING

Without demand for ECD interventions, the supply will remain limited. The importance of healthy development for all children has to be widely communicated. There is a particular need to raise awareness of the critical early years, when the structure and function of brains develop most.

Specific action is needed need to:

- Communicate the importance of healthy brain development in early childhood to a population's overall health, well-being and competence. To increase demand for ECD interventions, this message must be disseminated to everyone at every level—parents and caregivers in communities; government policy makers in health, education and social protection; central bankers and financiers; and heads of state.
- Promote a trans-disciplinary science of human development. The expansion of knowledge in neuroscience, neurobiology and epigenetics about how early brain development sets trajectories for health, learning and behaviour relates to university education across all disciplines, including the health sciences, economics and social sciences. Science has gone a long way to explain how experienced-based brain development in the early years of life influences the life course, and there is still much to learn. The challenge is to translate this emerging science into the design of programmes and policies that promote and foster healthy human development in all countries.

Recommendations

In the next 15 years, ECD efforts should converge on the four tasks of the unfinished agenda—redirection of social policies to focus on young children, incorporation of ECD into public health models, measurement of outcomes and linkage of them to programmes and policies, and communication of the importance of healthy brain development from birth to age six. This convergence of action will foster a common language for speaking about the trans-disciplinary

dimensions of early human development. It will support the accumulation of knowledge on how to promote healthy development by drawing on lessons learned and best practices in countries that have implemented coherent and comprehensive social policies integrating ECD.

Leveraging the machinery of public policy requires improving the understanding of and proficiency in ECD among senior policy makers and other leaders who have the ability, from their positions of power, to encourage social transformation from the ground up. Other efforts need to create essential building blocks for universal ECD programmes, namely:

- **A population-based outcome measure:** A widely accepted population-based measure of children's outcomes is critical to help countries assess the effectiveness of ECD interventions, and the magnitude of children who are entering primary school and are not ready to learn. This measure would be far superior to the 'process' or output measures—for example, pre-school enrolment, the percentage of first graders who have attended pre-school, immunization coverage and access to health services—that are currently used.
- **Quality practitioners:** Improving the quality of a cadre of ECD practitioners and trained caregivers is essential for all countries. Sensitive and responsive care is a key ingredient of quality for teachers, parents and health workers.
- **Targeted and expanded programmes:** Better targeting and expanded coverage of ECD programmes is needed, especially in East and South Asia, Eastern and Central Europe, the Middle East and North Africa, and sub-Saharan Africa. Recognition should be given to the additive and synergistic effects of programmes combining nutrition and stimulation, including positive parenting skills. Innovative approaches that integrate ECD services and expand them beyond traditional sectors such as education should be explored and encouraged.
- **Translational research:** Research informs policy and practice, and practice shapes and informs policy. This iterative process is essential in the ECD field, and needs to be continuous and ongoing. Translational research has increased understanding of risk and protective mechanisms involved in children's cognitive and non-cognitive development. The knowledge gained from such research provides the basis for policies of ECD prevention and intervention, keeping in mind that no blueprint can be developed to apply to every situation. Continued research and translation of knowledge gained into policies and practices should be accompanied by ongoing exploration of what works or not for whom, and in which settings and circumstances.

Conclusion

The first few years of a child's life have a multiplier effect for society. Children who are well nurtured during this period tend to do better in school and stand a greater chance of developing the skills to compete in the global economy. Investing in young children is thus an integral part of human and economic development.

Early human development is a powerful equalizer, as investments in early childhood yield significant long-term benefits that narrow the gap between high- and low-income families. Helping young children from disadvantaged or poor families has the highest potential returns of any educational policy. Nobel laureate James Heckman (2006) notes that investing in disadvantaged young children "...is a rare public policy initiative that promotes fairness and social justice and at the same time promotes productivity in the economy and in society at large." The WHO Commission on Social Determinants of Health (2008) notes that closing the inequity gap in one generation is doable, provided there is a more comprehensive approach to the early years in life—that is, "equity from the start."

Current understanding of the neurobiology of early childhood is that the development of the brain's architecture and function in early life affects health, learning and behaviour until we die. The implications of this knowledge are that what is done or not done in early childhood has long-term ramifications for both individuals and societies. Clearly, it is more equitable and cost-effective to invest in ECD programmes, which can enhance children's potential, than it is to pay far more later to try to remediate what could have been prevented. Children cannot defer their growing up until there are strong institutions and all the right policies are in place. We owe them, and ourselves, better than that.

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