THE UNTAPPED DEVELOPMENTAL POTENTIAL OF EARLY CHILDHOOD IN THE CEE CIS REGION
UNICEF Regional Office CEE/CIS Early Childhood Development Papers

Early Childhood Development (ECD) Papers, published by the UNICEF Regional Office for Central and Eastern Europe and the Commonwealth of Independent States, disseminate new research dealing with the economic, social and institutional aspects of realizing young children's rights.

The opinions expressed in this document do not necessarily reflect the policies or views of the United Nations Children’s Fund. The designations employed and the presentation of the material (including maps) do not imply on the part of UNICEF the expression of any opinion whatsoever concerning the legal status of any country or territory, or of its authorities or the delimitations of its frontiers.

Extracts from this publication can be freely reproduced with the condition that the source is cited.

For further information, please contact:
Patrice Engle  
pengle@calpoly.edu

Deepa Grover  
degrover@unicef.org

2009

Cover Design: SW Media
The Untapped Developmental Potential of Early Childhood in the CEE CIS Region

Patrice Engle
Consultant to UNICEF
Cal Poly State University
San Luis Obispo, CA

2009
Almost 10 million children in developing countries die before their fifth birthday. It is estimated that nearly 20 times that number – over 200 million children – survive, but do not reach their full human potential. Not only are children’s rights to survive and develop violated, but developing countries suffer an estimated 20 per cent annual loss in adult productivity as a result. However, strategies exist to promote those rights and reduce these economic losses; relatively low-cost and simple interventions early in the child’s life have been shown to increase adult productivity and reduce lifelong health risks. It is well recognized that the first few years of a child’s life are critical not only for survival, but also for growth and development. A growing scientific literature has shown just how important those years are in economic terms. And the earlier the intervention, the greater a chance of a positive benefit to cost ratio; early interventions are good investments for society as a whole as well as for the individual child.

The most dramatic loss of developmental potential occurs prenatally and in the first few years after birth, when children are most vulnerable to external threats and require the greatest nurturing. Failure to invest in young children at a population level will result in long-term deficits in that population overall.

This paper estimates the loss of developmental potential in terms of later adult productivity in the countries in the Central and Eastern Europe and Commonwealth of Independent States and the Baltic States (CEE CIS) region. This region is extremely diverse and includes a wide variation of conditions, from those that have predominately well-off populations to countries with widespread poverty and many children at risk. Not surprisingly, there is also a wide range in the extent of losses that countries face from their disparate patterns of development.

Although there are a number of ways that early experiences affect later development, including child mortality, this paper calculates the losses due to two of these pathways: stunting, poverty and learning opportunities. Children raised in poverty are more likely to be stunted, and to have a less stimulating home environment which in turn result in lower levels of cognitive, social and emotional development for the child. Delayed cognitive development is associated with fewer grades of school attained, and less effective learning, resulting in a lower grade level achievement. Lower levels of learning in school are associated with lower lifetime earnings. Because we do not have globally recognized measures of a child’s cognitive development, we rely on the highly associated measure of stunting as a proxy for delayed development. A second pathway is through opportunities for learning within and outside the home, such as quality early learning centres. These programmes have benefits for all children, regardless of social class. Thus, if children are unable to access these programmes, they will fall behind others, and miss the chance for a more equal start in life.

Based on these two pathways, two estimates are made: the number of children in each country who are not achieving their potential due to stunting, poverty or both; and secondly, an estimate of the cost to the society of the long-term reduction in their productivity as a consequence of poorer development (measured by stunting and poverty) and not experiencing preschool. Calculations of the loss of potential were based on estimates...
of the size of the effects from the Lancet Series on Child Development and from recent research on the effects of preschool on children’s learning.

In the region, 5.9 million children < 5 years are at risk of not reaching their full potential. These children represent 26 per cent of the 22 million children <5 in the region. They are not equally distributed across the region; in fact, most live in just 12 countries, where rates of children at risk are 20 per cent or greater: Albania, Armenia, Azerbaijan, Bosnia and Herzegovina, Croatia, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Tajikistan, Turkmenistan and Uzbekistan.

Unlike in other parts of the world, poverty and stunting are not always closely related in the CEE CIS region. Where stunting is common in other regions, as many as 50 per cent of poor children tend to be stunted, but in this region, only 19 per cent of poor children are stunted on average. Stunting continues to be a major risk factor for poor development, but others, such as parenting style and learning opportunities, micronutrients and lack of preschool, are also important.

The loss of socio-economic developmental potential is calculated in this paper based on the presumed contribution of additional school grade achievement to wage-earning, and factors predictive of school grade achievement. The three risk factors considered in calculating the economic loss are absolute poverty, stunting, and lack of preschool attendance in the two years prior to school entry.
The total loss is estimated at US$3.26 billion per year across all countries due just to stunting and poverty. When the loss due to lack of preschool attendance is included as well, the total amount of the loss is US$5.6 billion across the region, almost half of which is in the Russian Federation due to its large size and high wage rate. About US$2.4 billion, some 40 per cent, of this loss can be attributed to children’s not attending preschool.

This amount is on average 0.21 per cent of GDP. However, in some countries, as shown below, it reaches one per cent of GDP. In countries facing the highest levels of poverty and malnutrition, such as some of the Central Asian republics, it can account for more than one per cent of GDP. Often countries that have the greatest need to increase investments in early childhood face the great obstacles to making them.

This effort to calculate the cost of lack of investment in young children is a first step. The next and crucial phase is to design or strengthen existing high-quality, cost effective interventions that will reduce the losses and provide the best start for children. These interventions must not only reduce malnutrition, and lessen poverty, but must also include parenting education and support, early child development centres, media, and special programmes for high-risk children. Developing new and innovative forms of child care will make a difference. Parents themselves in many countries are not spending enough time playing with and teaching their children, and strengthening their role can make a major contribution to reducing the loss of developmental potential. Urgent action on all these fronts is required at both the policy level and in families and communities.
Contents

Introduction
- The Untapped Developmental Potential of Early Childhood in the CEE CIS Region
- Limitations of the Study

The Context of the Analysis: Changes in Disparities in the Region

Why Early Childhood Development is Important and Factors that Affect a Child’s Cognitive, Social and Emotional Development
- Definition of Child Development
- Factors Influencing Growth and Development

Economic Implications of Poor Development: Assessing the Loss of Potential in the Early Years
- Pathways of Influence
- Data Sources
- Estimating the Number of Children Not Achieving Their Potential in the CEE CIS Region
- Estimating the Size of the Effect
- Estimating the Loss of Potential
- Assumptions and Limitations in the Calculation of the Loss of Potential

Results: the Loss of Potential in the CEE CIS Region
- How Many and What Percentage of Children Are At Risk?
- What is the Economic Cost?
- Cost as a percentage of GDP
- Additional Sources of Risk

Interventions that Can Make a Difference

Conclusions and Implications

References

Annexes
List of Figures

Figure 1 Rates of return to human capital investment
Figure 2 Change in the Gini Coefficient from 1989 to 2004
Figure 3 Variations in the change in the Gini coefficient over time for five countries
Figure 4 Absolute income poverty rates, all ages and children, latest available year
Figure 5 Changes in GDP per country and sub-region, 1985-2005
Figure 6 Changes in preschool attendance rates from 1989 to 2004 for five countries
Figure 7 Changes in preschool attendance rates across the region since 2000
Figure 8 Percentage of children who are poor who are also stunted.
Figure 9 Percentage of children who are poor, stunted, and both stunted and poor.
Figure 10 Percentage of children not attending preschool
Figure 11 Total losses (in thousands) due to stunting and poverty
Figure 12 Total losses due to stunting, poverty and lack of preschool
Figure 13 Total percentage of GDP lost due to stunting, poverty and not attending preschool
Figure 14 Number of activities mother reports doing with child in the last three days by income quintile
Figure 15 Number of father’s activities in the last three days by income quintile
Figure 16 Number of children’s books by income quintile

List of Tables

Table 1 Estimates of poverty levels in the CEE CIS from a variety of sources
Table 2 Sources of stunting and poverty data
Table 3 Number of children in poverty, stunted overall, and both
Table 4 ECD Interventions that can make a difference
# Acronyms and Abbreviations

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEE CIS</td>
<td>Central and Eastern Europe and the Commonwealth of Independent States</td>
</tr>
<tr>
<td>DAR</td>
<td>Damage Assessment Report</td>
</tr>
<tr>
<td>ECD</td>
<td>Early Childhood Development or Early Child Development</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>IMCI</td>
<td>Integrated Management of Childhood Illnesses</td>
</tr>
<tr>
<td>IQ</td>
<td>Intelligence Quotient</td>
</tr>
<tr>
<td>MICS</td>
<td>Multiple Indicator Cluster Survey</td>
</tr>
<tr>
<td>NPV</td>
<td>Net Present Value</td>
</tr>
<tr>
<td>PPP</td>
<td>Purchasing Power Parity</td>
</tr>
<tr>
<td>SD</td>
<td>Standard Deviation</td>
</tr>
<tr>
<td>UNICEF</td>
<td>United Nations Children’s Fund</td>
</tr>
</tbody>
</table>
Introduction

Almost 10 million children in developing countries die before their fifth birthday, largely of preventable causes. It is estimated that nearly 20 times that number – over 200 million children – survive, but do not reach their full developmental potential. The result is that children’s rights to survive and develop are violated, and that developing countries suffer an estimated 20 per cent annual loss in adult productivity. However, strategies exist to promote their rights and reduce these economic losses; interventions early in the child’s life have been shown to increase adult productivity and reduce health risks later in life. It is well recognized that the first few years of a child’s life are critical not only for survival, but also for growth and development. There is a growing body of scientific literature showing just how important those years are in economic terms. And the earlier the intervention, the greater the chance that the benefit to cost ratio will be significant. As economists tell us, early interventions are good investments benefitting society as a whole.

This paper calculates the loss of developmental potential of children in the countries in the CEE CIS region due to their experiences in early childhood. It does not focus on or cost out interventions aimed at addressing these deficits. However, a table of possible interventions, and what is known from global experience about the size of their impact, is in the last section. Calculating the potential loss to society is a crucial first step to highlighting the economic importance of early childhood investments. Based on the potential losses, each country should choose to intervene to reduce this loss using a strategy most appropriate to the country. An example of a study that calculates both the loss of potential and the benefits from interventions is the recent paper on early childhood in Azerbaijan (Bagriansky and Engle, 2009).

Children do not reach their full human potential when they do not receive adequate nutrition, care and opportunities to learn. Good nutrition and health, consistent loving care and encouragement to learn in the early years of life help children to do better at school, be healthier, have higher earnings and participate more in society. The early years of a child’s life, and the health and well-being of the mother, are critical for the child’s growth and development. This is especially important for children living in poverty.

Brain development is most rapid in the early years of life. When the quality of nutrition, stimulation and care is deficient, brain development can be seriously affected, with long-term consequences. Experiencing extreme stress also can negatively impact brain functioning.

However, evidence shows that this damage can be prevented. In many parts of the world, studies show that children who are properly nurtured and receive assistance in their early years achieve more success at school. As adults they have higher employment and earnings, better health, and lower levels of welfare dependence and crime rates than those who lack these early opportunities. Nobel Laureate James J. Heckman determined that the most cost-effective interventions for reducing disparities for children living in poverty are those that occur prior to school entry.
The effects of early deprivation on children can be reduced or even -- in some cases -- overcome. Early intervention programmes for children living in difficult conditions around the world lead to improvements in children’s survival, health, growth, and cognitive and social development.9

The evidence is overwhelming, and it has been translated into policy. In the education sector, recognition of the importance of early childhood came first in 1990, at the World Conference on Education for All in Jomtien, Thailand. At the 1978 International Conference on Primary Health Care, in Alma Ata, Kazakhstan, sponsored by WHO and UNICEF, health was defined as a right and a state of well-being throughout the life cycle, and in 2005 WHO commissioned a series of expert papers to recommend how to reduce disparities in health status in one generation. The WHO’s Commission on the Social Determinants of Health in 2008 recognized the importance of early childhood development to equity, adult health, wellbeing and productivity. The report states: “What children experience during the early years sets a critical foundation for their entire life course. This is because ECD—including the physical, social/emotional and language/cognitive domains—strongly influences basic learning, school success, economic participation, social citizenry and health”.10 The report recommends a more comprehensive approach to early life, building on existing child survival programmes and extending interventions in early life to include social/ emotional and language/cognitive development.

Nevertheless, governments make relatively few investments in children between the end of the child’s first year and entry into school. Often there is too little support for families and communities that may be ill prepared or unaware of the critical role they play in their children’s growth and development in the first years of life. This lack of investment results in a missed opportunity for children and for economic development. We cannot afford to lose the potential of future generations.

---

**Figure 1. Rates of Return to Human Capital Investment**

![Graph showing rates of return to human capital investment](source: Heckman, 2006).
The Untapped Developmental Potential in the CEE CIS Region

One of the myths in CEE CIS – a largely middle-income region -- is that children can develop to their full potential because governments are making adequate investments in young children. However, a careful analysis suggests that there is much room for improvement, not only by increasing the availability and quality of services, but also by enhancing the role that families play in their children’s development. This paper first calculates the number of children in the CEE CIS region who are not developing to their full potential, and examines differences across the region. Second, it estimates the amount of the loss in economic productivity for each country from the lack of investment in these early years. Third, it suggests a list of possible interventions. Recognizing the size of these losses is critical, since losses are far more difficult to recoup than to prevent. An unfortunate consequence of early disadvantage is that it tends to extend across generations, resulting in increasing disparities within and between countries. As we will see, in some countries they contribute to a significant potential reduction of the GDP.

The data presented here challenge a number of myths and misconceptions that reflect the legacy of the Soviet period or that have emerged following the fall of the Berlin Wall in 1989.

These myths are:

- There are few, if any, poor children in this region;
- Economic recovery is sufficient to remedy the situation of the poor and vulnerable without specific investments in young children;
- Increased family income alone will lead to improvements in the lives of young children;
- Families are the sole and most competent duty bearers with respect to the rights of young children; the role of the state is important only after a child starts primary school;
- On the other hand, some believe that States are more competent to provide for young children than are families;
- The coverage of basic services and benefits is universal and even; and
- Health and education reforms are adequately addressing the needs and rights of young children.

These perceptions, although not supported by data or experience, could prevent urgently needed investments in young children. Therefore, data presented here show that there continue to be large inequalities within and among countries in the region on key indicators. Services to support young children’s development are far from being universally available; families could provide much more support for young children and in some countries, the resulting loss of developmental potential appears to have considerable negative impact on society as a whole.

Limitations of the Study

This paper draws on the latest available data, which means, unfortunately, that the effects of the economic crisis of 2008-2009 are not reflected. The data used were collected in the preceding period, when most economies were still growing (see Tables 1 and 2 in the Annex for sources of all data). The economic downturn appears to have resulted in rising poverty rates and declines in the nutritional status of children and preschool attendance. Therefore, it should be recognized that the estimates used in this study present a more positive picture than one that might emerge from data reflecting the recent global economic crisis.
A second limitation is the lack of a globally recognized measure of early child development. As the paper demonstrates, proxy measures are used to estimate these effects.

Third, the loss of potential is defined only in economic terms and does not include violations of child rights. Nor does it reflect the impact of early child development on the changes in the next generation of quality of parenting, or the costs and benefits to the society of improved citizenship, reduced social costs, and reduced crime programmes.

**The Context of the Analysis: Changes in Disparities in the Region**

In order to estimate the size of the loss of potential, the analysis is based on two proxies of child development: poverty rates and stunting, and on rates of preschool attendance. Levels of poverty, stunting and preschool attendance are assessed in each country.

**Poverty**

The recent UNICEF Report, *Education for Some more than Others (2007)*, provides an excellent overview of the economic changes that have taken place in the region. All countries have gone through major change since the fall of the Berlin Wall in 1989 and subsequent disappearance of the Soviet Union, but some have recovered more quickly than others. The economic crisis of 2008 suggests that, for many countries, recovery will slow again.

Inequality has increased within almost all countries except Turkey. Figure 2 below shows the change from 1989 to 2004. These disparities mean increasing numbers of children are becoming poor. Indeed, they are hardest hit by poverty,

**Figure 2. Changes in the Gini Coefficient from 1989 to 2004**

![Figure 2. Changes in the Gini Coefficient from 1989 to 2004](image)

*Note:* The Gini coefficient is a measure of the degree of inequality in the distribution of earnings. It is equal to 0 in the case of total earnings equality (everyone receives the same income) and to 1 in the case of total inequality (one person receives all the income).

*Sources: UNICEF, TransMONEE database, 2006; Russian Federation: Mitsa and Yentsov, 2006: Table 1; Turkey: Turkish Statistical Institute, 2006.*

These changes over time have varied by country. The chart in Figure 3 below shows the changes in the GINI coefficient for earnings in five countries in the region selected on the basis of the completeness of their records in the TransMONEE data set of 2008. A higher
number reflects greater inequality in earnings within the country. During the period from 1990 to 2006, disparities have increased in Macedonia and Romania, dropped slightly in Kyrgyzstan but are still high, and remained fairly constant in Bulgaria and Belarus. Overall, except for Belarus, these numbers suggest fairly high levels of inequality.

**Figure 3. Change in the Gini coefficient over time for five countries**

The proportion of people living in poverty varies enormously across the region. According to data from 2001-2003, 11 countries had income poverty rates of 10 per cent or more using the indicator of below US$2.15/day PPP (Figure 4). However, for many there has been a rapid change since 1998, with some countries and regions showing rapid progress, and others not (Figure 5). Although the general upward trend is encouraging, the increasing disparities reveal that not all are profiting from the change.
Figure 4. Absolute income poverty rate, all ages and children, latest available year

![Absolute income poverty rate chart]

*Note: Years vary between 2001 and 2003.*


Figure 5. Changes in GDP per Country and Sub-region, 1985-2005.

![Changes in GDP per Country and Sub-region chart]

*Note:
1. Sub-regions are defined as follows: EU CEE: Estonia, Latvia, Lithuania; Caucasus: Armenia, Azerbaijan, Georgia; Central Asia: Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan; Central and Eastern Europe: Czech Republic, Hungary, Poland, Slovakia, Slovenia; Countries of the former Yugoslavia: Bosnia and Hercegovina, Croatia, Montenegro, Serbia, The former Yugoslav Republic of Macedonia; Western Commonwealth of Independent States: Belarus, Moldova, Russian Federation, Ukraine.
2. Sub-regional index is unweighted average of countries.
3. Bosnia and Herzegovina is not included due to lack of data.*

*Source: UNICEF, TransMONEE database, 2006; Turkey: International Monetary Fund (IMF), World Economic Outlook database, 2006.*

(Source: Education: Some More Equal Than Others; UNICEF Regional Office Geneva, 2007)
Stunting
Whether stunting has changed over time is difficult to determine based on World Bank data, since few countries have more than one data point available.

Preschool attendance
As reflected in Figure 6 below, there are more data available on changes in preschool attendance (3-6 years, or ISCED 0) over time. Attendance initially declined in the region but has now begun to return to previous levels in some countries. However, this is not the case in all countries. Although there has been a considerable recovery in the Eastern European countries, other countries have not been able to recover to pre-1989 levels of preschool attendance.

![Figure 6. Changes in preschool attendance rates from 1989 to 2004 for 5 countries](Source: UNESCO Global Monitoring Report, Strong Foundations, 2007)

Since 2000, rates of attendance are increasing in most countries. Figure 7 shows changes in public preschool attendance between 2000-2007 for children 3-6 years old. However, the rate of preschool attendance is still very low in Central Asia and in some of the Caucasus countries.
Figure 7. Changes in preschool attendance rates (3-6 year olds) across the region since 2000

Current trends, therefore, include high and increasing social disparities in previously egalitarian societies. This trend poses a threat to child rights, social cohesion and political stability. Particularly at risk are ethnic minorities, disabled, unregistered/stateless, and those in conflict situations.

One potential risk factor is the changing role of the family. In societies with a legacy of service provision by a strong State, the role of the family as the safety net of last resort may not be as robust as in societies lacking such a history. As disparities grow and poverty becomes a longer-term trap, some families find themselves unable to cope or are being forced to adopt coping strategies or behaviours that are inadvertently harmful to children. Some of these include migration for work, institutionalization of children, substance and alcohol abuse and a high rate of single parenting. In many countries, the rate of institutionalization of children is growing. Not investing in the next generation has serious long-term consequences for individuals and the social fabric.

This paper examines the economic loss to family and society of failure to invest in young children. The first and most important investment a State can make is in adequate services – health, nutrition, quality early learning centres and support for families who need additional social protection. If these drop in priority, the cost for children, for families and for society as a whole will grow. In order to make an informed estimate of the loss, we must have an estimate of the size of the effect of the early environment on children’s cognitive development, which in turn affects their school performance and eventually their economic
productivity. The following section outlines the key factors to be considered in making the estimate of the loss of developmental potential, as well as some of the basic mechanisms that explain these effects.

**Why Early Childhood Development is Important and Factors that Affect a Child’s Cognitive, Social and Emotional Development**

**Definition of child development**

As children develop, their sensory-motor, cognitive and social-emotional capacities emerge and unfold. The process of development requires particular inputs to occur at particular times. The first few years of life are especially important because it is in this period that vital development occurs in all domains. Skills build on each other, such that small perturbations or deficits in one domain of development can have long term effects on the brain's structural and functional capacity.

Brain development is genetically influenced, but modifiable by nurture and the quality of the environment. Animal research shows that early undernutrition, iron deficiency, environmental toxins and even excessive stress and lack of stimulation and social interaction as a function of extreme poverty can affect brain structure and function and have lasting cognitive and emotional effects. The developing brain requires experiences and input in order to develop its structure – it needs experiences and input to complete the process. Insufficient experience such as too little maternal care or negative experiences such as lack of a consistent and responsive caregiver can produce lasting changes. These can range from anxiety and reactivity to stress memory function, on the one hand, to increased risk of health problems in adulthood though a heightened immune response.

In humans, critical or sensitive periods for input vary by developmental task. For vision and hearing, there is a very specific and limited timeframe for such experiences, and an absence of input can have long term consequences for abilities such as depth perception. For language learning, the sensitive period is longer and somewhat more flexible. For example, although the foundation for language acquisition is normally laid in the first 18 months of life, a child can develop native fluency in a second language through the first 4-5 years of life. Finally, a variety of higher cognitive functions such as planning and decision-making continue to develop through childhood. Despite the vulnerability of the brain to early insults, remarkable recovery is often possible with appropriate interventions, although generally the earlier the interventions the greater likelihood of benefit.

**Factors Influencing Growth and Development**

**Nutritional influences**

The influences of nutrition on growth are well recognized, and an increasing body of research has documented the effects of nutrition on development. The most thoroughly documented nutritional risks for a child’s cognitive and linguistic development include iodine deficiency, iron deficiency, stunting and low birth weight, although there are many others which are less well documented. Recent evidence from Belarus has demonstrated the cognitive benefits of breastfeeding with an intervention design, rather than the correlational designs available before.
**Cognitive stimulation and opportunities for learning**

Many studies have demonstrated the effectiveness of stimulation for improved development in both developed and developing countries. These studies demonstrate that children’s cognitive development can be improved through adult support of children’s intellectual capacities through a process called “scaffolding”, in which a child is encouraged to consider new options or extend her thinking through adult facilitation and joint attention (both adult and child attending to the same task). The amount and quality of language exposure, particularly language used meaningfully and in context, is strongly associated with superior language development, which in turn affects a child’s school performance and success. Learning materials that provide children with opportunities for manipulation and control, whether home-made or purchased, and books are important supports for learning in many societies.

Programmatic interventions have also been able to improve a child’s developmental level by changing patterns of interaction. Using a meta-analytic technique, Sweet and Appelbaum (2004) summarized the results of 60 studies of home visiting, primarily in the US and Europe. They found that many of the interventions had significant impacts, although the overall sizes of the effects were relatively small, around .2 to .3 SD in development scores, or 5-7 IQ points. Many of these interventions were directed toward children who were at risk, such as those with low birth weight or belonging to low-income households.

**Social and emotional development**

It is generally recognized that emotional availability is one of the most basic needs of the infant. Parents display their emotions to their children, and children provide their own emotional cues, resulting in a high level of engagement and care giving. There are several dimensions of emotional availability that are particularly relevant to infant development: maternal sensitivity or the ability to interpret or understand a child’s signals, and responsivity, the capacity to respond to these signals in a timely and appropriate way. A second set of abilities is associated with the way adults structure or “scaffold” new experiences for children, such as facilitating without being intrusive or overprotective, and a third is affective warmth or at least not being hostile or rejecting. These dimensions are summarized in three aspects of parenting that Shonkoff & Phillips found to be consistently related to young children’s cognitive and social emotional competence: (1) cognitive stimulation; (2) caregiver sensitivity and responsiveness and (3) caregiver affect (emotional warmth). From the child’s perspective, the combination of these factors results in age-appropriate exploration, enjoyment and involvement in activities, and in having success in engaging the mother or father.

Other features of the environment and the characteristics of the child can also influence the child’s development. These include neighborhood and community, elements of the immediate environment, such as house quality, crowding, or maternal behavior, as well as characteristics of the individual child such as health, temperament and social skills. The importance of each of these will vary by culture and by the ecological environment, but they all play a critical role in the child’s development.
Economic Implications of Poor Development: Assessing the Loss of Potential in the Early Years

It is well recognized that the first few years of a child’s life are critical not only for survival, but also for growth and development. A number of studies and analyses have shown just how important those years are in economic terms. Early interventions are good investments. Heckman and his team analyzed a large number of programmes in the United States that were designed to improve children’s long term outcomes. He calculated the cost of these programmes, and also their benefits -- both in terms of the individual (eg, increased work productivity) and society (e.g., reduced crime and placement in special education classes). In many reports, programmes in the first five years of life are described as having a greater benefit for their cost than programmes that begin later. This finding has been replicated not only in the U.S. and other industrialized countries, but also in 20 programmes in developing countries, including Bolivia, the Philippines and Turkey. The message is clear: investing in early child development is good for children and good for the economy.

Calculating the number of children not developing to their full potential is the first step in understanding the cost of not investing in young children. The second step is to estimate the effects developmental deficits on schooling and subsequent productivity. Each is considered in a separate section. But first, two different pathways of influence are outlined.

Pathways of Influence

One pathway for investments in the early years is through addressing stunting and poverty, used as proxies of cognitive development. Research shows that stunting and poverty contribute to poor cognitive development, which in turn is associated with fewer years of schooling, lower long-term income and decreased productivity. For example, a recent study in Guatemala found that men who had received a high quality protein-energy supplement in the first three years of their lives (from 0 through 2.99 years) had 46 per cent higher wages as adults than men who had not received this supplement (Hoddinott, Maluccio, Behrman, Flores and Martorell, 2008). The most fascinating finding was that children who received the protein-energy supplement after reaching the age of three showed no long-term effect – the benefits only came when supplementation was provided before the third birthday.

One pathway, then, to poorer productivity is through compromised cognitive development, lack of success in school and lower income earning. Poor cognitive development is the result of stunting, poverty and, perhaps, less stimulating home environments. Poverty and the lack of a stimulating and responsive environment have negative effects on children’s cognitive and social and emotional development.

A second pathway to poorer productivity is not having opportunities for learning in the first few years of life; this holds true for rich and poor, stunted and well-nourished alike. Lack of early stimulation has an effect on cognitive development above and beyond that of stunting, and is probably not completely captured in the measure of poverty. There are two major sources of stimulation in the first five years of life: families and early child development programmes. Both contribute to children’s cognitive development, schooling success and eventual productivity. In well nourished as well as poorly nourished populations, a child’s level of cognitive and social functioning influences years of schooling completed, school performance and future productivity.
Parents play a major role in children’s development through simple activities such as conversations, reading to children, and taking them out of the house for other experiences. These contributions have an effect on later outcomes, -- regardless of the social class of the child’s family – and these effects are seen in well nourished as well as poorly nourished populations²⁹.

Poorer as well as better-off children profit from preschool experiences. For example, in the U.S., a nationally representative sample showed that participation in preschool resulted in higher reading and math skills in the first grade, even controlling for family wealth.³⁰ Another study of a state-wide preschool programme in Oklahoma, also found that all children who had attended preschool performed better on achievement tests in first grade, regardless of socio-economic status.³¹ In the United Kingdom, positive effects of improved home environments on children’s development were also found in families at various economic levels, and these effects were more significant than socio-economic status.³² Not only the home environment but also preschool attendance had beneficial effects on children’s development and later mathematics achievement in both wealthy and poor families.³³

A third pathway is through reduction of risks due to low birth weight, disability and developmental delay, or family dysfunction. Without early intervention, children facing these risks will have lower levels of development and less chance for economic productivity. The cost of institutionalization can be very high, with limited or in some cases no benefit. Other pathways linking early psychosocial experience with poor outcomes include increases in mortality due to inappropriate maternal-child interaction and care, injuries and accidents, and the effects of toxic stress related to abuse, neglect, and conflict. They are not considered here, in part because good estimates of the size of their effects are not yet available.

**Data Sources**

*Poverty* -- For the analyses in this paper, a number of regional estimates of poverty were examined. These are shown in Table 1 below. Because the MICS3 presents poverty estimates as quintiles within countries, these figures cannot be used for comparisons across countries. Four different – and comparable – estimates of poverty were found, which are presented in the table. The first column shows the national poverty level, a country-specific estimate available at the World Bank database. The second shows absolute poverty rates based on the new Povcal system developed by the World Bank in 2005, described on their website.³⁴ This model allows one to specify a poverty level. Using the World Bank calculations of income per family, the cut-off used for extreme poverty was US$2.15 earned per person per day, the same cut-off used in the UNICEF (2007) paper, *Education for Some More than Others*. The third column is from the definition of poverty used in the UNICEF (2007) publication. The fourth set of numbers is from the World Bank Development Report database, constructed before the newest method of calculating poverty was introduced. It uses a daily estimate (PPP) of US$2.00 according to the report.

In general, when there were discrepancies, the most recent information was used. Preference was given to the newest estimates made by the World Bank. However, in a few cases, the differences were sufficiently marked that it was not possible to use only one. For example, the estimates for Azerbaijan ranged from 1 per cent to 49 per cent. In this case, the poverty rate was obtained from the Statistical Office of Azerbaijan (15.8 per cent). The table presents all estimates, and indicates that in all but one case, the most recent World
Bank calculation was used. It should be noted that increased levels of poverty in some of the countries in the region, caused by the 2008-2009 global economic crisis, are not reflected here because relevant data are not yet available.

**Stunting** -- As with poverty, there are numerous sources of information for the rate of stunting. In most cases, data were available from the Cattaneo paper (2008) which had selected the most reliable and recent indicators. As a comparison, stunting data were also obtained from the World Bank website. As Table 2 shows, these numbers were not always consistent, but most of the discrepancies could be explained by differences in the time of assessment. In all cases, the most recent estimate was used, unless another one had been recommended by Cattaneo et al (2008) as superior in methodology. Surprisingly, for many countries the differences, although significant, between the percentage of stunted for the highest and lowest income quintiles were not as large as expected.

**Number of children** -- Data for the total number of children from 0-4.99 years of age were obtained from the TransMONEE data base that was downloaded from the website in November 2008. In each case, the number of children in the year in which stunting was measured was used. Since most of these were 2007, that number was used.

**Lack of Preschool** -- The data from the TransMONEE data set for 2008 which gives the percentage of children 3-6 years old attending preschool (ISCED 0) was used. Private preschool attendance was not included – in any event, it is very low in most countries. The MICS3 data include only children 3-4 years of age, so they miss a number of children in preschool.

Unfortunately, Turkey does not appear in the TransMONEE data. Therefore, all of the estimates that relied on these data sets, including population size, wage and employment rates, were not available for Turkey, and the country could not be included in the analyses.

**Estimating the Number of Children Not Achieving Their Potential in the CEE CIS**

How many children in the region are not developing to their full potential? In order to estimate the number of children at risk, a methodology was used similar to that developed by Grantham-McGregor et al (2007). In this approach, stunting and poverty are both used as proxies for poor child development in the absence of a cross-culturally acceptable measure of child development.

Grantham-McGregor and colleagues justify the decision to use the stunting and poverty proxies based on a number of assessments of the associations between stunting and cognitive development, as well as between poverty and compromised child development. These reviews of the literature suggest that absolute poverty and stunting are robust proxies for poor cognitive and socio-emotional development.

The rationale developed in the 2007 paper requires an estimate of the number of children who are living below absolute poverty levels, the number who are stunted and the number of children who are both stunted and poor. Children who are both stunted and poor should not be counted twice if we are estimating the number of children affected. However, the size of the effect of the combined influences on later productivity is greater than either alone, which will be reflected in the analysis of the loss of potential, discussed in the subsequent section.
In order to estimate the number of children not developing to their full potential, then, we need estimates of the number of stunted only, poor only and stunted and poor children in each country in the region. Grantham-McGregor et al estimated across a variety of countries that, on average, about 50 per cent of children who are poor are also stunted, reducing by half the number of poor children at risk of developmental deficits. However, in some regions the percentage is lower; that is, fewer than 50 per cent of children living below the poverty level are stunted. Grantham-McGregor et al evaluated 13 MICS3 datasets and found that 43 per cent of children living in poverty (in the bottom quintile) were stunted.

This percentage overlap was calculated in the CEE CIS region by using the MICS3 data, and calculating the proportion of stunted children in the lowest quintile of the wealth index. Using this approach in the CEE CEIS region, the percentages are lower than in the global analysis. For example, in Kazakhstan, 15 per cent of children in the lowest wealth quintile are stunted, 32 per cent in Tajikistan and 37 per cent in Turkmenistan. Across the region, 19 per cent of children in the bottom quintile in each country are stunted. Percentages are shown in Figure 8. Therefore, in these analyses, the percent of overlap is specifically calculated for each country.

**Figure 8. Percentage of children who are poor who are also stunted**

![Figure 8. Percentage of children who are poor who are also stunted](image)

**Source:** Based on % in the lowest quintile who are stunted; Data are from MICS3.

The proportion of children in the lowest quintile is assumed to be the percent of poor children who are stunted. However, because the MICS3 estimate is a quintile within each country, and is not a level of absolute poverty, comparisons across countries cannot be made. Therefore, as noted above, the World Bank definition of poverty level is used. Then the number of children who are poor and stunted is based on the percentage from the MICS bottom quintile multiplied by the number who are poor from the World Bank estimate of
the minimum poverty level. It is possible that this number over or underestimates the overlap depending on the difference between the absolute poverty rate and a quintile (20 per cent) estimate.

Thus, in the CEE CIS, the overall number of children not developing to their full potential is calculated as the sum of children 0-4.99 years of age who are poor according to the best estimate of absolute poverty, plus the percent who are stunted according to those estimates, less the proportion of children in the poorest wealth quintile who are stunted, multiplied by the number who are poor by using the estimate of poverty in Table 1. These numbers are shown in Table 3, and the results are detailed in the next section.

But Grantham-McGregor et al stress that stunting and poverty themselves are only markers for a broader group of deficits that have negative effects on a child’s development, including health factors such as frequency of illness, but also the kind of responsive stimulation that children are receiving in the home and opportunities they have for learning. A substantial international literature documents the critical role of these factors on children’s cognitive, language and social development, including readiness for school. Moreover, even in well-nourished populations, increasing the level of stimulation through improved parenting programmes, or increasing opportunities for learning through preschool access, has been associated with significant improvements in cognitive functioning and school readiness with effect sizes of 0.3 to 0.6 (small to moderate).

**Estimating the Size of the Effect**

The second step is to estimate the size of the loss of productivity and to compare this loss to the GDP. Using the best data available, Grantham-McGregor et al estimated that the loss of future productivity of stunting, absolute poverty, or both, was 19.8 per cent of lost wages per person per year, representing a substantial loss of potential. This estimate is based on combining deficits in school grades attained and deficits in learning ability per grade for stunted, poor and both stunted and poor children based on longitudinal studies. For children who are poor but not stunted, the net loss in grade attainment was estimated as 0.71. For children who are stunted but not poor, the loss in grade attainment was estimated as 2.91, based on numerous studies. For children who are both stunted and poor, the deficit in grade level equivalent attained is 4.15 (0.71 for poor, plus 2.91 for stunted). These figures are used to estimate the loss in grade level attainment in this sample.

In order to translate loss of grades into loss of wage earnings, a review of 51 studies estimated that each year of schooling increases wages by an average of 9.7 per cent, and that a reduction of a year of schooling would reduce income by 8.3 per cent, slightly less than the benefit of attending school.

The amount of the deficit in productivity associated with stunting and poverty presumably operates through poorer cognitive and social-emotional development related to conditions of poverty, poor health and more limited opportunities for exploration and learning. However, as noted above, lack of preschool experience can result in an independent loss. That is, children may have a loss of earning potential due solely to not attending preschool, whatever the effects of stunting or poverty may be. How big might the effect of preschool attendance be for cognitive development and grade attainment?

A review of programme evaluations from developing countries found that almost all showed significant gains in cognitive skills during preschool in the range of effect sizes of
0.3 to 1.5 SD, depending on the strength, quality, timing and duration of the intervention. 40 The higher effect sizes are from comprehensive programmes that often include nutritional interventions and begin early, while those at the lower end – averaging 0.5 SD – are associated with more narrowly focused preschool programmes. In many of the countries that were studied, the age at primary school entry tends to be seven or even eight. If the child attends a quality preschool for two years, the effect should be larger. One study showed that the effects of two years of quality preschool might be 1.5 times larger although probably not twice as large as one year (Reynolds, 1995). Two years of preschool is common throughout Europe and in many of these countries. 41 Although it is not possible to determine the number of years children attend preschool from these data, it is reasonable to assume that many will attend for more than a year. Thus an approximate estimate is used.

If children gained 0.5 to 0.75 SD in cognitive skills in at least a year of preschool (that is, $1.5 \times 0.5 = 0.75$), what might be the effect on grade attainment and eventual wage-earning? Data from Brazil and Guatemala suggest that a 1 SD increase in preschool skills will be associated with an increase of 0.67 to 1 year increase in school attendance (or learning).42 The previously cited review of 51 studies suggests that there is a 9.7 per cent annual earnings increase for one additional year in school or a decrease of 8.3 per cent for not attending43. If we assume that the impact of one or two years of preschool is about 0.62 (the average of 0.5 and 0.75) and multiply this figure by the estimated impact on grade attainment/performance of 0.835 (the average of 0.67 and 1 SD), the result is the equivalent of about half a grade of school attendance. Thus, we can assume that attending a year or two of preschool will increase grade attainment by half a year, and reduce the loss of wage earnings by about half of 8.3 per cent, or 4.15 per cent. This is the figure used in the analyses. Given that children are between four and six when they attend preschool possibly resulting in a larger impact, this estimate seems conservative.

To check this estimate, the size of the deficit in early learning skills (0-6 years) can be estimated by finding the differences between the highest and lowest quintiles of socio-economic status on measures of school readiness, since numerous studies show that there is a strong association between poverty and a child’s development.44 We can use school achievement in the first or second grade as a proxy. Three longitudinal studies report differences of 0.7 SD in South Africa, 0.84 in the Philippines and 1.06 in Indonesia in school achievement as a function of socio-economic in early childhood.45 These differences may be due to poor parenting and not attending preschool, both of which are accentuated in poor populations in most countries, as well as stunting and poverty.46 Although one cannot break down the causes in this analysis, the size of the difference (between 0.7 and 1.1) suggests that our estimate of 0.65 for preschool effects is not unreasonable.

A second check on the size of the estimate of the loss is to examine the size of the improvements from early interventions. Engle et al. (2007) reviewed a number of programmes for young children in developing countries, and concluded that there are effective, tested interventions that can be used in low-resource settings. For example, in Jamaica, using paraprofessional home visitors with weekly visits on health, nutrition, parenting and income generation, the difference between visited and non-visited children was 0.5 SD, controlling for socio-economic status, on the Griffiths Mental Development Scales, and when professional health aides did the home visiting, the effect size was slightly larger (0.8) on the Griffiths.47

These effect sizes are the equivalent of about 7-10 IQ points and may be greater in children at risk. For example, low birth weight infants have been found to have lower scores on a
number of tests without intervention, but cognitive stimulation through a psychosocial intervention programme resulted in higher levels of functioning at seven months in low birth weight infants in Jamaica. In Brazil, early stimulation improved the cognitive levels of low birth weight children. Thus the estimated effects appear to be reasonable.

**Estimating the Overall Loss of Potential**

The model below shows the strategy for translating a risk during early childhood into the Net Present Value (NPV) of the losses related to a lack of investment in young children – sometimes called a Damage Assessment Report (DAR) in nutrition estimates. A Damage Assessment Report estimates the magnitude of the preventable mortality, lost work potential, depressed productivity and excess health care costs in a country. The calculation is based on the number of children who are affected, the size of the deficit (coefficient of deficit), the average wage rate of adult workers, the current labour force participation rate and the discount rate or reduction every year of 3 to 5 per cent between the end of the intervention and the start of the person’s employment. This discount rate must be included due to the fact that the funds have been invested and are in a sense not available for spending or use until the person begins to work. This calculation produces a Net Present Value amount of lost earnings – a financial algorithm that estimates the current or present value of future economic benefits. The lost earnings stream does not begin until the child becomes an adolescent and enters the work force at age 15 and the earnings stretch out for an average 45-50 years, depending on workforce patterns. The NPV “borrows” these earnings from up to 60 years in the future at a designated interest rate – set here as 5 per cent, a moderate estimate. The estimate depends substantially on the net discount rate taken, which as noted above, can range from 3 per cent to 5 per cent, depending on the cost of borrowing money in the country.

| 1. Annual Lost Productivity Due to Sub-Optimal Child Development Indicators |
|-----------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Number of children | X | Coefficient Of deficit | X | Average wage | X | Labour force participation rate | X | Discount rate 45 year work life from 15 years old | = | NPV of losses |
| # Children not served | Loss due to not being served | Wage rate as adult | Labour force participation of adults 15 - 60 | 5% (or lower) | calculated |

In a recent analysis, Bagriansky and Engle (2009) estimated that the loss of future productivity due to poor nutrition (mainly stunting and anaemia), child mortality and lack of responsive care (poor parenting and lack of attending preschool) was about 1 per cent of the GDP of Azerbaijan. About half of the losses were due to 10 nutritional indicators and related mortality, and the other half was due to lack of preschool attendance and poor parenting. In order to make these estimates, it was assumed that there is an incremental effect of an increased number of risks on eventual productivity. A large body of literature suggests that negative effects of a number of risks on children (cumulative risk) are much greater than a single risk. Thus, when making these estimates, both stunting/poverty, and lack of preschool are considered together as risks that the child faces. Ideally, one should estimate the multiple effects on productivity of stunting, anaemia, lack of preschool and poor parenting, as well as other risk conditions such as abuse and neglect.
Assumptions and Limitations in the Calculation of the Loss of Potential

One of the problems in this method of estimation emerged in the evaluation of the long-term impacts of early nutritional supplementation in rural Guatemala (Hoddinott et al., 2008). The effects of the early supplementation on subsequent wage-earning was strong for men, but was not found for women. Why was this effect not seen in women? In fact, women who had received this food supplement stayed in school on average 1.17 years longer, but this was not reflected in their wage rate. A previous report on the same data by Li et al. showed that women nutritionally supplemented at an early age had significantly higher levels of cognitive development than those who had not received the supplements. A likely explanation for this is gender bias in the labour market. However, evidence shows that women’s education and their intelligence do have a major impact on their children’s growth and development. A challenge is to assess the economic impact of mothers’ improved education levels, and intelligence, on children’s survival, growth and development.

The calculations which follow are based on several assumptions. First, the number of children who will not develop to their full potential is an underestimate. It was based only on children who were stunted and/or poor, and did not include children who were neither stunted nor poor but had lower levels of cognitive and social-emotional development in their early years due to inadequate parenting or home environments. The lack of a globally recognized measure of child development prevents us from basing our estimates on cognitive development. Although theoretically it is possible to calculate the percentage of children who, although not poor or stunted, had an inadequate home environment, we do not yet have measures that allow us to define a clear cut-off point for measuring inadequate parenting. Without such data, we could not include the number of children who were not poor or stunted, but were not attending preschool, in our estimates. Since this calculation would have increased the number of children not achieving their potential to some degree, our estimate is on the conservative side.

In calculating the loss of productivity, several assumptions were made that result in a more conservative estimate as well. First, long-term productivity was measured only by changes in wage rates due to schooling of employed adults. As explained earlier, this assumption reduces the potential size of the impact because it does not count the contributions of unemployed workers to the survival, growth and development of the next generation. Nor does it include such factors as reduced crime, savings in special governmental assistance or marital satisfaction, all of which have been shown to be associated with attendance in early child development programmes.

Another assumption is that the lack of preschool attendance will have a negative effect on both well and poorly nourished children and on children across a range of socio-economic levels. The justification for this assumption was presented in the previous section. Yet it is likely that the effect will be greater in a poorer population, and therefore using a single multiplier underestimates the loss of not sending poorer children to preschool.

Finally, in this analysis we have limited the list of risks children are facing to stunting, poverty and lack of preschool. Many other nutrition risks, such as iron and iodine deficiencies, and psychosocial risks, such as inadequate stimulation in the home
environment, were not included in this analysis, even though conceptually they should have been included. As noted above, mortality effects and morbidity effects were not included.

**Results: The Loss of Potential in the CEE CIS Region**

**How Many and What Percentage of Children Are At Risk?**

Based on the calculations described above, Table 3 shows the number and percentage of children who are at risk of not developing to their potential based on stunting and poverty. Over 5.9 million children are at risk -- out of the 22 million children 0-4 years of age living in the region in 2007. The proportion overall is 26 per cent of children at risk, well below the 39 per cent reported for the world overall, but still far above what one might hope to see in a primarily middle-income region. In fact, it is almost identical to the figure for the region reported by Grantham-McGregor et al. (2007).

The largest number of children not developing to their full potential are in Uzbekistan (2.16 million), followed by Russia (1.01 million) and Tajikistan (562 thousand). Two of these countries – Russia with 7.3 million and Uzbekistan with 2.6 million – have the largest populations of children 0-4 in the region. The very high rate in Uzbekistan can be explained by its very high poverty rate, according to World Bank figures.

In order to facilitate comparisons, the percentage of those who are poor, stunted or both are shown in Figure 9. They are not equally distributed across the region. Twelve of the 29 countries have rates of risk above 20 per cent: Albania, Armenia, Azerbaijan, Bosnia and Herzegovina, Croatia, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Tajikistan, Turkmenistan and Uzbekistan. When only these countries are considered, the rate of children at risk rises to 44 per cent, higher than the Middle East and North Africa (22 per cent), East Asia and the Pacific (23 per cent), and Latin America and the Caribbean (19 per cent), and closer to the developing country mean (39 per cent).

**Figure 9. Percentage of children in each country who are poor, stunted or both**

![Graph showing percentage of children in each country who are poor, stunted, or both.](image)

Sources: author calculations based on data in Tables 1 and 2 – see Annex. Population rates are based on the TransMONEE data from 2008.
Countries also differ considerably in the percentage of children 3-6 years old who are attending public preschools. Figure 10 shows this figure based on the 2007 year of the 2008 TransMONEE data. Although these children have not been included in the calculation of the number of children at risk, they are included in the loss of potential.

Figure 10. Percentage of children aged 3-6 years old not attending preschool

What is the Economic Cost?

The loss of developmental potential due to stunting and poverty was calculated for each country using the methodology described in the previous section. Figure 11 shows the loss of GDP (in thousands) of the lack of investment in overcoming stunting and poverty. Although the percentage of children who were stunted and poor is low for the Russian Federation, the amount is highest in absolute terms due to the greater population size and higher average wage rates. The total loss is US$3.26 billion per year across all countries due to stunting and poverty alone.

Source: 2008 TransMONEE Data
When the loss due to lack of preschool attendance is included as well, the results are shown in Figure 12. The amount of the loss increases and the order of the countries changes a bit. The total amount of the loss is US$5.6 billion across the countries, almost half of which is in the Russian Federation, probably due to its large population and relatively high wage rate. About US$2.4 billion, about 40 per cent, of this loss can be attributed to children’s not attending preschool.
Figure 12. Total losses due to stunting, poverty and lack of preschool attendance

The final analysis is to calculate the percentage of GDP that is lost due to stunting, poverty and not attending preschool. The GDP figure used is from the most recent data (2007) in the TransMONEE data set. Figure 13 shows the percentage of loss due to lack of preschool and to the combination of stunting and poverty. On average, the proportion of GDP lost is only 0.21 per cent, but in eight countries, it is more than 0.5 per cent, while in Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan, the rate climbs above 1 per cent of GDP.

As a check on these calculations, the figure for Azerbaijan (0.73 per cent) is a bit lower than the figure of 1 per cent reported in Bagriansky and Engle (2009), which was probably more accurate. Rather than using an estimate of poverty, the authors estimated losses due to other risk factors such as child mortality, low birth weight and anaemia, excess use of health care, adult anaemia, as well as lack of parenting skills.

The cost of not investing in young children is greatest in those countries in which malnutrition rates are highest and preschool attendance rates are the lowest. It is in these countries where there is a great opportunity for interventions benefitting young children to have a substantial pay-off.

Sources: Population data and preschool rates are from 2007 TransMONEE data (2008); sources of stunting and poverty data are shown in Table 2 (see Annex).
Figure 13. Total percentage of GDP lost due to stunting, poverty and not attending preschool

Additional Sources of Risk

Grantham-McGregor et al\textsuperscript{54} suggest that a risk analysis should include maternal illiteracy, unstimulating homes and micronutrient deficiencies, since each factor has been shown to have effects on child development -- even in the absence of child poverty and stunting. In this paper, given the limitations of the data, we have considered only one risk factor in addition to those in the Lancet analysis: non-attendance of preschool. The quality of stimulation in the home environment has been shown to be an important factor in child development, even controlling for overall socio-economic level and parents’ education, and should be included in risk analyses when relevant data are available.

This section examines evidence for the differences in quality of parenting in 11 of the CEE CIS countries for which data are available. In order to assess the potential size of the impact of parenting on a child’s development, schooling trajectory and long term well-being, we examine differences in three key measures of the quality of the home environment as a function of income quintile across the countries assessed.

The measures of the home environment used in this section are derived from the HOME scale, a validated indicator of the home environment developed by Bradley (1994) and used in many countries around the world \textsuperscript{55} The version used here is a survey module of the UNICEF Multiple Indicator Cluster Survey (MICS3) based on the HOME scale, but not requiring observation of parent/child interaction. Three measures described here are a) the
number of activities (out of six) mother reports doing with the child 0-4.99 years of age in the past three days, including reading stories, singing songs, telling stories taking the child outside the home, playing and naming, counting and drawing; b) number of activities the father engaged in with the child, according to the mother’s report from the same list; and c) number of children’s books in the home. Studies in Bangladesh and Mexico show that these measures correlate significantly with cognitive development outcomes, and with the HOME scale.56

Inadequate Parenting

As we noted above, it is extremely difficult to define a cut-off point at which “poor parenting” results in deficiencies in children’s cognitive development and learning. In many assessments of the quality of home stimulation, often measured with the HOME, there is a dose-response relationship between quality of the home environment and the child’s cognitive outcomes – the better the level of stimulation, the better the child outcomes. Recent studies in Bangladesh and in India have illustrated the linear relationship of subscales of the HOME and cognitive outcomes.57

Figures 14, 15, and 16 show data from the parenting scale developed for MICS3 and administered in 12 countries in the region for which data are now available.58 These three variables are compared across wealth quintiles. It is noteworthy that there is both variation among countries, but also variation within countries on some of the indicators.

For mothers’ activities, the difference by income quartile tends to be less than one child-centered activity in most of the countries, although the lower income mothers in Kyrgyzstan, Montenegro, Macedonia and Serbia engage in almost two activities’ fewer than their wealthier counterparts. None of the sub-groups reached a mean of six activities, but the higher income mothers in Belarus, Bosnia, Montenegro and Serbia report engaging with their children in five out of the six activities. On the other hand, in Kyrgyzstan, Serbia, Tajikistan and Uzbekistan, mothers in the poorest quintile are doing less than three activities with children in the previous three days.
Data on fathers’ activities (shown in Figure 15) suggest a lower level of involvement than for mothers, as well as greater variation by socio-economic status. The highest quintile fathers in Belarus, Bosnia, Macedonia and Serbia are reported to engage in almost three activities with their children over the three day period, but on average fathers in the poorest quintile are doing 2 to 3 activities less than in the richest quintile. Interesting exceptions are Georgia and Uzbekistan, where rates are more similar across SES levels. The rates in Tajikistan are extremely low for both wealthy and poor children.
Not surprisingly, the number of children’s books in the home is the variable most highly associated with income quintile, with differences of between four and six books between the richest and poorest quintiles. Two notable exceptions are Kyrgyzstan and Ukraine, where both rich and poor children are reported to have similar numbers of books. How books actually get to children even in poor families in these two countries should be investigated further to determine if there is a positive practice from which to learn. However, these data reveal that given the importance of books for early literacy, there is still considerable variability in the environments provided for young children both across and within countries, with ample room for improvement.

**Figure 16. Number of children’s books by income quintile**

![Graph showing number of children's books by income quintile](image)

*Source: MICS 3 data downloaded from childinfo.org; analyses by the author*

If one were to aim toward developing a cut-off point for “poor parenting” (as opposed to “good-enough” parenting) it could begin with constructing a scale with these three basic indicators, and examining the association of the scores with measures of child development, nutritional status, and family background that should be associated with the quality of the home environment. These variables appear to show important diversities, suggesting that they could be incorporated into an overall assessment of parenting quality to be added to the calculations. However, it will be necessary to have more global measures of child development.

**Interventions that can make a difference**

A critical component of this analysis is to show that low cost interventions exist that can reduce the loss of potential. The challenge is to have sufficient evidence to be able to define the impact of each intervention in the relevant social context. Whereas there has been considerable progress in this area for nutrition and health interventions, in the area of psychosocial interventions for young children in developing countries, the data base is not yet strong enough to estimate the potential impact of many interventions.
Table 4 (see Annex) outlines a number of interventions for improving a young child’s developmental level in addition to health and nutrition interventions. The kinds of interventions for which most data are available include centre-based preschools and home visiting models. The list also includes a number of other models that are being used in a variety of countries, which are currently being evaluated and should be able to contribute to the estimates of effectiveness. It is impressive to see the range of interventions underway in the region, including through mass media (e.g., Magic Journey in Kyrgyzstan and versions of Sesame Street in other countries); incorporating child development into health care systems (e.g., the Integrated Management of Childhood Illnesses --IMCI), and a wide variety of community-based preschool models, Child to Child models and many forms of parenting education and support.

**Conclusions and Implications**

In the CEE CIS region, 5.9 million children are at risk of not developing to their full potential due to stunting and poverty, representing fully 26 per cent of all children 0-4 years of age -- and there are wide disparities among countries. In as many as 12 countries, a greater focus on the earliest years could significantly benefit the well being of young children. There is much room for improvement.

Given the overwhelming evidence for associations among stunting, poverty and child development, there is urgency to move forward with nutrition and child development interventions that have proven their efficacy and affordability in many countries. Children are at risk for poor development in their earliest years, and interventions can make a significant difference only during the window of opportunity of the first years of their lives.

The widespread belief that children in the region are being provided with the best start in life does not seem to be supported by the data presented in this paper. In at least 12 countries, as many as 20 per cent of children are experiencing poverty or stunting in the first few years of life, compromising their future development. Many more are unable to attend preschool. On the other hand, another group of countries has very low rates of poverty and stunting, and high rates of preschool attendance. They can serve as role models for the countries that are lagging behind.

A total of over US$5.6 billion is being lost now in the region every year due to failure to invest in young children, but the impact of the loss will only reveal itself down the line. These are long-term costs to society as a whole as well as to the children and families involved, and will have grave effects in the future. In some cases, the damage may not be repairable.

Effective interventions exist and are being used -- albeit unevenly -- throughout the region. However, progress is limited by unclear patterns of responsibility within government structures, inadequate services and budgets and by lack of understanding of the importance of these years. A careful analysis of the best intervention efforts can determine which have the greatest benefit for their cost. The next step is careful planning, particularly in countries that have the greatest loss of potential, to implement evidence-based, cost-effective and immediate interventions. For this to happen, however, effective advocacy is urgently needed in all countries, along with strategies to increase cooperation between ministries to improve the well being of young children from their earliest years of life.
As shown in the first few figures in this paper, disparities between countries are widening in the region, and the increasing size of GINI coefficients in some countries suggest that internal disparities are also widening. Early interventions benefitting children are also the most effective strategies for reducing these disparities. Unless children can get off to a healthy start in life, they may never be able to catch up to those who are ahead of them, and they will fall farther behind. It is not surprising that so many programmes for young children are based on the notion of a “head start”.

Countries with the highest losses, and therefore the greatest potential for improvement, include Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan, as well as Albania, Armenia, Azerbaijan, Bosnia and Herzegovina, Croatia, Georgia and Kazakhstan. The size of the loss of potential is greatest in the Russian Federation, due most likely to its large population and high wage rates.

These estimates are conservative; they do not include loss of potential due to inadequate parenting which may not be fully captured by the three measures used above. They reflect only wage rates, and not the many other positive impacts of early intervention shown in the literature. Data are often not reflective of the current, as yet unassessed situation. However, they should provide a sense of urgency about the importance of undertaking a thoughtful, focused planning effort to improve outcomes for young children. Assessing the loss – as we have outlined here -- is only a first step; the next is to develop the strategy for planning and costing interventions to meet these challenges. For this generation of children – for every child -- the time is now.
References


Table 1 Estimates of poverty levels in the 22 countries of CEE CIS from a variety of sources

<table>
<thead>
<tr>
<th>Country</th>
<th>National poverty level (1)</th>
<th>Year</th>
<th>New WB Calculation: % below 2.15 PPP (2)</th>
<th>Year</th>
<th>UNICEF ESTIMATE (3)</th>
<th>World Development Report 2006 (4)</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albania</td>
<td>25.4</td>
<td>2002</td>
<td>10.2</td>
<td>2005</td>
<td>24</td>
<td>11.8</td>
<td>2002</td>
</tr>
<tr>
<td>Armenia</td>
<td>50.9</td>
<td>2001</td>
<td>49.41</td>
<td>2003</td>
<td>50</td>
<td>31.1</td>
<td>2003</td>
</tr>
<tr>
<td>Azerbaijan</td>
<td>49.6</td>
<td>2001</td>
<td>0.46</td>
<td>2005</td>
<td>4</td>
<td>33.4</td>
<td>2001</td>
</tr>
<tr>
<td>Belarus</td>
<td>18.5</td>
<td>2002</td>
<td>0.59</td>
<td>2005</td>
<td>1</td>
<td>&lt;2</td>
<td>2000</td>
</tr>
<tr>
<td>Bosnia and Herzegovina</td>
<td>19.5</td>
<td>2002</td>
<td>0.9</td>
<td>2004</td>
<td>5</td>
<td>34.3</td>
<td>1999</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>12.8</td>
<td>2003</td>
<td>2.9</td>
<td>2003</td>
<td>4</td>
<td>6.1</td>
<td>2003</td>
</tr>
<tr>
<td>Croatia</td>
<td></td>
<td></td>
<td>0</td>
<td>2005</td>
<td></td>
<td>&lt;2</td>
<td>2001</td>
</tr>
<tr>
<td>Czech Republic</td>
<td></td>
<td></td>
<td>0</td>
<td>1996</td>
<td></td>
<td>1996</td>
<td></td>
</tr>
<tr>
<td>Estonia</td>
<td>8.9</td>
<td>1995</td>
<td>1.92</td>
<td>2004</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Georgia</td>
<td>54.5</td>
<td>2003</td>
<td>33.75</td>
<td>2005</td>
<td>51</td>
<td>15.7</td>
<td>2001</td>
</tr>
<tr>
<td>Hungary</td>
<td>17.3</td>
<td>1997</td>
<td>0.34</td>
<td>2004</td>
<td>0</td>
<td>&lt;2</td>
<td>2002</td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>15.4</td>
<td>2002</td>
<td>20.37</td>
<td>2003</td>
<td>21</td>
<td>24.9</td>
<td>2003</td>
</tr>
<tr>
<td>Kyrgyz Republic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>24.7</td>
<td>2003</td>
</tr>
<tr>
<td>Latvia</td>
<td>5.9</td>
<td>2004</td>
<td>1.29</td>
<td>2004</td>
<td>3.5</td>
<td>11.5</td>
<td>1998</td>
</tr>
<tr>
<td>Lithuania</td>
<td></td>
<td></td>
<td>1.59</td>
<td>2004</td>
<td>4</td>
<td>6.9</td>
<td>2000</td>
</tr>
<tr>
<td>--------------------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td></td>
</tr>
<tr>
<td>Macedonia</td>
<td>21.7</td>
<td>4.14</td>
<td>2003</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moldova</td>
<td>48.5</td>
<td>33.22</td>
<td>2004</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Montenegro</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td>14.6</td>
<td>0.81</td>
<td>2002</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Romania</td>
<td>25.4</td>
<td>4.45</td>
<td>2005</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Russian Federation</td>
<td>19.6</td>
<td>2.11</td>
<td>2005</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Serbia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slovak Republic</td>
<td></td>
<td>0</td>
<td>2004</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slovenia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tajikistan</td>
<td>74.9</td>
<td>56</td>
<td>2004</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turkey</td>
<td>27</td>
<td>10.67</td>
<td>2005</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turkmenistan</td>
<td>53.73</td>
<td>1998</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ukraine</td>
<td>19.5</td>
<td>0.66</td>
<td>2005</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uzbekistan</td>
<td>27.5</td>
<td>80.1</td>
<td>2003</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


2. Refers to the World Bank’s new system of calculating the PPP which came out in 2005 (see ref. on website). (cut-off used here was $2.15/day PPP from 2005 estimates)

3. UNICEF publication on Education for Some more than Others (data from 2001-2003 and based on a PPP of $2.15/day)

4. From World Development Report 2006, before new calculations made, with a cut-off of $2.00/day with PPP.
<table>
<thead>
<tr>
<th>Country</th>
<th>Source</th>
<th>Year</th>
<th>Stunting % used HAZ&lt;-2</th>
<th>Cattaneo (2008)</th>
<th>MICS reports</th>
<th>World Bank Database using PovCal methods</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Year</td>
</tr>
<tr>
<td>Albania</td>
<td>MICS12</td>
<td>2005</td>
<td>22.3</td>
<td>20</td>
<td>30.1</td>
<td>39.2</td>
</tr>
<tr>
<td>Armenia</td>
<td>DHS12</td>
<td>2005</td>
<td>13</td>
<td>10</td>
<td>15</td>
<td>9</td>
</tr>
<tr>
<td>Azerbaijan (3)</td>
<td>DHS12</td>
<td>2006</td>
<td>25.1</td>
<td>3</td>
<td>26</td>
<td>15</td>
</tr>
<tr>
<td>Belarus</td>
<td>MICS13</td>
<td>2005</td>
<td>2.5</td>
<td>7</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Bosnia and Herzegovina</td>
<td>MICS60</td>
<td>2006</td>
<td>2.5</td>
<td>20.2</td>
<td>19.4</td>
<td>19.6</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>World Bank</td>
<td>2003</td>
<td>8.8</td>
<td></td>
<td>14.4</td>
<td>8.5</td>
</tr>
<tr>
<td>Croatia</td>
<td>MICS61</td>
<td></td>
<td>19.5</td>
<td></td>
<td>32.0</td>
<td>18.9</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>World Bank</td>
<td></td>
<td>2.6</td>
<td></td>
<td>4.3[^63]</td>
<td>2.5[^16]</td>
</tr>
<tr>
<td>Georgia</td>
<td>MICS63</td>
<td>2005</td>
<td>12</td>
<td>15</td>
<td>15</td>
<td>4</td>
</tr>
<tr>
<td>Hungary</td>
<td>World Bank[^13]</td>
<td></td>
<td>2.6</td>
<td></td>
<td>4.3[^16]</td>
<td>2.5[^16]</td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>MICS12</td>
<td>2006</td>
<td>13.1</td>
<td>11</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>Kyrgyzstan</td>
<td>MICS12</td>
<td>2005</td>
<td>13.7</td>
<td>6</td>
<td>16</td>
<td>11</td>
</tr>
<tr>
<td>Moldova</td>
<td>MICS12</td>
<td>2005</td>
<td>8.4</td>
<td>32</td>
<td>14</td>
<td>6</td>
</tr>
<tr>
<td>Montenegro</td>
<td>MICS12</td>
<td>2005</td>
<td>5.2</td>
<td>13</td>
<td>10.7</td>
<td>3.9</td>
</tr>
<tr>
<td>Romania</td>
<td>World Bank</td>
<td></td>
<td>12.8</td>
<td></td>
<td>20.9[^16]</td>
<td>12.4[^16]</td>
</tr>
<tr>
<td>Country</td>
<td>Organization</td>
<td>Year</td>
<td>Sample Size</td>
<td>Mean Age</td>
<td>HIV Incidence</td>
<td>Malaria Incidence</td>
</tr>
<tr>
<td>---------------</td>
<td>--------------</td>
<td>------</td>
<td>-------------</td>
<td>----------</td>
<td>---------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Russian Federation</td>
<td>RLMS</td>
<td>2005</td>
<td>12.3</td>
<td>21</td>
<td>34</td>
<td>20.2&lt;sup&gt;16&lt;/sup&gt;</td>
</tr>
<tr>
<td>Serbia (4)</td>
<td>MICS</td>
<td>2005</td>
<td>10.8</td>
<td>15</td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>Slovakia</td>
<td>World Bank&lt;sup&gt;13&lt;/sup&gt;</td>
<td>2005</td>
<td></td>
<td>4.3&lt;sup&gt;16&lt;/sup&gt;</td>
<td>2.5&lt;sup&gt;16&lt;/sup&gt;</td>
<td>1.59</td>
</tr>
<tr>
<td>Slovenia</td>
<td>World Bank&lt;sup&gt;13&lt;/sup&gt;</td>
<td>2005</td>
<td></td>
<td>4.3&lt;sup&gt;16&lt;/sup&gt;</td>
<td>2.5&lt;sup&gt;16&lt;/sup&gt;</td>
<td>1.590</td>
</tr>
<tr>
<td>Tajikistan</td>
<td>MICS&lt;sup&gt;12&lt;/sup&gt;</td>
<td>2005</td>
<td>26.9</td>
<td>2.5</td>
<td>38</td>
<td>32</td>
</tr>
<tr>
<td>Turkmenistan</td>
<td>DHS&lt;sup&gt;12&lt;/sup&gt;</td>
<td>2000</td>
<td>22.3</td>
<td>36</td>
<td>36.6&lt;sup&gt;16&lt;/sup&gt;</td>
<td>22.6&lt;sup&gt;16&lt;/sup&gt;</td>
</tr>
<tr>
<td>Ukraine</td>
<td>CDC&lt;sup&gt;12&lt;/sup&gt;</td>
<td>2002</td>
<td>2.7</td>
<td>19</td>
<td>22</td>
<td>4.4&lt;sup&gt;16&lt;/sup&gt;</td>
</tr>
<tr>
<td>Uzbekistan</td>
<td>MICS&lt;sup&gt;12&lt;/sup&gt;</td>
<td>2005</td>
<td>14.6</td>
<td>7</td>
<td>33</td>
<td>15</td>
</tr>
</tbody>
</table>

<sup>16</sup> Data from 2016
Table 3. Estimated Number of children in each category by country. (numbers in red are estimates).

<table>
<thead>
<tr>
<th>Country</th>
<th>% stunting -2 and -3</th>
<th>% stunting poorest 20%</th>
<th>% stunting richest 20%</th>
<th>Poverty Rate (WB)</th>
<th>Stunted ONLY in one year</th>
<th>Poor ONLY in one year</th>
<th># Poor &amp; Stunted in one year</th>
<th>Total number of children in one year</th>
<th>Total number of children 0-4.99</th>
<th>% Poor Who are Also Stunted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albania</td>
<td>22.3</td>
<td>30.1</td>
<td>13.9</td>
<td>10.2</td>
<td>8674</td>
<td>3216</td>
<td>1385</td>
<td>13276</td>
<td>66378</td>
<td>30%</td>
</tr>
<tr>
<td>Armenia</td>
<td>13</td>
<td>15.0</td>
<td>9.0</td>
<td>49.41</td>
<td>1985</td>
<td>14919</td>
<td>2633</td>
<td>19536</td>
<td>97682</td>
<td>15%</td>
</tr>
<tr>
<td>Azerbaijan (3)</td>
<td>25.1</td>
<td>26.0</td>
<td>15.0</td>
<td>15.8</td>
<td>26857</td>
<td>14959</td>
<td>5256</td>
<td>47072</td>
<td>235358</td>
<td>26%</td>
</tr>
<tr>
<td>Belarus</td>
<td>3</td>
<td>5.0</td>
<td>1.0</td>
<td>0.59</td>
<td>2674</td>
<td>504</td>
<td>27</td>
<td>3205</td>
<td>16023</td>
<td>5%</td>
</tr>
<tr>
<td>Bosnia and Herzegovina</td>
<td>19.5</td>
<td>19.4</td>
<td>19.6</td>
<td>0.9</td>
<td>7465</td>
<td>280</td>
<td>67</td>
<td>7812</td>
<td>39062</td>
<td>19%</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>8.8</td>
<td>14.4</td>
<td>8.5</td>
<td>2.9</td>
<td>5756</td>
<td>1704</td>
<td>287</td>
<td>7747</td>
<td>38735</td>
<td>14%</td>
</tr>
<tr>
<td>Croatia</td>
<td>19.5</td>
<td>32.0</td>
<td>18.9</td>
<td>1.59</td>
<td>7718</td>
<td>440</td>
<td>207</td>
<td>8364</td>
<td>41821</td>
<td>32%</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>2.6</td>
<td>4.3</td>
<td>2.5</td>
<td>1.59</td>
<td>2500</td>
<td>1503</td>
<td>67</td>
<td>4070</td>
<td>20348</td>
<td>4%</td>
</tr>
<tr>
<td>Estonia</td>
<td>2.6</td>
<td>4.3</td>
<td>2.5</td>
<td>1.92</td>
<td>347</td>
<td>253</td>
<td>11</td>
<td>611</td>
<td>3053</td>
<td>4%</td>
</tr>
<tr>
<td>Georgia</td>
<td>12</td>
<td>15.0</td>
<td>4.0</td>
<td>33.75</td>
<td>3222</td>
<td>13322</td>
<td>2351</td>
<td>18895</td>
<td>94476</td>
<td>15%</td>
</tr>
<tr>
<td>Hungary</td>
<td>2.6</td>
<td>4.2</td>
<td>2.5</td>
<td>0.34</td>
<td>2493</td>
<td>314</td>
<td>14</td>
<td>2821</td>
<td>14106</td>
<td>4%</td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>13.1</td>
<td>15.0</td>
<td>10.0</td>
<td>20.37</td>
<td>26359</td>
<td>45437</td>
<td>8018</td>
<td>79814</td>
<td>399069</td>
<td>15%</td>
</tr>
<tr>
<td>Kyrgyzstan</td>
<td>13.7</td>
<td>16.0</td>
<td>11.0</td>
<td>56.8</td>
<td>4871</td>
<td>50391</td>
<td>9598</td>
<td>64860</td>
<td>324301</td>
<td>16%</td>
</tr>
<tr>
<td>Latvia</td>
<td>2.6</td>
<td>4.3</td>
<td>2.5</td>
<td>1.29</td>
<td>535</td>
<td>260</td>
<td>12</td>
<td>807</td>
<td>4034</td>
<td>4%</td>
</tr>
<tr>
<td>Lithuania</td>
<td>2.6</td>
<td>4.3</td>
<td>2.5</td>
<td>1.59</td>
<td>765</td>
<td>460</td>
<td>20</td>
<td>1245</td>
<td>6225</td>
<td>4%</td>
</tr>
<tr>
<td>Macedonia</td>
<td>9</td>
<td>14.8</td>
<td>8.7</td>
<td>4.14</td>
<td>1906</td>
<td>802</td>
<td>139</td>
<td>2847</td>
<td>14234</td>
<td>15%</td>
</tr>
<tr>
<td>Moldova</td>
<td>8.4</td>
<td>14.0</td>
<td>6.0</td>
<td>33.22</td>
<td>1392</td>
<td>10604</td>
<td>1726</td>
<td>13722</td>
<td>68611</td>
<td>14%</td>
</tr>
<tr>
<td>Montenegro</td>
<td>5.2</td>
<td>10.7</td>
<td>3.9</td>
<td>1.59</td>
<td>398</td>
<td>112</td>
<td>13</td>
<td>524</td>
<td>2622</td>
<td>11%</td>
</tr>
<tr>
<td>Poland</td>
<td>2.6</td>
<td>4.3</td>
<td>2.5</td>
<td>0.81</td>
<td>9183</td>
<td>2776</td>
<td>124</td>
<td>12082</td>
<td>60412</td>
<td>4%</td>
</tr>
<tr>
<td>Romania</td>
<td>12.8</td>
<td>21.0</td>
<td>12.4</td>
<td>4.45</td>
<td>25200</td>
<td>7467</td>
<td>1983</td>
<td>34650</td>
<td>173250</td>
<td>21%</td>
</tr>
<tr>
<td>Russian Federation</td>
<td>12.3</td>
<td>20.2</td>
<td>11.9</td>
<td>2.11</td>
<td>171538</td>
<td>24335</td>
<td>6145</td>
<td>202018</td>
<td>1010092</td>
<td>20%</td>
</tr>
<tr>
<td>Serbia (4)</td>
<td>10.8</td>
<td>9.0</td>
<td>4.7</td>
<td>1.59</td>
<td>8040</td>
<td>1092</td>
<td>108</td>
<td>9240</td>
<td>46199</td>
<td>9%</td>
</tr>
<tr>
<td>Slovakia</td>
<td>2.6</td>
<td>4.3</td>
<td>2.5</td>
<td>1.59</td>
<td>1332</td>
<td>801</td>
<td>36</td>
<td>2168</td>
<td>10839</td>
<td>4%</td>
</tr>
<tr>
<td>Slovenia</td>
<td>2.6</td>
<td>4.3</td>
<td>2.5</td>
<td>1.59</td>
<td>461</td>
<td>277</td>
<td>12</td>
<td>750</td>
<td>3752</td>
<td>4%</td>
</tr>
<tr>
<td>Tajikistan</td>
<td>26.9</td>
<td>32.0</td>
<td>22.0</td>
<td>56</td>
<td>15536</td>
<td>65880</td>
<td>31002</td>
<td>112418</td>
<td>562089</td>
<td>32%</td>
</tr>
<tr>
<td>Turkmenistan</td>
<td>22.3</td>
<td>36.6</td>
<td>21.6</td>
<td>53.73</td>
<td>2995</td>
<td>38383</td>
<td>22113</td>
<td>63491</td>
<td>317454</td>
<td>37%</td>
</tr>
<tr>
<td>Ukraine</td>
<td>2.7</td>
<td>4.4</td>
<td>2.6</td>
<td>0.66</td>
<td>11162</td>
<td>2636</td>
<td>122</td>
<td>13921</td>
<td>69604</td>
<td>4%</td>
</tr>
<tr>
<td>Uzbekistan</td>
<td>14.6</td>
<td>15.0</td>
<td>11.0</td>
<td>80.1</td>
<td>13526</td>
<td>356243</td>
<td>62866</td>
<td>432635</td>
<td>2163175</td>
<td>15%</td>
</tr>
</tbody>
</table>
Table 4. Range of interventions for ECD used in CEE CIS and estimated effect sizes.

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Age for most important focus</th>
<th>Effect size in Standard Deviation Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preschool/early learning</td>
<td>Half day preschool</td>
<td>3-6</td>
<td>0.3-1.0</td>
</tr>
<tr>
<td></td>
<td>Full day preschool and child care</td>
<td>1-6</td>
<td>0.3-1.0</td>
</tr>
<tr>
<td></td>
<td>Community based preschool</td>
<td>3-6</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>School readiness sessions</td>
<td>6</td>
<td>N/A</td>
</tr>
<tr>
<td>Parent education and support</td>
<td>Home visiting by professionals and para-professionals</td>
<td>0-3</td>
<td>0.3-0.5</td>
</tr>
<tr>
<td></td>
<td>Group sessions younger</td>
<td>0-3</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Group sessions school readiness</td>
<td>4-6</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>In health visit</td>
<td>0-5</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Community outreach through health center</td>
<td>0-5</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Responsive feeding and care</td>
<td>0-3</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Neonatal psychosocial care</td>
<td>1 month</td>
<td>N/A</td>
</tr>
<tr>
<td>Media</td>
<td>Media for parents</td>
<td>Prenatal-5</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>TV programming for young children</td>
<td>2-5</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Supply of books for young children, mini-libraries</td>
<td>1-5</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Toy supply, production, toy libraries</td>
<td>0-5</td>
<td>N/A</td>
</tr>
<tr>
<td>Child to Child</td>
<td>Older children teaching younger in groups or individually</td>
<td>3-6</td>
<td>N/A</td>
</tr>
<tr>
<td>Risk reduction</td>
<td>Early stimulation/intervention for children with disabilities</td>
<td>0-5</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Early stimulation/intervention for low birth weight children</td>
<td>0-3</td>
<td>Benefit 4:1</td>
</tr>
<tr>
<td></td>
<td>Supplementary stimulation for anemic or iron deficient children</td>
<td>0-5</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Mental health interventions for mothers with post-partum depression</td>
<td>Child 0-3</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Social interventions for children facing toxic stress</td>
<td>0-3</td>
<td>N/A</td>
</tr>
</tbody>
</table>
Endnotes

1 McGregor et al., The Lancet Child Development Series, 2007
2 McGregor et al., The Lancet Child Development Series, 2007
3 Heckman, 2006; Shonkoff et al, 2009
4 ibid
6 Shonkoff et al., 2009
7 Engle et al., 2007.
8 Heckman, 2006; Heckman & Masterov, 2005).
12 Grantham-McGregor et al., 2007; Bagriansky and Engle, 2009
14 Grantham-McGregor et al., 2007
16 ibid
17 ibid
18 Walker et al, 2007; Victora 2008 and the Lancet Series on Nutrition
19 Kramer et al.
22 Bornstein and Lamb, 2008; Bornstein, Putnick, Heslington et al., 2008
23 Shonkoff and Phillips 2000
24 Bradley 1994
25 Heckman 2006; Heckman and Masterov, 2005
26 Behrman et al., 2004 for Bolivia; Katzibasi et al., 2001; Engle et al. 2007 for summary.
27 There are several mechanisms to explain these relationships27. A malnourished child may suffer from central nervous system dysfunction which has long-term effects on cognitive and social-emotional functioning. These children may also exhibit behavioral characteristics such as irritability, passivity, or fearfulness, which may evoke less adequate caregiving. These children may also be perceived as younger and less competent, further limiting their learning opportunities.
29 Bradley & Corwyn, 2005
30 Magnusson, Meyers, Ruhm & Waldfogel, 2004)
31 Gormley, Gayer, Phillips, & Dawson, 2004
32 (e.g., Melhuish, Sylva, Sammons, Siraj-Blatchford et al. (2008), Preschool influences on mathematics achievement. Science, 321 (Aug 29), 1161-1162
33 ibid
36 Walker et al., 2007; Bradley and Corwyn, 2005; Brooks-Gunn et al., 1997, etc.; Engle and Black 2008
37 e.g., Love et al., 2005; Engle et al., 2007
38 “A reduction of 1 year of schooling will reduce income by 8.3% ((1/1.09-1) = 0.083). (Grantham –McGregor et al., 2007, p. 67).
39 The term “effect size” reflects the size of the difference between groups independent of the sample size, but it does not indicate level of significance. A small effect size is around .2-.4 SD, a medium one about .5 -.7 and large effect size is .8 to 1.0. A large effect size suggests that there is a big difference between groups. For IQ measurements such as the Stanford Binet, whose standard deviation is usually 15 with a mean of 100, an effect size of .5 would be equivalent to 7.5 IQ points, or half of a standard deviation.
40 Engle et al., 2007.
42 Engle et al., 2007
43 “Studies from 51 countries show that, on average, each year of schooling increases wages by 9.7%.
Although some of the studies had methodological weaknesses, this average matches another more rigorous study, which reported that each year of schooling in Indonesia increased wages by 7–11%. (McGregor et al., 2007).
44 Assuming that every year of schooling increases adult yearly income by 9%, we estimate that the loss in adult income from being stunted but not in poverty is 22-2%, the loss from living in poverty but not being stunted is 5-9% and from being both stunted and in poverty is 30-1% (table 6). Taking into account the number of children who are stunted, living in poverty, or both (table 6), we calculate the average deficit in adult yearly income for all 219 million disadvantaged children to be 19-8%.” (Grantham-McGregor et al., 2007).
45 Grantham-McGregor et al., 2007. About 25-30% of children are stunted in these countries.
47 Powell et al., 2006; Powell et al., 2005.
48 Walker et al., 2004.
49 Grantham-McGregor et al., 1998.
50 It should be noted that NPV is very sensitive to the discount rate used. This DAR analysis uses a 5% discount rate, which is often the rate charged to governments for loans.
51 See Walker et al., 2007 for a discussion of this point.
52 Hoddinott et al., 2008.
53 Li et al, 2006).
54 Grantham-McGregor et al., 2007
55 Bradley and Corwyn, 2005 report use of this measure in over 100 countries.
56 Hamadani et al., in preparation, submitted for publication, and Fernald et al., in preparation.
57 Engle et al., 2009 in India; Hamadani et al., in press in Bangladesh.
58 Child Info.org.
59 Used Cattaneo’s judgement on stunting data
60 2.5% UNICEF web 7%, Upper and lower quintiles 19-20%
61 Used figure for Bosnia
62 Insert data for Lithuania if no data
63 Estimated as stunting rate * average stunting rate in this quintile for countries with data (=1.64 for poorest; .97 for richest 20%)
64 Assumed to be same as Czech
65 UNICEF website