

# **Emerging Early Childhood Inequality: On the Relationship Between Poverty, Sensory Stimulation, Child Development, and Achievement**

**Yossi Shavit, Isaac Friedman, John Gal,  
and Dana Vaknin**

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# Emerging Early Childhood Inequality: On the Relationship Between Poverty, Sensory Stimulation, Child Development, and Achievements

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and Dana Vaknin\*

**Keywords:** socioeconomic status (SES), poverty, economic inequality, inequality in scholastic and educational achievement, sensory stimulation, stress, brain development, brain plasticity, sensitive periods, critical periods, range of reaction, myelination, synaptic pruning, gene-environment interaction, life experiences.

## Abstract

Exposure to experiences and to environmental stimulation has been found to play a critical role in the development of the brain and the central nervous system. The absence of such exposure, and stressful situations — especially chronic stress — are factors that delay the development of cognitive, social, and physical abilities. Low socioeconomic status (SES) may deprive those affected by it of enriching experiences and expose them to frequent stressful situations. This, in turn, may result in inadequate brain and central nervous system development, thereby triggering a process of cognitive and scholastic-achievement inequality. This literature review aims to illuminate the main mechanisms behind inequality in educational achievement — mechanisms that are rooted in economic inequality.

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Levels of inequality in educational achievement in Israel are among the world's highest with one of the principal causes being economic inequality. Family socioeconomic status affects the supply of sensory stimulation that young children are exposed to, which in turn affects brain development. Our thesis is that low socioeconomic status in early childhood may lead to stress – negative sensory stimulation – which itself affects brain development and intelligence. Thus, an effort should be made to reduce the incidence of stress caused by low socioeconomic status in early childhood. Early and intensive intervention with young children, at a point when their brains are relatively malleable, would be considerably more effective than intervention in later childhood.

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## Introduction

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Against a background of ideological divisions that characterize Israeli society, the large-scale public consensus that gaps in the educational sphere should be narrowed is particularly striking. There is general agreement that education is the key to success in life, and that equal educational opportunity for all of Israel's children should be assured. Yet despite this prevailing consensus on the importance of educational opportunity, substantial gaps exist between social, national, and ethnic strata. These disparities have shown great stability over time, despite major efforts on the part of the state, and, in particular, on the part of Israel's education system, to reduce them.

Government efforts to narrow scholastic and socioeconomic gaps have been focused on the education system itself. The prevailing assumption is that, because scholastic-achievement disparities reveal themselves within the school setting, they may be addressed through changes in the education system's organizational and pedagogical structure, and through a redistribution of the system's resources. For example, some feel that the education system can eliminate disparities by reducing class size, especially for classes populated by children from the weaker social strata, or by improving instructional quality, limiting the use of ability grouping and tracking, or through affirmative action that allocates resources of various kinds to low-SES pupils. These types of measures often help reduce achievement gaps between social strata, but their efficacy is quite limited.

Studies show that scholastic-achievement disparities between children belonging to different socioeconomic strata appear at very young ages, even before they enter the formal education system. Breznitz and Norman (1998) investigated the attainments of Israeli first-graders and found substantial performance differences on all tests between pupils of higher and lower socioeconomic standing. They also found that the gap remained stable between first and fourth grade and in some cases even grew (Breznitz and Norman 1998). McCall (1981) showed a relationship between socioeconomic background and success on cognitive exams administered to infants. In light of these and similar findings, researchers maintain that a significant portion of the observed achievement gaps between economic and educational strata emerge during early childhood; some even argue that the traits necessary for scholastic success develop even before the child is born.

This paper reviews research literature on two types of environmental factors that affect development in early childhood and have an impact on future scholastic achievements. These factors are stress and sensory stimulation. We assert that children growing up in poverty are liable to

be deprived of enriching experiences and stimuli on the one hand, and are exposed to higher levels of stress on the other. These two factors delay cognitive and emotional development relative to children of higher socioeconomic status. This explains some of the achievement gap between different socioeconomic strata.

## 1. Income inequality in Israel

Recent years have witnessed growing public awareness of the fact that Israel is one of the developed world's least equitable countries. This is a saddening recognition as Israel, in its early years of statehood, aspired to establish a just society, "as envisaged by the prophets of Israel." During the early decades of statehood, Israel indeed seemed to be developing as a relatively equitable nation. The prominence that the kibbutz concept enjoyed both in Israel and abroad, the ideal of Histadrut<sup>1</sup>-style cooperation, and the rhetoric of the worker parties that dominated Israel's political scene in those years created an impression of true commitment to values of equity and social justice.

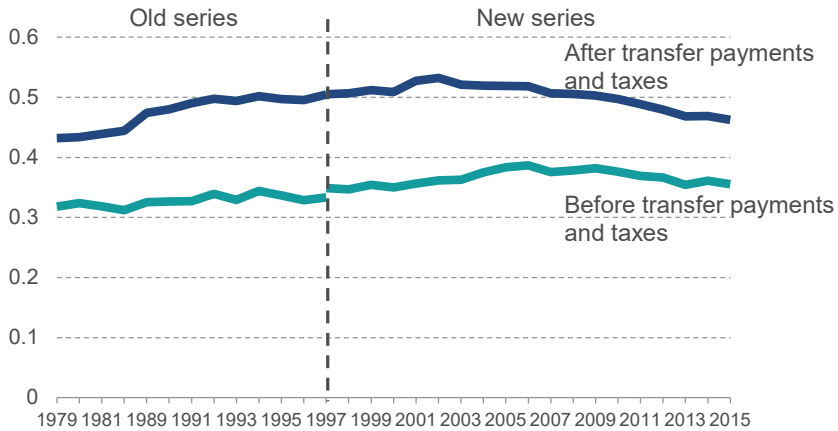
Since then, however, inequality has grown considerably in Israel (Kristal and Cohen, 2007). According to National Insurance Institute data (National Insurance Institute, 2016) the Gini coefficient of income inequality for families in Israel increased from 0.43 in 1979 to 0.53 in 2006. Between 2006 and 2015, the index decreased slightly but remains at the high level of approximately 0.48. Bleikh (2015) compares Israeli disposable-income inequality to that of other OECD countries and finds that, despite a slight decline in recent years, Israel leads in disposable income inequality for heads of households and their spouses.

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1 The Histadrut, General Organization of Workers in Israel, is the national trade union center and represents the majority of trade unionists in Israel. It was established in 1920 in Mandatory Palestine (pre-state) and became one of the most powerful institutions before and after the establishment of the State.

## Figure 1. Gini index of inequality in income distribution among families

Before and after transfer payments and direct taxes  
(excluding East Jerusalem)



Source: National Insurance Institute, 2016

A number of developed countries have experienced rising economic inequality in recent decades, but in Israel the increase has outpaced the OECD average (Cornfeld and Danieli, 2015). Interestingly, Israeli economic inequality is greater than the OECD average even when one excludes the very low incomes of Israel's Arab and Haredi (ultra-Orthodox) populations. Since the 1990s, Israel has seen rising income inequality mainly between the upper socioeconomic stratum (the highest income decile) and the middle and lower classes. That is, the economic status of Israel's middle class has



eroded and is approaching that of the lower class, while the status of the upper class has remained robust and has even strengthened over the years.<sup>2</sup>

Researchers distinguish between economic income and disposable income. Economic income is income from wages or profit, while disposable income takes transfer payments (such as National Insurance Institute benefits) and taxes into account. Ben-David and Bleikh (2013) compared economic-income and disposable-income inequality for 23 developed OECD countries and found that, in terms of economic income, Israel ranks among the five most unequal countries, while in disposable income terms it comes in second in inequality terms, after the United States. What this means is that, in Israel, taxation and allowances do less to reduce inequality in income distribution than do the countries in the comparison group.

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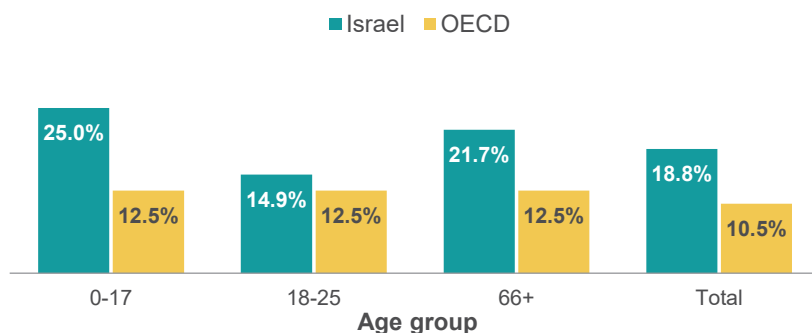
<sup>2</sup> Researchers point to three main causes of rising economic inequality in developed countries. One is the demand for skilled manpower, which has increased due to technological changes, especially the computer revolution. Those who favor this approach, referred to in the professional literature as skill-based technological change (SBTC — e.g., Autor, Katz, and Kearney, 2005), argue that the worldwide technological revolution of the past few decades is increasing economic inequality because computers enhance the productivity of educated workers — e.g., engineers, researchers, and designers — and this is reflected in rising wages for people in those occupations. By contrast, computers replace workers engaged in routine occupations such as salespeople, shop assistants, and postal workers, and this lowers their wages. At a more general level, the final decades of the twentieth century witnessed a rise in demand for more-educated workers, while the supply of less-educated workers grew excessively, widening the wage gap between these two groups (Goldin and Katz, 2007). The second explanation for the increase in the wage gap between those with more and those with less education focuses on processes of globalization, with the growing mobility of goods, capital, and workers between countries. The big winners of globalization are the owners of capital and workers with skills that are in demand who are able to leverage the economic opportunities around the world to improve their profits and wages. Workers without such skills are forced to compete with workers from developing countries who are willing to do quality work for low wages. In other words, globalization improves the wages of those workers with the appropriate skills and education, but harms the earning abilities of workers of medium and low education levels. Similarly, competition from developing countries makes it difficult for industry branches in Israel (and abroad) that are labor intensive, like textile manufacturing, where many workers earned little to begin with and now are forced to work for even less.

The third explanation for a rise in the wage gap is related to changes in labor relations in the Israeli marketplace. Kristal and Cohen (2007) analyzed changes in labor relations in Israel and their contribution to wage gaps. They show that since the 1950s and even more so, since the 1970s and 1980s, there has been a substantial diminishing of collective labor agreements in the private sector. Collective bargaining gave workers the power to succeed and effectively negotiate for continuous improvements in wages. The breakdown of this has led to a weakening of workers' power and so influenced the substantial increase in wage inequality between 1970 and 2001.

Another indication of the relative ineffectiveness of Israel's welfare state in reducing economic inequality can be found in a comparison of Israeli poverty rates to those of other OECD countries. In economic-income terms, Israel has a much lower poverty rate than do most other countries in the OECD, ranking 9 out of 35 (Bleikh, 2015). In disposable-income terms, however, Israel's poverty rate (along with Mexico's) is the highest of all of the comparison countries.

Not only is the incidence of poverty in Israel high overall, it is particularly high among children. In 2015, there were 460,800 Israeli families living in poverty, including 764,200 children, while the share of children ages 0-17 living in poor families was 25 percent (National Insurance Institute, 2016). Child poverty is especially prevalent among the Arab Israeli and Haredi populations, which have exceptionally high birth rates.

**Figure 2. Incidence of poverty by age, 2016**



Source: National Insurance Institute, 2016

Comparative studies show that economic inequality is closely linked to several major markers of social welfare, population health, and social stability (Wilkinson and Pickett, 2009), as well as intergenerational mobility levels. The Great Gatsby curve plots the relationship between a country's economic inequality level (the Gini coefficient) and its degree of intergenerational mobility between income percentiles. Countries where economic inequality is high have been found to have low levels of intergenerational mobility in terms of parent and adult-child incomes (Corak, 2013).

## 2. Scholastic achievement inequality

It is widely held that the key to reducing income disparities lies in the education system. High-quality, equitable education may narrow income gaps and increase intergenerational income mobility because it equips members of the weaker socioeconomic strata with skills, thereby enhancing their earning ability. Once the inequality discussion reaches the education sphere, though, it becomes necessary to address the extent and causes of educational inequality, and the various means of combating it.

The term “scholastic achievement” refers to the amount of knowledge a person has accumulated in specific areas, whether in the education system or outside it. Scholastic achievement levels and inequality can be compared by means of standardized tests that measure knowledge in relevant subjects. Israel’s GEMS (Meitzav)<sup>3</sup> exams and the international PISA assessment are examples of such tests.

Israeli children’s achievements on international exams are among the lowest in the economically-developed world. PISA measures mathematical and scientific literacy and reading comprehension levels of fifteen-year-olds. The tests are administered in 35 OECD member states and several OECD partner countries. The PISA-participating group includes both highly-developed countries and developing nations. Israel, again, places at the bottom of the scale — below all of the other developed countries and on par with Turkey. For example, in 2015, the average Israeli scores in science and reading were lower by a quarter of a standard deviation and 0.14 percent of a standard deviation, respectively, than the OECD average computed for developing and developed nations together (RAMA, 2016). Some maintain that Israel’s poor showing is due to the particularly poor performance of Arab Israeli and Haredi pupils. However, even when the scores of the two latter groups are excluded, the average achievements of Israeli pupils are very low relative to those of the other developed countries (Ben-David, 2011).

No less problematic than Israeli pupils’ relatively poor scholastic performance is the inequality of achievement that prevails among them, at levels that are among the OECD’s highest (Ben-David, 2011). For example, the PISA 2015 results indicate that the gap between the average score of Israel’s 5<sup>th</sup> percentile and the average score of the 95<sup>th</sup> percentile in scientific literacy is the largest of all participating countries except for Malta, and the largest among all OECD member states. In reading literacy as well, the distribution

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<sup>3</sup> GEMS is an acronym for Global Education Management Systems which has devised exams for education assessment. Meitzav is the Hebrew acronym for Measurement of School Growth and Efficiency. These are exams administered generally in fifth and eighth grade in Israel.

of Israeli scores is the widest of all participating countries except for Malta and Lebanon (Israel ranks third). With regard to math, the disparity between weaker and stronger Israeli pupils is the largest of all participating countries except for Malta and China (Israel ranks third). One could argue that Israel's high degree of score variance is consistent across the assessment cycles of PISA and other international exams (RAMA, 2016).

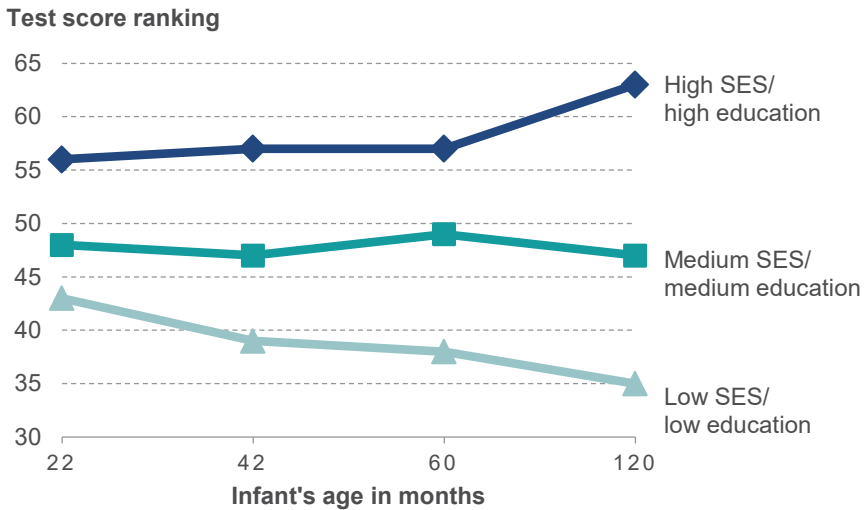
Moreover, scholastic achievement inequality is closely linked to socioeconomic differences. That is, in addition to the substantial inequality between Israeli pupils in terms of their scholastic performance, there is also significant inequality of educational opportunity between socioeconomic strata. A study by Lewin-Epstein (2000), based on a sample of 1,607 families representing Israel's urban Jewish population, found a relationship between the education levels of fathers and their offspring (education levels were assessed in terms of the type of school the study subject last attended and the number of years of schooling). The data show that 48 percent of children of fathers with only a primary-school education had similar educational levels, while 63 percent of children of fathers with academic backgrounds reported also having an academic education. The correlations between Israeli pupils' socioeconomic backgrounds and PISA achievements in 2012 range from 0.3 to 0.41. That is, high-SES children have an average scholastic advantage over low-SES children. An even more troubling finding is that the relationship between family social status and children's educational attainments became stronger between 1995 and 2008 (Bar-Haim, Blank, and Shavit, 2013).

Studies indicate that family socioeconomic background affects children's achievements throughout their years of schooling. Learning-ability differences can be detected at very young ages between children of different social strata. For example, Liaw, Meisels, and Brooks-Gunn (1995) showed that poverty-related familial distress has a negative effect on children's cognitive abilities as early as age 3. Feinstein (2003) analyzed test outcomes for 22-month-old toddlers and found major differences between socioeconomic strata. Not only that, but once developmental gaps emerged between the children of the different strata, they proceeded to widen. Figure 3, shows that, over time, high-SES children continue to improve their average achievements on developmental tests, while the average achievements of low-SES children continue to "lose ground."

This figure raises two separate questions. The first is why major developmental differences are discernible between children of different social strata as early as the very young age of 22-months? The second question is why these gaps between strata continue to widen over time. This review is devoted primarily to the first question.

### Figure 3. Relationship between infant abilities and socioeconomic background

As measured by mother's SES and level of education, by infant's age



Source: Feinstein, 2003

Most research on achievement differences between socioeconomic strata focuses on school-age children – first-grade and above. We know quite a bit about the family and school-related factors that affect scholastic performance. Higher-status parents are, on average, better-educated than lower-status parents, and they value education and are aware of its advantages. Thus, they encourage their children to invest in their studies and are also able to help them with homework and with understanding the material taught in school.

Lareau (2011) compared the parenting styles of families from different social classes. She conducted 137 interviews with 88 children ages 8-10 and their parents, and engaged in participant observation with 12 families. Her study shows that middle-class families focus on cultivating their children's knowledge, skills, and abilities, while lower-class families provide their children with the basics – food, shelter and physical comfort – but let them develop naturally, with no particular additional effort on their part. Upper-middle-class children's afternoons are crammed with activities organized by

their parents, while lower-class children spend their leisure time in front of the television or playing outdoors. Differences were also found in the way children of different classes interact verbally with their parents: upper-middle-class children use rational explanation and logical argumentation, while in the lower classes parent-child relationships are ones of authority, with little room for argument or persuasion (Lareau, 2011). In addition to these socializing differences, educated parents are familiar with the nuances of the education system and know how to guide their children through the maze of decisions and choices posed by the competitive educational arena (Lareau and Weininger, 2003).

Moreover, family economic status is closely linked to children's achievements (Blanden and Gregg, 2004). Living in poverty has a negative impact on children's cognitive, emotional, and social development, and these processes are particularly critical in very early childhood (Shaffer and Kipp, 2014). This is reflected in the impact of early childhood poverty on the chance of scholastic success, not only in primary school but in high school (Duncan, Yeung, Brooks-Gunn, and Smith, 1998).

The education system is also involved in maintaining and increasing the advantage enjoyed by pupils who come to it with good learning skills. Schools identify strong pupils and encourage them to fully realize their potential. Strong pupils are challenged to study demanding subjects and to do it at a faster pace than their scholastically-weaker peers. They are placed in classes designed to foster excellence and in high-ability groups and selective tracks, while the schools' expectations of weaker pupils are lower.

As noted, most studies of stratification in educational achievement focus on school-age children. However, as we have seen, by the time children reach school, major differences in average cognitive development have already emerged between the social strata. These differences affect children's achievements later on, by which point it is considerably harder to address them. It is, therefore, important that we understand why the differences appear in early childhood and what can be done to minimize them.

### **3. The theoretical model guiding the review**

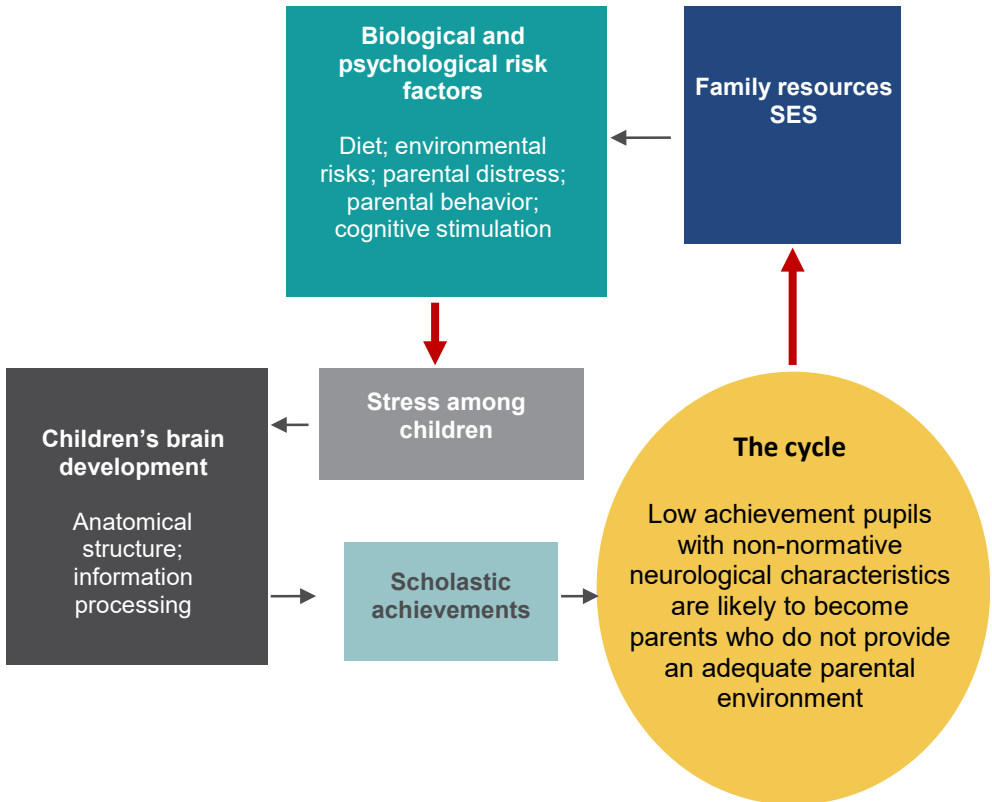
The literature review presented here is guided by a theoretical model postulating relationships between five variables that characterize families and children in both younger and older age groups. The model is based on the hypothesis, prevalent in the research literature, that one of the mechanisms that mediate the impact of socioeconomic background on children's educational achievement is the process through which stress

and insufficient or negative sensory stimulation compromise development in early childhood (see Figure 4). The model's independent variable is the socioeconomic status of the very young child's family. The variable is defined in terms of the material resources available to the family (relative to its size), and parental education levels. With regard to the children in the family, socioeconomic status is reflected in the level of nutrition provided to them, the environmental dangers to which they are exposed, parental distress and behavior patterns, including the degree to which parents provide their children with both cognitive stimulation and emotional support.

Socioeconomic status as an independent variable affects children's scholastic attainments by means of several major mediating variables, such as the degree of stress to which children are exposed to in early childhood, and the sensory stimulation that they receive during this period. Children growing up in poverty are exposed to continual high level stress, and when parents are less-educated, children receive inadequate or minimal sensory stimulation. The combination of high-level, continuous stress and sensory deprivation in early childhood hinder optimal brain development (the model's fourth variable), which in turn affects the child's future scholastic achievements (the model's fifth variable).

The model seeks to illustrate the circular nature of the phenomenon that it describes: pupils with low abilities and non-normative neural characteristics are liable to become parents of low socioeconomic status, who themselves do not provide their children with an optimal developmental environment. It should be emphasized that the model does not seek to establish a deterministic relationship between low socioeconomic status and low scholastic, social, or occupational achievements. That is because there are people who are resilient to stress and to risk factors, and who are able to recover from the harm associated with those factors, so that they go on to succeed even under difficult circumstances. The model also seeks to identify the points in the process where intervention may prevent this cyclical relationship.

**Figure 4. The relationship between family socioeconomic background (poverty, distress, and stress) and child scholastic achievement**



Source: Yossi Shavit, Isaac Friedman, John Gal, and Dana Vaknin, Taub Center

## 4. Between genetics and environment

In the early 1990s a book entitled *The Bell Curve* (Herrnstein and Murray, 1994) was published to popular acclaim, sparking vigorous public and scholarly debate. The book examined the importance of intelligence as a driver of inequality in the United States. Its main argument was that socioeconomic classes are distinguished from each other by the average intelligence level



of their members, and that these cognitive differences explain differences in achievement. The authors even showed major intelligence disparities between races and ethnic groups, hinting that these disparities are the cause of the educational and economic-attainment advantage enjoyed by whites over blacks and Hispanics. The book aroused large-scale opposition because the claim that intelligence differences between people are genetically-determined has racist and eugenicist connotations.<sup>4</sup>

If intelligence is genetically determined and if it strongly influences scholastic achievement, it will be very hard to combat inequality. Genetic endowment remains quite stable over generations, and is not amenable to change through public policy. It is, therefore, important to understand what hope the genetic influence on educational achievement leaves us. Fortunately, research shows that it leaves us a great deal of hope. As we shall see, intelligence is to some degree an inborn trait, but its transmission from one generation to the next, and its impact on attainment, occur in combination with environmental factors that can be altered through public and education policy, that is, through epigenetic processes.<sup>5</sup>

Before we delve into this further, we need a clearer understanding of what intelligence is. Psychometrics defines intelligence as a general ability to understand the environment in which we live (Gottfredson, 1997).<sup>6</sup> Psychologists point to a hierarchical structure of intelligence. The highest level — general intelligence — is referred to as the “g factor.” The g factor denotes a person’s ability to solve cognitive problems in all areas. At its lower levels, intelligence manifests in the ability to solve problems in specific areas (e.g., language, math, graphics), while at the lowest level, intelligence is the ability to solve specific thinking tasks as exemplified by certain kinds of test questions. Researchers also note the multidimensionality of intelligence. They maintain that the g factor is an important form of intelligence but that

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4 The eugenics movement of the early twentieth century presupposed that such innate differences exist and advocated improving the human race by encouraging higher rates of reproduction among groups of people with ostensibly superior genes, and suppressing reproduction among genetically “inferior” groups (Horgan, 1993). These ideas were embraced by the Nazis; when the Third Reich fell, the eugenics movement collapsed. However, the view that intelligence is a trait transmitted genetically from parents to children was not discredited.

5 Epigenetics posits that there are inherited characteristics that are passed from parent to offspring that are not passed through the DNA or genetic code. That is, a parent’s experiences, in the form of epigenetic tags, can be passed down to future generations.

6 Psychometrics measures the validity, reliability, and fairness of an educational and psychological measurement programs.

it is not the only one. Sternberg (1997), for instance, distinguishes between practical-functional abilities and learning abilities. In contrast, Gardner (1983) identifies a larger number of abilities, including verbal, interpersonal, visual, and others.<sup>7</sup>

As noted, there are interpersonal differences in intelligence across its various dimensions, and the question arises as what causes these differences. Behavioral geneticists compare the effect of hereditary and environmental factors on intelligence, especially general intelligence or the g factor. Studies in this area compare intelligence between relatives, siblings, and twins. Bouchard and McGue (1981) demonstrate, for example, that identical twins have very similar general intelligence levels, even if they were separated immediately after birth and adopted by families of different classes. They conclude that general intelligence is largely an inherited trait transmitted from parents to children. Other studies belonging to this school of thought argue that a high percentage of variation in intelligence — from 40 to 70 percent — can be attributed to genetics.<sup>8</sup>

Were we to end our literature review at this point, we might, perhaps, conclude that inequality of educational opportunity is influenced by genetic factors and very hard to change. However, more recent literature shows that the effect of genetics on intelligence, and the impact of intelligence on scholastic achievement, depend on environmental factors. One concept that explains the complex relationship between genetics and environment is that of range of reaction. Range of reaction is the idea that genotype determines the limits of the range of phenotypes that the organism can potentially develop in reaction to different environments, while the environment in which the organism will ultimately live determines its actual phenotype

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7 Many sociologists object to the idea of a distinction between intelligence and scholastic achievements. Fischer et al. (1996), for example, argue that intelligence tests actually measure learned knowledge, such as the ability to read, to pay attention, or to write. Moreover, some intelligence-test questions are strikingly similar to math or geometry questions of the type that refer to material taught in school. In their view, intelligence is not fundamentally different from knowledge.

8 Criticism of twin studies: the assumption of equal environment appears to be unfounded. Monozygotic twins share not only genes but also environment. By contrast, dizygotic twins share only half of their genes, and their environments differ to a certain degree, as reflected in, for example, the environment's reaction to physical differences. Accordingly, due to their identical appearance, monozygotic twins have a much more similar experience of the interaction with parents and the outside world than do dizygotic twins or regular siblings. Thus, the difference in degree of heredity between monozygotic and dizygotic twins cannot be attributed solely to genetic differences (Beckwith and Morris, 2008).

(Berk, 2013).<sup>9</sup> The argument is that the genetic endowment of the organism (e.g., the young child) interacts with the environment in which it grows and develops. To illustrate the importance of the interaction between genetic and environmental factors in influencing human traits, imagine the effect of genetics on skin color. The degree of skin pigmentation is largely determined by genetic factors but the expression of these factors in skin color depends on exposure to sunlight. Without such exposure, there would be only small skin-color differences even between children who are distinct from each other genetically (Adkins and Vaisey, 2009). Similarly, the effect of intelligence on scholastic achievement depends on the degree to which children are exposed to learning opportunities. For example, in an environment where there is no instruction at all, intelligence levels will be expressed in minor learning differences.

Interesting evidence of the importance of environmental factors in shaping intelligence can be found in James Flynn's work on IQ scores in developed nations and their evolution over time (Flynn, 2013). Flynn finds that IQ scores in these countries have risen substantially over the last few decades. In the US, for example, the average IQ score improved by a full standard deviation between the 1930s and the 1980s. Genetic endowment, however, apparently did not change significantly during this period, making it impossible to attribute the climbing IQ scores to genetic change. Rather, the improvement appears to be due to environmental change, exemplified by better nutrition, increased exposure to intellectual stimulation in school and in everyday life, and a growing emphasis on cognitively-demanding tasks in the workplace (Flynn, 2013). In his book *Intelligence and Human Progress: the Story of What Was Hidden in Our Genes*, Flynn writes:

*“Current environment can do a great deal to raise or lower an individual's IQ compared to what it would be on strict hierarchy of genetic endowment.”* (Flynn, 2013, p.80)

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9 A genotype is the organism's genetic composition, while phenotype is the actual expression of these genes in the organism itself. Both environment and genetics determine how genotypes are translated into specific phenotypes — which is to say that environmental factors clearly affect gene function (Gottlieb, 1996). For example, a child who suffers malnutrition for an extended period at a developmentally-critical age may not reach the average height even if he has the potential to grow tall.

While studies in the behavioral genetics tradition examine the influence of genetics by looking at similarities and differences between siblings, twins, and other relatives that intensify under different circumstances, research taking a molecular genetics approach examines the statistical relationships between different kinds of alleles and measured intelligence. Since the human genome project got underway in 1990, numerous studies have surveyed the correlations between intelligence and the entire array of alleles and the interactions between them. So far, these studies have not succeeded in identifying strong correlations. A pioneering work in this vein by Conley, Domingue, Cesarini, Dawes, Rietveld, and Boardman (2015) looks at the relationship between parental education, children's education, and the degree to which they are mediated by heredity. The authors seek to determine to what degree the known relationship between parental education and children's education levels is mediated by parent-child heredity. The study findings indicate that parental genetic endowment is weakly linked to their education level ( $r=0.24$  for mothers and  $r=0.09$  for fathers). It also found that parents' education levels are moderately linked to the education levels of their children ( $r=0.35$ ,  $r=0.32$ ), but that very little (a sixth) of the correlation between parental and children's education levels is mediated by heredity. That is, the vast majority of inequality in educational opportunity between members of different social strata is due to environmental or random factors that affect parents' and children's education levels, and not to heredity.

To conclude, the genetic transmission of intelligence from generation to generation is not the main factor behind educational inequality between socioeconomic strata. Although children's IQ levels are affected to a significant degree by heredity, heredity itself depends on environmental factors such as the family's economic status and the degree of cognitive stimulation the child receives. Beyond the impact of intelligence, scholastic achievement is also influenced by an array of economic, cultural, social, and institutional factors that determine the availability of learning opportunities. Moreover, the brain in general, and intelligence in particular, develop in response to environmental conditions, including the degree of stress endured at different ages, and the amount of stimulation to which the young child is exposed. Studies show that the stress suffered by children growing up in poor families compromises the functional development of different areas of the brain. Accordingly, one may conjecture that this explains the relationship between families' socioeconomic characteristics and the scholastic achievements of their children (Nelson and Sheridan, 2011). We will discuss these factors in the following sections.

## 5. Stress and brain development

The classic psychiatric definition of stress is that of strong doubt regarding the individual's ability to overcome a specific situation, at a specific point in time (Ropper, Samuel, and Klein, 2014, p. 514). Among the wider circle of practicing clinicians, stress is regarded as a multidimensional phenomenon of troubling stimuli that exert an impact on the individual's information processing systems, including cognitive assessment of stimuli as stress and reactions to the perceived stimuli. Stress has many different psychological, physical, and emotional manifestations, and shares psychobiological features with depression (Hyman and Cohen, 2013). Stress is often associated with such psychological comorbidities as nervousness, unease, anxiety, and depression (Ropper, Samuel, and Klein, 2014).

Research literature differentiates between different types of stress — positive, tolerable, and toxic stress — and distinguishes between reactions and coping mechanisms to these sources of stress and environmental distress. While a positive stress response is normal and positive for healthy child development, toxic stress response is likely to occur when a child experiences negative stress for prolonged periods of time, like exposure to neglect, abuse, or economic distress. Experiences of this type may interfere with optimal brain development and increase the danger of cognitive impairment during adolescence. The more a child experiences toxic stress response, and particularly when this is experienced at a very young age, the greater the risk of other developmental impairments as well as health, psychological, and cognitive issues. In this survey, we are examining those toxic stress responses that are likely to take a cumulative heavy toll on the lives of young children (Center on the Developing Child, 2018).

Environment has been found to play a critical role in mammals in terms of promoting neural development during the immediate postnatal period. Epigenetic factors are thought to contribute to this process, and recent studies have revealed some of the molecular mechanisms through which DNA expression during the early developmental stages is affected by early life experiences, something that is regarded as critical to brain function (Whalley 2017). Animal and human studies have both shown that, during early infancy (and old age), the brain is particularly sensitive to stress, apparently because it undergoes major changes during those periods. Moreover, exposure to stress early in life causes heightened reactivity to stress and cognitive deficits in adulthood (Lupien, McEwen, Gunnar, and Heim, 2009). Low birth weight in combination with low maternal involvement with the infant is related to a decline in hippocampal volume in adolescence. This

finding is consistent with evidence that the effects of gestational stress are often moderated by high-quality post-natal care, which is itself consistent with the human brain's lengthy postnatal developmental process. That is, the postnatal environment moderates prenatal risks (Buss, et al., 2007).

Recent research raises the possibility of observing what goes on in nerve cells in the brain over a lengthy period, using two-photon excitation microscopy. Through studies conducted using this technique, brain cell changes during situations of stress or fear can be tracked. Studies using laboratory mice found that a relatively short time (two days) after exposure to two causes of stress and fear, cellular connectors (axons and dendrites) in the prefrontal cortex, which is functionally linked to the amygdala<sup>10</sup> (known to play a role in states of fear and stress) disappeared from the brains of the mice (Breedlove and Watson, 2013).

Stress can impair the functioning of vital neural systems, including those located in the pre-frontal cortex, which is responsible for planning, emotion, and social judgment, and is also involved in attention and concentration (Hyman and Cohen, 2013). Excitatory fibers found in the amygdala transmit information on stress and also secrete hormones that give rise to such phenomena as heightened arousal, periodically accompanied by decline in some cases to the point of depression. Stress can also manifest in biochemical changes such as accelerated and extended activation of the hypothalamic-pituitary-adrenal axis — HPA. Prolonged stress also leads to increased secretion of corticotrophin-releasing hormone — CRH and corticotropic hormone — which in turn suppresses the immune system and gives rise to cognitive and behavioral changes. Continuous, chronic secretion of these hormones can produce depressive symptoms, the most basic of which are indifference, avoidance, and lack of energetic activity (Gordon and Hen, 2004). The hormonal array created by stress disrupts sensory reception and processing, which in turn negatively affects the ability to receive and process information. It may, therefore, be hypothesized that the presence of stress during the young brain's developmental stages can disrupt normal cognitive and emotional development, and significantly delay children's ability to learn and to integrate socially.

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10 The amygdala is the neural structure involved in a number of brain processes, particularly signal modulation and transmission to other structures for processing in accordance with their nature. The amygdala is largely responsible for the creation of sensory signal movement blockers during stressful situations. Signals of negative import, especially in states of anxiety or stress, are halted at the amygdala gateway and are not transmitted to the areas necessary for processing, such as the hippocampus and the frontal lobe which are responsible for information processing and memory.

Children exposed to inferior care for long hours during the early developmental period are at greater risk for behavioral problems later in life. Parent-child interaction and the mother's psychological state also affect development. Maternal depression often hampers sensitive and supportive care of infants and young children. There is a growing body of evidence that the children of depressed mothers, especially mothers who were clinically depressed during the children's early years, are at risk of developing depression in adolescence. Moreover, young children growing up with depressed mothers display changes in the activity of the frontal lobe, correlating with reduced empathy and other behavioral problems (Lupien et al., 2009).

## 6. Gestational stress

Stress experienced by a mother during pregnancy may affect the development of the fetus and the infant. When we experience fear and anxiety, stimulatory hormones released into the bloodstream cause us to be "ready for action." Large quantities of blood are sent to the parts of the body that are involved in the defensive response, as reflected in brain, heart, and muscle function. Blood flow to other organs, including the uterus, dwindles. As a result, gestational stress impairs the supply of oxygen and nutrients to the fetus. Maternal stress hormones cross the placenta, causing a dramatic increase in fetal stress hormones, heart rate, blood pressure, blood glucose levels, and activity levels. These processes increase the lifelong risk of major illnesses, such as cardiovascular disease and diabetes. Infants and children of mothers who experienced serious prenatal anxiety have exceptionally high or anomalous cholesterol levels, which reduces the physiological ability to manage stress. Consistent with the findings, these children are more disturbed than their peers are by new or challenging experiences. Moreover, maternal emotional tension during pregnancy has been found to predict childhood anxiety, short attention spans, anger, aggression, and hyperactivity, beyond the impact of other risks such as maternal smoking during pregnancy, low birth weight, maternal postnatal anxiety, and low family income (Berk, 2013).

Stress during pregnancy may cause developmental delays, an increased incidence of allergy and respiratory infection, and child behavioral problems. Mice who experienced gestational stress, like human children, show reduced inclination for social interaction, increased anxiety in threatening or new situations, depressive-like alterations in physiology and behavior, and even sleep disorders (Weinstock, 2001).

Adverse intrauterine conditions due to maternal stress may have a negative impact on the pregnancy itself during the short term, and on offspring in the long term. Social stress adversely affects pregnancies and offspring. In early pregnancy it may cause pregnancy loss; during later pregnancy it can lead to low birth weight, itself a risk factor for a variety of diseases in adulthood. Mothers who experience gestational stress exhibit hyperreactivity to stress and anxiety, reflected in permanent alterations in the brain morphology of their offspring. Prenatal social stress shapes future maternal behavior, increasing the potential for negative phenotypes to be transmitted to future generations (Brunton, 2013).

Chronic exposure to stress hormones, whether during pregnancy, infancy, childhood, adolescence, adulthood or old age, affects brain structures involved in cognition and mental health. However, the specific effects on the brain, on behavior and on cognition emerge as a function of the exposure's timing and duration; some are dependent on interaction between gene effects and prior exposure to adverse environmental conditions (Lupien et al., 2009). Retrospective studies of children whose mothers experienced psychological stress during pregnancy indicate long-term neurodevelopmental sequelae. Gestational stress, anxiety and depression are linked with lower birth weights. Child developmental and behavioral deficits are linked with maternal stress and depression during pregnancy. These behavioral changes include antisocial and inconsiderate behavior, attention deficit, hyperactivity, and psychiatric disturbances such as depressive symptoms, substance abuse, mood disorders, and anxiety (Lupien et al., 2009).

Another study supporting the hypothesis that gestational stress affects children's development before they are born asked whether prenatal stress affects developmental outcomes at 3 and 8 months of age. A significant relationship was found between high anxiety levels in early pregnancy and lower emotional development scores in 8-month-old infants. Gestational stress is a factor in delayed motor and mental development at 8 months, and may be a risk factor for developmental problems later on (Huizink, Robles de Medina, Mulder, and Buitelaar, 2003). An additional study found that gestational stress predicts both cognitive development problems and fearfulness. The degree of impact remains unchanged after controlling for postnatal stress, maternal education and psychological status, exposure to drugs and other substances during pregnancy, and birth outcomes.<sup>11</sup>

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<sup>11</sup> Birth data were taken from hospital notation after birth and include birth weight, gestational age, method of childbirth, gender of baby.



Prenatal stress explained 17 percent of the variance in cognitive ability and 10 percent of the variance in fearfulness. These findings reinforce earlier studies indicating that the prenatal environment has a major impact on fetal and child development (Bergman, Sarkar, O'Connor, Modi, and Glover, 2007).

## 7. Class-related differences in stress and its outcomes

As noted, early experiences in life and before birth have a major impact in terms of shaping brain development and cognitive abilities. Studies show a relationship between socioeconomic status and biological/social phenomena, including highly stressful situations. In Western countries it has been found that those in the lower socioeconomic strata have a higher risk of cardiovascular and respiratory disease, joint disorders, and psychiatric conditions; they also have higher mortality rates, including infant mortality, than do people of higher socioeconomic standing. The stress endured by children growing up in low-income families compromises the functional development of various areas of the brain (Nelson and Sheridan, 2011).

Conger, Ge, Elder, Lorenz, and Simon (1994) proposed a model that connects family economic stress with internalization and externalization of emotions and behavior in adolescents. Their theoretical model posits that parental economic stress intensifies tensions between parents and drives family conflict, including conflict between parents and children over money. A high prevalence and intensity of marital disputes, combined with economic stress, are linked to parents' hostility toward their children, which in turn increases the likelihood that the children will have emotional and behavioral problems (*ibid.*)

Research has demonstrated the major role of chronic childhood stress in emotional regulation among adults (Evans and Schamberg, 2009; Kim et al., 2013). Chronic exposure to the stressors that characterize low-income families has a long-term adverse effect on physiological regulators of stress, with potential pathological outcomes. Cumulative empirical evidence suggests that chronic exposure to stress and low socioeconomic status produce ongoing neurobiological changes. That is, chronic stress is a potential mediator of the negative relationship between childhood poverty and adult health outcomes (*ibid.*)

Allostatic load refers to bodily wear-and-tear caused by stressful events in which the body responds maladaptively. Childhood poverty has an impact on chronic stress, which in turn affects health. Increased allostatic

load has health consequences, indicating that some of the impact of low socioeconomic status may take years to emerge. Infants and children who experience chronic stress or social deprivation exhibit structural alterations in the brain that ultimately affect memory, education, and the future ability to cope with stress (Conroy, Sandel, and Zuckerman, 2010).

## **8. Class differences in the recovery from the adverse effects of stress**

Infants can overcome some of the damage caused by gestational stress, but the degree of recovery is closely related to family socioeconomic status. Torche (2011) looked at the impact of gestational stress on birth weight. Research shows a connection between birth weight and children's cognitive abilities, future education levels, and lifelong socioeconomic achievements (see Richards, Hardy, Kuh, and Wadsworth, 2001; Shenkin, Starr, and Deary, 2004). Babies born to women who experienced stress during the first trimester of their pregnancies weighed significantly less than other infants. In the months after birth, the weight of infants of high socioeconomic status recovered, while infants born to low-income families continued, over time, to exhibit low weight and developmental problems (Torche 2001).

Torche and Shwed (2015) looked at infants born to women who, during their pregnancies, had lived in areas of northern Israel targeted by missile fire during the 2006 Lebanon War, and compared them to infants born in central Israel during the same period. The study's underlying assumption was that pregnant women in northern Israel had higher stress levels, on average, than their central-Israeli counterparts. Infants whose mothers were in their first and second trimesters during the war in northern Israel were born at weights slightly but significantly lower than the other infants.

## **9. Sensory stimulation and brain development**

We argue that early childhood poverty may affect the supply of sensory stimulation to which children at this critical age are exposed, with consequences for brain development. Young children are dependent on their environment, and may enter or avoid the cycle of poverty due to their families' economic circumstances (Brooks-Gunn and Duncan, 1997). The early years of life lay the foundation for future skill acquisition, learning, and well-being. By age 3, a child's brain has reached nearly 90 percent of its adult size; growth in all brain regions strongly depends on the kind of stimulation

that drives brain activity. Stimulation provides a basis for learning, meaning that all children need stimulation for healthy development (Child Welfare Information Gateway, 2015).

Neurological research shows that early experiences have an ongoing impact throughout the lifespan on personal and social behavior and on human cognitive activity (Sanes and Jessell, 2013). The effects of environmental conditions on child development are far-reaching, especially where brain development is concerned. Researchers use the term “plasticity” to refer to the brain’s ability to change in response to repeat stimuli. Brain plasticity levels are determined by developmental stage and by the brain region affected (Child Welfare Information Gateway, 2015). In early childhood the brain is plastic and its development is strongly influenced by surrounding conditions; the brain adapts to the living environment. Family, school, and neighborhood provide an array of environmental experiences that are assimilated by the child’s brain. All developmental processes involve the brain, meaning that one cannot understand child development without understanding child brain development (Nelson and Sheridan, 2011).

According to Flynn (2013), for whom the “Flynn effect” is named, people’s intelligence and cognitive abilities are higher now than they were formerly, because today’s environment exposes them to cognitive stimuli that are more numerous, more challenging, and more complex than in the past. Cognitive abilities, according to this view, are determined by the environment rather than by heredity, and the relative richness or paucity of environmental stimulation has far-reaching consequences for the brain. For example, an experiment on mice sought to determine how a stimulus-rich environment would affect their brain structure. It was found that few new neurons formed in the brains of mice raised in a stimulus-poor environment, while mice living in an enriched environment exhibited brain cell survival over time. Physical changes result from experience and interaction with the world, and the brain needs stimulation in order for it to develop (van Praag, Kempermann, and Gage, 2000).

Neuroscientists maintain that brain size is not what determines a person’s mental abilities or the factors that delay and support his functional status. The latter are determined by the nervous system’s maturation process which, as noted, is largely dependent on trial and error and on personal and environmental experiences. This process is facilitated by the central nervous system’s amazing lifelong plasticity. This plasticity manifests in varying degrees over the lifespan, with certain periods characterized by greater sensitivity to change and greater adaptability. Such periods are referred to as “sensitive periods,” and they occur at specific times in the

course of human development. During sensitive periods for nervous system development at different ages, if the individual is not exposed to certain vital stimuli, it is extremely difficult, if not impossible, to compensate for the experiential deprivation. These periods are also referred to as “critical periods,” but because new studies have shown that the boundaries between “sensitive” and “critical” periods are unclear, neuroscientists generally refer to all of the sensitive periods as “critical.” It is, therefore, correct to say that early childhood intervention is more effective than intervention at older ages — a neurological fact rooted in the critical periods of brain development at different stages of life.<sup>12</sup> If certain synapses<sup>13</sup> and neural pathways are not activated repeatedly, they may weaken, and their associated abilities will deteriorate. For example, infants are genetically programmed for strong attachment to their primary caregivers, but if their environment is suboptimal and they are neglected, they will be unable to develop secure attachment. Nelson, Fox, and Zeanah (2013) compared the emotional, physical, and cognitive state of Romanian children in orphanages to that of orphans who were later placed in adoptive families in Bucharest. The researchers followed the children for more than 10 years, and found that, on average, the intelligence level of children who grew up in the orphanage was lower than those who were placed in adoptive homes. The reason is that children in orphanages did not receive sufficient attention or emotional support, and were not exposed to rich and varying stimulation. It was also found that some 53 percent of the children who grew up in orphanages were diagnosed with psychiatric disorders by the age of four and a half. Of these, 44 percent were diagnosed with anxiety disorders and 23 percent with attention disorders (ADHD). This is compared to 20 percent among children who were placed with adoptive families. This research provides additional proof that the first years of life are critical in terms of exposure to richly stimulating environment — physical and emotional — that are essential for healthy development.

Sparse and limited sensory stimulation in early childhood and, in particular, at the very youngest ages (two to three years) squanders the brain plasticity of this age group and keeps the neural connections necessary for cognitive

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12 It is important to stress that in contrast to the accepted theory in the past that when a critical period is over the brain is “locked” and unable to continue developing, it is currently felt that even after critical periods changes continue in response to stimulation. Closing gaps, though, becomes more difficult, slower, and incomplete.

13 Synapse — a structure in the nervous system that permits a neuron (nerve cell) to pass an electrical or chemical signal to another neuron or to the target cell.

and social development from forming. Existing neural connections may disappear if not activated. While there are sensitive periods for development and learning, we also know that brain plasticity often enables children to recover from a deficit of meaningful experiences. Children and adults may both be able to compensate for the missed experiences later in life, but it will then be much harder. This is especially true for young children who have been deprived of a particular form of stimulation, leading to neural pruning and the loss of neural pathways relevant to that stimulation (Child Welfare Information Gateway, 2015).

Critical periods have been found for different areas of human behavior and for the process of adjusting to one's environment. Most research has looked at the relationship between exposure to environmental experiences and brain development in the context of vision, visual perception, and the development of the visual nervous system, and the effects of this exposure on behavior patterns and environmental and motor responses at older ages (see Hubel and Wiesel, 2005). The findings have generally indicated that experiences affect the structure and function of the visual cortex (the part of the cerebral cortex that processes visual information), and that postsynaptic regions change their signaling order during the critical period. This is also true of cerebral-neural structures such as the thalamus.

These studies have also shown that the connections between nerve cells in infants' brains arise from two different developmental foundations. One foundation is the genetically-determined patterns of neural activity. The other is the array of signals that guide the connections between neurons (those that direct the growth of the connections between the various neurons in a process that is naturally imprinted in the neurons). These connections were found to be amenable to change by means of activity and sensory experience (exposure to situations, to information, and to interpersonal interactions). Change, in turn, enables the nervous system to adapt itself to the environment while also maintaining individuality. However, thanks to the nervous system's wonderful plasticity, there are certain possibilities for "repair" and adaptation of the neural connections that foster cognitive, emotional, and motor abilities even after the critical periods have passed (Sanes and Jessell, 2013).

Most of the research and experiments that have been carried out on neurological and brain development have used animals. In early research, cats and monkeys predominated in these studies; they have been replaced by mice in recent years (see Hensch, 2005). A 1975 study of kittens by Blake and Hirsch highlights the importance of the critical period as the time when certain kinds of stimulation must occur in order for the nervous system to

develop properly. Blake and Hirsch allowed kittens to see with only one eye at a time, which altered the distribution of the intraocular cells in the cerebral cortex and led to long-term depth perception deficits. That is, the lack of the appropriate stimulation at the critical time prevented the ability from developing.

Human studies have looked at language acquisition by immigrants and native residents of the same country at different ages, and at their socialization processes and interpersonal behavior. For example, Johnson and Newport (1989) found a clear relationship between the age at which immigrants arrived in the United States and their mastery of English grammar. It emerged that young immigrants to the US (ages 3-7) learn English as a second language easily and naturally, in a manner similar to that of local residents whose first language is English. By contrast, children ages 8-15 who immigrated to the United States speak English with some degree of foreign accent all their lives. From the biological perspective, it was found that language acquisition takes place much more effectively during the critical period, because exposure during this period to a language creates neural circuitry oriented toward the reception of that language's characteristic phonemes, giving rise to a kind of neural "commitment." The commitment is rooted in the neural connections that are formed during this period and that are established with relative ease compared with other periods. This neural commitment enables quick and easy identification of words and sentences acquired at a young age, but makes it difficult to learn linguistic patterns that are inconsistent with the neural connections that were formed during the critical period (Kuhl and Damasio, 2013).

These and other studies (see for instance, Lennenburg, 1967) clearly show that relevant experiences need to happen within the critical period if behavior is to develop normally and cognitive abilities are to reach their full genetic potential (Sanes and Jessell, 2013). The studies also suggest that social isolation at young ages has a prolonged impact on social and interpersonal behavior later on. This is exemplified by the case of the "feral" child Genie who was forcibly isolated from the outside world from the age of 20 months, did not learn to walk and received no linguistic stimulation. Genie, who was not exposed to language during the most critical period for language acquisition, did not succeed as an adult in learning new words, composing sentences, or producing syntax.

At the other end of the spectrum, children whose parents talk to them more display better-developed linguistic capabilities. Hart and Risly (1995) looked at the everyday lives of one- and two-year-olds in typical American families, and found significant differences between social classes in the level

of parent-child interaction. These differences in early family experience translate into major differences in children's rates of vocabulary growth, vocabulary use, and IQ scores (Hart and Risley, 1995). In another study, substantial disparities in vocabulary and in language processing efficacy were found between toddlers from different socioeconomic strata, as early as 18 months of age. The average vocabulary size of 18-month-olds from the lower classes is 107 words, versus 174 words for upper-class children of the same age. Gaps in language processing between toddlers of different socioeconomic strata were even wider half a year later, at 24 months of age. The vocabularies of children of higher-SES families were found to be significantly larger at 18 months, and the gap grew over the years. Eighteen-month-old high-SES toddlers were even found to surpass 24-month-old low-SES toddlers on language comprehension tests (Fernald, Marchman, and Weisleder, 2013).

As noted, children's brains develop in response to environmental conditions and the degree of stimulation offered to them. The alterations that occur in the brain in early childhood sometimes endure even once the environmental conditions that caused them change. It is our view that family socioeconomic status may affect the supply of sensory stimulation available to young children, which affects brain development in its turn.

It has been found that children from families receiving social assistance often grow up lacking emotional support, a literate environment, safe physical conditions, and the types of stimulation that encourage intellectual growth. Only a third of young children in such families receive intellectual stimulation and emotional support from their parents at levels similar to those enjoyed by most children in families that are not poor or dependent on social assistance (Zill, Moore, Smith, Stief, and Coiro, 1995). Low-SES families are subject to high levels of stress; they exhibit greater degrees of conflict, suffer tension over paying the bills, are at greater risk of moving house, and face more problems generally. All of these things create tension within the family, to which children are not immune. The deeper the poverty and the longer its duration, the greater the stress borne by the child (Evans and Schamberg, 2009). Put differently, childhood poverty leads to chronic stress, which in turn constitutes negative sensory stimulation for young children. Also, infants and children who experience chronic stress or social deprivation display structural changes in the development of the brain, which ultimately affect memory, educational achievement, and the ability to handle future stress (Conroy, Sandel, and Zuckerman, 2010).

## 10. Poverty and brain development

Recent years have witnessed a growing awareness that socioeconomic differences are linked to differences in cognitive/brain development, and that poverty during the first two decades of life is likely to hinder brain development. According to Lipina (2017), gathering scientific data on how childhood poverty affects the brain and cognition is a difficult task that raises numerous conceptual and methodological issues. The way in which poverty affects child development has been a topic of academic interest for decades, but many questions have yet to be resolved. What aspects of cognitive development tend to be more strongly affected by what types of poverty experience? How do the timing and severity of poverty affect cognitive development? These are just two examples of the complex questions addressed by childhood poverty research (ibid.)

According to Noble, Norman, and Farah (2005), childhood socioeconomic status is closely linked to cognitive abilities and achievements. The research team studied 30 high-SES and 30 low-SES kindergarten children in Philadelphia, measuring socioeconomic status in terms of parental education, parental employment status, and family income. The children were given functional-assessment tasks representing five neurocognitive systems: the occipitotemporal/visual cognition system, the parietal/spatial cognition system, the medial temporal/memory system, the left perisylvian/language system, and the prefrontal/executive system.<sup>14</sup> The study found a particularly strong connection between socioeconomic status and the left perisylvian/language system and the prefrontal/executive function system that was disproportionate to the other functions assessed. It emerged that low-SES children performed especially poorly on language tasks<sup>15</sup> and on executive function tasks,<sup>16</sup> compared with higher-SES children. Socioeconomic differences between kindergarten children are thus linked to major performance disparities in the language and executive function spheres, and to smaller gaps in visual cognition, parietal/spatial cognition, and memory.

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14 Executive functions are the higher cognitive abilities that allow self-management and management of the environment, like emotional regulation and self-control.

15 Peabody Picture Vocabulary Test (PPVT); Test of Phonological Awareness (TOPA); Test of Reception of Grammar (TROG).

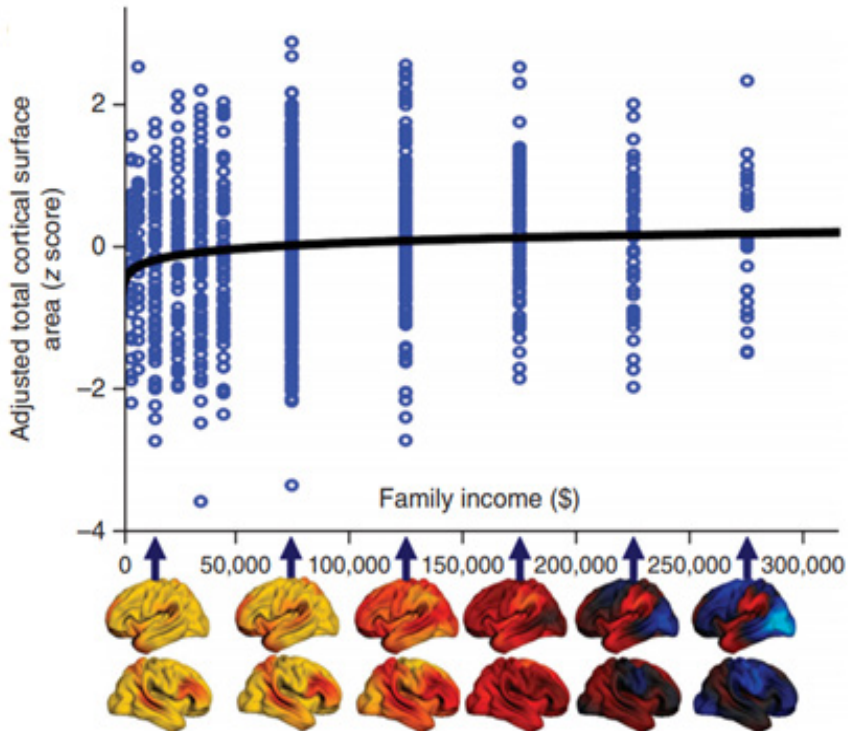
16 Go/no-go task; Spatial Working Memory task; False Alarms task.



In the years following the Noble, Norman and Farah study, scientists began using magnetic resonance imaging (MRI) to assess the brains of children from across the socioeconomic spectrum. Although childhood socioeconomic status has been established as a predictor of various prefrontal cortex functions, we know little about the links between them. A study conducted by Lawson, Duda, Avants, Wu, and Farah (2013) looked at 283 child MRI scans in order to investigate the relationship between socioeconomic status (measured in terms of family income and parental education) and prefrontal cortical thickness. The study found that the prefrontal cortex in low-SES children tends to be thinner than in high-SES children. Parental education was also found to be a significant predictor of children's prefrontal cortical thickness. These differences in the thickness of the prefrontal cortex, which is responsible for flexible and creative thinking and for higher-level cognitive and executive functions, likely offer a partial explanation for academic achievement gaps between children of different socioeconomic strata. In other words, these findings indicate that the prefrontal cortex may represent a meaningful link between socioeconomic status and children's higher cognitive functioning.

A recent study by Noble, Norman, and Farah (2015), based on a sample of 1,099 children and adolescents ages 3-20, found that family income has an independent impact on brain structure. The study linked large differences in brain surface area among low-SES children with small differences in family income, in contrast to children from higher-income families. Family income was significantly associated ( $p=0.004$ ) with total brain surface area, meaning that children growing up in the poorest families have the smallest brain surface area relative to the population as a whole. For example, the brain surface area of children from families whose income was below the base level (less than \$25,000 per year) had 6 percent less brain surface area than children from families of average or higher income (\$150,000 per year or more). These data show that family income levels have a particularly strong impact on brain structure and functioning among the most disadvantaged children. Brain surface area disparities between low-income children and their higher-income peers were also found when controlling for parental education, and particularly significant differences appeared in the areas responsible for language, reading, and executive function.

**Figure 5. Relationship between annual family income (in dollars) and cerebral cortex area**



Source: Noble, Norman, and Farah, 2015

It is well known that children living in poverty have lower scholastic achievements, and that the more prolonged the period of poverty, the larger the scholastic gaps (Brooks-Gunn and Duncan, 1997). Hair, Hanson, Wolfe, and Pollak (2015) analyzed 823 MRI scans of children and young people ages 4-22 who had undergone cognitive and scholastic assessment in addition to measurements of the volume of grey matter in the brain. The results indicate that poverty is related to structural differences in several areas of the brain that are involved in school readiness skills, with the largest impact observed for children living in the poorest households. On average, the attainments of low-income children were 4.7 points lower on standardized tests ( $p < 0.5$ ). Strong links were also found between household income and grey matter

volume in the frontal and temporal lobes and in the hippocampus. The authors conclude that poverty's impact on children's learning and academic achievement is mediated by brain structure development (*ibid.*)

In conclusion, early life experiences are critical in shaping brain development. These studies show that reduced brain growth and intellectual potential are not due to a single factor, but rather to a broader environment of poverty encompassing household socioeconomic status, parental education, and parental employment status. Childhood socioeconomic status is one of the "experiences" that shape the young child's growing brain. In this review, we argue that the negative effect of poverty on cognitive/brain development is mediated by the supply of sensory stimulation to which young children are exposed, including stress.

Critical and sensitive periods — those times when the brain is especially sensitive to external stimuli and to environmental experiences — shape the structural and functional organization of the brain compromised by poverty. According to Shonkoff (2012), early-childhood environmental experiences and impacts can leave an ongoing mark on the developing brain's architecture. Stress and uncertainty due to economic deprivation increase the likelihood of negative emotional states, anxiety, depression, and anger. Many researchers feel that negative experiences associated with high degrees of stress occur more frequently in low-SES families and families living in poverty. These negative experiences include exposure to environmental hazards, violence in the home and in the community, and destabilizing events such as breakup of the family unit, moving house, job change, and unemployment (Bradley and Corwyn, 2002; Lipina, 2016).

Parental economic difficulties and stressful situations such as those described may also lead to excessive reliance on negative parenting strategies and may cause parents to show less warmth and emotional support to their children, and to be less involved in their children's everyday lives. All of these things can impair children's social functioning and disrupt the parent-child relationship (McLoyd, 1990).

Current research on brain science and child poverty postulates that the two most important channels of influence on neurocognitive development are quantitative and qualitative exposure to stress. According to McEwen and Gianaros (2010), neural systems in the brain that modulate and regulate the physiological and behavioral response to stress (the hippocampus, the amygdala, and the prefrontal cortex) may be impaired by extreme poverty and chronic stress. Additionally, regulation of the stress response in children is one of the main mechanisms by which poverty affects emotional, cognitive, and social functioning. They also postulate that the regulation of

responses to stress in children is one of the most important mechanisms that is influenced by poverty with impact on emotional, cognitive, and social regulation. Chronic stress may even mediate the relationship between low family income in childhood and prefrontal cortex activity during emotional regulation tasks in adulthood (Kim et al., 2013). At the same time, young children's exposure to high levels of poverty-related stress tends to delay cognitive competence and memory processing, with implications for learning ability later on (Blair, 2010).

It should be noted that neuroscience and neuropsychology are fields that are constantly developing and changing. One notable and interesting study, the first effort of its kind, is being conducted by an impressive team comprising Katherine Magnuson, Kimberly Noble, Greg Duncan, and others (2014). The study, whose findings are slated for publication in early 2018, divided one thousand low-income mothers into two groups. The experimental group received a \$333 monthly allowance for three years from the time their children were born, while the control group received only \$20. At age three the children's language skills, memory, and social-emotional development were assessed, and electroencephalography (EEG) was carried out. If the children who received the larger monthly allowance exhibit healthier brain activity and better performance on cognitive tests than the children in the control group, Magnuson et al. will be the first to provide causal evidence linking family income levels with neurological and brain development.

The last few years have witnessed the growing popularity of an approach that is fundamentally different from those surveyed earlier in this review, one that emphasizes non-cognitive skills. A major proponent of this approach is James Heckman, a University of Chicago economist and co-recipient of the Nobel Prize in Economic Sciences in 2000. Heckman formulated the "Heckman Equation,"<sup>17</sup> which shows that investing in education for disadvantaged families, nurturing young children's cognitive and social skills, and providing quality education through adulthood help ensure an effective, productive, high-quality work force in the future. According to Heckman, socio-emotional character skills such as patience, persistence, self-control, motivation, and self-confidence — and not necessarily cognitive skills — are crucial for future achievements and promote the good of society as a whole (Heckman, 2012). While public interest is channeled mainly towards cognitive skills and IQ tests of various kinds, Heckman argues that

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17 The Heckman Equation: <https://heckmanequation.org>

attention should be paid to noncognitive characteristics that also help society flourish (Heckman, 2013).

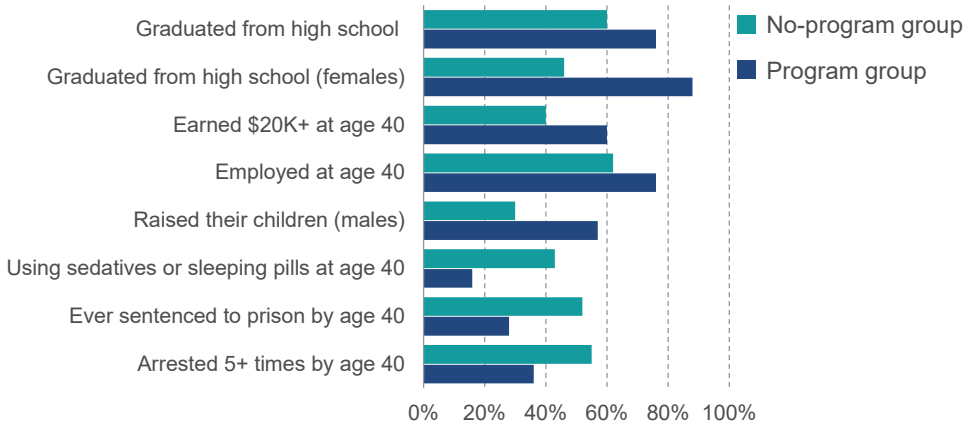
According to Heckman, American society is polarized in terms of skill levels, and this division stems from early childhood experiences. These early experiences are major factors in shaping children's social, emotional, and cognitive skills (Heckman, 2013). An environment that fails to stimulate young children, or one that does not succeed in fostering the aforementioned skills and abilities, puts children at a disadvantage early in life and extends that disadvantage into adulthood (Heckman, 2006). Problematic environments also put children at higher risk of being unskilled, of having low earning ability as adults, and of facing personal and social problems such as poor health or criminality (Heckman, 2013).

Poverty reflects society's failure to provide the resources and environments needed for development of the character skills crucial to children's future success. Investing in development and quality education for disadvantaged young children is likely to dramatically improve their future performance in the education and employment spheres, promote better health, and increase their human potential (Heckman, 2012). In public policy terms, focusing on early childhood would have positive long-term effects on children of low-income families, and would improve their cognitive and socio-emotional skills (Heckman, 2013).

Can quality early childhood education really improve the quality of life of children from low-income families? The Perry Preschool Study, one of the best-known longitudinal studies in the field of education, tracked 123 African-American children ages 3-4 in the state of Michigan, who were living in poverty and at high risk for failing at school. The children who participated in the study, which was conducted between 1962 and 1967, were divided randomly into an experimental group and a control group. The children in the experimental group were enrolled in an educational program at a high-quality preschool, while the control-group children attended no special early childhood program. The study found that those who had received high-quality education in early childhood had higher incomes at age 40, had been involved in fewer crimes, and were more likely to hold high school diplomas and to be employed than those who did not participate in a quality early-childhood program. In other words, quality educational programs for young children living in poverty can help ensure optimal long-term development (Schweinhart, 2005). James Heckman tried to estimate the rate of return to the Perry Preschool Study intervention programs, and found that every dollar invested in the intervention at age 4 yielded a personal return of between 60 and 300 dollars by age 65, with social rates

of return ranging from 7 to 12 dollars. According to Heckman, the rate of return to early childhood investment increases the earlier the intervention starts (birth to age 5), and the more disadvantaged the family (Heckman, Moon, Pinto, Savelyev, and Yavitz, 2010).

**Figure 6. Long-term consequences of participation in the Perry Preschool Study**



Schweinhart, Lawrence J., 2005.

The study by Lessman et al. (cited in Blossfeld, Kulic, and Skopek, 2017) also discusses the success of quality early childhood education policy vis-à-vis disadvantaged children in the Netherlands, with disadvantage defined as low parental education, non-Western background, and first language other than Dutch. It was found that young disadvantaged children (ages 2-6) who attend long-term educational programs close the gap not only in terms of vocabulary, but also in executive functions like selective attention. These findings reinforce Heckman's view that life success requires skills that are not necessarily cognitive. Another study by Barnett and Frede carried out in New Jersey describes a high quality program for early childhood that involved teaching staff upgrades, wage incentives, and the introduction of a challenging curriculum. Achievement gaps in reading, math and general knowledge were reduced by 30 percent after this intervention program (Barnett and Frede, 2010).

According to Blossfeld, Kulic and Skopek (2017), quality preschool for low-SES children may be particularly effective in reducing inequality in cognitive development. Early childhood education policy implemented by both educational institutions and parents has the power to narrow social gaps. Children do not benefit equally from the advantages of quality education, though. A German study found that low-SES children benefit much more from quality education than do high-SES children (Felfe and Lalive, 2013).

## **11. Social policy options for addressing poverty in early childhood**

The argument that inequality of educational achievement in Israel is related to economic inequality and to living in poverty is the central claim of this literature review. Moreover, assuming that a family's socioeconomic status affects the supply of sensory stimulation available in early childhood, it can be assumed that intensive intervention at early ages, when children's brains are particularly malleable, will be substantially more effective than later intervention. The low average scholastic achievements of Israeli children living in poverty and the gaps between children of low and high SES as well as between Israeli children and those in other welfare states indicate that much more extensive and comprehensive intervention on the part of the Israeli welfare system is needed if the effects of poverty on early childhood development are to be addressed more effectively.

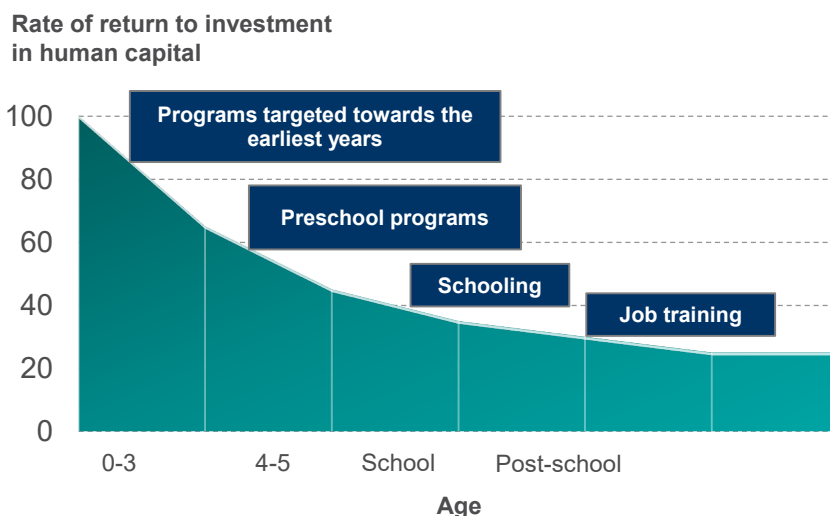
Interventions aimed at mitigating the effects of poverty and inequality on educational attainments in early childhood can conceivably be undertaken in a broad range of areas, among them the labor market, healthcare system, and education system. In this brief report, we focus on three areas that have the most direct impact on the poverty that affects development of scholastic abilities in early childhood. More specifically, the emphasis will be on:

- A. Substantially increasing access to daycare and improving the quality of care;
- B. Comprehensive interventions at the community level, focusing on families living in poverty and young children;
- C. More comprehensive and effective anti-poverty policies, particularly those that are directed at combating poverty among children in low-income families.

## A. Substantially increasing access to daycare and improving the level of care

We noted that economic investment in the early developmental stages and in quality educational programs in early childhood is crucial for proper child development, and may dramatically improve children's future educational, occupational, and health status while also contributing to society as a whole and generating growth and productivity (Heckman, 2008; Lo, Das and Horton, 2017). As shown in Figure 7, educational programs with the highest rates of return are those that target the youngest age group, from birth to age 5. According to Heckman, investment should be focused on the first few years of the child's life. He argues that the most useful investments go to quality early childhood educational programs, particularly those intended for low-income families (Heckman, 2008).

**Figure 7. Returns to a unit dollar invested**



Source: Heckman, James J., 2008

As we have shown in this review, early childhood is a critical life stage at which time the groundwork is laid for the child's development. Quality educational programs for young children may therefore be expected to enrich the home learning environment, especially for low-SES children,



since they are likely to compensate effectively for the cognitive, social, and emotional deficits accumulated by children growing up in needy families. The Perry Preschool Study demonstrated that children from weak socioeconomic backgrounds are the big winners when high-caliber early childhood programs are offered (Schweinhart, 2005). Intervention during the first few years of life can mitigate the disadvantages these children suffer early on, and help them when they start school. As such, quality early childhood education is a policy tool capable of improving child welfare and exerting a positive ongoing impact on children from disadvantaged families (OECD, 2017b).

Studies have also shown that the more time children spend in early childhood programs, the better will be their cognitive performance and non-cognitive development later on. PISA data indicate that children who participated in early childhood programs tend to earn higher scores on reading tests at age 15, and this finding is particularly true of children who spent more than a year in such programs (OECD, 2016). Pupils who attended early childhood programs for three years or more earned, on average, 50 more points on PISA's mathematical and scientific literacy test than did pupils who had spent less than a year in such programs (OECD, 2017b).

Not only is the amount of time spent in early childhood educational frameworks a major factor in terms of later scholastic achievements; the age at which children enter such programs is important as well. It was found that children who enter early childhood programs at younger ages perform better on cognitive tests (OECD, 2017b). Some also maintain that the window of opportunity for the most meaningful degree of intervention is the first three years of the child's life – whether through parenting, support from educational institutions, or good nutrition (Lo, Das and Horton, 2017). Moreover, Sylva (2010) argues that the quality of early childhood education and services provided to this age group are also decisive. That is, increased access to high-quality early childhood programs may contribute more to children's cognitive development than access to lower-quality programs.

Existing data indicate that, despite positive efforts made over the past few years to increase the number of daycare centers and family-based frameworks available to Israeli children ages 0-3, and to increase subsidies for daycare, access is still limited, especially for youngsters whose families are living in poverty. Based on data published by the Ministry of Economy, which until recently was responsible for these frameworks, only 20 percent of children in the relevant age group attend recognized and supervised daycare centers or family daycare. In the Arab Israeli sector, the figure is only 10.6 percent, with most children attending home-based daycare rather

than daycare centers (Fichtelberg-Bermetz and Harris-Olshek, 2013). Since most daycare centers are operated by nongovernmental agencies, most of the public investment is channeled toward creating infrastructures and subsidizing children's enrollment in daycare centers or home-based daycare. Although several committees, most notably the Trajtenberg Committee, recommended major expansion of the daycare system, the data do not suggest any significant change in investment in this system. This has implications for supply, especially in Arab Israeli localities where the supply of daycare centers is particularly limited (Rabinowitz, 2015).

At present, responsibility for, and government supervision of, Israel's early childhood frameworks are in the hands of the Ministry of Health, the Ministry of Education, and the Ministry of Labor, Welfare, and Social Services. Each ministry is responsible for budgeting and service provision in different areas and for different target populations. Thus, Israel has no specific authority that coordinates services provided to young children. Early childhood services are coordinated by local authorities who operate children's daycare centers based on the budgets available to them and on resident needs; but there is no law that obligates the local authorities to establish such centers. Transferring responsibility to the local authorities, whose budgets differ greatly, can lead to inequality in service provision to young children (Rabinowitz, 2013).

With the exception of the children of clients of welfare services, a mothers' participation in work determines eligibility for state subsidies of children's daycare. While the system is relatively progressive, the cost of placing children in daycare centers is high and imposes a heavy burden on families, especially those with many children (Gal and Holler, 2011). Moreover, the system's underlying assumption is that daycare's main purpose is to enable mothers to participate in the labor market (Doron, 2017). Consequently access to daycare is withheld from precisely those children whose mothers are living in poverty and not working, or whose work is temporary or precarious. The outcome is that children often attend unsupervised frameworks, or do not attend daycare at all.

In countries such as Australia and the UK, children's daycare is subsidized through tax credits (Heckman, 2017; Gal and Holler, 2011). The cost of this household expense is reduced through tax credits for working parents of young children, or through deductions for daycare and preschool payments. Policies of this kind are included in the Net Family Plan introduced by the Israeli government in 2017 (Ministry of Finance, 2017). The program increases tax credits enjoyed by middle class families with young children. However, Net Family's impact is much more limited with regard to low-

income working families (that do not reach the tax threshold) and those who do not participate in the labor market.

The quality of daycare has also been inadequately addressed by Israeli government policy (Rabinowitz, 2015). Although a professional committee formulated recommendations and concrete proposals for ensuring the quality of daycare, attempts to regulate daycare quality through the Daycare Supervision Law have failed (Moshel, 2014).

Given the knowledge we possess about early childhood education and its importance in fostering children's cognitive and noncognitive skills, especially for children living in poverty, and given the positive externalities of investment in such frameworks, access to a system of quality education programs for young children seems crucial. Currently the share of young children enrolled in supervised frameworks is low, and the quality of care that they receive is unsatisfactory. As such, consideration should be given to a policy that would substantially increase the supply of ECEC (early childhood education and care) programs and allow easier access to daycare centers for children whose parents do not regularly and continuously participate in the labor market. This would entail much greater investment in the construction of daycare centers, eligibility conditions would have to be changed, subsidy levels would have to rise, statutory guidelines would have to be issued regarding caregiver training and staff-child ratios, and regulation of the sector would have to be strengthened. Clearly there would have to be special emphasis on developing a system of daycare centers to serve the Arab Israeli population.

## **B. Comprehensive interventions at the community level, focused on families with young children living in poverty**

To a large degree, parents determine their children's life course. Good and supportive parenting in early childhood provides children with learning opportunities, a safe, loving, and supportive environment, and the experiences and stimulation needed for optimal development. Poverty and distress can make it hard for parents to provide their children the best possible developmental environment. These kinds of difficulties, especially in early childhood when the brain develops most rapidly, can disrupt the process by which brain architecture is shaped, and cause long-term damage (UNICEF, 2017).

Since parental skills and behaviors have a great impact on child development, special programs can potentially help low-SES parents overcome the challenges of poverty. One such program is Noshmim Lirvacha

B'Mercaz Otzma Murchav<sup>18</sup> — a program that serves 3,500 families around the country. Noshmim Lirvacha, which is operated in the community by local social workers and other social service department professionals, directly and holistically addresses the diverse needs of these families. The program provides comprehensive individual and family interventions to parents and children, and is intended to help parents enter the labor force, take-up their rights, manage the family budget more effectively, and overcome debt. The program also addresses access to housing and healthcare services. Noshmim Lirvacha and other recently-launched programs are based on the broader approach of “poverty-aware social work” (Saar-Heiman, Lavie-Ajayi, and Krumer-Nevo, 2017), which advocate intensive and participatory work with service users and are supported by the Ministry of Labor, Welfare, and Social Services, the National Insurance Institute, and NGOs such as JDC-Israel, the Be-Atzmi organization, and the International Fellowship of Christians and Jews (Gal and Madhala-Brik, 2016).

While Noshmim Lirvacha provides comprehensive assistance to families with children, other community level programs concentrate specifically on early childhood. Examples are Hatchala Tova (“Good Beginning”) and the Etgar (“Challenge”) early childhood program that was launched in Israel and later adopted by other countries (the program is also known as HIPPY — Home Instruction for Parents of Preschool Youngsters) as well as the Program 360°, a national program for children and youth at risk, intended to reduce the number of children and youth at risk in Israel. These programs emerged in the framework of state initiatives to extricate young children from poverty. For example, Etgar serves over 3,000 at-risk families living in Israel, and encourages mothers and fathers to play an active role in their children’s education and their cognitive, emotional, and social development, thereby promoting their readiness for primary school.

Despite the importance of these programs in improving the quality of life of families and children living in poverty, the number of families actually served, and the workload borne by the participating social workers and other professionals, severely limit the programs’ contribution. Clearly, focused and intensive intervention with families living in poverty and their young children is impossible without a major expansion of community level programs of this type.

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18 Literally, “A Breath of Relief.” A joint program of Ashalim, the Ministry of Labor, Welfare, and Social Services, Keren Rashi, and the local authority administration to offer intensive, short-term psycho-social assistance to families in poverty and distress.

### C. A comprehensive and effective approach to addressing poverty

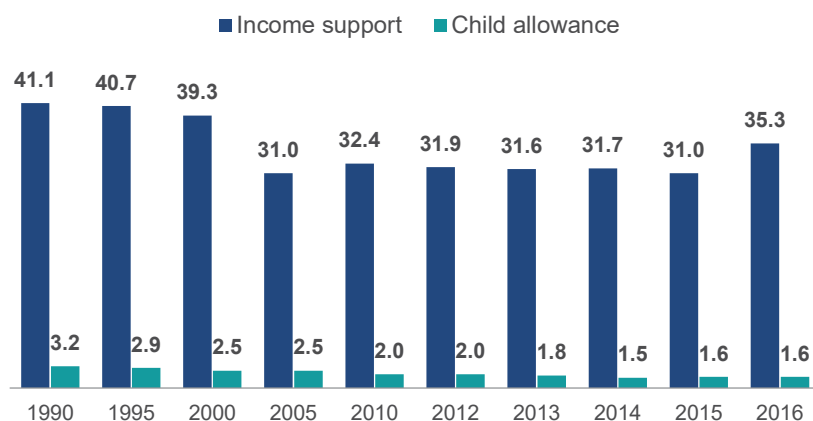
Efforts to address the difficulties faced by young children in poor families cannot be based solely on community programs or an expanded system of educational frameworks. Rather, there is a need to address the broader phenomenon of poverty. Israel's poverty levels, especially among children, indicate that the overall incidence of poverty has remained stagnant at an exceptionally high level, over a lengthy period of time. One way to mitigate the negative impact of poverty on children's scholastic development is direct intervention to curb the prevalence of child poverty or, at the very least, to affect the depth of poverty (that is, to raise living standards in order to narrow the distance between poor families from the poverty line). While efforts by the Israeli welfare state to address poverty through a social welfare system of benefits and taxes have succeeded in narrowing the incidence of poverty, it has served to extricate only a third of families and 13.6 percent of children living below the poverty line (National Insurance Institute, 2017).

Efforts of this kind require a close look at the program's unintended consequences, especially those resulting from changes in incentives. For example, raising allowances may lower the incentive to work, or increase the incentive to work solely in the black market. Every measure considered in the war on poverty should, therefore, reflect consideration of its anticipated impact on the labor market.

The establishment in 2014 of the Committee for the War Against Poverty, headed by Eli Elalouf, drew public attention to the problem of poverty, and the Committee produced a series of recommendations for addressing the phenomenon. Many of the recommendations focused on families with children (Committee for the War Against Poverty in Israel, 2014). The Elalouf Committee's stated goal was to reduce poverty in Israel to the mean level in other OECD welfare countries within a decade. A Taub Center follow-up on the Committee recommendations shows that half of the committee's recommendations had been implemented by 2017, and only a third (31 percent) of the cost of the recommendations had been included in the state budget for that year (Gal and Madhala, 2017). Some of the Elalouf Committee recommendations are relevant to this report, in particular those that relate to raising the level of social assistance for families with children, increasing child allowances, expanding the work grant, boosting programs that address poverty at the community level, and increasing the number of daycare centers. To date, these recommendations have been implemented only partially, or not at all (Gal and Madhala, 2017).

Social assistance programs provide a final safety net for families with no or very low income. These programs are critical for improving the quality of life of Israel's neediest populations. Following serious cutbacks in benefits and tightening of eligibility criteria for benefits from 2002 to 2003, especially those benefits for families with children, the number of benefit recipients declined drastically (Figure 8). As such, the maximum level of the income support for a family with children is currently 40 percent of what is defined as the poverty line. Moreover, National Insurance Institute data suggest that from one-third to one-half of eligible families do not take-up this benefit for a variety of reasons. While the income support benefit is not intended to raise its recipients above the poverty line, an adequate benefit would enable families with children living in poverty to substantially improve their quality of life (Committee for the War Against Poverty in Israel, 2014).

**Figure 8. Family income support and child allowances as a percentage of the average wage**



Source: John Gal and Shavit Madhala, Taub Center | Data: NII, *Statistical Quarterly*

Another major and particularly effective social security program for dealing with poverty discussed by the Elalouf Committee is child allowance benefits. As the figure shows, these benefits were also slashed during the early 2000s, especially for large families. Although the benefits have increased somewhat in recent years, the fact that the cash benefit provided is still very low limits its effectiveness in improving the quality of life of

families living in poverty (Wasserstein, 2016). It is worth noting that one apparent consequence of the cuts in child allowances was that it contributed to increased labor market participation, in particular among Haredim. An effort should be made to determine whether increasing the allowances would undo these achievements.

The Israeli child allowance is paid for children from birth to age 18, and the amount remains fixed throughout. Assuming that a special effort is needed to improve the quality of life of young children belonging to poor families, consideration should be given to adopting the child allowance model implemented in other welfare states (Denmark, Norway, and Portugal). In these countries a larger allowance is paid to families with young children (Wasserstein, 2016). This addition takes into account both the high cost of childcare for this age group, and the assumption that young children tend to belong to young families, whose resources are more limited.

The work grant, which is based on the negative income tax concept, is intended to boost the income of families with children, where one or both parents are in the work force but their income remains low. This program was first instituted in Israel in 2008. It is an effective tool for encouraging labor market participation and raising the income of the “working poor.” However, the work grant’s efficacy in Israel is limited, both because of its level and because of relatively low take-up. Data from the Israel Tax Authority, which is responsible for administering the work grant, indicate that only 70 percent of those eligible receive the grant and that the maximum amount that a family can receive is NIS 3,500 (Israel Tax Authority, 2016). Steps are now being taken to enlarge the eligible population and to make the work grant more generous as part of the Net Family Plan, with an increase expected in 2018.

If the Israeli welfare state is to address poverty among families with young children, a major effort to address these needs has to be made through the social security system. This means bolstering the income of families, thereby relieving the early sources of stress for children in these families. Policy options in which cash benefits are used to reduce the incidence of poverty can include an increase in income security benefit, or improved take-up of the benefit. The Elalouf Committee recommendation was that the level of social benefits should not fall below two-thirds of the poverty line. Another possibility is to increase universal child allowances, or increase it specifically for families with young children. Steps should be taken to ensure that these measures do not encourage people to leave the labor force. Finally, consideration should be given to measures that improve working families’ access to the work grant, so that the grant actually constitutes a substantial addition to the family income.

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