

Living in poverty can put children at risk for health and behavioral problems, but could disadvantage actually affect brain development? Emerging evidence suggests that living in poverty may indeed alter how the brain grows, which may have implications for a child's life chances through adulthood.

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This Is the Brain

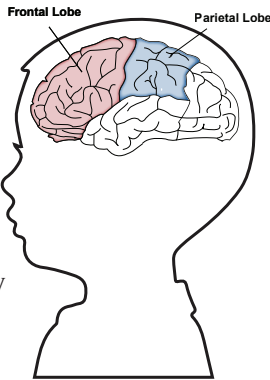
Frontal Lobe: the brain's control center that manages other cognitive functions. These "executive functions" include processes for planning, organizing, problem solving, paying attention, and impulse control.

Parietal Lobe: processes sensory information. It is important for interpreting and understanding sensory stimulation and aspects of visual attention.

Hippocampus: central to learning, memory, and stress response.

Amygdala: processes emotional and social information.

Gray Matter: one of two major tissue types in the brain (the other is white matter). It is key for processing information and executing actions—it makes the brain "fire."



This Is the Brain on Poverty

Recent studies analyzing the MRI brain scans over the course of children's lives have shown that children from poor and near-poor households have significantly lower average overall frontal and parietal lobe volumes of gray matter than children from wealthier families. These studies also showed lowered gray matter growth over the first three years of life, despite newborns having roughly equal volumes across income groups. (See Figure 1.)

These findings suggest that while children start their lives with similar levels of gray matter, those from lower income households develop significantly lower gray matter volume in their early years than children from higher income households in their early years.

Researchers have also found that low familial socioeconomic status and other early life stresses (e.g., physical abuse, neglect) are associated with smaller hippocampus and amygdala volumes in children.

Why Does it Matter?

Lower gray matter volume in the frontal and parietal lobes may impede children's ability to learn and affect school readiness even before children enter kindergarten. Further, smaller hippocampus and amygdala volumes may further inhibit a child's ability to learn and their ability to function socially. Differences in the volume of these structures are associated with behavioral problems in children.

The presented research provides strong evidence that lower family SES is associated with child brain development, although it is unclear which factors are the most important to consider and whether the associations are causal.

Who Is at Risk? U.S. and WI

More than 14.5 million children—just under 1 in 5—were in poverty in the United States in 2013. That's over two-and-a-half times the size of the entire population of Wisconsin. In Wisconsin, 241,108 (18%) of children were in poverty in 2013. That's nearly identical to the entire population of the state capital, Madison.

The Brain's Growth

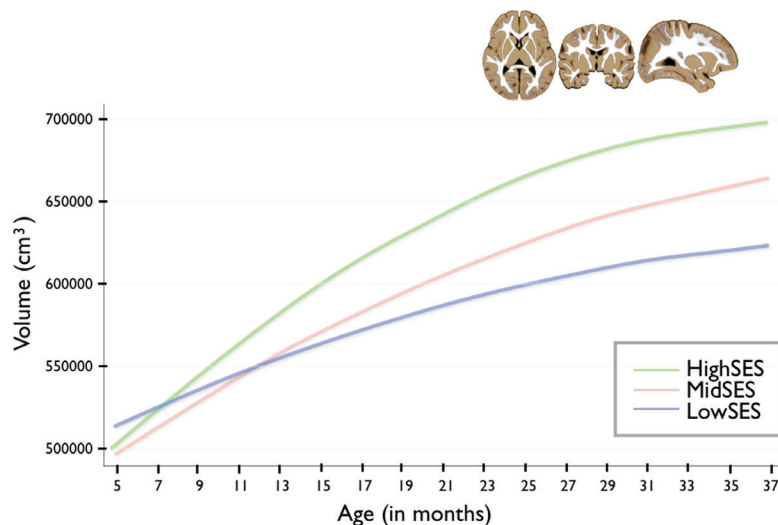
The brain grows fastest in the first four years of a child's life and gray matter accounts for most of this growth.

The frontal and parietal lobes are among the last parts of the brain to develop and they continue to develop throughout childhood. This prolonged period of growth makes them particularly vulnerable to environmental stress factors.

"Poverty seems to be putting children's brains on a different trajectory of development. It's slowing the development of the brains of infants living in poverty."

—Dr. Seth Pollak

Figure 1. Total Gray Matter Growth in the First 3 Years of Life, by SES



Note: SES = socioeconomic status.

Source: Hanson et al. 2013.

The Full Burden of Childhood Poverty

Children who are poor often experience a cluster of disadvantaging circumstances, including frequent and repeated environmental stress factors. As such, there are many possible explanations for how poverty and related experiences may affect brain development; major theories are described below.

Less Cognitive Stimulation

Children living in poverty often experience less cognitive stimulation than their more affluent peers. They often have less access to home learning resources, books, and computers and smaller designated play spaces. Low-income parents often engage in fewer literary learning opportunities (e.g., reading aloud or visiting the library). Further, studies have shown that parents from low-SES tend to speak less often, use less complex words, and speak in a less encouraging way to their children than parents in higher-SES families.

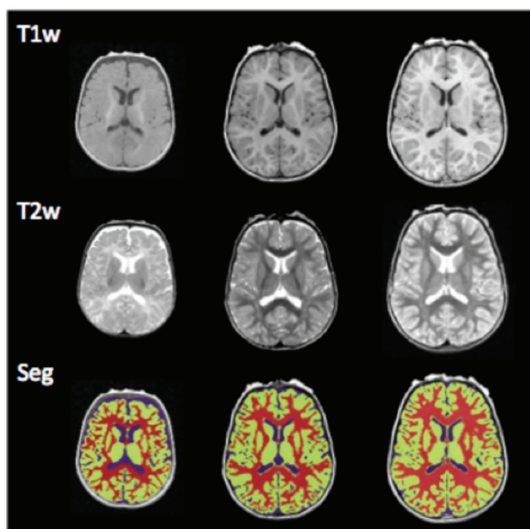
Stressful and Unsafe Living Conditions

Impoverished households and neighborhoods often have many environmental stressors, which can adversely affect a child's development. Low-income households may be more crowded and noisier. Further, poor children are often exposed to more neighborhood crime and violence contributing to stress among parents and children. Children from low-income families are also often exposed to more polluted water and air and carry a heavier burden of toxins (e.g., lead) than their more affluent peers. Exposure to harmful agents may also have implications for development.

Harsh Parenting and Family Instability

Parenting also plays a large role in child development. Beyond receiving less cognitive stimulation, children from low-income families also are often exposed to harsher and less responsive parenting than children from better-off families. In addition, children from low-income families are more likely to be exposed to family turmoil, domestic violence, and conflict than their wealthier peers.

Figure 2. MRI Brain Scans, Birth to Age 4



This figure shows views of a typical child's brain scanned at birth (first column), age 2 (second column), and age 4 (third column). The MRI brain scans (T1w and T2w) show the tremendous brain growth that occurs in first four years of life and the last row shows the relative growth of gray matter (green) and white matter (red) during the same time period. Researchers believe that the protracted development of the brain and the relatively large amount of gray matter growth in the first four years of life make the brain particularly sensitive to external stimulation in early childhood.

Source: Hanson et al. 2013.

Which Policies Work to Counter Poverty's Negative Effects on Children?

While evidence suggests that poverty is associated with brain development, further research is needed to understand to what extent the associations are causal and the exact causal pathways between poverty (or related factors) and brain development. Even without such an understanding, a large body of research suggests that the following three policies have been effective at countering the negative effects of disadvantage on children:

Income Supports

Income support policies for families with children can reduce hardship and increase parents' investments of resources in their children. There is evidence to show that increasing family income through policies such as the Earned Income Tax Credit can lead to a child's increased achievement in school. This suggests that policies that increase the income of low-income families with children (e.g., a fully refundable child tax credit, increased minimum wage) would benefit children. Researchers have also argued that targeting income support towards families with young children would be a cost-effective policy option.

High-Quality Preschool

Given that disparities in cognitive and behavioral development emerge in early childhood, it is not surprising that enriching early education programs for three- and four-year-olds have been shown to be both cost-effective and improve short- and long-run outcomes for children. For instance, the High Scope Perry Program was shown to increase long-term school attainment and adult earnings and to reduce both crime and adult poverty. There is strong evidence that the initial investment in these programs is cost-effective due to societal savings (e.g., from less crime) in the long run.

Nurse Home Visitation

Intensive nurse visitation programs for low-income mothers of newborns and young children have been shown to lower levels of abuse and neglect and to improve children's outcomes even into adolescence. For instance, in programs like the Nurse Family Partnership program nurses conduct regular visits to low-income mothers starting during pregnancy through the first couple years of life, and teach mothers about healthy behaviors, parenting skills, and long-term planning strategies for the purpose of improving health and development outcomes for children.

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