



Early Stress Gets under the Skin: Promising Initiatives to Help Children Facing Chronic Adversity

Ross A. Thompson and Ron Haskins

Many children experience adversity in the form of poverty, abuse or neglect, homelessness, or other conditions that make them vulnerable to the damaging effects of chronic stress. New research reveals that chronic stress alters their rapidly developing biological systems in ways that undermine their ability to succeed in school and in life. The good news is that we have strong evidence for programs and approaches that policy makers could use to help these children overcome the effects of stress. Home visitation and early childhood health care can give parents much-needed support and guidance. Economic aid for low-income families can alleviate the grinding financial stress that many families face. And high-quality child care can offer a safe, warm, and predictable environment amid otherwise chaotic lives.

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To read the full report on two-generation mechanisms, go to www.futureofchildren.org.

Everyone wants children to get a good start in life. But for a surprising number of young children, the effects of chronic adversity undermine their chances. This brief profiles new research on the biological and behavioral effects of early adversity, examines adversity's prevalence in children, and highlights promising interventions to mitigate chronic stress and its effects.

Growing up can be especially difficult for children who live in poor or low-income families, who are homeless, who regularly witness marital conflict or domestic violence, who are in foster care, who are abused or neglected, whose mothers are depressed, or who have chaotic and unpredictable lives. Young children depend on adults to care for them, and they become fearful and anxious when adults victimize them or cannot protect or support them. Research is revealing, moreover, that in addition to its social and emotional consequences, stress produced by extreme

early environments also undermines children biologically. Chronic stress changes how their nervous system manages adversity and how their immune system resists infection. Chronic stress even impairs brain areas that affect attention, memory, and thinking. Early chronic stress has biological consequences that can produce long-term physical and mental health problems during the rest of childhood and into adulthood.

Many young children live with stress of this kind. In 2012, more than six million, or 22 percent, of US children under age six lived in poverty—the highest proportion of any age group. About half of all children under age six live in low-income families (those whose income is less than 200 percent of the poverty line). Nearly 120,000 children under age six entered foster care in 2012, with the highest proportion of them under age one. Children one year old and younger account for 13 percent of substantiated abuse or neglect cases, and children under age six account for nearly half of all cases. In 2010, more than half the children living with their families in homeless shelters were under age six. More than one infant in 10 will experience her mother's major depression in the first year. Many children experience more than one of these adversities. Although not all of these children will suffer the long-term consequences of chronic stress, all are at increased risk of developmental problems.

Those who seek to understand what causes the intergenerational transmission of poverty and the surprisingly low level of upward mobility in the United States have usually focused on family influences and socioeconomic forces. Now we must add to this list the biological effects of stress associated with poverty and disadvantage, which can undermine the capacities that children need to succeed. That's the bad news. The good news is that efforts to reduce stress and provide support to young children, sometimes through two-generation interventions, can reverse these biological effects and the behaviors associated with them.

The Problem

Young children are stressed when they are physically harmed or emotionally traumatized. But even when children are protected from physical harm, stress can arise from chaos and unpredictability in their living

conditions, the unreliability of emotional support from parents, or fear of danger or abandonment.

Consider families living in poverty as an example. Studies show that parents' depression and anxiety about financial problems increase their punitiveness, unresponsiveness, and harshness toward their children; in two-parent families, they are more likely to have marital conflict. These children are more likely to be exposed to violence in their homes and neighborhoods. Child-care arrangements for younger children are likely to be inconsistent and of low quality, especially if parents work nonstandard hours. Older children's schools are also likely to be poor and in dangerous neighborhoods. Because poverty contributes to housing instability, poor children are likely to move more frequently to crowded homes and new neighborhoods, and they must make many transitions to new relationships and different child-care and school arrangements. Because of poor housing and neighborhood conditions and limited health care, these children are likely to be in poorer health, with more short-term infectious illnesses and chronic conditions such as asthma. In rural settings, where poverty rates are higher, key services are less accessible, and parents often work nonstandard hours, children's lives are likely to be even more disorganized, unstable, and unpredictable.

Poverty presents children with multiple, compounding sources of stress in and outside the home. Their parents, beset by the same circumstances, often can provide little relief or support. These multiple sources of stress help to explain why socioeconomic status is such a significant predictor of adult physical and mental health, as well as education, income, and longevity. The timing of poverty is also important. Poverty in early childhood has more significant consequences for adult wellbeing than does poverty later in life. And the longer poverty endures during childhood, the worse adult outcomes are likely to be.

One reason these poor outcomes occur is that the stress associated with poverty and associated conditions gets under the skin—it becomes biologically embedded in the physical systems that develop so rapidly in the early years. In much the same way that the brain is shaped by experiences early in life, whether positive or negative, we now know that early experiences shape other biological systems as well. These

biological effects begin even before birth. Mothers who are malnourished during pregnancy give birth to newborns with lower birth weight, lower metabolism, and compromised long-term health. A mother's chronic stress during pregnancy also has significant effects on fetal development that are manifested in her baby's heightened physiological reactions to moderate challenges. This "fetal programming" can have enduring consequences because of the multiple biological systems it affects.

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A similar process occurs after birth. Young children who experience chronic adversity quickly show dysregulation in the functioning of stress hormones such as cortisol. In one study of children in poverty, for example, poor housing quality, financial problems, and poor parenting were associated with elevated cortisol levels, beginning at seven months and continuing into early childhood. In another study, toddlers living in homes where they experienced domestic violence and mothers who were emotionally unavailable to them also showed a compromised stress response. Children who live with chronic stress also show elevated blood pressure and heart rate, together with greater inflammation, which reflects compromised immune function.

Stressful events activate multiple biological systems, and thus chronic stress influences many aspects of physiological functioning. Stress hormones such as cortisol have widespread effects throughout the brain, altering immune function and nervous system reactivity. Cortisol affects brain structures such as the hippocampus (which influences the creation of memories from current experience), the hypothalamus and amygdala (which are involved in motivational processes, including emotion), and the prefrontal cortex

(which is involved in self-regulation). When children experience chronic, persistent stress, the compounding effects contribute to physiological "wear and tear" that undermines the functioning of each system.

We have increasing evidence that chronic stress produces these physiological effects partly because it affects gene expression. Research shows that genes can be activated or deactivated without altering the structure of DNA, and that early experiences can influence whether genes are expressed in a person's behavior. As an illustration of how this can occur, one research group reported that mothers' depression during pregnancy was associated with heightened cortisol levels in three-month-old infants who were performing a moderately challenging procedure. The heightened cortisol level was associated with decreases in the expression of the infants' glucocorticoid receptor gene. Such changes in gene expression help to account for the enduring influence of early stressful experience.

These biological impacts have behavioral consequences. Many young children who have experienced persistent threat and adversity become hypervigilant to signs of danger and, when threatened, respond quickly and with strong emotion in self-defense. This reaction is consistent with the effects of chronic stress on heightening cortisol response and the effects of stress hormones on brain regions affecting emotion and motivation. Young children experiencing chronic stress also have poorer impulse control, more difficulty focusing their attention and thinking, and more trouble controlling their emotions, consistent with the effects of stress hormones on the prefrontal cortex and related brain areas.

Children from poorer families also show other cognitive deficits, including problems with working memory and language; the neurobiological bases for these deficits have been confirmed by brain imaging. One research group measured brain volume in critical areas (including the hippocampus and amygdala) in school-age children and reported that volume was lower among the poorest children. Stressful life events and hostile parenting in early childhood helped to account for this association.

The association among stress, biological development, and behavior casts a new light on the

characteristics of children who live in poverty and disadvantage. Their academic underachievement is associated with poorer cognitive stimulation at home, but it also seems to be related to the effects of stress on their developing brain functions and on memory, learning, language, and focused attention. The reason some children have trouble paying attention in the classroom, remembering and following instructions, and focusing their thinking has more to do with the neurobiological effects of stress hormones than with their unwillingness to do what the teacher says. The behavioral problems that children in stressful circumstances also commonly exhibit may have similar roots in the biological effects of chronic adversity. When these children get into conflict with peers or adults at school, for example, their overreaction may reflect the threat vigilance that they developed in a home or neighborhood where they genuinely feel in danger.

Promising Avenues and Recommendations

Children in foster care, children who are maltreated, children who often witness family violence, and children who experience serious adversity in other ways need help. A collection of intervention programs can improve their chances for healthy development and reduce the long-term problems that arise from early stress.

First, the fact that early adversity becomes biologically embedded does not necessarily mean that its effects are permanent. Young children's rapid development in the early years means that biological systems remain open to change, and interventions that take biological processes into account can produce positive change among children in difficult circumstances. Two studies show how this is true for young children in foster care. In one case, Phil Fisher and his colleagues at the University of Oregon designed a six- to 12-month intervention to ease preschool children's transitions to new foster care placements by promoting responsive relationships with the new foster parents, providing services tailored to the children's needs, and reducing the foster parents' stress through daily phone support. In the other, Mary Dozier at the University of Delaware developed a 10-week program for infants and toddlers that focused on helping foster parents better respond to infants' needs and communications, enhance their affectionate behavior, and support children's self-regulation. Each program succeeded in normalizing

the dysregulated patterns of cortisol reactivity that children showed when they entered. Children's behavior also improved; for example, they developed more supportive attachments to their foster parents.

The program designers' decision to focus on improving relational support for children, reducing stress for adults, and addressing children's specific needs (such as self-regulatory problems) is backed by research on the social buffering of stress reactivity, which shows that supportive relationships with adults can help children better cope with adverse circumstances, both physiologically and psychologically. In a study by Leah Hibell and her colleagues of rural families living in poverty, for example, toddlers' chronic exposure to domestic violence was associated with heightened cortisol reactivity at age two. But this heightened reactivity was diminished in children whose mothers were observed to respond sensitively to their children's needs. Maternal sensitivity helped to buffer the effects of family violence on children's stress reactivity.

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Relational support from adults outside the family can also reduce children's stress, and such support is a component of programs for children in adverse circumstances, such as those who have been abused. Unfortunately, such programs are not readily available in either the foster care system or the child

protection system. States should devote resources to enhancing such services for young children whose adverse life experiences threaten their long-term physical and mental health. In circumstances of abuse or domestic violence, these services will often occur in an out-of-home setting, where, besides relational support, children should experience a safe and predictable environment in which threat vigilance can be minimized and more constructive social and emotional competencies can be enhanced. Children need early intervention of this kind before their biological and behavioral problems become consolidated.

State and federal policy should also strengthen preventive efforts to help young children whose families are at risk of experiencing overwhelming adversity. In light of what we've learned about brain development and other biological systems in children's early years, these efforts should begin early. One area to target is health screening and primary care. The Obama administration's initiative to support evidence-based home-visitation programs is a good start, especially when these programs begin during pregnancy, because a mother's nutrition, health practices, stress, and use of alcohol, drugs, and tobacco can significantly affect fetal development. Home visitation that continues through early childhood, moreover, can support positive family practices that help young children by emphasizing responsive parent-child relationships; positive, noncoercive parenting practices; and activities such as reading and conversation. Congress should continue to fund the Obama home-visiting initiative, which now costs about \$400 million per year.

But the reach of home-visitation programs is limited, even when they target young families at the greatest risk. The pediatric health community should also take up the challenge of helping to ensure that all young families, especially those in difficulty, establish a primary source of care, or what health professionals call a medical home, in which health and behavioral screening can occur. In pediatric exams, screening for health, nutrition, vision, and hearing problems should be complemented by attention to behavioral and emotional problems that may indicate that a child is experiencing significant stress.

Because poverty brings significant stress for young children and their parents, another target for these efforts is the financial difficulty that so many young

families face. In the issue of *Future of Children* that accompanies this brief, Greg Duncan and his colleagues document substantial research evidence to show that enhancing family income can improve children's wellbeing, especially if the support occurs in early childhood. For example, Lia Fernald and Megan Gunnar studied a conditional cash-transfer antipoverty program in Mexico in which families were paid if they complied with requirements for preventive health care and immunization, nutrition monitoring and supplementation, and health education. After three and a half years of participation, preschool children showed lower cortisol levels, and children of depressed mothers showed the greatest benefit.

Expanding the Earned Income Tax Credit, increasing the Child Tax Credit, continuing to support the Supplemental Nutrition Assistance Program, and raising the minimum wage would significantly ease the financial stress on families with young children. In a recent study that followed participants over time, researchers reported that children who grew up in families with access to food stamps had better health as adults, especially when food stamp eligibility began prenatally. Economic assistance to families who face financial difficulty helps their young children's development.

In addition to health care and income, a third target for these efforts is improving access to high-quality child care. Early childhood educators have long known that the greatest benefits of high-quality early education accrue to children at the greatest disadvantage who have the farthest to go to catch up. Research on the effects of early adversity suggest that one reason for these benefits is that in high-quality programs, young children who are experiencing stress get access to warm, responsive, child-centered teachers who provide a safe, predictable environment. Moreover, high-quality programs are likely to devote attention to these children's other needs, such as their self-regulatory problems. As one illustration, the Chicago School Readiness Project developed by Cybele Raver and her colleagues gave Head Start teachers specialized training in classroom procedures to promote young children's self-regulatory behavior. By the end of the school year, these children showed fewer disruptive and impulsive behaviors, and their cognitive performance improved.

More typically, however, children who live in adversity attend poor-quality child care and school programs staffed by teachers who are themselves stressed by low income and difficult living circumstances. Rather than contributing to children's coping, these settings exacerbate the stresses of home and neighborhood. The nation must face the challenge of recruiting, training, and supporting early childhood and primary-grade educators who have the skills to work with children in adversity—children who face the greatest risks to their long-term development and have the most to gain from high-quality care and education.

It would be best if high-quality programs like these were universally available to young children and their families, perhaps on a sliding-fee pay scale. If not, how do we identify children experiencing the greatest stress, who thus have the greatest need? Pediatricians, care providers, educators, and other practitioners should look for the behavioral signs of stress in young children—not just self-regulatory problems, emotional outbursts, and acting out, but also withdrawal, peer problems, and other characteristics. The science of early childhood development is

beginning to understand these behavioral attributes of early stress and how they change with development, but we know enough to incorporate attention to behavioral signs of stress into pediatric, early child care, and education programs. With time, we may also be able to make greater use of biomarkers such as cortisol levels.

The fact that adversity is biologically embedded in the bodies of very young children is another reminder that the rapidly developing brain and biological systems are vulnerable in the early years. Policies and programs like those we recommend here would reduce this vulnerability and could help seriously disadvantaged young children achieve a decent start in life. Research shows that improved versions of high-quality preschool programs and home-visiting programs are the types of two-generation interventions that hold the most promise. The key to making these interventions work for seriously disadvantaged children will be finding ways to train and pay for professionals who can provide sensitive caregiving themselves or teach parents and foster parents how to respond more sensitively to these children's needs.

Additional Reading

Clancy Blair and C. Cybele Raver. "Child Development in the Context of Adversity: Experiential Canalization of Brain and Behavior." *American Psychologist* 67 (2012): 309–18.

Mary Dozier et al. "Effects of an Attachment-Based Intervention on the Cortisol Production of Infants and Toddlers in Foster Care." *Development and Psychopathology* 20 (2008): 845–59.

Gary W. Evans and Pilyoung Kim. "Childhood Poverty, Chronic Stress, Self-Regulation, and Coping." *Child Development Perspectives* 7 (2013): 43–48.

Lia Fernald and Megan R. Gunnar. "Poverty-Alleviation Program Participation and Salivary Cortisol in Very Low-Income Children." *Social Science & Medicine* 68 (2009): 2180–89.

Phillip A. Fisher, Mark J. Van Ryzin, and Megan R. Gunnar. "Mitigating HPA Axis Dysregulation Associated with Placement Changes in Foster Care." *Psychoneuroendocrinology* 36 (2011): 531–39.

Daniel A. Hackman and Martha J. Farah. "Socioeconomic Status and the Developing Brain." *Trends in Cognitive Sciences* 13 (2009): 65–73.

Leah C. Hibbel et al. "Maternal Sensitivity Buffers the Adrenocortical Implications of Intimate Partner Violence Exposure during Early Childhood." *Development and Psychopathology* 23 (2011): 689–701.

Sonia J. Lupien et al. "Effects of Stress throughout the Lifespan on the Brain, Behavior, and Cognition." *Nature Reviews Neuroscience* 10 (2009): 434–45.

Gregory E. Miller, Edith Chen, and Karen J. Parker. "Psychological Stress in Childhood and Susceptibility to the Chronic Diseases of Aging: Moving Toward a Model of Behavioral and Biological Mechanisms." *Psychological Bulletin* 137 (2011): 959–97.

Cybele C. Raver et al. "CSRP's Impact on Low-Income Preschoolers' Preacademic Skills: Self-Regulation as a Mediating Mechanism." *Child Development* 82 (2011): 362–78.

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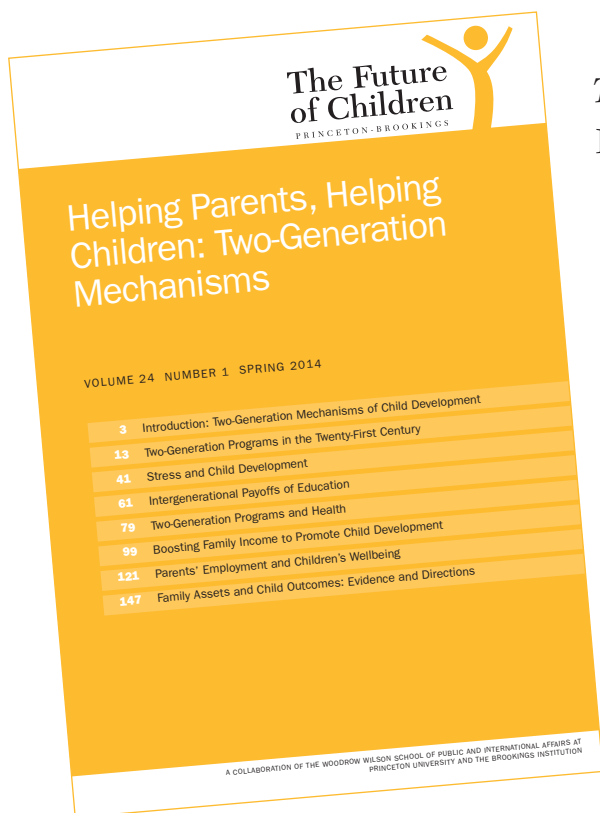
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