Item 6

*Expert Panel on Trauma Informed Care*
First 5 LA’s next strategic plan will bring greater focus and clarity to the organization’s role and impact on the lives of LA County’s children 0-5 and their families. To date, the Commission has made a number of important policy decisions that inform the final strategic plan to be approved in November, 2014.

At the June 30, 2014, Strategic Plan Commission Retreat, the Board approved a priority health-related outcome and related focus area that emphasizes trauma-informed care for children 0-5 and their families. In order to develop a body of work that is responsive to the Commission’s priority to build provider capacity to provide trauma-informed care, staff has engaged a number of experts in this field who can speak to what is currently known about this topic and its effects on children, families, and the communities in which they live including what this means for creating trauma informed systems of care. This information, along with a review of current literature, is helping to inform the emerging programmatic strategies staff is presenting to Commissioners for discussion.

Staff is interested in sharing some of the current thinking on this topic with Commissioners to provide insight into the essential elements of trauma-informed care and how this work is applied in a clinical environment as well as through policy, professional development and practice change. The panel of experts include:

- Leslie Anne Ross, PsyD, Vice President, Leadership Center, Children’s Institute, Inc.
- Elisa Nicholas, MD, MSPH, Chief Executive Officer, The Children’s Clinic
- Sam Chan, Ph.D., District Chief, L.A. County Department of Mental Health

Each of these speakers bios accompany this cover memo along with sample articles of related research, which has informed staff learning. These articles are for Commissioners to peruse in advance of the panel discussion.
Informing First 5 LA Systems Change Efforts: Trauma, Stress and Chronic Adversity in Early Childhood

First 5 LA’s emerging framework for impact for the 2015-2020 strategic plan focuses on ensuring that all children ages 0-5 reach their maximum potential in three key areas of development: physical health, social-emotional health, and cognitive development and are able to enter kindergarten ready to succeed in school and life.

To accomplish these goals, it is critical that First 5 LA’s efforts identify and strengthen those factors that are known to promote healthy child development. It is equally important to identify and limit the influence of those factors that are known to impede healthy child development. One of the most pervasive and damaging of these negative influences is the impact of trauma and chronic adversity. Children who experience trauma such as abuse, neglect, loss, terrorism and disasters or chronic adversity such as persistent poverty, community and family violence, homelessness, parental substance abuse, maternal depression often are at high risk of experiencing “toxic stress” (Shonkoff et al., 2011).

**Toxic Stress and Child Outcomes**

Toxic stress can result when a child’s stress response systems are activated and stay activated for prolonged periods of time and the child is without the buffering protection of a supportive adult relationship (Shonkoff et al., 2011). Prolonged exposure to stress and stress hormones can not only affect a child’s immune system, making them more vulnerable to both acute and chronic illness, but can have long term effects on the structure and functioning of the child’s developing brain (Thompson, 2014). These neurobiological changes, in turn, can impact a child’s ability to control their impulses and emotions, to stay focused and pay attention, and to respond appropriately in social situations (Shonkoff et al., 2011). These behavioral and cognitive impairments prevent many of these children from reaching their full potential and from being successful in school and life. There is a growing body of research that links toxic stress to a host of negative long-term outcomes including substance abuse, diabetes, cardiovascular disease as well as school failure and economic hardship (American Academy of Pediatrics Committee on Psychosocial Aspects of Child and Family Health et al., 2011).

While the impact of trauma, chronic adversity and stress can be profound and can have lifelong negative implications, the same biological and behavioral plasticity that makes young children vulnerable to the negative effects of trauma and chronic adversity also make them more open to the positive effects of nurturing relationships. The research on stress and resilience demonstrates that a positive and secure attachment with at least one caring adult can serve a protective function for children and can actually buffer the negative impact of toxic stress on the child’s developing brain (Werner, 2000). This recognition of the fundamental importance of safe, loving and nurturing relationships is the foundation of First 5 LA’s 2015-2020 strategic plan.

**Trauma-Informed Systems**

In addition to child and family level outcomes, First 5 LA has identified systems change as essential to achieve ultimate impact on children’s ability to enter kindergarten ready to succeed in school and life. First 5 LA’s definition of systems change is “intentional efforts to transform the existing structure, function, and culture within and across organizations and communities by shifting policies and practices; resource allocations; relational structures; and norms, values, skills
and attitudes to create the conditions for sustainable improvements in outcomes.” There is a movement across many systems including mental health, substance abuse, housing and homelessness, child welfare, criminal justice and education to shift the culture to one that is trauma-informed by recognizing the prevalence of trauma and instituting policies, practices, and procedures that fully integrate knowledge of trauma (National Center for Trauma-Informed Care, 2012).

According to the SAMHSA National Center for Trauma-Informed Care (NCTIC) (2011), “trauma-informed” systems, organizations and programs have the following characteristics: (1) an acknowledgement of the widespread impact of trauma and a collective understanding of the potential paths for healing; (2) a recognition of the signs and symptoms of trauma in staff, clients, and others involved with the system; (3) a culture that fully integrates knowledge about trauma into policies, procedures, practices, and settings.

**Health, Mental Health and Substance Abuse Systems**

- The American Academy of Pediatrics (AAP) (2011) recently released a policy statement urging the pediatric community to take an active role in prevention and early identification and treatment of chronic stress in young children. One of the mechanisms to do this is by using the pediatric medical home as a universal platform to identify children and families at risk for toxic stress.
- The Safe Environment for Every Kid model (SEEK) is an evidence-based approach in which pediatricians screened families for common problems that are factors for child maltreatment including maternal depression, alcohol and substance abuse, domestic violence, and parental stress and difficulty coping. Families who scored high on the 7-item screener were referred to a social worker. Two randomized control trial studies demonstrate significantly lower rates of child maltreatment (Dubowitz, Feigelman, Lane and Kim, 2009).
- Evidence-based home visitation services have been shown to strengthen parent-child attachment, reduce family stress and strengthen positive parenting practices and thereby prevent, as well as buffer, the potential negative consequences of chronic stress and trauma on children’s early development (Thompson, 2014). In addition to a prevention role, trauma—informed home visitation services also provide the opportunity to connect families who are experiencing heightened levels of stress to needed services and supports in their community.
- Given the high prevalence of rates of trauma among children and families served by mental health and substance abuse systems and the need for providers to be sensitive that not all individuals will be able to talk about these experiences and ask for help, the NCTIC recommends taking “universal precautions” by presuming that clients have a history of trauma.

**Early Care and Education Systems**

- Early care and education settings provide a critical opportunity for children to experience a safe, predictable, and positive environment. This is especially critical for children who have experienced or are experiencing toxic stress at home.
- Similar to pediatric providers, early care and education providers can serve as a universal platform to identify and refer children and families who are experiencing trauma and who need help.
- Early childhood education providers need to: (a) understand the impact of trauma and toxic stress, (b) recognize the developmental context of trauma and toxic stress in early childhood, and (c) be prepared to identify and address trauma in a way that supports and protects the child and his or her family and links children and their families to valuable resources and, when needed, effective intervention.
- There are some promising models within Head Start and Early Head Start to promote the development of systemic trauma awareness and a trauma-informed early childhood environment for all children. One of these models is the Head Start Trauma Smart (HSTS) model created by Crittenton Children’s Center in Kansas, MO. The model includes a series of training sessions for staff (including teachers, administrators, bus drivers, etc.) and parents, identification of children requiring therapeutic intervention, and site-based therapy for children and families.
Dr. Leslie Anne Ross is currently the Vice President of the Leadership Center at Children’s Institute, Inc. (CII) in Los Angeles; CA. where she oversees programs in research, training and implementation of evidence-based practices for the treatment of child trauma and family violence. She is the Project Director of CII’s National Child Traumatic Stress Network (NCTSN) partnership in the Los Angeles Child Trauma Collaborative and is co-chair of the NCTSN Secondary Traumatic Stress National Collaborative group which focuses on the occupational risk of secondary trauma associated with working with children and families exposed to trauma. Dr. Ross provides training and consultation for individuals and organizations on early intervention and risk-management of secondary trauma, compassion fatigue, and burnout both locally and nationally. She oversees the program development of CII’s national annual conference, “Vicarious Trauma: Wellness Strategies for Helping Professionals and Their Organizations.” In addition, she is a faculty trainer and developer for NCTSN’s Core Curriculum on Child Trauma, and is co-author of “Responding to Domestic Violence: The Whole Person Approach” integrating wellness strategies in a group treatment model for adult victims of DV and their children.
Dr. Elisa Nicholas has served as Chief Executive Officer of The Children's Clinic, “Serving Children and Their Families” (TCC) for 26 years. Under her visionary leadership, Dr. Nicholas has taken what was once a small, mostly volunteer-run clinic serving only children in Long Beach, California to an innovative and progressive system of nine community health centers that provide comprehensive health care services to all ages throughout greater Long Beach. Addressing not only the individual health issues of patients, but also the social determinants of health, Dr. Nicholas' long-term passionate commitment to helping children and their families to lead healthier and happier lives and experience success has driven pioneering work in the area of chronic diseases, such as asthma, diabetes, obesity, and most recently toxic stress and adverse childhood events. She embraces and celebrates the ethnically diverse, multi-cultural community that TCC serves. Prior to taking the helm at TCC, she worked in Kenya and Uganda on a child survival project and at Harbor UCLA Medical Center in the division of general pediatrics and their child abuse center.

Dr. Nicholas commitment to pediatrics and community health is unwavering. Under her leadership TCC is embarking on the Everychild Bright Beginnings Initiative (EBBI), an innovative, collaborative program that is being implemented throughout TCC’s clinic system to identify and address the effects of toxic stress and chronic exposure to violence on infants, toddlers and pregnant mothers. As part of this effort, TCC has become a member of a national trauma-informed care Learning Community with the National Council for Behavioral Health (NCBH) to begin the process of adapting a Trauma-Informed Care (TIC) organizational infrastructure, including trainings which will enhance our established services and better promote the healing and well-being of both patients and staff. When fully operational, EBBI will change the way we practice, identify and respond to the needs of at least 4,900 children ages 0-3 and at least 300 pregnant women per year.

Dr. Nicholas' work with childhood asthma is nationally recognized. She is a founding member and directs the efforts of the Long Beach Alliance for Children with Asthma (LBACA). Under her guidance, LBACA, which was founded in 1999, was one of seven sites in the United States and Puerto Rico awarded grants under the Robert Wood Johnson Foundation’s Allies Against Asthma program. She established the Long Beach Alliance for Food and Fitness (LBAFF) in 2005, where the vision is to create a vibrant community that supports families and their children by promoting a way of life focused on healthy eating, physical activity, and play. She is dedicated to making the healthy choice, the easy choice. The Healthy Lifestyles program at TCC, integrates patient, parent and staff education with motivational interviewing through the use of community health workers in home and with community interventions. She understands the need to address the two sides of the obesity epidemic – the individual choice and the community environment that encourages that choice.

Dr. Nicholas has received numerous awards in recognition of her work, such as Senator Alan Lowenthal's Women of the Year award, the Robert M. Zweig, the MD Memorial award from the South Coast Air Quality Management District’s Annual Clean Air Award, the California League of Conservation Voters 5th Annual Environmental Leadership Award, the
Community Service Award from Blue Cross, and the Community Health Star Award from the Community Clinic Association of Los Angeles County. She is a recipient of the Southern California Public Health Lifetime Achievement Award. Most recently, she was also invited by Dr. Nadine Burke Harris, founder and CEO of the Center for Youth Wellness (CYW) to be on the steering committee for the upcoming summit, Children Can Thrive: California's Response to Adverse Childhood Experiences, sponsored by Kaiser Permanente, DuPont, The San Francisco Foundation, and The California Wellness Foundation in November of 2014.

Dr. Nicholas’ background includes serving as Chief of Staff at Miller Children’s Hospital from 2004 to 2008 and serving on the American Academy of Pediatrics Executive Committee of the Community Pediatric Section. She is currently an Associate Clinical Professor of Pediatrics at the University of California, Irvine (UCI) School of Medicine. Dr. Nicholas is a graduate of the University of California, Los Angeles (UCLA) School of Medicine. She completed her pediatric residency training at the Yale University School of Medicine/New Haven Hospital in pediatrics and completed the Robert Wood Johnson Clinical Scholar program at the UCLA School of Medicine, where she earned her Masters of Science in Public Health (MSPH) and a preventive medicine residency. Dr. Nicholas is fluent in Spanish, has traveled extensively and has worked and lived in various parts of the Caribbean, Latin America, and Africa, including Kenya, Uganda, Paraguay, Cuba, Guatemala and Haiti. She is the proud parent of two young adults.
Sam Chan, Ph.D.

Sam Chan is a clinical psychologist and District Chief with the Los Angeles County Department of Mental Health where he directs the Family and Community Partnerships unit in the Children’s Systems of Care Bureau. He formerly held senior administrative and faculty positions at the California School of Professional Psychology, the University Affiliated Program at Children’s Hospital Los Angeles, the USC School of Medicine, and UCLA Department of Psychiatry. Dr. Chan has focused much of his career on mental health promotion, prevention, and early intervention with infants and young children with special needs. He has supervised/trained graduate students and professionals in the health care, education, and human services fields and developed nationally recognized parent advocacy, leadership, and community-building programs for culturally and linguistically diverse populations. He has authored related publications, produced video programs, and given keynote presentations at numerous conferences.

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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.

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.

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.

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 Hibel 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.
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


This policy brief is a companion piece to Helping Parents, Helping Children: Two-Generation Mechanisms, which can be found at no charge on our website, www.futureofchildren.org. Print copies of Helping Parents, Helping Children: Two-Generation Mechanisms can also be purchased on our website. While visiting the site, please sign up for our e-newsletter to be notified about our next issue, Policies to Promote Child Health, as well as other projects.

The Future of Children would like to thank the Annie E. Casey Foundation, the Foundation for Child Development, and Cynthia King Vance for their generous support. The Future of Children is a collaboration of the Woodrow Wilson School of Public and International Affairs at Princeton University and the Brookings Institution.

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A Science-Based Framework for Early Childhood Policy

Using Evidence to Improve Outcomes in Learning, Behavior, and Health for Vulnerable Children
### National Forum on Early Childhood Program Evaluation

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### National Scientific Council on the Developing Child

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Executive Summary

It is widely recognized that the path to our nation’s future prosperity and security begins with the well-being of all our children. To this end, one of the most important tasks facing policymakers is to choose wisely among strategies that address the needs of our youngest children and their families. Until now, confusing messages about which strategies actually can improve children’s life chances have presented enormous challenges to this decision-making process. As scientists, we believe that advances in the science of early childhood and early brain development, combined with the findings of four decades of rigorous program evaluation research, can now provide a strong foundation upon which policymakers and civic leaders with diverse political values can design a common, effective, and politically viable agenda. With this goal in mind, we describe in this report the process by which brain architecture is formed in very young children, with special attention to the important influence of early experiences on the production of a weak or sturdy foundation for future development, and integrate this scientific knowledge with the identification of those factors from the program evaluation literature that appear to offer the best course toward positive outcomes for children. We believe that this combination of neuroscience, child development research, and program evaluation data can provide an informed and pragmatic framework for those engaged in policy design and implementation.

This paper builds on a process of systematic analysis that began with the publication in 2000 of a landmark report by the National Academy of Sciences entitled From Neurons to Neighborhoods: The Science of Early Childhood Development, followed by the ongoing work of the National Scientific Council on the Developing Child and the National Forum on Early Childhood Program Evaluation, both of which are based at the Center on the Developing Child at Harvard University. These groups of scientists and scholars engage in active debate about what the rapidly advancing biological and social sciences do and do not say about early childhood, brain development, and the impact of intervention programs. As agreement is reached on each issue, the groups integrate findings across disciplines and communicate this integrated information to policymakers and civic leaders to bring accurate knowledge to bear on public decision-making aimed at enhancing children’s learning, behavior, and health.

Neuroscience and child development research address the why and what questions about investing in young children. The applied sciences of intervention and program evaluation attempt to answer questions about when and how. Four decades of data from a small number of intensive programs demonstrate that it is possible to improve a wide range of outcomes for vulnerable children well into the adult years, as well as generate benefits to society that far exceed program costs. But evaluations also have shown that many programs, particularly if they are designed or implemented poorly, have generated few to no
beneficial effects. Together, these findings provide an instructive and continuously growing body of knowledge about both successful and ineffective investments.

For the first time, researchers are now able to present a unified framework that can guide priorities for science-based early childhood policies and practices that are grounded in a combination of cutting-edge neuroscience, developmental-behavioral research, and program evaluation. Drawing on the best and most widely accepted evidence from all of these fields of study, we can confidently articulate the following findings.

**Early experiences determine whether a child’s developing brain architecture provides a strong or weak foundation for all future learning, behavior, and health.** The brain is composed of billions of highly integrated sets of neural circuits (i.e., connections among brain cells) that are “wired” under the interactive influences of genetics, environment, and experience. Genes determine when circuits are formed, but a child’s experiences shape how that formation unfolds. Children develop in an environment of relationships that begins within their family, extends into their community, and is affected by broader social and economic resources. From early infancy, they naturally reach out for interaction through such behaviors as babbling, making facial expressions, and uttering words, and they develop best when caring adults respond in warm, individualized, and stimulating ways. In contrast, when the environment is impoverished, neglectful, or abusive, the result can be a lifetime of increased risk for impairment in learning, behavior, and health.

Because brain architecture and skills are built continuously over time, policies that promote healthy development throughout the early years create a foundation for later school achievement, economic productivity, responsible citizenship, and successful parenting. For children at unusually high risk, neuroscience provides a compelling argument for beginning programs at birth, if not prenatally, since a substantial amount of brain circuitry is constructed very early in life. Developmental research shows that children master different skills at different ages, which suggests that opportunities for a variety of effective interventions are present throughout early childhood.

**Four decades of program evaluation research point to a number of factors that can enhance positive development in the first five years of life. We have labeled these influences “effectiveness factors.”** The following principles draw on these findings and provide a framework for a variety of informed policy choices.

- **Access to basic medical care for pregnant women and children can help prevent threats to healthy development as well as provide early diagnosis and appropriate management when problems emerge.** Examples of well-documented benefits, among many others, include: the positive effects of adequate prenatal and early childhood nutrition on healthy brain development; improved outcomes for young children with developmental delays (or impairments in vision or hearing) when their difficulties are detected and early intervention is initiated; and the developmental benefits for very young children when parental problems such as maternal depression are identified and treated effectively.

- **For vulnerable families who are expecting a first child, early and intensive support by**
skilled home visitors can produce significant benefits for both the child and parents. One program model, which follows a detailed and effective curriculum provided by trained nurses beginning in the prenatal period and extending through the third year of life, has been studied extensively and shown to be highly effective. In contrast, few consistent impacts on child outcomes have been found in studies of low-intensity home visitation programs, services provided by poorly trained visitors, and programs with relatively low levels of family engagement.

- For young children from low-income families, participation in very high-quality, center-based, early education programs has been demonstrated to enhance child cognitive and social development. Effective center-based programs provide some combination of the following characteristics: (1) highly skilled teachers; (2) small class sizes and high adult-to-child ratios; (3) age-appropriate curricula and stimulating materials in a safe physical setting; (4) a language-rich environment; (5) warm, responsive interactions between staff and children; and (6) high and consistent levels of child participation. The most extensive evidence for the benefits of high-quality learning environments for children from low-income families comes from growing numbers of programs that serve three- and four-year-olds. Evaluations also have shown positive effects of some early care and education programs that began shortly after birth (e.g., the Abecedarian Program), but fewer long-term studies of these programs have been conducted.

- For young children from families experiencing significant adversity, two-generation programs that simultaneously provide direct support for parents and high-quality, center-based care and education for the children can have positive impacts on both. Some of the best-known early childhood evaluation research studied programs that provided a combination of services for children and parents. These include, among others, the Perry Preschool Project, the Infant Health and Development Program, Early Head Start, and Head Start itself. Although each of these programs has been associated with positive child outcomes, currently available knowledge does not tell us what mixture of program components best meets the needs of particular families and children.

- For young children experiencing toxic stress from recurrent child abuse or neglect, severe maternal depression, parental substance abuse, or family violence, interventions that provide intensive services matched to the problems they are designed to address can prevent the disruption of brain architecture and promote better developmental outcomes. Parents at high risk for child maltreatment, for example, have been found to benefit from model programs that provide individualized coaching aimed at increasing their awareness of specific child behaviors and encouraging them to use praise and nonviolent discipline strategies. Children of mothers with depression are also likely to benefit from interventions that treat the maternal symptoms and teach parents how to protect their children from the deleterious effects of their illness.

- For families living under the poverty level, work-based income supplements for working parents have been demonstrated to boost the achievement of some young children. Studies suggest that these benefits are most likely to occur in the later preschool years. Policy options available for those who wish to pursue this strategy include expanded income tax credits for low-income families, welfare reform policies that provide more money for low-income parents who are working, and employment support programs that reward full-time work with wage supplements for working parents with dependent children.

- Environmental policies that reduce the level of neurotoxins in the environment will
protect fetuses and young children from exposure to substances that are known to damage their developing brains. The reduction of lead in gasoline and paint is one example that has reduced a preventable cause of mental retardation, hyperactivity, and learning disabilities. In contrast, increasing levels of mercury in the food chain (particularly in certain types of fish) present a growing threat to the immature brains of fetuses and young children, despite the availability of technology to reduce emissions from coal-burning plants, which are the largest source of environmental methyl mercury.

- **No single program approach or mode of service delivery has been shown to be a magic bullet.** The diverse nature of the best practices described in this report demonstrates that there are a number of proven ways to promote the healthy development of young children. Moreover, the core concepts of neuroscience and child development remain equally valid, whatever the program category, administrative structure, or funding mechanism. This gives policymakers some latitude in choosing among program approaches to address specific objectives. The key is to select strategies that have documented effectiveness, assure that they are implemented well, and recognize the critical importance of a strong commitment to continuous program improvement.

- **“Scaling up” successful model interventions into effective, multi-site programs is a formidable challenge that can be addressed, at least in part, by establishing quality standards and monitoring service delivery on a routine basis.** Successful large-scale programs typically have organizations that provide rigorous assessment and periodic monitoring of the quality of individual implementation sites, as well as training and technical assistance for continuous quality improvement.

- **Return on investment is more important than up-front costs.** Without minimizing the reality of budget constraints, decisions regarding investments in young children and their families would be strengthened considerably by greater attention to long-term societal benefits relative to program costs. Cost-benefit studies demonstrate positive returns from some programs that target vulnerable children beginning as early as prenatally and as late as age four. However, research has not yet identified precisely how these returns differ by child age, level of risk, and program focus. In some cases, inexpensive services may generate sufficiently positive impacts to warrant their modest outlays. In other circumstances, expensive, comprehensive, multi-year programs may also provide long-term, positive returns. Model programs with proven benefits that are “scaled up” in low-cost, ineffective ways present a significant problem when short-term cost savings diminish their impact and reduce their ultimate investment value.

In summary, a rich body of scientific knowledge is available to guide informed early childhood policies and practices. This knowledge points to four key challenges that are worthy of sustained attention: (1) matching supports and services to the needs and strengths of the children and families to be served; (2) paying careful attention to the quality of implementation when effective model programs are taken to scale; (3) developing new intervention strategies for children and families for whom conventional approaches appear to have minimal impact; and (4) providing an environment that supports ongoing, constructive evaluation and continuous program improvement.
Introduction

A remarkable convergence of new knowledge about the developing brain, the human genome, molecular biology, and the interdependence of cognitive, social, and emotional development offers scientists and policymakers an exceptional opportunity that did not exist a decade ago. Now researchers are able to present a unified framework that can guide priorities for science-based early childhood policies built around common concepts (from neuroscience and developmental-behavioral research) and broadly accepted empirical findings (from four decades of program evaluation studies) that have been generated across these diverse fields of study.

In 2003, the Human Genome Project completed the task of identifying and sequencing the

The Continuum of Early Childhood Development

From the beginning of pregnancy to the first day of school, the ongoing construction of brain architecture and the emergence of increasingly complex behaviors and skills progress at a remarkable pace that is characterized by both continuity and change. Although there may be practical reasons for policymakers and program administrators to segment children by age ranges (e.g., birth to three versus three to five), neither developing brains nor emerging skills make such distinctions. Thus, the process of development is continuous and ongoing, but the maximal capacity of the immature brain to grow and change means that the early childhood years offer the ideal time to provide experiences that shape healthy brain circuits.

• Important prenatal influences on developing brain architecture include the mother’s health and nutritional status (such as adequate folic acid to prevent spina bifida), as well as potentially serious damage from certain prenatal infections (such as rubella, cytomegalovirus, and toxoplasmosis), environmental toxic exposures (such as mercury, lead, and organophosphate insecticides), and both legal and illegal drugs (such as alcohol, nicotine, and cocaine). The threat of toxic exposures during pregnancy is particularly worrisome because widely available substances such as alcohol (which is the most common, known prenatal cause of mental retardation) and mercury (another potent cause of mental retardation, which is present at increasingly high levels in fish) are tolerated with minimal or no adverse effects in adults at doses that are highly damaging to the developing brains of embryos (during the first trimester of pregnancy), fetuses (during the second and third trimester), and young children (during the early childhood years).

• Adverse pre- and postnatal experiences can have a profound effect on the course of health and development over a lifetime. The premise underlying this phenomenon, known as developmental programming, is that biological events that occur during fetal and postnatal life predispose the child to an elevated risk of subsequent problems in physical and mental health. Babies with low birth weight, for example, have an increased lifetime risk for cardiovascular disease, diabetes, and learning difficulties.

• The period between birth and three years is a time of rapid cognitive, linguistic, social, emotional, and motor development. Explosive growth in vocabulary, for example, starts at around 15-18 months and continues into the preschool years. The ability to identify and regulate emotions in oneself and others is also well underway.
by the second year. Language-rich, nurturing, and responsive caregiving fosters healthy development during this period, but not all children have such experiences. When inadequate stimulation is provided or barriers to opportunities for productive learning exist, these can lead to early disparities in capability that generally persist in the absence of effective intervention. Consequently, children who live in families with lower income and less parent education begin to score lower on standardized developmental tests as early as 18 months, and the differences typically increase into the school-age years.\textsuperscript{10} Formal assessments of language development, for example, have shown that young children who grow up in homes with high incomes and high parent education levels have more than twice the expressive vocabulary at age three compared to children raised in homes characterized by low socioeconomic status.\textsuperscript{11}

- **Between three and five years of age**, there is an emergence of increasingly complex social behaviors, emotional capacities, problem-solving abilities, and pre-literacy skills that build on earlier developmental achievements and are essential building blocks for a successful life. By the ages of four and five, most children have learned the basics of the grammatical system in their language, can detect and identify simple emotions in themselves and others, begin to understand other people’s points of view, experience emotions that are important to the development of conscience (e.g., shame and guilt), have learned the rudiments of how to negotiate with others to achieve common goals, and can sit quietly with a group of children and pay attention for at least brief periods of time. In the absence of intervention, early social class disparities in language and social-emotional development can become increasingly apparent during this period and grow with age.
The Science of Early Childhood Development

The basic science of development, including its underlying neurobiology, can be summarized in the following six core concepts. More detailed information on these concepts can be found in a companion document produced by the National Scientific Council on the Developing Child entitled The Science of Early Childhood Development: Closing the Gap Between What We Know and What We Do,¹ and in the Council’s signature series of working papers.²

Brains are built over time and a substantial proportion is constructed during the early years of life. The basic architecture of the brain is constructed through an ongoing process, beginning before birth and continuing into early adulthood. Like the construction of a home, the building process begins with laying the foundation, framing the rooms, and wiring the electrical system in a predictable sequence, and it continues with the incorporation of distinctive features that reflect increasing individuality over time. A strong foundation in the early years increases the probability of positive outcomes, and a weak foundation increases the risk of later difficulties.³

The interactive influences of genes and experience shape the architecture of the developing brain, and the active ingredient in that process is the “serve and return” nature of children’s relationships with their parents and other caregivers in their family and community. The architecture of the brain is composed of highly integrated sets of neural circuits (i.e., connections among brain cells) that are “wired” under the continuous and mutual influences of both genetics and environment. Genes determine when specific brain circuits are formed and experiences shape their formation. This developmental process is fueled by a self-initiated, inborn drive toward competence that depends on appropriate sensory input (e.g., through hearing and vision) and stable, responsive relationships to build healthy brain architecture. What scientists refer to as “mutuality and reciprocity” describes this “serve and return” process in which young children naturally reach out for interaction through such behaviors as babbling, facial expressions, and words, and adults respond with responsive vocalizing and gesturing back at them, as the process continues back and forth like a game of tennis or volleyball. Children’s experiences with all of the people who are important to them have an influence on their brain’s structure and function. These relationships begin in the family but often also involve other adults who play important roles in their lives.⁴

Both brain architecture and developing skills are built “from the bottom up,” with simple circuits and skills providing the scaffolding for more advanced circuits and skills over time. The brain is built in an ordered sequence that is associated with the formation of specific circuits that influence particular abilities. Once a circuit is up and operating, it participates in the construction of later-developing circuits. Brain circuits that process basic information are wired earlier than those that process more complex information. Higher-level circuits build on lower-level circuits, and adaptation at higher levels is more difficult if lower-level circuits were not wired properly. Parallel to the construction of brain circuits, increasingly complex skills build on the more basic, foundational capabilities that precede them. Stated in simple terms, circuits build on circuits and skills beget skills.⁵
Stress and the Developing Brain

Stress in early childhood can be either growth-promoting or toxic to developing brain architecture and physical health. Different effects depend on the intensity and duration of the experience, differences among children in the magnitude of their body's stress reactions, and the extent to which a supportive adult is available to help the child cope with the adversity. These differences can be understood within the context of three types of stress experience that lead to different outcomes.14

- **The first, called positive stress,** is associated with moderate, short-lived physiological responses, such as brief increases in heart rate and blood pressure or mild elevations in cortisol or cytokine levels. Positive stress (e.g., associated with meeting new people or dealing with frustration) is an important and necessary aspect of healthy development. It occurs in the context of stable and supportive relationships, which help to keep physiological stress responses small and manageable, and assist the child to develop increasing mastery and self-control.

- **The second kind of stress experience, called tolerable stress,** is associated with events that could trigger physiological responses large enough to disrupt brain architecture, but are relieved by supportive relationships that facilitate adaptive coping and thereby restore heart rate and stress hormone levels to their baseline. These kinds of experiences (e.g., death of a loved one, divorce of one's parents, a natural disaster such as Hurricane Katrina, or an act of terrorism such as 9-11) could have long-term consequences, including the development of clinically significant post-traumatic stress disorder. What makes them tolerable rather than invariably harmful is the presence of trusted and supportive adults whose actions protect the child by reducing the sense of being overwhelmed and whose availability literally turns down the child's stress response system (i.e., heart rate, blood pressure, and stress hormones). Most often this support is provided by parents and their informal support system. When a stressful experience overwhelms the family's capacity to cope, professional assistance can make a substantial difference. The resulting return of stress hormones to baseline levels gives the brain an opportunity to recover from the potentially damaging effects of an overactive stress management system, and thus prevents permanent harm.

- **The third and most threatening kind of stress experience, called toxic stress,** is associated with strong and prolonged activation of the body's stress response systems in the absence of the buffering protection of adult support. Stressors include recurrent child abuse or neglect, severe maternal depression, parental substance abuse, or family violence. Under such circumstances, persistent elevations of stress hormones and altered levels of key brain chemicals produce an internal physiological state that disrupts the architecture and chemistry of the developing brain. Although individuals differ in their physiological responsiveness and adaptive capacities, these bodily reactions can lead to difficulties in learning and memory, as well as health-damaging behaviors and later adult lifestyles that undermine well-being over time.15 Continuous activation of the stress response system also can produce disruptions of the immune system and metabolic regulatory functions. In fact, science has shown that toxic stress in early childhood can result in a lifetime of greater susceptibility to physical illnesses (such as cardiovascular disease, hypertension, obesity, diabetes, and stroke) as well as mental health problems (such as depression, anxiety disorders, and substance abuse).16
Cognitive, emotional, and social capabilities are inextricably intertwined throughout the life course, and their interactive relationship develops in a continuous process over time. The brain is a highly integrated organ, and its multiple functions operate in a richly coordinated fashion. All of our human capabilities develop through a process that is both simultaneous and deeply inter-connected. Thus, emotional well-being, social competence, and emerging cognitive abilities are highly inter-related, and together they are the bricks and mortar that comprise the foundation for human development.\textsuperscript{12}

Toxic stress in early childhood is associated with disruptive effects on the nervous system and stress hormone regulatory systems that can damage developing brain architecture and chemistry and lead to lifelong problems in learning, behavior, and both physical and mental health. Activation of the body's stress management systems produces a variety of physiological reactions. These include an increase in heart rate, a rise in blood pressure, and elevated blood levels of stress hormones (e.g., cortisol) and proteins associated with inflammation (e.g., cytokines). Such responses prepare the body to deal with threat and are essential to survival. Healthy development depends on the capacity of these systems to ramp up rapidly in the face of stress, as well as their ability to ramp back down and return to baseline when they have done their job. When these physiological responses remain activated at high levels over a long period of time, they can have adverse effects on developing brain architecture, which weakens the foundation upon which future learning, behavior, and health are built.\textsuperscript{13}

The basic principles of neuroscience tell us that providing the right conditions for healthy development in early childhood is likely to be more effective than treating problems at a later age. As the maturing brain becomes more specialized to assume more complex functions, it becomes less capable of reorganizing and adapting to new or unexpected challenges. Once a circuit is “wired,” it stabilizes with age, making it increasingly more difficult to alter over time. Scientists use the term “plasticity” to refer to the capacity of brain architecture and function to change. Plasticity is maximal in childhood and decreases with age. Although “windows of opportunity” for skill development and behavioral adaptation remain open for many years, trying to change behavior or build new skills on a foundation of brain circuits that were not wired properly when they were first formed requires more work and is more expensive. For the brain, the notion of “more expensive” means that greater amounts of metabolic energy are needed to compensate for circuits that do not perform in an expected fashion.\textsuperscript{17}

The Science of Program Evaluation: Effectiveness Factors for Early Childhood Policies and Programs

The basic science of early childhood and early brain development answers the \textit{why} and \textit{what} questions about investing in young children. The applied science of intervention and program evaluation is essential to answer the \textit{when} and \textit{how} questions. Over the past four decades, a compelling body of empirical data from a relatively small number of successful programs has begun to answer these latter questions for young children who are at risk for poor life outcomes. The analysis of these data by child development researchers, education specialists, and economists has

It is possible to improve a wide range of outcomes for vulnerable children well into the adult years, as well as generate benefits to society far in excess of program costs.
shown that it is possible to improve a wide range of outcomes for vulnerable children well into the adult years, as well as generate benefits to society far in excess of program costs. Over this same 40-year period, however, evaluations also have shown that many interventions, particularly those that are poorly planned or implemented, have generated few to no beneficial effects. Together, these positive and negative findings have contributed to a growing body of knowledge about both successful and ineffective programs and/or practices.

Because the selection of outcome variables has varied across studies, the question of what constitutes a successful early childhood program impact does not have a single answer. Within this context, evaluation research has included various combinations of standardized developmental assessments in the preschool years; measures of academic achievement, grade retention, and need for special education during the school-age years; and long-term data on high school graduation rates, unintended pregnancy, employment status, income, dependence on public assistance, home ownership, and incarceration in the late adolescent and adult years.18

An important challenge confronting policymakers who are trying to design and implement effective policies for all young children and their families, and particularly for those who are most vulnerable, is to understand what is possible from successful models and then to replicate the essential elements of effective interventions in scaled-up programs. Central to meeting this challenge is the need to differentiate rigorous evaluation research from inappropriately designed or poorly conducted studies that do not meet conventional scientific standards. The most powerful data on program effectiveness come from experimental studies in which participants are randomly assigned to either an intervention or control group. Additional information of value can be gleaned from non-experimental studies in which participants are randomly assigned to either an intervention or control group. Additional information of value can be gleaned from non-experimental research, but such studies cannot definitively answer questions about cause and effect. This document provides an overview of what has been learned from high-quality evaluation research that meets rigorous scientific standards. The scope of the report includes programs that delivered services between the prenatal period and age five years.

**Effect Sizes**

Evaluation studies often express program impacts in terms of “effect sizes.” These are differences between parents or children who receive program services and parents or children in the control (comparison) group, expressed as a fraction of the variation (standard deviation) of the outcome. For example, in the case of the SAT college entrance test scores, the standard deviation is 100. An early education program with sufficiently enduring impacts that led program children to score 30 more points on their SAT tests than control-group children would have an effect size of 0.30. Effect sizes are useful because they offer researchers the ability to compare program effects across a range of different tests and assessments using a common metric.

Conventional guidelines consider effect sizes as “large” if the program versus control difference is at least 0.80 standard deviations; “moderate” if the impact is 0.30 to 0.80 standard deviations; and “small” if the impact is 0.30 or less.112 We use these adjectives throughout our report to characterize impacts from program evaluations.

It is tempting to conclude that “large” effects make for better policy than “small” effects. Unfortunately, effect sizes can provide incomplete and at times, misleading guidance to policymakers. It is important to recognize that sometimes small effects may translate into meaningful differences in children’s lives. In addition, it is possible that small effects across a range of domains taken together may also lead to important improvements. A cost-benefit approach may be more useful because it quantifies the value of a program’s effects relative to the costs incurred in achieving them. Thus, an inexpensive program that produces small but economically valuable outcomes may make for good policy, while a very expensive program that produces larger, but not proportionately larger, effects may not.
The following sections focus on the multiple environments within which children develop and summarize what evaluation science has to say about maximizing the contribution of these environments to the production of healthy outcomes. To this end, we identify five “contexts” for which sufficient data exist to provide important lessons for policy consideration: (1) the nuclear family; (2) out-of-home settings; (3) multi-generational programs; (4) family economics and maternal employment; and (5) environmental contamination. In each context we identify, to the degree possible, the effectiveness factors that emerge from the scientific literature about successful interventions.

Helping Children by Strengthening their Family Environment

Improving Health and Nutrition. Given the multitude of preventable threats to brain architecture early in life, high-quality health care and adequate nutrition before birth (for pregnant women) and after birth (for both the primary caregiver and baby) are fundamental to the promotion of healthy child development. Providing access to affordable health services (including mental health care, when needed) is, therefore, one of the most effective policies available for reducing perinatal and early childhood health impairments.19

Before birth, the developing brain architecture of a fetus can be disrupted by poor maternal nutrition, exposure to a variety of hazardous substances (including recreational substances, such as alcohol and cocaine, and environmental toxins, such as organophosphate pesticides, mercury, and lead), and the adverse physiological effects of a pregnant woman’s chronic stress. Access to prenatal health care can help identify such high-risk circumstances and provide a vehicle for addressing hazards to healthy brain development in a preventive fashion. After birth, a regular source of primary health care for children can be an important vehicle for identifying and initiating early intervention for concerns that could lead to more serious problems later in learning, behavior, and both physical and mental health.20 In addition to its traditional focus on health supervision, pediatric care also has been shown to be capable of improving the chances that mothers will read to their children.21

Beyond the extent to which investments in prenatal care have generated favorable benefit-cost returns22, mothers who participate in the Supplemental Food Program for Women, Infants, and Children (WIC) are less likely to bear low birth-weight or pre-term infants, both of which are associated with lower educational achievement, lower probability of employment, and lower earnings as an adult.23 Research also shows that the WIC program is especially effective for families who are at greatest risk for poor nutrition.24 Although not all studies point to such positive conclusions,25 the preponderance of the evidence supports these findings.26

Effectiveness Factors for Home Visiting Programs. Most families adapt successfully to the challenges of preparing for a newborn’s birth and caring for a young baby. Nevertheless, this transition can be a difficult time, particularly for first-time parents who may be socially isolated or experiencing severe adversity (which can result in the experience of toxic stress by their babies). Under such circumstances, home visiting services can provide critical support and have positive impacts on a variety of outcomes. Not every home visiting program, however, has proven equally effective.
A study reviewing the characteristics of home visiting programs that were most likely to be effective found that those serving targeted populations (i.e., narrower selection criteria than all families in poverty) were more likely to have measurable benefits. Home visitation was also found more likely to be successful if it is provided by well-trained and adequately supervised professional staff who implement a range of services guided by clear goals, and who are successful in engaging families for the duration of the program.

The home visiting program with the strongest evidence of success, which has been replicated in multiple settings across the country, is the model introduced by the Nurse Family Partnership. This program provides home visits by trained nurses, starting in the second trimester before birth, although some families begin services later in the prenatal period. The relative high intensity of this service model (roughly 50 visits from the prenatal period to age two years, with weekly visits at the beginning of the program and immediately after birth) differentiates it from other predominantly home-based services. Visits focus on improving pregnancy outcomes, enhancing child health and development through improvements in parenting and access to health care, and enhancing the mother's life course by facilitating goals in education, employment, and partner/family involvement.

In a series of rigorous experimental evaluations, the Nurse Family Partnership has produced multiple, positive impacts on families and children, including fewer subsequent pregnancies, increased maternal employment, higher cognitive performance, and better social behavior by children in the preschool years, as well as (in the study with the longest-term follow-up) fewer arrests in adolescence. Moreover, an experiment comparing program impacts when home visits were provided by paraprofessionals (versus skilled nurses) found positive effects roughly twice as large for the nurse-delivered intervention. This program appears to be effective for young, first-time mothers living in poverty, perhaps because they may be more likely to perceive the need for information and formal support, and be more open to accept visitors into their homes. Its results have not been replicated for other target groups.

Evaluations of other home visiting models have shown less consistent positive impacts. One example is Healthy Families America (HFA), a program to prevent child maltreatment that was modeled after the Hawaii Healthy Start Program, which was developed in the early 1990s and implemented state-wide in several states. The core of this program involved identifying parents at high risk of abusing or neglecting their children through broad-based screening and then offering voluntary home visiting services delivered by paraprofessionals for a period of three to five years. Home visitors were expected to provide a range of services including service referrals, modeling problem-solving skills, and parent education. Randomized trials have yielded mixed findings. One study conducted in Hawaii yielded disappointing results, with as many negative impacts as positive effects on key family process outcomes. In contrast, a study in New York showed promising reductions in harsh parenting during the first year of the program, although fewer effects on other dimensions.

Several explanations for the lack of results in the Hawaii study were offered by the evaluators. First,
the program may have been poorly implemented, as 51 percent of the parents dropped out within the first year and participating families received fewer home visits than intended. Second, evaluators questioned whether the paraprofessional staff had sufficient skills to identify high-risk situations and engage parents in the process of reducing risks associated with abusive parenting. Finally, to accommodate funding requirements, the program shifted away from an emphasis on recognizing and addressing risks for abusive parenting and moved toward an early intervention philosophy of parent-driven goal-setting, which may have compromised its effectiveness.

A recent evaluation of an augmented Healthy Families America program, with a sharper focus on using a specific intervention (i.e., cognitive appraisal theory) to reduce risks for abuse and neglect, as well as better implementation practices, yielded considerably more favorable results compared with both the unenhanced HFA program and a control group that did not receive any home visiting services. These positive findings were particularly evident for medically vulnerable infants, such as those born prematurely or those with low Apgar scores at birth. Although the study was small, and thus in need of replication, the lessons learned (i.e., the importance of engaging families, providing high-quality training and ongoing supervision of staff, and ensuring consistent and well-implemented service delivery) illustrate the value of evaluating and refining program improvements rather than terminating potentially effective services that produce initially disappointing results.

Focusing Supports on Sources of Toxic Stress. Finally, families in greatest need of support (e.g., parents with mental health or substance abuse problems, parents experiencing high levels of conflict or violence, or parents at risk for child maltreatment) may benefit from more focused services targeted to the particular sources of their stress. For example, parents at high risk for child abuse have been found to benefit from individualized coaching to increase their awareness of specific child behaviors and to use praise and nonviolent discipline strategies. Similarly, young children of mothers with depression are likely to benefit from interventions that treat maternal symptoms and teach parents how to protect their children from the deleterious effects of their illness. The targeting of services to particular needs requires a family-focused screening process for sources of excessive stress before, at, or soon after birth. Although some monitoring strategies have been implemented in pediatric care systems (e.g., for postpartum depression), screening for other kinds of risk factors and comparisons of different approaches to monitoring and follow-up are scarce.

Policy Implications
Access to basic medical care for pregnant women and children can help prevent threats to healthy development, as well as provide early detection and intervention for problems that emerge. The unique nature of the U.S. health care system depends on a complex mix of federal, state, work-related, and personal finance mechanisms. While the science of early childhood development and intervention has nothing to say about health care financing or the formulation of optimal health insurance policies, it clearly points to the benefits of consistent, uninterrupted...
access to health care for all pregnant women and children. Well-documented benefits include, among many others, the positive effects of adequate prenatal and early childhood nutrition on healthy brain development; improved outcomes for young children with developmental delays (or impairments in vision or hearing) when their difficulties are detected and early intervention is initiated; and the developmental benefits for very young children when parental problems, such as maternal depression, are identified and treated effectively.

Intensive family support through home visiting by skilled personnel can produce benefits for children and parents, especially when it is targeted to families at particular risk. The best studied and most effective example of this model to date provides nurse home visitation targeted to first-time parents who are living in poverty. Programs of low intensity (for example, fewer than 10 visits) and services that are provided on a universal basis appear unlikely to produce significant benefits. In addition, effective services are designed to address identified risks and stresses, dependent on the qualifications and skills of the staff, and associated with the quality of the home visitors’ engagement with parents.

Serving Children in Out-of-Home Environments: Early Care and Education

The science of child development tells us that significant variations in the quality of early care and education programs have the potential to produce lasting repercussions for both children and society as a whole. Evidence points to the beneficial impacts at the highest end of the quality spectrum and to detrimental impacts at the lowest end. For children whose life circumstances lead to greater vulnerability, the nature of their out-of-home experiences is particularly important and the potential impacts are greater.

Transitions into and among out-of-home child care arrangements vary greatly in the first years of life. These variations include differences in timing (early vs. later), setting (center-based, relative, or nonrelative family care arrangements), auspices (public vs. private funding sources, secular vs. faith-based programs, for-profit vs. not-for-profit centers), and quality as measured by both structural indicators (e.g., the physical environment, materials, group size, child-adult ratio) and process indicators (e.g., caregiver stimulation, warmth, and discipline). Given the large number of children in the United States who experience some form of non-parental care of highly variable quality, the application of science-based effectiveness factors to policy and program design offers important benefits.

Effectiveness Factors for Center-Based Programs. A number of intensive programs providing early care and education experiences for infants and toddlers at risk for problems have successfully boosted cognitive performance, with effects in some cases lasting for years after the termination of services. Several random-assignment studies suggest that programs beginning in infancy have the potential to affect key outcomes for vulnerable children during the period from birth to three years. The best known is the Abecedarian Program, which provided a full-day, center-based, educational program for children who were at high risk for school failure, starting...
in early infancy and continuing until school entry. Despite its $18,000 annual cost, this program is estimated to have returned roughly $3 for every $1 invested. What isn’t known is how much each individual program component contributed to these long-term program effects.

Very high-quality early care and education programs for vulnerable preschoolers can produce short-term gains on standardized cognitive and social-emotional measures and longer-run reductions in grade retentions, suspensions, and referrals for special education services. Evaluations of such programs have shown that, as a group, this form of intervention can produce benefits that outweigh costs when provided to three- and four-year-olds from low-income families.

Beyond the documented impacts of intensive model programs, it is important to assess the benefits of scaled-up, center-based programs that are actually in operation. In this regard, a number of recent studies have examined the short-term effects of state-initiated pre-K programs on children’s test scores. One investigation of pre-K programs implemented in five states found small effects on receptive vocabulary and math and moderate to large effects on print awareness. A study of Oklahoma’s universal pre-K program conducted in Tulsa (which has the largest school system in the state) found large effects on pre-reading and pre-writing skills and moderate effects on early math scores for children from all racial-ethnic and income groups.

Although early care and education programs vary greatly and some of the evidence for their effectiveness is mixed, the principal elements that have consistently produced positive impacts include: (1) highly skilled teachers; (2) small class sizes and high adult-to-child ratios; (3) age-appropriate curricula and stimulating materials in a safe physical setting; (4) a language-rich environment; (5) warm, responsive interactions between staff and children; and (6) high and consistent levels of child participation.

Most successful programs have included nearly all of these elements. The question that the available data do not answer, however, is whether any of these program features are more important than others or whether the full combination is essential to achieve the strongest impacts. For example, although it is possible that improvements in particular dimensions of program quality, such as a stronger curriculum, may be more influential than others, current knowledge does not give us the information needed to differentiate among multiple, positive program characteristics.

Questions also remain about the threshold of quality that must be crossed in order to see consistent and enduring developmental benefits from out-of-home care and education programs. Previous efforts to address this important question have been inconclusive with respect to whether modest increments in community-based child care quality are correlated with children’s later cognitive ability, school achievement, or social behaviors. However, studies of children from low-income families that have reported associations between variations in quality among typical child care settings and developmental outcomes for children underscore the need for greater policy attention to this concern.
The Problem of Unsafe and Poor Quality Programs. Numerous studies of early care and education settings in the United States have documented that extremely wide variation in quality is the norm. Of greatest concern, the largest, multi-state, observational study to date—the NICHD Study of Early Child Care and Youth Development—found that 26 percent of infant care settings were characterized by moderately or highly insensitive care-giving, and 75 percent were minimally or not at all stimulating. For preschool-age children, positive care-giving (defined as sensitive and stimulating adult-child interactions) was uncharacteristic or not at all characteristic in over half of all child care settings. Overall ratings of quality revealed that 12 percent of observed centers and 11 percent of home-based arrangements provided poor quality care for both toddlers and preschoolers.

At this lower end of the quality spectrum, basic safety and protection are significant concerns for all young children, poor and non-poor alike. For example, a 1998 study of 220 licensed child care facilities by the Consumer Product Safety Commission found at least one safety hazard in two-thirds of the settings they visited. These included cribs with soft bedding that posed suffocation risks, no safety gates on stairs, unsafe (or no) playground surfacing, and use of recalled products. The magnitude of this problem is underscored by data from the multisite, NICHD Study of Early Child Care and Youth Development, which found that 20 percent of child care centers failed to meet any of the basic standards for six- and 15-month olds established by the American Public Health Association and American Academy of Pediatrics.

Current federal policy provides funding for states to improve the quality of child care through the Child Development Fund. Nevertheless, there is a paucity of national and state-level data about whether these investments actually have succeeded in raising the quality of care, particularly for children from low income families, or whether they have produced better developmental outcomes for children.

The fact that all young children in the U.S. military’s exemplary child care system enjoy access to either center-based or family settings that provide rich learning experiences in a safe and health-promoting environment demonstrates what can be accomplished if quality standards are established and enforced. According to a 2006 Annual Report, 97 percent of the military’s child development centers meet the professional standards of quality required to be accredited by the National Association for the Education of Young Children. For comparison purposes, it is noteworthy that the average rate of accredited centers across the 50 states is eight percent, and the highest state figure is 40 percent in Massachusetts.

Effects on Young Children Who Spend Extensive Time in Out-of-Home Care. Persistent concerns have been raised about whether long hours in non-parental care—especially center-based care with its exposure to large peer groups—have negative effects on children’s long-term social behavior. Although studies have shown statistically significant differences in behavioral ratings of aggressive or assertive behaviors, the magnitude of the differences is small, a minority of children is affected, and the children’s behavior is within the range of normal variability for the age groups involved.

The principal elements that have consistently produced positive impacts include:
- highly skilled teachers;
- small class sizes and high adult-to-child ratios;
- age-appropriate curricula and stimulating materials in a safe physical setting;
- a language-rich environment;
- warm, responsive interactions between staff and children; and
- high and consistent levels of child participation.
Policy Implications

The participation of children from low-income families in very high-quality early education centers can enhance their developmental outcomes. Evidence from program evaluation research supports efforts to enroll children who are living in poverty in high-quality early care and education programs, beginning at age three, and, in some cases, earlier. Well-implemented, effective programs can increase the odds that children will have the kinds of experiences and interactions that produce long-term, positive benefits in academic achievement, social and emotional adjustment, economic productivity, and responsible citizenship. The basic concepts of neuroscience and child development research indicate that early environments that do not provide such growth-promoting experiences, beginning in early infancy, miss out on key windows of opportunity for building healthy brain architecture and mastering important foundational skills that are building blocks for increasingly complex brain circuits and capacities over time.

The well-being of all young children requires greater public attention to early care and education settings that fail to meet minimal standards for health and safety. National health and safety performance standards for out-of-home child care programs have been formulated by a joint effort of the American Public Health Association and American Academy of Pediatrics. Despite the existence of these standards, many child care settings in the United States, particularly those for infants and toddlers, operate outside the protective net of basic safety provisions and monitoring.

Multi-Generational Programs: Combining Support for Vulnerable Families with Direct Services for Children

Since the original design of the Head Start program in 1965, the concept of providing support for low-income parents in conjunction with high-quality, center-based care and education experiences for their young children has been implemented in many program models. The rationale for this blended approach is to focus broadly on the environment of relationships within which young children develop and to strengthen those aspects that are associated with improved cognitive, linguistic, social, emotional, and health outcomes for children who are at risk for problems. In practice, these programs vary greatly in their intensity, duration, and component services, as well as in their effectiveness.

Small-Scale Demonstrations: What We Have Learned. Perhaps the best known single-site demonstration test of a two-generation model is the Perry Preschool Project. This program provided not only a high-quality preschool program for three- and four-year olds at a single site beginning in the late 1960s, but it also included weekly home visits to families by trained teachers. These visits reinforced the curriculum implemented at the center by providing support for parents to engage with their children in cognitively and socially enriching activities. Although the evaluation could not establish the unique contribution of the parent component, this flagship program has demonstrated long-term benefits in stronger school performance, reduced special education placements, higher rates of high school graduation, reduced teen pregnancy, higher rates of employment, higher earnings, and lower rates of juvenile crime and adult arrests.

Some two-generation programs have been successful in focusing their interventions on very specific child outcomes. One example, the Incredible Years Program, has demonstrated effectiveness in reducing rates of aggressive behaviors in young children by providing a behavior management curriculum with professional support for teachers, as well as a videotape-based behavior management program for parents.

Multi-Site Programs: The Challenge of Scale. Several large-scale, two-generation models
have been evaluated rigorously using experimental designs. These include a mixture of programs that have demonstrated strong and even long-term benefits for children, as well as those with less conclusive findings.

Head Start includes elements that focus on parent involvement, social services, physical health, mental health, and community engagement in addition to its early education component. In its first national experimental evaluation, this multi-dimensional program produced small effects on more than half of its targeted outcomes across cognitive, social, emotional, health, and parenting domains after one year of services, but found no effects on other measured outcomes. After taking into account the complicating presence of “crossovers” (i.e., children and families assigned to the experimental group who did not end up receiving Head Start services, and those assigned to

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**Cost-Benefit Calculations**

From an economic perspective, a program constitutes a worthy social “investment” if the total benefits it generates exceed its costs. Cost-benefit accounting typically distinguishes costs borne by and benefits accruing to taxpayers versus participants and their families. Summing across these two groups provides estimates of total social costs and benefits. Although policymakers sometimes choose to focus only on the taxpayers’ costs and benefits, economic logic stresses the need to compare total resource costs, regardless of the degree to which they are borne by taxpayers or the participants, and total benefits, regardless of whether they are enjoyed by taxpayers or only by participants. If total benefits exceed total costs, then the program constitutes a worthy social investment.

The available evidence on early childhood interventions is largely restricted to model programs, which have generated benefit-cost ratios ranging from 2:1 to 17:1, depending on the program. The most successful intervention with the longest longitudinal data base, the Perry Preschool Project, generated an estimated annual internal rate of return of 16 percent projected to age 65 years, with a 4 percent return realized by program participants and 12 percent realized by society at large. For individuals, economists estimate that each additional year of schooling increases lifetime labor-market earnings by about 10 percent. For society, most of the documented returns from Perry Preschool to society accrued from decreased expenditures in the juvenile and criminal justice systems, decreased special education costs, increased tax revenues from higher incomes, and decreased reliance on government assistance. Benefit-cost analyses conducted on a few demonstration programs begun prenatally or soon after birth (e.g., the Nurse Family Partnership) also have shown positive returns. As with the Perry Preschool study, cost-savings from reductions in crime are the primary saving mechanisms. Unfortunately, large-scale programs, which are of particular interest to policymakers, generally have failed to track their costs and to invest in studies that quantify their benefits, particularly in the years after children leave the programs.
The control group who did), the effects of Head Start on children and families who actually participate are larger, falling in the moderate range.68

The Early Head Start national evaluation also tested a two-generation model that provided relatively more intensive family support services (including assistance with parenting, health promotion for the children, and guidance in formulating parents’ own life goals) with services provided directly to children (in center-based child care or during child-focused home visits) from the prenatal period to age three years. This study was conducted in the context of a program model that was being taken to national scale quickly, which suggests that its federally-mandated evaluation may have been conducted before all the programs were operating as planned and, therefore, measured the effects of varied levels of implementation. Age of entry ranged from the prenatal period to the first year of life, services were provided until 36 months, and implementation was guided by Early Head Start performance standards.

A 17-site experimental evaluation reported small effects of Early Head Start when the children were 36 months of age.69 Across children and program models, these effects included multiple domains of cognitive, social, and emotional development, as well as several areas of parenting and economic self-sufficiency.70 The strongest positive effects on parents and children at age three were found in programs that mixed center- and home-based services, those that implemented the Head Start Performance Standards earlier rather than later, those that enrolled parents during pregnancy, and those serving children in families at medium levels of risk as defined by demographic characteristics. The national infrastructure provided by Early Head Start offers a promising network for ongoing experimentation, careful evaluation, and continuous program refinement for infants and toddlers in low-income families.

Although most two-generation models focus on families in poverty, some programs have targeted groups experiencing other risks. The Infant Health and Development Program, for example, combined home visits beginning at birth for parents with low-birth weight, premature infants across the socioeconomic spectrum, along with high-quality, center-based care for the children between one and three years of age.71 Evaluation results showed positive effects on cognitive ability at ages two and three for all children except those born to college-educated mothers. For the heavier-weight infants (ranging between 3.3 and 5.8 pounds at birth), there were positive impacts on receptive language, vocabulary, and standardized math scores at age eight, as well as positive effects on receptive language, math, and some youth-reported risk behavior at age 18.

Finally, in contrast to Head Start, Early Head Start, and the Perry Pre-school Project, in which services were designed and provided directly by local program sites, the Comprehensive Child Development Program utilized a parent education and case management model to integrate pre-existing services for families with children from birth to five years of

**Thinking Beyond Economic Benefits**

Despite the obvious value of economic impact data, it is also important to recognize that ensuring the health and well-being of young children is an important objective in its own right, regardless of whether financial benefits can be documented in the future. Policies for children with significant developmental disabilities or complex medical problems may be viewed most appropriately through this lens. The same can be said about certain public expenditures for adults, such as the rapidly escalating costs of custodial care that are projected for the growing frail, elderly population that will make up an increasing part of our nation’s population and not be expected to generate positive financial returns in the future. Some might even suggest that policies related to subsidized child care should be evaluated primarily for their role in supporting working families rather than for their potential impact on child outcomes. These issues, among many others, raise important challenges for policymaking, particularly when they speak more to society’s moral values than to its economic interests.
Results of a 23-site experimental evaluation of this large-scale federal initiative revealed no overall impacts on parent or child outcomes at age five.\(^7\)

Explanations for why the program may not have had significant effects include both program design and implementation issues. First, it may be that direct child development services were weak and both the content and delivery of the parenting education was inappropriate or simply ineffective.\(^7\) In addition, many families received extremely modest levels of service because of implementation difficulties, and many control-group members received similar kinds of services as their experimental-group counterparts. It also has been postulated that simply coordinating existing services, even within an intensive case management model, may not be beneficial to families if the services to which they have access are not high quality.\(^7\)

**Policy Implications**

Two-generation programs can have positive impacts on both children and parents who are experiencing adversity, but further evaluation is needed to match the mix of service components to the circumstances of the participants. Positive impacts have been documented in model programs like the Perry Preschool Project, as well as scaled-up, multi-site programs, such as Head Start and Early Head Start. The considerable variability in costs associated with different combinations of service formats and locations provides compelling motivation to identify the “active ingredients” that contribute the most to successful outcomes. Yet one of the most difficult challenges facing those who seek to convert evaluation findings into sound policy recommendations has been the inability to disentangle the relative contributions of different program components. In fact, the hypothesis that a combined focus on parenting skills/self-sufficiency and high-quality educational experiences for children will produce greater impacts than providing either alone, although highly suggestive, has not been proven conclusively.

The “unpacking” of services that are provided through large, multi-site programs would help us learn more about the relative effectiveness of interventions for a diversity of target populations. Evaluations of the Infant Health and Development Program and Early Head Start indicate that these programs have had greater impacts on some groups compared with others. However, far less is known about the differential effects of specific program models for young children in non-English speaking or immigrant families in comparison to what is known about program impacts on low-income, African-American families in the United States. Thus, evidence from existing, multi-site interventions are best viewed not as a final answer but as an important starting point for continuous program improvement through the ongoing design, implementation, evaluation, and refinement of alternative service approaches over time.\(^7\)

**Effectiveness Factors That Cut Across All Program Models**

Four decades of evaluation research have made it abundantly clear that effective policies and programs in the first five years of life require attention to the specific needs of children and families in a variety of circumstances. Positive results have been achieved in a diverse array of programs,
including child-focused, parent-focused, and two-generation models, and in a variety of ser-
vice settings, including families’ own homes and community-based centers. Program evaluation
research indicates that several strategies can be effective for young children and fami-
lies experiencing significant adversity. Depending on the specific circumstances, these might
include intensive home visiting by specialized nurses or highly trained practitioners, skilled
counseling for mental health problems, or a mixture of intensive home visiting for parents
and high-quality center-based services for children, among others.76

The core scientific concepts of early childhood and early brain development remain
equally valid, whatever the program category, administrative structure, or funding mecha-
nism. This gives policymakers some latitude in choosing among program approaches to
address specific objectives. The key is to select strategies that have documented effectiveness,
to assure that they are implemented well, and to be specific and clear about how their impact will be measured.

Screening Services and Staff Skills. In order to provide appropriate services in a timely
manner, it is important to have effective screening and referral mechanisms in place in a va-
riety of settings in which young children and their families are seen regularly. These can in-
clude doctors’ offices, child care facilities, and preschools, among others. Once specific needs
are identified, it is essential that prescribed services are sufficiently prepared to address them,
particularly for those families facing the greatest challenges. For example, home visiting pro-
grams staffed by non-professional staff would be grossly inadequate for mothers coping with
serious depression, substance abuse, or family violence. Stated simply, programs that cost less
because they employ less skilled staff are a waste of money if they do not have the expertise
needed to produce measurable impacts. Similarly, it is essential that all screening, assessment,
and intervention efforts are matched appropriately to the language and cultural characteris-
tics of the children and families they are asked to serve. This latter requirement is increasingly
important as the early childhood population in the United States is becoming more diverse
racially, ethnically, and linguistically.77

Program Targeting. Successful programs that are more broadly targeted (e.g., to families
in poverty) have generally provided more broadly defined services (e.g., high-quality early
education, child development information, support for parenting and parent self-sufficiency)
than those targeted to families at risk due to specific factors such as parental depression or
likelihood for child maltreatment. This suggests the potential benefits of both broadly target-
ed programs and screening for specific problems in the first years of life. To this end, screen-
ing systems should be broad-based so that a high proportion of families at specific risk can
be identified. However, very little evidence exists regarding the effective implementation of
such screening systems, with follow-up referral to programs targeted to particular risks.

Mental Health Services. Finally, the striking shortage of well-trained professionals with
expertise in mental health services for families with young children also needs to be ad-
dressed. The particular importance of greater attention to early childhood mental health
concerns is underscored by recent reports of expulsions of disruptive children from early
childhood programs;78 rising rates of off-label drug treatment for young children with emo-
tional or behavioral problems (i.e., use of medications that have been tested for efficacy and
safety in adults but not for children, although they can be prescribed legally at the discretion

Programs that cost less because they employ less skilled staff are a waste of money if they do not have the expertise needed to produce measurable impacts.
of a physician); and the comparatively high prevalence of depression in mothers of very young children, particularly in low-income families. In this context, it is important to note that the original federal legislation mandating early intervention for children from birth to age three (now provided through Part C of the Individuals With Disabilities Education Act) included services to address emotional and social difficulties, as well as problems in cognition, language, and motor development. Thus, the need for professional staff development in this area is not a new directive but simply a delayed implementation of the original provisions of the Education for All Handicapped Children Act Amendments of 1986.

Family Economics and Maternal Employment

Approximately 4.1 million infants, toddlers, and preschoolers lived in poverty in the United States in 2005. For a family of three, this means a total income of less than $15,577, which actually falls well above the income level of many poor families. Extensive research shows that children who grow up under conditions of poverty are more likely (relative to non-poor children) to be less successful in school, less productive as adults in the labor market, have lifelong health problems, and commit crimes and engage in other forms of problematic behavior.

There are many reasons why low family income may be detrimental for young children. Early development can be compromised when parents cannot afford to provide nutritious meals, are unable to assure access to age-appropriate learning experiences both in the home and in early care and education settings outside the home, and cannot guarantee safe and growth-promoting neighborhood environments. Poverty and economic insecurity also can take a toll on parents’ mental health, with depression and other forms of psychological distress profoundly affecting their interactions with their children.

Despite the strong and consistent correlations between poverty and diminished child well-being, relatively few studies have focused on isolating the adverse child impacts of low income itself in contrast to the effects of a host of associated conditions, such as decreased parent education and high levels of family stress. Nevertheless, many of the most sophisticated studies point to the early childhood period as the stage in which children are most vulnerable to economic deprivation. This might be expected, given the greater malleability of early development and the overwhelming importance of the immediate environment of relationships (i.e., within the family, in contrast to school or peer contexts) for infants, toddlers, and preschoolers.

Income Support. Two well-designed sets of studies have shown that employment-based boosts in family income can produce achievement gains in young children. One, using data from random-assignment program evaluations of welfare-to-work initiatives, found that earnings supplements that increased family income by $1,000 to $1,500 per year were consistently associated with small, positive impacts on the achievement of preschool-aged
children, although the same policies had negative effects on children entering adolescence. A recent study estimating the impacts of the Earned Income Tax Credit also found small benefits for younger children’s achievement but did not test for impacts on adolescents. These findings suggest that the transition from pre-school into middle childhood (i.e., age four to five) may be a period during which financial supports for families can have a positive influence on their children’s development. These financial supports have been successfully implemented in a variety of policy and service settings, including tax policy (the EITC), the welfare system, and community-based work support organizations that are outside the welfare system.

**Effectiveness Factors for Supporting Working Parents.** Beyond the special problems faced by families who live in poverty, the challenges of balancing work and parenting are substantial across all income groups. This issue is particularly problematic in early infancy, as the United States is one of the few western, industrialized nations that does not offer the option of paid parental leave following the birth of a baby. Although the Family and Medical Leave Act (FMLA) does provide for unpaid leave for up to three months, this provision covers only about half of employed parents, and evidence strongly suggests that many parents, particularly those with low incomes, cannot afford financially to take time out of the labor market to stay home with their infants. Consequently, current FMLA leave provisions have very small effects on whether mothers take maternity leave, and appear to have no effect on fathers’ leave-taking behavior. In contrast, evidence from other countries suggests that policies that provide wage replacement have considerably stronger effects on leave-taking.

Research on leave policies in countries that support new mothers to stay home beyond the first few weeks and months of life has documented improved health outcomes for both children and their mothers. Research in the United States has found that women who return to work later in the first year experience less depression. Comparative studies have found that when paid leave periods are longer, infant mortality rates are lower. Unpaid leave—the parental leave policy in the United States—does not have the same protective effect, presumably because parents are less likely to take it. There also is evidence that children whose mothers stay home longer in the first year of life are more likely to receive well-baby care and to be fully immunized. While some evidence suggests that paid parental leave may enable parents to better balance work and caregiving demands, more research is needed to better understand how leave policies will affect work patterns and the quality of caregiving, and which families will benefit from such policies.

Extensive behavioral and developmental research evidence supports the importance of sensitive caregiving in the early months of life. Whether child well-being would be facilitated by a paid parental leave policy in the United States has not been quantified, primarily because research in this country has not been able to evaluate the direct effects of such policies on child outcomes. Instead, studies have linked variation in the timing of mothers’ return to work after the birth of their children with variation in their children’s development. Although most studies of maternal employment show no links with adverse child outcomes for pre-adolescent children, questions continue to be raised about the special vulnerability of
infants. Some recent reports, for example, indicate that full-time maternal employment in the first year of life may be linked to lower levels of cognitive development and higher levels of problem behavior later in childhood.99

An overarching problem with this literature, however, is that few of these studies have been able to explain the possible mechanisms for the negative effects that have been found for children in more advantaged families.100 For example, adverse outcomes may arise from the conditions—rather than the mere fact—of early maternal employment (e.g., an unemployed father, shift work, etc). It also is possible that mothers who return to work early may experience elevated levels of stress or depression and thus may be less sensitive caregivers or may not engage in such health-promoting behaviors as breastfeeding and immunization.101 In addition, because of the substantial cost and scarcity of high-quality care for infants in the United States, children whose mothers work full-time during the first year may experience lower quality out-of-home care than children of mothers who work only part-time.102

Finally, it is important to note that negative impacts of maternal employment are less likely to be found among disadvantaged, single-parent families. In fact, some evidence suggests that maternal employment may be beneficial for disadvantaged children, especially if it leads to higher family income.103

Policy Implications

Income supplements for low-income parents that are tied to employment offer a potential strategy for supporting the development of young children. Research suggests that two policy directions are worthy of consideration. The first would be to design state welfare reform policies and employment support programs to reward full-time work with wage supplements for employees with dependent children. A second is to expand the Earned Income Tax Credit (EITC), which would provide more money, contingent on work effort, for low-income parents whose financial resources are limited. Nearly half of all states have implemented their own EITC and, thus, could consider this option. States without these tax credits should be aware of their potential positive effects on child and family outcomes. In both cases, focusing expanded financial support on families with young children would help contain the total cost and concentrate resources where they appear to generate the highest returns.

Studies in other countries indicate that parental leave with wage replacement is associated with positive health benefits for children and mothers, but research focused explicitly on how paid parental leave affects child outcomes is not sufficiently developed in the United States to inform the policymaking debate. Considerable public discussion has been generated about the potential tradeoffs of various durations of parental leave with or without wage replacement. Unfortunately, the paucity of systematic research about the specific impacts of alternative leave policies on either parent well-being or child development in this country limits the extent to which empirical evidence can inform this policy question.

Environmental Contamination:
Recognizing the Vulnerability of the Young Brain

There is no question that exposure to certain chemical substances during the period from conception through the early years of life can interfere with the normal function of genes, proteins, and other small molecules that influence brain development. There is also no question that exposures at levels that appear to be harmless for adults can cause significant and
irreversible damage to the developing architecture of the brain of a fetus or infant. Despite this well-established scientific fact, the importance of determining which substances are safe and specifying thresholds of exposure for those that are dangerous is not generally incorporated into public policy. Moreover, when safe levels of exposure to known environmental neurotoxins (i.e., substances that have a poisonous effect on brain cells and circuits) are established, they are determined primarily through a process that is guided by research findings from studies of mature animals and adult humans.

**Legal and Illegal Substances.** The fact that some legally available substances (such as alcohol and certain prescription drugs) are far more toxic to the developing brain of an embryo or fetus than many illegal drugs (such as cocaine or marijuana) is not known by most people. This underscores the need for expanded access to health care, education, and monitoring for women in the child-bearing years, both before and immediately after they become pregnant. Although a great deal remains to be learned about the full breadth of risk during pregnancy and early childhood, there is much that can be done based solely on what we know now about how to reduce the number of children whose brains are seriously harmed by environmental toxins.

**Environmental Toxins.** Reductions in the levels of well-documented neurotoxins in the environment have been proven to lower the risk of preventable damage to the brains of fetuses and young children. For example, the U.S. Environmental Protection Agency (EPA) imposed new regulations on the use of organophosphate pesticides, largely because of concerns about the potential exposure of young children. Follow-up studies found that the percentage of food samples with detectable residues of these pesticides dropped from 29 percent in 1996 to 19 percent in 2001.

The problem of mercury and its increasing presence in our nation’s food supply shows that there is more work to do. Resistance to the imposition of restrictions on the sources of environmental mercury is particularly problematic, given the results of a recent EPA study that reported: (1) there is no safe blood level of methyl mercury; (2) 50 percent of women of childbearing age in the U.S. have blood levels that reach or exceed one part per billion; (3) an estimated eight percent of women of childbearing age have dangerously high blood levels; and (4) mercury levels in the food chain are increasing (particularly in swordfish and tuna). Perhaps the most troubling aspect of this serious cause of brain damage in fetuses and young babies is the fact that the largest production of environmental mercury comes from the emissions of coal-burning power plants and incinerators, despite the fact that technology is available to reduce its atmospheric release.

The costs of ignoring the devastating impacts of neurotoxins are high. Cognitive impairments caused by lead poisoning alone have been estimated to result in societal costs of approximately $43 billion annually. The emotional costs of severe disabilities that could have been prevented are exceedingly high.

**Policy Implications**

The determination of safe levels of exposure to toxic substances should be based on rigorous studies that focus on the critical link between relative vulnerability and age. There
is no question that the brain of a young child can be seriously damaged by exposure to certain chemicals (such as mercury, lead, and alcohol) at levels that would have essentially no harmful effects on the brain of an adult. Moreover, levels of exposure that are relatively safe for a young infant can be harmful to a fetus, and what is relatively less dangerous for a fetus can have serious and permanent consequences for the brain of an embryo at the beginning of pregnancy. Given this basic scientific principle, policies designed to protect the public from harm should be focused on establishing thresholds of safety based on the best data available for the youngest children, as well as for pregnant women.

**Expanding public awareness with more extensive dissemination of accurate scientific information through warning labels and proactive controls on toxic exposures could lead to significant benefits.** Information on the toxic effects of organophosphates, for example, could be disseminated more effectively by requiring clearer content and warning labels on the packaging of commonly used insecticides. This would enable pregnant women and families with young children to make more informed choices about the products they use around their home. In an effort to move beyond policies that rely solely on individual monitoring by parents alone, Michigan enacted legislation in 2004 that prohibits the use of any pesticides at a school or child care center unless it has adopted an integrated pest management program that focuses on non-pesticide alternatives to chemical compounds. Both the Michigan law and legislation in Rhode Island and Illinois, among others, require schools and child care centers to notify parents in advance before pesticides are used on school grounds.109

**Concluding Thoughts**

Decreasing risk and improving life-long outcomes for vulnerable, young children do not require the full implementation of all the policy alternatives described in this document. The task for policymakers is to choose wisely among politically viable options and to maximize the return on their investments through effective interventions that target well-defined needs with proven, well-implemented programs. Recent advances in the science of early childhood and early brain development, combined with the findings of increasingly sophisticated program evaluation research, provide a strong knowledge base upon which people with diverse political values can design a common agenda.

It also is essential to underscore the critical need to strengthen program quality. To this end, honest accountability practices would be facilitated by a governing environment that supports stable funding for needed services in the context of ongoing research and continuous program enhancement. Persistent discrepancies in effectiveness between model programs and many scaled-up service systems call for greater attention to the importance of quality control and the need for ongoing investigation of impacts in the implementation of large scale programs. When all is said and done, interventions should be evaluated to strengthen
their impact, not to erect barriers to participation.

Can these principles be enacted in ways that take into account very different cultures, geographies, populations, and political environments across states? The answer is yes. Although much work still remains to be done, recent efforts in places as varied as Nebraska, South Carolina, Oklahoma, Connecticut, Washington, and Illinois, among others, provide impressive examples of the many ways that different states can design and implement alternative strategies for investing in the needs of young children.

Are some investments more strategic than others? Absolutely. While good programs can enhance the performance of all children, current knowledge about brain and child development, as well as empirical data from cost-benefit studies, presents a compelling case for early, public investments targeted preferentially toward those children who are at greatest risk for later failure in school, in the workplace, and in society at large.

Can or should government do it all? The answer is no. The magnitude of the challenges and the considerable up-front costs of doing things right suggest that shared responsibility through public-private sector partnerships offers greater promise than either government or voluntary action alone—and both will benefit greatly in the long term.

Seven years ago, the introductory chapter of *From Neurons to Neighborhoods* proposed two complementary agendas:

The first is focused on the future and asks: How can society use knowledge about early childhood development to maximize the development of the nation’s human capital and ensure the ongoing vitality of its democratic institutions? The second is focused on the present and asks: How can the nation use knowledge to nurture, protect, and ensure the health and well-being of all young children as an important objective in its own right, regardless of whether measurable returns can be documented in the future? The first agenda speaks to society’s economic, political, and social interests. The second speaks to its ethical and moral values. The committee is clear in our responsibility to speak to both.110

In the final chapter, the report concluded:

Finally, there is a compelling need for more constructive dialogue between those who support massive public investments in early childhood services and those who question their cost and ask whether they really make a difference. Both perspectives have merit. Advocates of earlier and more intervention have an obligation to measure their impacts and costs. Skeptics, in turn, must acknowledge the massive scientific evidence that early childhood development is influenced by the environments in which children live.111

This paper is designed to further inform sound policy decisions guided by state-of-the-art knowledge. Its objective is to create a science-based framework within which a broad range of thoughtful people from both the public and private sectors can come together and find common ground on behalf of our nation’s young children and their families in order to improve both the quality of their lives today and the future of our nation tomorrow. We recognize that, for some, this is a critical moral responsibility. For others, this is a wise economic investment. As scientists, we believe that rapidly growing scientific knowledge about early childhood and early brain development provides a compelling framework for both.
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About the Authors

The work for this paper began in 1998 with the establishment of a blue ribbon committee by the Board on Children, Youth, and Families at the Institute of Medicine and National Research Council, which produced a report in 2000 entitled *From Neurons to Neighborhoods: The Science of Early Childhood Development*. Subsequent to the publication of this widely acclaimed volume, a working group of distinguished scientists and scholars was convened under the auspices of the MacArthur Research Network on Early Experience and Brain Development to explore strategies for educating the public about this growing knowledge base. In 2003, individuals from these two groups merged their commitment to the application of rigorous science to social policy and established the National Scientific Council on the Developing Child. More recently, the National Forum on Early Childhood Program Evaluation was created to expand the Council’s focus beyond neuroscience and basic child development research to include evidence from evaluation studies of intervention effectiveness. In 2006, both the Council and Forum were incorporated within the newly established Center on the Developing Child at Harvard University, which has sponsored the development of this document. The final product combines the neuroscience expertise of the Council, the program evaluation expertise of the Forum, and their shared knowledge of research in child development and economics.

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Selected Background Readings

From the National Academy of Sciences


From the National Scientific Council on the Developing Child


Stress and Child Development

Ross A. Thompson

Summary

Children’s early social experiences shape their developing neurological and biological systems for good or for ill, writes Ross Thompson, and the kinds of stressful experiences that are endemic to families living in poverty alter children’s neurobiology in ways that undermine their health, their social competence, and their ability to succeed in school and in life. For example, when children are born into a world where resources are scarce and violence is a constant possibility, neurobiological changes may make them wary and vigilant, and they are likely to have a hard time controlling their emotions, focusing on tasks, and forming relationships. Unfortunately, these adaptive responses to chronic stress serve them poorly in situations, such as school and work, where they must concentrate and cooperate to do well.

But thanks to the plasticity of the developing brain and other biological systems, the neurobiological response to chronic stress can be buffered and even reversed, Thompson writes, especially when we intervene early in children’s lives. In particular, warm and nurturing relationships between children and adults can serve as a powerful bulwark against the neurobiological changes that accompany stress, and interventions that help build such relationships have shown particular promise. These programs have targeted biological parents, of course, but also foster parents, teachers and other caregivers, and more distant relatives, such as grandparents. For this reason, Thompson suggests that the concept of two-generation programs may need to be expanded, and that we should consider a “multigenerational” approach to helping children living in poverty cope and thrive in the face of chronic stress.

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Children depend on the care of adults in the environment of relationships in which they live. This provides a compelling justification for two-generation efforts to support healthy growth. In this issue, other scholars draw attention to the ways that family resources—such as assets (including income), parents’ education and health, and family assistance programs—can have both direct and indirect benefits for children.

This contribution is different from the others in several ways. First, I focus not only on resources but also on how family stress, and especially sources of stress that are common to at-risk children, can threaten healthy development. The children in the studies I discuss live in poverty, witness domestic violence or persistent marital conflict, live in foster care, are abused or neglected, have a depressed mother, or experience other kinds of significant chronic stress. Second, I focus on developing biological systems, although the studies I review also have considerable implications for behavioral development, socioemotional adjustment, and cognitive growth. Third, I try to “get under the skin” of early development to understand how parenting quality and parent-child relationships affect children’s biological functioning in ways that can have enduring behavioral consequences. My argument is that children are biologically designed to rely on early social experiences to guide the organization of their developing biological systems in ways that can be healthy or maladaptive. Those social experiences, especially in the family, can assist or undermine positive coping and adjustment, or in some cases alleviate the effects of prior stressful experiences. This is where the research I discuss has implications for early, multigenerational interventions.

The next section outlines a general portrayal of a child’s developing biology, drawing on research into fetal programming, the neurobiology of stress and development, and how immunological systems function. The picture is incomplete because these research fields are rapidly advancing, but we know enough already to draw conclusions about how early experience affects the developing organization of these biological systems. In the third section, I expand on the concept of “stress,” drawing on research into the interaction of genes and the environment, to provide a more refined analysis of the kinds of experiences and conditions that pose immediate and longer-term risks to young children. The fourth section introduces the concept of developmental plasticity as a way to understand why early intervention is important, and what characteristics distinguish promising interventions to ameliorate children’s stress. This section also profiles several examples of interventions that improve the stress neurobiology of children who live in difficult circumstances. The final section offers several provisional conclusions and implications of this work for thinking about multigenerational approaches to strengthening healthy development.

Developing Brain, Biology, and the Environment

Children are born into a world of unknowns. Newborns have no idea whether the environment into which they are born is rich or deficient in food, dangerous or secure, or populated by nurturing or abusive adults. Yet the ability to quickly adapt to environmental conditions is crucial to the newborn’s immediate survival and to long-term development, especially if these conditions are likely to persist. Depending on which environmental conditions are detected, for example, the
infant’s developing metabolism might slow down to prepare for a world of deficient or inconsistent food resources, and its perceptual processes might become more or less vigilant for threats to its safety. Obviously, these adaptations are not made consciously. Rather, they reflect how young, developing biological systems organize themselves in response to environmental signals. The most important source of these signals is the quality of care that young children receive.

An illustration of how this occurs is early language learning. Newborns cannot know whether they’ve been born in Paris, London, New York, Tokyo, or Kiev. Consequently, the young brain must develop the potential to learn any language, and studies show that six-month-olds can discriminate among a wide variety of human speech phonemes, many more than their parents can discern. Young infants are figuratively “citizens of the world.” But this universal perceptual ability is lost by age one as the child overhears the language (or languages) spoken in the home. This signals the brain to reorient speech perception to language-specific phonemes, making the child a more efficient language learner, and soon afterward an explosion in language learning occurs. Early experience instructs the brain about the language environment into which the child has been born.

There is every reason to believe that this biological sensitivity to environmental signals is not unique to language learning, nor does it begin at birth. In the uterus, the fetus is exposed to a variety of signals from the mother’s diet, her emotions, and extrauterine influences that can have potent effects on development. This was dramatically illustrated by longitudinal research (that is, research that follows people over time) on the Dutch famine of 1944. During World War II, the German military occupying the Netherlands blockaded food transports in reprisal for a strike by Dutch railway workers in support of the Allied invasion. As a result, official rations for the adult population fell abruptly to between 400 and 800 calories daily from December 1944 until April 1945, when the Allied liberation of the Netherlands began to succeed and adequate nutrition was quickly restored. The children born to the women who were pregnant during the Dutch famine have been followed into late adulthood. Although some of the immediate effects of maternal malnutrition (such as birth weight) did not significantly predict later outcomes, latent effects of malnutrition had long-term consequences. In adulthood, these children were at significantly greater risk for a range of health and mental health problems, including obesity, heart disease, and schizophrenic disorders, compared with children, including same-sex siblings, whose gestation was not affected by the famine. Investigators have concluded that these adult health problems may have resulted from fetal “programming” for nutritional deprivation followed by a lifetime of plentiful food for which these individuals were biologically unprepared.

Another illustration of how developing biology adapts to environmental signals concerns the neurobiology of stress. At birth, newborns have no idea whether they are living in the West Bank or the East Side, but adapting quickly to environmental conditions of threat or security is crucial to their survival. Considerable evidence suggests that the fetus is sensitive to hormonal and other physiological indicators of maternal stress, and that heightened exposure to stress in the womb is associated with greater reactivity to stress after birth, as well as longer-term problems with emotional and cognitive functioning. In one longitudinal study, for example, mothers’
depression during pregnancy was associated with heightened cortisol levels when infants were observed three months after birth as they underwent a moderately stressful procedure (cortisol is an important stress-related hormone). In another longitudinal study, early exposure to maternal cortisol in the womb was associated with emotional difficulties and larger volume in the right amygdala (a brain structure that helps detect and respond to threat) in girls at age seven. These findings are consistent with substantial research on animals that documents similar effects in the offspring of pregnant females that were subjected to stress. In general, then, prenatal stress exposure makes children more reactive to challenge and threat.

After birth, a child’s direct exposure to chronic stress alters developing stress neurobiology in comparable ways. A wealth of research with animals and humans has focused on the hypothalamic-pituitary-adrenocortical (HPA) axis, an important part of the neuroendocrine system (the body’s regulatory system that integrates the nervous system with the endocrine system). The HPA axis matures significantly during the prenatal period and the early postnatal years. When the brain detects threatening events and activates the HPA system, the consequences include production of cortisol that mobilizes energy, suppression of immune functioning, enhanced cardiovascular tone, and other critical components of the stress response. These responses have important psychological consequences, including greater focus on threat vigilance, heightened motivation for self-defense, and emotional arousal. In addition, basal levels of HPA functioning, which follow a circadian clock, are important to cortisol output, which helps to maintain our capacity to regulate our emotions and cope with stress. Chronic stress, however, changes HPA functioning over time by altering the neurological circuitry that underlies the body’s regulation of responses to stress. This occurs as repeated exposure to stressful events alters the sensitivity of the HPA system, in part through its effects on the limbic and cortical processes that regulate HPA activity. The limbic system is central to motivation and memory; cortical processes influence thinking, reasoning, and emotional regulation. Owing to their effect on these systems that regulate HPA activity, stressful events can have far-reaching consequences for behavior and cognition.

The biological effects of stress undermine [children’s] ability to concentrate, remember things, and control and focus their own thinking.

As the HPA system matures early in life, it is especially susceptible to the effects of chronic or severe stress. In a longitudinal study of children living in poverty, for example, environmental characteristics like poor housing quality, economic strain, and poor parenting were associated with disrupted HPA activity from seven months to age four. Another study of poor children found that toddlers living in families characterized by violence between parents and mothers’ “emotional unavailability” to the child also exhibited disruptions in normal HPA activity. In older children, higher cortisol levels were associated with lower family socioeconomic status, and mothers of older children with higher cortisol levels were more likely to have symptoms of depression.
The behaviors correlated with disrupted HPA activity are complex and depend in part on the nature of the stress that children experience. They include heightened vigilance and self-regulatory problems that may be manifested in poorer coping, cognitive and attention problems, poor emotional regulation, and difficulty in social functioning. This constellation of behavioral problems, which arise from chronic activation of the HPA axis and the influence of stress hormones like cortisol on other biological systems (described below), have important implications for children's academic functioning as well as their capacity to develop constructive relationships with peers and adults. Stated differently, one of the reasons that children in stressful circumstances fall behind academically is that, in addition to the other disadvantages they experience, the biological effects of stress undermine their ability to concentrate, remember things, and control and focus their own thinking. And one of the reasons they experience social difficulties—with peers, for example—is that, in addition to the other disadvantages they experience, the biological effects of stress heighten emotional reactivity and undermine emotional self-regulation.

Early, chronic stress is associated with other biological challenges that also contribute to these behavioral consequences. Stress is associated with sharp increases in the autonomic nervous system's activity, including elevated blood pressure. As we’ve seen, stress hormones influence the functioning of cortical systems (such as the prefrontal cortex, which regulates many other neurobiological and cognitive processes) and limbic structures, including the amygdala, the hypothalamus (which is involved in motivational processes, including emotion), and the hippocampus (which contributes to the creation of memories from current experience). Chronic stress also suppresses the functioning of the immune system. Stress undermines the immune system's sensitivity to infectious challenges, increasing its response to cytokines (that is, inflammatory agents) and generally embedding “proinflammatory tendencies” into biological functioning. In short, chronic and severe stress influences multiple biological systems, with diverse behavioral consequences; when this occurs early in life, the organization and functioning of these systems may be permanently altered.

Viewed from the perspective of biological adaptation, these developments are consistent with the young child's preparation for a life of adversity. If early experiences of family conflict, limited resources, and poor parenting are biological signals of the environmental conditions into which the child has been born, then it makes sense that the child develops biological systems that allocate mental resources to threat vigilance, foster quick and strong reactions to perceptions of danger, enable rapid mobilization of energy, and alter immunological functioning, yielding a behavioral pattern well suited to this kind of environment.

But there are several trade-offs. First, mental resources devoted to vigilance cannot as readily be devoted to learning, problem-solving, and other constructive pursuits. Second, although this behavioral pattern is adapted to conditions of adversity associated with family experience, it may be poorly suited to other social settings, such as at school and with peers, that require a different and more constructive set of behavioral skills. A social orientation toward detecting threats makes it hard to develop constructive relationships. Furthermore, the trouble these children have controlling their impulses and emotions...
limits their capacity to quickly adjust to the different requirements of other social settings. Because they respond to most situations in the way they have learned to respond at home, these children get into trouble.

A third trade-off of these biological adaptations to stress is that they are taxing. Chronic activation of the neuroendocrine, cardiovascular, and immunological systems extracts a cost. These systems are designed for short-term activation, and chronic arousal makes it more difficult to mobilize them and recover from their activation in the future. This principle is captured by the concept of “allostatic load,” which refers to the progressive “wear and tear” on biological systems from the long-term effects of chronic stress. Considerable research documents that people with high allostatic load—or overload—are more susceptible to physical and mental health problems.17

Here is another way to consider the effects of chronic stress on developing biological systems. Human young have evolved to depend on their caregivers for protection, nurturance, and emotionally responsive care. When they receive these things, their developing neurological, neuroendocrine, immunological, and other biological systems organize to function appropriately, which also helps their developing cortical systems facilitate the growth of learning, problem-solving, and self-regulation. Stated simply, healthy biological and behavioral development depends on a supportive, responsive human environment. When children instead experience poverty, parental depression, family violence, or other circumstances, these biological systems and their interactions are disrupted. Such disruption may help children adapt to these conditions, but it also has immediate and long-term costs for healthy development.18

**Defining Stress**

Throughout this discussion, I have used the term stress, with qualifiers such as chronic or severe. But what exactly is stress?

Stress is a complex psychobiological process with biological, emotional, mental, and behavioral consequences, all of which influence one another.19 It begins, of course, with the perception of threat or danger in the environment. Some threats are experienced in common by everyone (for example, the approach of a menacing stranger), and others are based more on individual experience (for example, the approach of a familiar person whom one fears). As I’ve noted, the biological processes associated with reactions to stress have psychological consequences for both children and adults.20 Thus stress responses are accompanied by a mental orientation toward threat, mobilization of energy for self-defense, and emotional arousal. Stressful experiences vary significantly, however, in their severity, duration, and predictability. When children experience manageable stress, their developing biological systems are not disrupted. Indeed, children need such experiences to help these systems become adaptively self-regulating.21 “Good” stress yields positive developmental and behavioral outcomes throughout life by helping individuals acquire coping skills.

What are the characteristics of good stress? Generally speaking, stressful experiences that are mild or moderate, predictable, and of short duration can be characterized as manageable and are likely to enhance biological functioning and promote mastery and competence. When stressful experiences are severe, chronic, compounding, and unpredictable, they are generally more likely to exceed an individual’s self-regulatory capacities. For
children, of course, another important factor in making stress manageable is the supportive presence of a caregiver. Considerable research with human and animal young shows that a parent’s support buffers stressful events and helps children cope.\textsuperscript{22} Although adults also rely on social support, for children the assistance of a caregiver is more fundamental in making stressful experiences manageable. When they experience a frightening injury or a routine immunization, the loss of a pet or a peer’s rejection, children who have the support of caregivers manage more successfully than children who must rely on their own resources alone.

But this straightforward portrayal is complicated by individual differences in stress reactivity and coping. More resilient people may be able to manage amounts of stress that would undermine the coping of less resilient individuals. Research on how genes interact with the environment underscores how significantly individual characteristics moderate the effects of environmental events. In one widely publicized study, for example, a research team identified indicators of harsh or abusive parenting in the childhood histories of a large sample of men from Dunedin, New Zealand, who had been studied from birth through adulthood.\textsuperscript{23} They also obtained information about the men’s genetic characteristics—in particular, whether they were genetically prone to aggression and antisocial behavior. When the researchers sought to identify which adults would be most likely to exhibit antisocial behavior, they found that the combination of early harsh parenting and genetic vulnerability best foreshadowed behaviors like adolescent conduct disorder, criminal convictions for violent behavior, and antisocial personality disorder. Although genetic vulnerability and parenting history were each important, adults who had genetic vulnerability together with a history of harsh parenting were most likely to exhibit antisocial behavior.

Other studies have shown similar results. In one study, researchers observed mothers’ sensitivity to their children when their infants were 10 months old, and measured externalizing behaviors (that is, acting-out behaviors such as conduct difficulties and aggression) when the children were 39 months old. Maternal insensitivity was significantly associated with later externalizing problems, but only for children with a genetic vulnerability to novelty-seeking and conduct problems. For children without this genetic factor, earlier maternal insensitivity did not predict later problems.\textsuperscript{24} Taken together, therefore, the effects of stressful experiences depend significantly on a person’s individual characteristics.

But here is a complication. Stressful experiences may actually alter the expression of genetic characteristics. The discovery that environmental experiences can alter how genes function is one of the signal achievements of the field of epigenetics. Epigenetics is concerned with influences on gene expression—that is, the activation, or “turning on and turning off,” of genetic activity—that occur without changes in the DNA itself. These influences occur through changes in the biochemical regulatory systems surrounding the gene, which can be altered through the effects of environmental experiences.\textsuperscript{25} As a result, a gene can remain the same but no longer be active. Epigenetic changes in gene expression can be short-term or enduring, and some can be transmitted across generations. Epigenetics has long been studied in plants and animals, but until recently we did not have the technology to study epigenetic influences in human behavior.
Epigenetic research on humans is still in its early stages, but it is already yielding important insights into how the environment influences gene expression. For example, early stress appears to produce changes in gene expression in children. One study examined children and adolescents born to mothers who said that they had experienced violence from their intimate partners while pregnant. The children exhibited epigenetic changes in the activation of the glucocorticoid receptor gene, which affects how the body reacts to stress. There was no evidence of epigenetic change in children whose mothers reported partner violence either before pregnancy or after the child’s birth.26 Looking at a more extreme situation, researchers found greater evidence for epigenetic changes in a group of children raised in orphanages than in a group raised by their biological parents, with changes evident in genes associated with brain development and functioning, stress reactivity, and immune function.27 Indeed, there is some evidence that epigenetic changes in gene activation may help to account for some of the research findings discussed earlier in this article concerning the effects of early experience on developing stress reactivity. For example, the association between mothers’ depression during pregnancy and greater cortisol reactivity in their children three months after birth was related to epigenetic changes in the activation of the glucocorticoid receptor gene.28 Similarly, some of the adult health problems of people whose mothers were pregnant during the Dutch famine of 1944 may be related to a change in activation of the gene for insulin-like growth factor II (IGF2).29 Thus epigenetics may be one reason that stress reactivity and other behaviors change in response to early adversity.

We don’t know where the science of behavioral epigenetics will lead in understanding behavioral development. It is clear, however, that gene activity is part of a surprisingly dynamic constellation of biological influences on behavioral development. Equally consequential, early experience is an important influence on gene activity, and an important feature of early experience is stress.

These considerations are relevant to the concept of toxic stress, which was recently adopted by the American Academy of Pediatrics (AAP).30 In a policy statement, the AAP alerted the pediatric community to sources of toxic stress that may affect children and urged them to work to reduce these harmful influences. The value of reducing chronic, severe stress in children is self-evident, and the AAP’s effort to enlist the pediatric community is admirable. To the extent that we understand toxic stress solely as a characteristic of the experiences that befall children, however, we overlook the child’s own characteristics as factors that exacerbate or buffer the impact of stressful events. Harm from stress, in other words, is not only in the nature of the experience but also in the nature of the child. In addition, the concept of toxic stress misses one of the most important factors that can make these experiences toxic: their epigenetic effects, which can render some children less capable of adapting to cope with stress over time.

There is another way that the concept of toxic stress may simplify the effects of stress on children. It contributes to the expectation that the effects of stressful experiences can accumulate to eventually overwhelm children’s coping capacities and thus contribute to the breakdown of their health, consistent with the concept of allostatic load. Accumulation and overload is indeed one way that stressful events have their detrimental
impact. As we’ve seen, for example, infants and children in poverty, young children of chronically depressed mothers, and children who are abused show greater cortisol reactivity. In this manner, heightened cortisol activity—combined with its neurobiological, cardiovascular, and immunological correlates—contributes to long-term health and mental health problems.

But there is a second way that stress can harm children. Rather than fostering hyperreactivity to stressful events, stress can make the body hyporesponsive; that is, it underreacts to stress. One way this occurs is in children’s responses to acute stress: rather than reacting to stressful events with heightened cortisol activity, they instead show a lower cortisol response than other children do. Another way this occurs is in basal levels of cortisol throughout the day: rather than exhibiting the normal diurnal pattern of elevated morning cortisol followed by a gradual decline, they instead show a flat cortisol response from morning through night. Hyporesponsiveness has been found among children who live in homes characterized by domestic violence and mothers’ emotional unavailability, and among preschoolers who live in foster care. This response pattern seems to reflect a stress system that shows signs of shutting down.

Hyperreactive and hyporesponsive stress responses are both disrupted patterns that arise from experiences of chronic stress with distinct risks to healthy development. Just as chronically high cortisol levels have many harmful consequences, including impaired immune function, chronically low cortisol levels can impair the body’s ability to maintain appropriately high blood pressure and respond to stress with an increase in cardiovascular activity. We don’t know for certain why some children manifest one disrupted pattern rather than the other. But one hypothesis is that the hyperreactive pattern is associated with recurrent threat and danger, and hyporesponsiveness is associated with the deprivation or withdrawal of caregiver support. We also don’t know the distinct behavioral characteristics that are associated with each pattern of stress response. Much more remains to be understood about how chronic stress affects children’s development.

From what we do know, however, it is clear that the effects of chronic, severe stress on children’s development are more complicated than simple concepts like toxic stress suggest. We must consider the nature of the event, children’s individual vulnerability or resiliency, the availability of support from caregivers, and the effects of prior experiences on children’s coping capacities. As the AAP policy statement recognizes, this web of interrelated factors makes it important to view at-risk children in the context of their experiential history and their social ecology. Children who experience chronic, severe stress may be biologically and psychologically less able to adapt and cope with new stresses when they occur, contrary to the idea that regular stress toughens people and increases their resiliency. The social ecology is also important because children’s coping capacities are significantly affected by the availability of social support from adults who can act as caregivers. Research on the Louisiana child victims of Hurricane Katrina indicates, for example, that children who showed the best long-term recovery from this tragedy were in the care of adults who could provide support, while children fared much worse either when they lost contact with their parents or when their parents were so traumatized that they could no longer function as caregivers.
Studies like these, of course, are directly relevant to understanding multigenerational influences on child development. They illustrate how significantly children’s ability to cope with stress relies on the support of caregivers. Unfortunately, they also illustrate how the stresses that affect children also have multigenerational impact, sometimes rendering the adults who could potentially provide support incapable of doing so. This is likely to be true not only when communities are beset by natural disasters, but also when they are economically impoverished, enmeshed in gang violence, or undermined in other ways. Indeed, when stressful events occur at the same time and compound one another—for example, when a family must cope with loss of income, parental depression, marital conflict, and moving to a different and more dangerous neighborhood in a short period of time—their impact is greater. These events affect not only children, but also the parents on whom children ordinarily rely for assistance, making the mobilization of two-generation efforts to support children much more challenging.

**Plasticity**

One reason that young organisms are more vulnerable to severe stress and other kinds of harm is the plasticity, or pliability, of their biological systems. Plasticity is the capacity of organisms to change with experience. Biological and behavioral plasticity is greatest early in life, when the organism is developing most rapidly. It declines progressively with increasing age, as neural networks and behavioral patterns consolidate, although mature individuals retain some adaptive plasticity even at advanced ages. Early biological plasticity helps to explain why harmful experiences can have a more profound impact on the youngest children, whose immature systems are in their formative stages, than on older children and adults, whose biological and behavioral systems have become consolidated. On the other hand, early plasticity also helps explain the remarkable pace of early-developing capacities, as the brain and other biological systems rapidly mature. Early biological plasticity, therefore, is a double-edged sword; it helps to explain why young children are affected so significantly by their experiences, for good or ill.

The early plasticity of the brain and other biological systems offers hope to those who aspire to help at-risk children. It suggests that even though early harm can undermine the organization of brain and behavioral systems, this disruption does not necessarily become immediately hard-wired to create dysfunction that cannot be changed. Because most of these systems remain relatively plastic (contrary to portrayals in the popular media of a fixed “brain architecture”), we may be able to intervene early in children’s lives with experiences that help reorganize biological systems constructively. However, to capitalize on these opportunities, we must detect harm early. To be sure, we can intervene successfully at later ages. But later interventions are likely to require greater intensity (and cost) to overcome well-established neural networks or routinized behavior patterns that have consolidated over time. The fact that the plasticity of brain and behavioral functioning declines over time is one justification to focus on early experience, early screening, and early intervention when developmental problems are detected.

What kinds of rehabilitative interventions can have such effects? We can find clues in studies of interventions that have focused on at-risk children whose experiences of chronic adversity disrupted their biological stress systems. One such program, designed by
psychologist Philip Fisher of the University of Oregon and his colleagues, aimed to reduce the stress associated with foster care by easing young children’s transitions to new foster homes and enhancing continuity of care.37 After their earlier foster-care placements, these children showed the profile of cortisol hyporesponsiveness described earlier. The intervention was designed to promote warm, responsive, and consistent relationships between children and their new foster parents in which positive behavior was encouraged, problem behavior was reduced, and caregiver stress was lowered. The program included individualized sessions with child therapists, weekly playgroup sessions, and other child-focused services. Foster parents completed intensive training before the children’s placement, and they continued to receive support and supervision in daily phone contacts and weekly group meetings, and through on-call assistance. The children’s biological or adoptive parents also received special assistance to establish consistency with the care provided by foster parents and to ease transitional adjustments. The program was thus a two-generation intervention involving multiple adults who functioned as caregivers for the child. Over six to 12 months of treatment, children in the intervention group progressively showed patterns of HPA reactivity that resembled the normal patterns of a community comparison group of children who had not experienced abuse; a control group of children assigned to regular foster-care placements did not show such improvement.38 The recovery of the children in the treatment group was directly linked to reductions in the foster parents’ stress levels.39

With a group of colleagues, Mary Dozier, a psychologist at the University of Delaware, designed another intervention to improve very young foster children’s relationships and behavioral competence by helping foster parents better interpret and respond to infants’ signals, enhance affectionate behavior, and provide more reliable support for infants’ self-regulation. After 10 weeks of the home-based program, infants and toddlers in foster care showed more typical daily patterns of HPA activity and more moderated cortisol reactivity to a stressor compared with a group of foster-care infants in a different treatment program.40

Even though early harm can undermine the organization of brain and behavioral systems, this disruption does not necessarily become immediately hard-wired to create dysfunction that cannot be changed.

Nonexperimental studies of at-risk children paint a similar picture. In a study of families living in rural poverty, for example, another research group found that 24-month-old toddlers who had been exposed to chronic domestic violence were likely to have elevated cortisol reactions when presented with a challenging task. However, when mothers had warm relationships with their children—as recorded by the researchers when they observed the mothers and children together at seven, 15, and 24 months—this effect was buffered: children did not show enhanced cortisol reactivity.41 This finding is consistent with other research on humans and animals that documents the social buffering
of children’s responses to stress, primarily through support from parents.42

The experimental studies with children in foster care show that time-delimited interventions can help to normalize the biological disruptions that occur when children are exposed to stress early in their lives. Of course, we need more research to confirm and expand on these findings. In particular, we need long-term studies that follow children in the intervention and comparison groups as they grow older; we need to see whether other researchers can replicate the findings with different groups of people; and we need studies that measure a wider range of biological and behavioral outcomes.

We also need to understand the limits of biological and behavioral plasticity, even early in life. For example, one study of children adopted from Romanian orphanages, where they were profoundly deprived of normal human relationships, found that after six and a half years of supportive adoptive care, children who had been adopted after less than four months in the institution had basal cortisol levels that resembled those of comparison children raised in families. However, children who had lived at the orphanage for eight or more months did not show such a recovery. In fact, the longer the children had been in the institution’s care, the more likely they were to show evidence of enduring cortisol disruption.43

These studies of children with adoptive and foster parents are promising, however, for at least two reasons. First, they expand the concept of two-generation interventions for at-risk children by targeting caregivers who are not biological parents. Such caregivers may also be important for other children in difficult circumstances whose parents are either not available or not capable of providing the stress-buffering support their children need, even with outside assistance. Indeed, parents may themselves be the primary source of children’s stress. In such circumstances, it may be especially important for two-generation programs to mobilize other adults in children’s lives, such as grandparents, child-care providers, and teachers.

Second, these programs demonstrate that well-designed early interventions can produce parallel advances in behavior and biology. Research in developmental biology underscores that the connection between biology and behavior is complex, and biological changes often occur without the expected behavioral correlates, or vice versa. In both the Dozier study and the Fisher study, however, alongside their biological measurements, the researchers obtained measures of behavioral change that can be viewed as further indicators of the programs’ efficacy. In the Dozier intervention, infants and toddlers showed greater evidence of attachment to their foster parents. The Fisher intervention saw a similar gain in secure attachment behavior, and foster-care placements were more likely to succeed.44 Because insecure attachment is associated with disturbed biological stress responses, the increases in secure attachment and the improved HPA reactivity in each study together indicate that the intervention was effective. In the end, researchers and practitioners should measure both behavioral and biological outcomes when they evaluate promising interventions to ameliorate the effects of early stress.

Even if they do not measure both behavioral and biological outcomes, evaluation researchers can focus on behaviors that are theoretically tied to the biological consequences of early stressful experiences. For example,
one intervention for at-risk young children in poverty focused not on HPA reactivity (which, as we have seen, can contribute to self-regulatory problems for children experiencing stress), but on the difficulty in regulating their own behavior that at-risk young children in poverty commonly experience. At the beginning of the school year, the Chicago School Readiness Project gave Head Start teachers specialized training in classroom management strategies designed to help lower-income preschoolers better regulate their own behavior. When the school year ended, children in the treatment group showed fewer disruptive behaviors, less impulsiveness, and better preacademic performance than did children from classrooms where teachers underwent a different training regimen. These findings are consistent with the results of other early intervention programs designed to help low-income preschool children with behavioral problems, especially the self-regulatory difficulties that can undermine academic success. Significantly, these benefits for young children were obtained without parallel efforts to improve the quality of family functioning, which is sometimes the source of stress for at-risk young children.

Once again, then, we see that two-generation programs can improve children's outcomes by targeting their relationships with adults who are not their biological parents.

Taken together, the studies I've discussed suggest ways to design two-generation interventions to ease the consequences of chronic stress for young children. In particular, they illustrate the value of an integrated biological-behavioral approach that considers children's needs from the standpoint of both stress neurobiology and behavioral competence. From a biological perspective, children exposed to chronic stress need rehabilitative experiences that minimize threat, maximize consistency and support, and strengthen self-regulatory skills. From a behavioral perspective, these biological remediations are further supported by an environment of relational warmth and responsiveness in which children can begin experiencing self-directed mastery. Aside from their focus on early intervention, the programs I've discussed are also distinguished by their emphasis on relationships between children and adults in which these various elements of support can be integrated. Whether two-generation programs target preschool teachers, foster parents, or biological parents, focusing on relationships is likely to enhance their success.

The research on biological and behavioral plasticity has another implication for two-generation interventions designed to improve developmental outcomes. Interventions that seek to change parents' conduct in an effort to improve their children's wellbeing must confront the fact that adults' behavioral and biological plasticity is more limited than children's. In “risky families,” parents as well as children experience chronic stress, and parents are likely to exhibit the same neuroendocrine, immunological, and cardiovascular correlates of persistent stress that their children do. The difference is that persistent stress over time has caused the adults' biological and behavioral systems to become more consolidated and less flexible. Parents are also likely to have developed a network of personal beliefs—attributions, self-referential beliefs, and social schemas—and behavioral routines that reinforce their biological patterns of threat vigilance, quick stress reactivity and poor self-regulation. In short, the early plasticity of biological and behavioral systems benefits young children, and the decline of plasticity as we grow older can impede interventions for their parents. Adults who have lived with chronic stress for a long
time are likely to have adapted to a life of challenge and adversity in ways that are not well-suited to sensitive, responsive parenting.

It is remarkable, therefore, that interventions to improve parenting behavior and thereby strengthen children's development can sometimes show such positive results. There is increasing evidence that carefully designed interventions, with goals suited to specific family needs, can promote changes in caregiver behavior that benefit young children. Moreover, research is showing that preventive interventions to support the mental and emotional health of children in poverty are also yielding promising success. By integrating our understanding of both the biological and behavioral consequences of chronic stress, we can carefully design interventions to better meet the needs of young children and their families. And we can conclude from these studies that young adult parents of at-risk children retain sufficient adaptive plasticity to promote beneficial change for the benefit of their offspring.

Conclusions

One theme of the articles in this issue of Future of Children is that adverse environments create stress that alters children’s development. I have focused on the biological effects of stress on children to better understand how adversity “gets under the skin” to alter children’s biological functioning and, partly as a consequence, their behavior. Of course, stress gets under the skin of parents and other caregivers, which is why two-generation interventions that strengthen child development are also important for adults. Because major sources of stress in young children’s lives arise from family experience, and because the quality of parental care is children’s major resource for buffering stress, we must consider multigenerational interventions to address the multigenerational origins of children’s stress. I use the term “multigenerational” deliberately. At times, three-generation interventions may be necessary, for example, to enlist a grandparent to help a parent provide the kind of sensitive care that young children need for healthy growth.

Because major sources of stress in young children’s lives arise from family experience, and because the quality of parental care is children’s major resource for buffering stress, we must consider multigenerational interventions to address the multigenerational origins of children’s stress.

What are the benefits of taking biology into account when we examine how stress affects early development? What does a biological approach contribute that an exclusive focus on behavioral development does not? Biological markers of disturbance from adverse early experiences are important because they provide a multilevel analysis of how stress affects children in which behavioral disruption and biological disruption mutually underlie young children’s adaptive difficulties. Looking at biology and behavior together, we can better understand the causes and consequences of stress, the benefits and costs of behavioral plasticity, and, most of all,
the potential avenues for early intervention and remediation.

For this reason, one important avenue for future research is to look more deeply into the biological consequences of promising interventions to benefit at-risk young children. The intervention studies discussed in this article provide encouraging leads. But we need to expand the range of behavioral and biological markers that could tell us whether an intervention is achieving the desired developmental outcomes, so that we can use biological as well as behavioral indices in field studies of interventions for at-risk children and families. As one illustration, a pair of researchers showed that after three and a half years of participation in a conditional cash-transfer antipoverty program in Mexico, preschool children showed lower basal cortisol levels, and children of the most depressed mothers showed the greatest benefit. In another instance, using data from the National Health and Nutrition Examination Survey to study mothers with two or more children, two economists showed that, over time, the 1993 expansion of the Earned Income Tax Credit significantly reduced the levels of multiple biological indicators that reflect allostatic stress and inflammation. In yet another example, a group of researchers reported that an intervention program for at-risk four-year-olds was effective in improving cortisol reactivity, and this led to reductions in aggression by the follow-up assessment. Studies like these are important not because biological outcomes are more important than behavioral ones (indeed, biological markers can be difficult to interpret without corresponding behavioral data), but because they give us added insight into the developmental processes that can make an intervention more or less effective.

The research discussed in this article also underscores that relationships are crucial to normalizing at-risk children's biological and behavioral systems. The Fisher and Dozier studies both emphasize strengthening young children's security in relationships by improving caregivers' responsiveness and reducing their stress. Nonexperimental studies also show the importance of secure relationships early in life. We've seen, for example, that sensitivity on the part of adults buffers the effects of young children's exposure to domestic violence, that negative relationship influences (such as mothers' "emotional unavailability" or fighting between parents) contributes to HPA hyperreactivity, and that harsh parenting produces epigenetic changes in gene expression that are related to conduct problems. Taken together, young children's early relationships seem to be the most important context for shaping individual differences in stress reactivity and coping. These early relationships can affect young children in many ways: solicitude and support may be reliable or unreliable; they may feel protected from or exposed to threats; adults may or may not respond to their specific needs; and they may or may not feel a generalized sense of security. Unpacking these diverse relational influences can help us develop better theories, and strengthening the security and responsiveness of young children's early relationships seems to be a promising way to make interventions more effective.

If young children are born into a world of unknowns, they quickly begin to understand the characteristics of those who care for them. Those characteristics guide them biologically and behaviorally to prepare for a life of security or adversity. This is the foundation of two-generation interventions for young children.
ENDNOTES


15. Ulrich-Lai and Herman, “Neural Regulation.”


20. Lupien et al., “Effects of Stress.”


29. Lumey et al., “Cohort Profile.”


34. Ibid.


38. Ibid.


48. See review in Blair and Raver, “Child Development in the Context of Adversity.”


53. Thompson, “Relationships, Regulation.”
Addressing Trauma-Informed Care, ACEs, and Toxic Stress in a Pediatric Setting

Elisa Nicholas, MD, MSPH
Chief Executive Officer

Board Meeting
First 5 LA
September 11, 2014
Who We Serve

• Greater Long Beach.
• 1/3 of all low-income residents in our service area.
• Most culturally diverse city in the U.S. (CNN, 2012)
• 36,000 patients
• 111,000 visits
Our Mission
To provide quality integrated, innovative health care that will contribute to a healthy community, focusing on those in need and working with patients and the community as partners in their overall well being.

Our Vision
A Community that is Healthy for All.
Everychild Bright Beginnings Initiative (EBBI)

• Screening
• Identification
• Intervention
• Treatment
• 4,900 children ages 0 to 3
• 300 pregnant women
Capacity Building & Training in Trauma Informed Care

- Advisory Council
- EBBI Program Staff
- Clinical Leadership
- All Clinic Staff
- All Staff with Patient Contact

Identify Target Population

- Prenatal Patients
- Children Ages 0 to 3
- Parents of Children Ages 0 to 3

Screening

For Children’s Parents, Guardians or Caregivers
- Parents' Evaluation of Developmental Status (PEDS), Modified Checklist for Autism in Toddlers (MCHAT)
- Sensitive and probing questions

For Parents and Prenatal Patients
- Edinburgh Postnatal Depression Scale
- Family Psychosocial Screening

Assessment and Stratification

HIGH RISK
- Intake interview/
- Assessment which includes the Patient Health Questionnaire (PHQ9) for depression, and the Generalized Anxiety Disorder Assessment (GAD7)
- Referrals and Linkage

MEDIUM RISK
- Intake Interview/
- Assessment
- Referrals and Linkage

LOW RISK
- Resources
- Referrals and Linkage

Patient Care
Plan Interventions

- Multidisciplinary Case Consultation
- Case Management, including Intensive Case Management
- Mental Health Services and Referrals
- Medical Legal Partnership Services
- Home Visits
- Medication
- Resources
- Parenting Classes
- Parent Cafes, Group Counseling, Parent Institute, Project Fatherhood
- Recreational Classes
- Parent and Mommy and Me Yoga, Cooking and Nutrition, Walking Clubs

The good news is that we know what works to address children’s exposure to violence. Now we must work courageously to find the resources to spread the solutions and implement them where they are needed.

Robert L. Listenbee, Jr & Joe Torre
DEFENDING CHILDHOOD
PROTECT HEAL THRIVE

Everychild Bright Beginnings Initiative
Because every child deserves a bright and healthy beginning

The Children’s Clinic
“Serving Children & Their Families”
Why this? Why Now?

Recent Headlines:

When toxic stress in young children lasts forever

Tender Young Brains
What kind of childhood stress should parents actually be stressing about?

Dangers of “Crying It Out”
Damaging children and their relationships for the long-term.
The Evidence
Three Levels of Stress

Positive
- Brief increases in heart rate, mild elevations in stress hormone levels

Tolerable
- Serious temporary stress responses, buffered by supportive relationships

Toxic
- Prolonged activation of stress response systems in the absence of protective relationships
What Are Adverse Childhood Events?

• Abuse
  o Emotional
  o Physical
  o Sexual

• Neglect
  o Emotional
  o Physical

• Domestic Violence

• Substance Abuse

• Mental Illness

• Divorce

• Incarcerated Family Member
Why should we care?
Toxic Stress Changes Architecture of Brain
Adverse Childhood Events (ACE) Study

- Assessed the effects of abuse and household dysfunction during childhood on long-term health and quality-of-life outcomes
- A sub-analysis of these data demonstrated that adults who were exposed to IPV as children were
  - 6 times more likely to be emotionally abused
  - 4.8 times more likely to be physically abused
  - 2.6 times more likely to be sexually abused

Content source: Centers for Disease Control and Prevention, National Center for Injury Prevention and Control, Division of Violence Prevention
Dose-Response Relationship: More ACEs = More Disease
Exposure to Toxic Stress and Adverse Childhood Events

**Decreased**
- Executive functions
- Judgment

**Increased**
- School failure
- Behavioral problems
- Substance abuse

**Increased**
- Heart disease
- Obesity
- Diabetes
- Smoking
- Divorce
- Poverty

Exposure to Toxic Stress and Adverse Childhood Events
ACE Study Findings

• Exposure to IPV, along with other ACEs, has been shown to be associated significantly with many risk factors for the leading causes of death in adulthood
  – Smoking
  – Severe obesity
  – Physical inactivity
  – Depression
  – Suicide attempts
ACE Study Findings, cont.

- Children of abused caregivers demonstrate significantly more
  - Internalizing behaviors, including
    - Anxiety
    - Depression
    - Withdrawal and somatic complaints
  - Externalizing behaviors, including
    - Attention problems
    - Aggressive behavior
    - Rule-breaking actions
  - Difficulty with social functioning and academic performance
  - Trouble establishing and maintaining relationships, including cruelty, bullying, and meanness to others
  - Persistent stress and anxiety, exhibiting symptoms consistent with PTSD
  - Ultimately, some of these children become abusers themselves
Where do we begin?
The Five Protective Factors

- Parental Resilience
- Social Connections
- Support in Times of Need
- Knowledge of Parenting
- Social and Emotional Competence
Step One: Capacity Building & Training in Trauma Informed Care
- Advisory Council
- EBBI Program Staff
- Clinical Leadership
- All Clinic Staff
- All Staff with Patient Contact

Step Two: Identify Target Population
- Prenatal Patients
- Children Ages 0 to 3
- Parents of Children Ages 0 to 3

Step Three: Screening
- For Children’s Parents, Guardians or Caregivers
  - Parents’ Evaluation of Developmental Status (PEDS), Modified Checklist for Autism in Toddlers (MCHAT)
  - Sensitive and probing questions
- For Parents and Prenatal Patients
  - Edinburgh Postnatal Depression Scale
  - Family Psychosocial Screening

Step Four: Assessment and Stratification
- HIGH RISK
  - Intake interview/
  - Assessment which includes the Patient Health Questionnaire (PHQ9) for depression, and the Generalized Anxiety Disorder Assessment (GAD7)
  - Referrals and Linkage
- MEDIUM RISK
  - Intake Interview/
  - Assessment
  - Referrals and Linkage
- LOW RISK
  - Resources
  - Referrals and Linkage

Step Five: Patient Care Plan Interventions
- Based on Intervention Level
  - Multidisciplinary Case Consultation
  - Case Management, including Intensive Case Management
  - Mental Health Services and Referrals
  - Medical Legal Partnership Services
  - Home Visits
  - Medication
  - Resources
  - Parenting Classes
  - Parent Cafes, Group Counseling, Parent Institute, Project Fatherhood
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Because every child deserves a bright and healthy beginning
Training and Education

All TCC Staff

All Staff Who Come Into Contact with Patients

Everychild Bright Beginnings Staff, Leadership, and Advisory Committee
The Everychild Bright Beginnings Initiative Advisory Council

- UCLA Center for Children and Families Children Institute, Inc.
- For The Child
- Legal Aid Foundation of Los Angeles (Medical Legal Partnership)
- Long Beach Police Department, Chief Jim McDonnell
- TCC Patient Advisors
- Su Casa
- Long Beach Department of Health and Human Services
- Long Beach Memorial Medical Center Miller Children’s Hospital
- St. Mary's Hospital
- First 5 LA
- Headstart
- Los Angeles Department of Mental Health
- Women’s Shelter Long Beach
- Long Beach Unified School District
- Lullaby Lounge Post Partum Support Group
- Mental Health America
- Pacific Asian Counseling Services
- Perinatal Mental Health Task Force
- Perinatal Psychiatrist
- The California Endowment
- The Guidance Center
- Welcome Baby Hospitals
- End Abuse Long Beach
- Long Beach Violence Prevention Taskforce
- Assemblywoman Bonnie Lowenthal
- Staff of Congressman Alan Lowenthal
An approach emerging nationally as a successful means of recognizing the impact of past trauma, such as child abuse and domestic violence, on a parent’s ability to provide a nurturing and safe home environment for children.
Video: “What is Trauma?”

- https://www.youtube.com/watch?v=u1yYC08zz1o
A Trauma-Informed Organization

A program, organization or system that
• realizes the widespread impact of trauma and understands potential paths for recovery
• recognizes the signs and symptoms of trauma in those involved with the system
• resists re-traumatization
• responds by fully integrating knowledge about trauma into policies, procedures, practices, and settings
Seven Domains of Trauma-Informed Care

• Domain 1: Early Screening & Comprehensive Assessment of Trauma
• Domain 2: Consumer Driven Care & Services
• Domain 3: Trauma-Informed, Educated & Responsive Workforce
• Domain 4: Provision of Trauma-Informed, Evidence-Based and Emerging Best Practices
• Domain 5: Create a Safe and Secure Environment
• Domain 6: Engage in Community Outreach and Partnership Building
• Domain 7: Ongoing Performance Improvement
Principles of Sensitive/Empathetic Practice

• Changing the lens
• Be respectful
• Take time
• Build rapport
• Share information
• Share control
• Respect boundaries
• Foster mutual learning
• Understand non-linear healing
• Demonstrate awareness and knowledge of trauma

*Handbook on Sensitive Practice for Health Care Practitioners: Lessons from Adult Survivors of Childhood Sexual Abuse*
Everychild Bright Beginnings Initiative
Because every child deserves a bright and healthy beginning

The Children’s Clinic
“Serving Children & Their Families”

Advisory Council
• EBBI Program Staff
• Clinical Leadership
• All Clinic Staff
• All Staff with Patient Contact

EBBI Program Staff
• Prenatal Patients
• Children Ages 0 to 3
• Parents of Children Ages 0 to 3

Clinical Leadership
For Children’s Parents, Guardians or Caregivers
• Parents’ Evaluation of Developmental Status (PEDS), Modified Checklist for Autism in Toddlers (MCHAT)
• Sensitive and probing questions

All Clinic Staff
For Parents and Prenatal Patients
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• Family Psychosocial Screening

All Staff with Patient Contact
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Step One
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Step Two
Identify Target Population

Step Three
Screening

Step Four
Assessment and Stratification

Step Five
Patient Care Plan Interventions

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Home Visits
Medication
Resources
Parenting Classes
Parent Cafes, Group Counseling, Parent Institute, Project Fatherhood
Recreational Classes
Parent and Mommy and Me Yoga, Cooking and Nutrition, Walking Clubs
Identify Target Population

Prenatal Patients

Children 0 to 3 years of age

Parents and Caregivers of Children ages 0 to 3
• Advisory Council
• EBBI Program Staff
• Clinical Leadership
• All Clinic Staff
• All Staff with Patient Contact

• Prenatal Patients
• Children Ages 0 to 3
• Parents of Children Ages 0 to 3

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Everychild Bright Beginnings Initiative
Because every child deserves a bright and healthy beginning

The Children’s Clinic
“Serving Children & Their Families”
Expanded Screening Opportunities

For Children Ages 0 to 3
- Pediatric Developmental Screening
- Modified Checklist for Autism in Toddlers
- Sensitive and Probing Questions

For Parents and Prenatal Patients
- Edinburgh Post Natal Depression Scale
- Family Psychosocial Screening
- ACEs Screening
- Sensitive and Probing Questions
Family Psychosocial Screening

Patient screening includes the following domains through intake questionnaires:

- Early Literacy
- Food Insecurity
- Crowding (Housing)
- Perinatal Social Support
- Parental Self-Efficacy
- Parent Child Attachment
- Child Development
- Intimate Partner Violence
- Trauma
Capacity Building & Training in Trauma Informed Care

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- All Staff with Patient Contact

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- Parents’ Evaluation of Developmental Status (PEDS), Modified Checklist for Autism in Toddlers (MCHAT)
- Sensitive and probing questions

For Parents and Prenatal Patients
- Edinburgh Postnatal Depression Scale
- Family Psychosocial Screening

Assessment and Stratification

HIGH RISK
- Intake interview/
- Assessment which includes the Patient Health Questionnaire (PHQ9) for depression, and the Generalized Anxiety Disorder Assessment (GAD7)
- Referrals and Linkage

MEDIUM RISK
- Intake Interview/
- Assessment
- Referrals and Linkage

LOW RISK
- Resources
- Referrals and Linkage

Patient Care Plan Interventions

- Multidisciplinary Case Consultation
- Case Management, including Intensive Case Management
- Mental Health Services and Referrals
- Medical Legal Partnership Services
- Home Visits
- Medication
- Resources
- Parenting Classes
- Parent Cafes, Group Counseling, Parent Institute, Project Fatherhood
- Recreational Classes
- Parent and Mommy and Me Yoga, Cooking and Nutrition, Walking Clubs

The good news is that we know what works to address children’s exposure to violence. Now we must work courageously to find the resources to spread the solutions and implement them where they are needed. …

Robert L. Listenbee, Jr & Joe Torre
DEFENDING CHILDHOOD
PROTECT HEAL THRIVE

Everychild Bright Beginnings Initiative
Because every child deserves a bright and healthy beginning

The Children’s Clinic
“Serving Children & Their Families”
**Risk Levels**

- Low Risk
  - Resources
  - Referrals and Linkage

- Medium Risk
  - Intake Interview/
  - Assessment (PHQ9, GAD7)
  - Referrals and Linkage

- High Risk
  - Intake interview/
  - Assessment (PHQ9, GAD7)
  - Referrals and Linkage

**Patient Care Plans**

- **Low Risk**
  - Multidisciplinary Case Consultation, Intensive Case Management, Mental Health Referrals (Internal-External), Home Visits, Medical-Legal Partnership services, Medication and Resources

- **Medium Risk**
  - Multidisciplinary Case Consultation, Case Management, Mental Health Referrals (Internal-External), Home Visits, Medical-Legal Partnership services, Medication and Resources

- **High Risk**
  - Resources including Parenting Classes (Parent Café, Group counseling, Mommy and Me, Parent Institute, ESL, Parent and Baby Yoga, Mommy and Me, Cooking, Nutrition, Arts and Crafts.)
Recommendations and Strategies for A Capacity-Building and Systems-Level Change

• Focus on building resilience
• Train on trauma-informed care (TIC) in multiple sectors
• Develop systems of policies and procedures for TIC
• Recognize the role of vicarious trauma on staff and patients
• Expand integrated behavioral health in the medical home, including home visitations
• A coordinated approach, such as a learning collaborative, to identify and mitigate toxic stress and build resiliency
• Have comprehensive referral and resources available for staff and patients to deal with trauma/toxic stress, such as:
  • Medical-Legal Partnership (MLP)
  • Intimate Partner Violence (IPV)/Domestic Violence (DV) Services
  • Evidence-based therapies for children and parents integrated into the medical home and/or with partnering mental health providers
  • Substance abuse services
  • Support services that strengthen the families, including skills-building parenting programs and literacy programs
It is easier to build strong children than to repair broken men and women.

Adapted quote from Frederick Douglas