

# EARLY EXPERIENCES MATTER: THE EFFECT OF CHILDHOOD ADVERSITY ON THE BRAIN AND BODY

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**O**ur early experiences shape us for a lifetime. Prenatal to age 3 is a time of both vulnerability and opportunity, as young children's brains are developing quickly in response to their environment. Adverse childhood experiences (ACEs) such as abuse, neglect, and household challenges can cause negative changes to the brain and stress the body. The stress can become toxic if these adversities are strong and prolonged, and children do not have a responsive adult caregiver to buffer these negative experiences and help them adapt. Toxic stress can lead to mental and physical illnesses, economic disadvantages, and even reduced life expectancy. New parents also experience changes in their brains that help them become positive, responsive caregivers. These changes may be diminished in parents with risk factors including depression or a history of toxic stress, possibly leading to poor parenting and unhealthy home environments. Strategic investments in evidence-based programs and policies can support both children and parents during this paired period of major neurobiological change. Two-generation programs (e.g., home visiting) and parenting programs (e.g., Mom Power) can protect children against toxic stress and improve parents' skills and well-being. Policymakers might also consider policies that address parental depression, family financial stress, community resources, family leave policies, and family protective factors.

## INTRODUCTION

This chapter summarizes four key research findings from brain science that can inform policy: (1) early life experiences, positive and negative, are particularly impactful, (2) stress, especially early life stress, can have profound effects on development, (3) risk and opportunity can be transmitted from one generation to the next, and (4) the birth of a baby opens a special window of opportunity to help two generations at once. Taken together, this research can help policymakers invest in cost-effective, evidence-based policies and programs to prevent and mitigate the effects of early stress.

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## HOW DO EARLY EXPERIENCES AFFECT THE DEVELOPING FETAL AND INFANT BRAIN?

Decades of research has found that early life is a sensitive time for brain development. The first three years are especially important, as the architecture of the baby's brain is being developed from the bottom up by experiences and environmental inputs. This is a time of both vulnerability and opportunity. It's a time of vulnerability because negative early experiences can weaken the architecture of the brain and shape development in ways that negatively affect physical and mental health, relationships, and achievement into adulthood. It's also a time of opportunity because environmental impacts are so powerful. Effective prevention and intervention programs can prevent negative

experiences from happening and mitigate the effects when negative experiences have already occurred.

At birth, a baby will have more than 100 billion nerve cells—many more than will ever be needed. Cells are reduced, or pruned, in response to what the baby needs. For example, newborns are born with the ability to hear sounds from any language in the world. This ability drops off sharply during the first year as babies interact in an environment where only one or two languages are spoken.

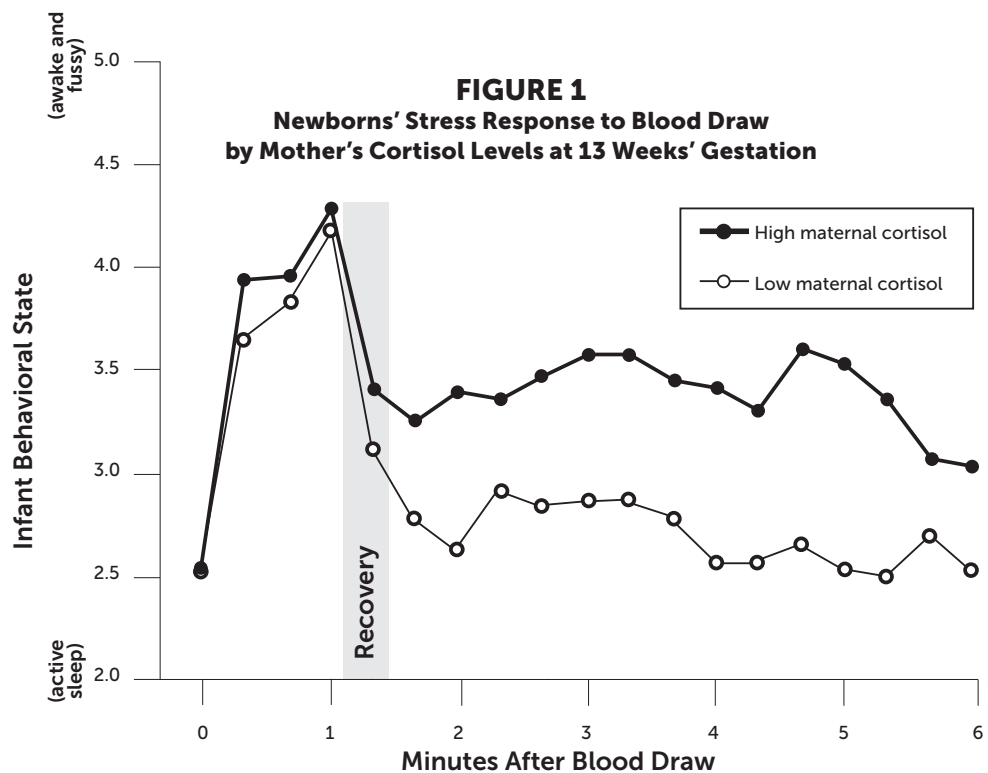
Similarly, babies can recognize faces immediately after birth, allowing them to understand and interpret emotions common to their culture. In adverse situations, babies might mostly see negative emotions, which is not only stressful for the baby, but also limits their exposure to a full range of emotions. Due to selective pruning, some babies become very good at detecting negative emotions. These examples illustrate the importance of building a strong foundation of neurobiological development in the early years.

The brain's architecture is being built even before birth. One interesting study examined whether fetuses were affected by maternal stress.<sup>1</sup> The researchers first measured the levels of the stress hormone cortisol in pregnant women throughout their pregnancy. At birth, they measured the babies' behavioral response during their first encounter with stress—a standard blood draw. Although all the babies experienced stress after the blood draw, most recovered after approximately one minute (see Figure 1). Babies whose mothers had high levels of cortisol early in the pregnancy did not recover as quickly. The babies have been followed into adolescence, and those who did not recover as quickly continue to show increased hypervigilance when compared to children not exposed to stress hormones as fetuses.

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Source: Davis, E.P. et al. (2011). Prenatal maternal stress programs infant stress regulation. *Journal of Child Psychology and Psychiatry*, 52(2), 119-129.

A similar finding was documented in an innovative study of infant brain responses to angry or neutral adult voices.<sup>2</sup> When parents reported more conflict at home, the babies' brains were hypervigilant to angry voices even while they were asleep.

The evidence is clear: the prenatal to age 3 time period is critical for a baby's development. It builds the foundation for future development in adolescence and young adulthood. For this reason, early childhood is the most effective and efficient time to administer evidence-based prevention and intervention programs.

## WHAT IS STRESS AND UNDER WHAT CONDITIONS IS IT TOXIC?

Whether due to something as minor as a missed appointment or as major as a life-threatening injury, stress increases our heart rate, blood pressure, and certain hormones (e.g., cortisol). Not all stress is bad. Children need to experience some stress to learn healthy ways to respond to adversity and develop appropriately. Researchers have identified three forms of stress—positive, tolerable, and toxic—that can be useful for framing policy discussions about effective solutions.<sup>3</sup> These categories describe the person's *response* to the stressors, not the apparent *severity* of the event itself. Even a significant stressor can be mitigated, or buffered, if a child has responsive adult caregivers and other resources to support them.

**Positive** stressors, such as taking an exam, are minor challenges to the body and brain that have a positive effect on development. Some events or experiences are more serious and have the potential to negatively affect a child's development. These events include divorce, injury, or natural disaster. If a child experiences this type of stress but has supportive adults in his life, the child's physiological stress response can return to a healthy baseline. This is considered **tolerable** stress.

**Toxic** stress results when a child faces strong, prolonged, or frequent adversities without the buffering support of adult relationships. In these situations, the child's brain and body can reorganize in such a way that the architecture becomes adapted to high-threat and low-resource conditions. These adaptations have significant consequences for adult health, achievement, well-being, and even life expectancy. One landmark study that contributes to this understanding is discussed next.

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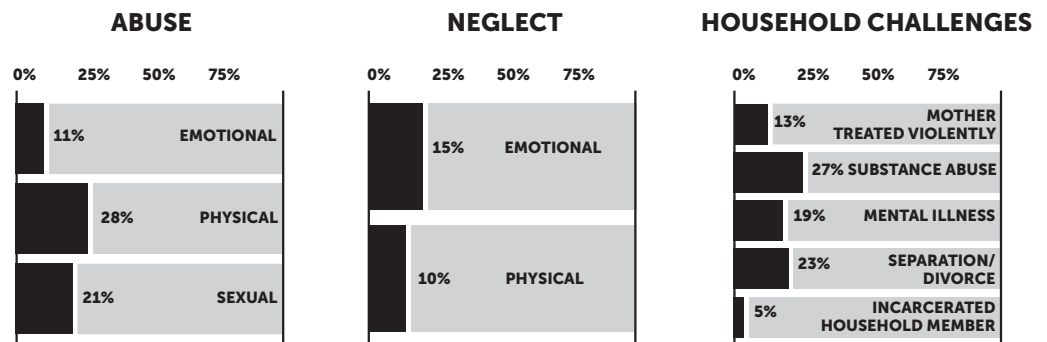
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## WHAT ARE ADVERSE CHILDHOOD EXPERIENCES (ACES) AND WHAT IS THEIR PREVALENCE IN THE UNITED STATES?

In the mid-1990s, a study conducted by the Centers for Disease Control and Prevention (CDC) and Kaiser Permanente looked at the effects of childhood stress.<sup>4</sup> More than 17,000 adults completed a survey that asked about adverse experiences prior to age 18 and evaluated the relationship between these reports and current mental and physical health as documented in their medical record. The study identified 10 adverse childhood experiences (ACEs) that were impactful for later outcomes. These ACEs fall into three categories: abuse, neglect, and household challenges. The most commonly reported ACE was physical abuse, followed by a parent's substance abuse (see Figure 2, next page).

**FIGURE 2**  
**Types and Prevalence of Adverse Childhood Experiences (ACEs)**  
**among CDC-Kaiser Permanente Study Participants**



Source: Centers for Disease Control and Prevention (CDC). [https://www.cdc.gov/violenceprevention/acestudy/ACE\\_graphics.html](https://www.cdc.gov/violenceprevention/acestudy/ACE_graphics.html)

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ACE scores can range from zero to 10 and are considered an index of a person's cumulative childhood stress exposure. Almost two-thirds (64%) of participants reported at least one ACE and 13% reported four or more, suggesting that ACEs are quite common. The respondents in the original study were living in southern California and had private health insurance. They were largely white, educated, and middle-class. Research since then has shown that the prevalence of ACEs in the general population across the U.S. is fairly consistent with the original study.

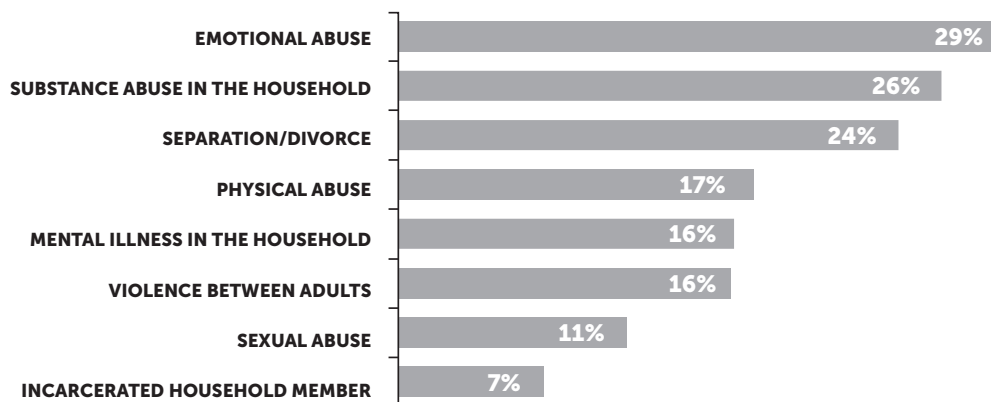
Recent research also has shown that ACEs are more common among people experiencing inequity, including among low-income populations (see Joshua Mersky's chapter in this report). Furthermore, adverse experiences not included in the original study, such as homelessness and bullying, likely have similar long-term effects.

### **HOW PREVALENT ARE ADVERSE CHILDHOOD EXPERIENCES (ACES) IN WISCONSIN?**

Wisconsin is one of a small number of states that has collected data to better understand childhood adversity within its borders. Between 2011 and 2015, data were collected on the annual Behavioral Risk Factor Survey (BRFS) from 25,518 residents (more than the number who participated in the original CDC-Kaiser ACE study).

The results from the Wisconsin survey mirror the results from the original ACE study and from other states.<sup>5</sup> About 57% of respondents reported one or more ACEs, with 14% reporting four or more. Among those who reported at least one ACE, the most common experience was emotional abuse (see Figure 3). (Note: The Wisconsin survey did not assess neglect until 2014 due to difficulties capturing this information on a phone survey.)

**FIGURE 3**  
**Prevalence of Specific Types of ACEs among Wisconsin Adults**



Source: Child Abuse and Neglect Prevention Board. (2018). Adverse childhood experiences in Wisconsin: 2011-2015 Behavioral Risk Factor Survey findings.

ACEs commonly occur together. There were a number of co-occurring adverse experiences among people who reported four or more ACEs. For example, 64% of people with four or more ACEs reported that a household member was incarcerated, even though it was the least common ACE. Furthermore, 60% of people in this high ACE group witnessed violence between adults and 58% experienced physical abuse.

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### WHAT ARE THE LONG-TERM EFFECTS OF TOXIC STRESS?

A large body of research across many decades has found that ACEs significantly affect both society and the individual. The CDC estimates the total lifetime economic costs associated with child abuse and neglect cases that take place in one year at \$124 billion, which is comparable to health conditions such as stroke. Nearly \$84 billion of that amount is due to lost productivity, and \$25 billion is spent on health care.<sup>6</sup>

Toxic stress has lasting and negative effects on the person, such as:

- Increased prevalence or seriousness of diseases such as cardiovascular disease, diabetes, infection, and some types of cancer.
- Increased likelihood of “risk” factors such as obesity, depressed immune function, and metabolic syndrome that can lead to disease. For example, managing stressful experiences requires a lot of energy, and the body will store energy in fat, particularly in the midline, leading to obesity.
- Impaired cognitive functioning. Stressful events require intense focus, which in turn affects memory and attention.
- Increased risk for mental health problems such as anxiety and depression.
- Accelerated aging, as evidenced by measures of altered DNA replication and cell death signaling.

Perhaps surprisingly, toxic stress also affects life expectancy (see Table 1). In fact, significant childhood stress reduces life expectancy more than twice the reduction due to

smoking. If a person's life expectancy at birth was 80 and they subsequently experienced six or more ACEs, that estimate would drop to 60 years.

**TABLE 1**  
**Risk Factors' Effect on Life Expectancy**

<b>Risk factor</b>	<b>Reduction in life expectancy</b>
Smoking	10 years <sup>7</sup>
Obesity	6-7 years <sup>8, 9</sup>
High blood pressure	5 years <sup>10</sup>
Diabetes	7-8 years <sup>11</sup>
<i>Childhood stress</i>	<i>20 years<sup>12</sup></i>

Data from the Wisconsin Behavioral Risk Factor Survey (BRFS) is consistent with these national research studies. The BRFS examined four categories of health:

- (1) health risk behaviors (e.g., tobacco use, heavy drinking, no exercise),
- (2) general health (e.g., obesity, fair/poor health, bad physical health days),
- (3) chronic health conditions (e.g., arthritis, cancer, asthma), and
- (4) mental health (i.e., diagnosed depressive disorder).

The prevalence rate of every health condition was higher for respondents reporting four or more ACEs compared to those reporting none.<sup>13</sup> Most strikingly, people with four or more ACEs are three times more likely to be diagnosed with a depressive disorder compared to those with zero ACEs.

The research is strong and clear: the higher a person's ACE score, the more likely he or she will experience physical health, mental health, and socioeconomic challenges in adulthood. Yet research also shows that not everyone who has a high ACE score will experience lifelong effects. A key feature of resilient children is the presence of a reliable, stable adult who can prevent, or mitigate, the effects of adversity and help children adapt.

## **HOW DOES A NEW PARENT'S BRAIN CHANGE AND WHAT HAPPENS WHEN THE CHANGES DO NOT OCCUR?**

One fascinating recent discovery is that at the same time infants and young children are experiencing the first and most important time of vulnerability and opportunity, their parents are also in transition. During the first year after a baby's arrival, parents must monitor their newborn's safety, establish caregiving routines, and develop an emotional bond. Research suggests that new mothers and fathers experience changes in their brain structure and activity that improve how they handle stress and increase positive, responsive parenting behaviors. This is achieved through changes in the reward circuit, social information circuit, and emotion regulation circuit. Together these changes help parents attend to, understand, and respond sensitively to their infants' cues.

When parents are highly stressed, depressed, have substance abuse problems, did not receive warm and caring parenting themselves, or have a history of trauma, the changes to their brain may be diminished.<sup>14,15</sup> Without these supportive neurobiological changes, the universal challenges of parenting may be harder to navigate and, when combined with

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stressful life experiences, may make positive parenting less likely.

In sum, research has revealed a “paired” sensitive period at the birth of a child; both children and parents are experiencing major neurobiological change. These brain changes are less evident in parents with risk factors such as depression, possibly leading to poor parenting and an unhealthy environment in which to raise a child. This evidence supports investments in programs that target parents and children together to protect against toxic stress and foster healthy growth and development. Programs that may increase these supportive brain changes include Circle of Security, Triple P (Positive Parenting Program), Video-Feedback Intervention to Promote Positive Parenting, and Mom Power. The Mom Power program, for example, is a 13-session group program for high-risk mothers and their young children that focuses on improving mothers’ mental health and parenting skills.<sup>16</sup>

## WHAT ARE EVIDENCE-BASED POLICY OPTIONS TO ADDRESS CHILD AND PARENTAL ADVERSITY AND STRESS?

Policymakers have the opportunity to leverage this knowledge about paired sensitive periods into policy and practice. When parents receive support to improve their parenting abilities and their own well-being, a child’s environment changes for the better and the child is less likely to experience toxic stress and negative long-term effects.

For families experiencing a lot of stress, we can decrease the stress in the environment, increase the parents’ ability to buffer the stress for their children, or both. Environmental stress can be decreased by efforts that:

- alleviate poverty and strengthen the family’s financial security (e.g., tax credits, housing, food assistance, job training, and child care assistance),
- increase community resources and support available to families,
- create family leave policies that take into consideration the critical brain development that takes place for both the parent and infant when a child is born, and
- strengthen families and build protective factors, which help families navigate difficulties and promote their well-being (e.g., Wisconsin’s Five for Families campaign).

Parents’ ability to buffer stress can be increased through programs that support parenting skills and efforts to improve their physical and mental health. Providing services to parents and children at the same time—known as two-generation interventions—is particularly effective in building parents’ skills. Evidence-based, two-generation programs such as home visiting can create transformational change for families. Investments in these programs can lead to an upward cycle of opportunity and an end to intergenerational trauma.

Another policy option with great potential is to improve the mental health of new mothers and fathers. Depression is a common occurrence during the transition to parenthood, even more so for parents with a high number of ACEs. Reducing the stigma of depression around the birth of a new baby, in tandem with effective universal screening and treatment, could be quite effective in improving outcomes for both parents and their children.

Finally, much attention is deservedly placed on the healthy neurodevelopment of our youngest children, when prevention and intervention efforts are most cost-effective and

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efficient. However, adolescence is also an important time for neurodevelopment that provides another window of opportunity for policy action. Evidence-based interventions for adolescents can change their brains and lives as well.

Each state implements various programs and policies that target our youngest children, new parents, and adolescents. To ensure investment in the most effective programs, state policymakers might ask: Can we increase the capacity of existing evidence-based programs? Are these programs incorporating the latest brain science into their work? Do our programs reduce family stress?

## **KEY TAKEAWAYS AND NEXT STEPS**

This chapter summarized research findings that can help policymakers develop evidence-based policies and programs to help vulnerable children and parents. Key takeaways include:

- Prenatal through age 3 is a time of significant neurobiological change in which babies' brains are developing quickly in response to their environment. Policies and interventions that reach children and families during this time are particularly effective and efficient.
- The number of adverse childhood experiences (ACEs) is one measure of a person's cumulative childhood stress. ACEs include abuse, neglect, and household challenges. In Wisconsin, 57% of survey respondents reported one or more ACEs, with 14% reporting four or more. Among those who reported at least one ACE, the most common experience was emotional abuse.
- Toxic stress can result when children face strong, long-lasting, and/or frequent adversities without supportive, responsive adult caregivers. Without these buffering relationships, a child's stress response system stays activated, which can lead to poor brain development and an increased risk for disease and other problems later in life.
- Toxic stress can lead to chronic disease, obesity, impaired cognitive functioning, mental health problems, and accelerated aging. Significant toxic stress can reduce life expectancy by 20 years.
- New mothers and fathers also experience changes in their brain in the months following a baby's arrival. These neural changes improve stress management and promote sensitive and responsive parenting behaviors. Parents who are highly stressed, have depression, or have experienced their own childhood trauma experience fewer neural changes during this period and are less biologically able to deal with the complex challenges and stresses of parenting.

Based on this research, policy options include investments in:

- Evidence-based programs to increase parents' ability to buffer stress for their children. These programs typically focus on parenting skills and parents' physical and mental health.
- Two-generation programs, which provide services to parents and children at the same time. These programs are particularly effective at building parents' skills and increasing their responsiveness to their children's cues. Home visiting is one such program with a strong evidence base.



- Broad efforts that alleviate poverty, increase community resources and support, and strengthen families, with the goal of decreasing the stress that vulnerable families experience.
- Effective identification and treatment of parental depression.

The latest research on brain development offers important insights into the causes and impacts of early life stress. Well-designed policies and programs can support healthy parenting and build a cycle of opportunity for our youngest children.

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