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Roots of Adult Disease Traced to Early Childhood Adversity

Early childhood programs could prevent chronic problems in physical and mental health, as well as premature death, for millions of Americans, says new JAMA article.

EMBARGOED UNTIL 10 A.M., E.D.T., JUNE 2, 2009—The origins of many adult diseases can be traced to negative experiences early in life, so confronting the causes of adversity before and shortly after birth may be a promising way to improve adult health and reduce premature deaths, says a new paper published today in *JAMA: The Journal of the American Medical Association*. These adversities establish biological “memories” that weaken physiological systems and make individuals vulnerable to problems that can lie dormant for years.

“Recent scientific advances confirm that early life experiences are incorporated into our bodies and build a foundation not only for later achievement in school and eventual economic productivity, but also for lifelong physical and mental health,” says co-author Jack P. Shonkoff, Founding Director of the Center on the Developing Child at Harvard University. “This means that our growing national investment in early childhood services should not be viewed solely through the lens of school readiness. When these programs augment the provision of enriched learning opportunities with the effective reduction of toxic stress, they also serve as promising vehicles for health promotion and disease prevention across the lifespan.”

The report distinguishes between “positive” and “tolerable” levels of stress for young children, which, with the support of adults, help the body and brain learn to cope with brief situations of adversity, and “toxic” stress, which can disrupt brain architecture and other organ systems, increasing the risk for stress-related disease and cognitive impairment well into the adult years. Major risk factors for toxic stress include extreme poverty, recurrent physical and/or emotional abuse, chronic neglect, severe maternal depression, parental substance abuse, and family violence.

A fundamental transformation in the circumstances of children who face toxic stress early in life could not only affect their own individual well-being but also improve societal health and longevity, the report concludes, proposing three promising directions in health policy and clinical practice:

- Adult disease prevention begins with reducing toxic stress in early childhood, as a reduction in the number and severity of early adverse experiences will lead to a decrease in the prevalence of a wide range of health problems.

- High-quality early care and education programs can benefit lifelong health, not just learning, by providing safe, stable, responsive environments and evidence-based treatments for family mental health problems.
- Child welfare services represent an opportunity for lifelong health promotion by augmenting their exclusive focus on child safety and custody with comprehensive developmental assessments and appropriate interventions by skilled professionals.

“Health care reform is clearly essential for assuring universal access to needed medical care,” says co-author W. Thomas Boyce, the Sunny Hill Health Centre/BC Leadership Chair in Child Development at the University of British Columbia, Vancouver. “Yet we also know that health disparities linked to social class, race, and ethnicity are not primarily about health care access or quality, since these inequalities persist in countries that provide health care for all their citizens. These disparities are rooted in where and how we live, work, and play. Science is now telling us that they’re also about how we as a society treat our youngest members.”

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Suggested citation: Shonkoff, JP, Boyce, WT, McEwen, BS. “Neuroscience, Molecular Biology, and the Childhood Roots of Health Disparities: Building a New Framework for Health Promotion and Disease Prevention” (June 3, 2009) *JAMA: The Journal of the American Medical Association*.

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All three authors are members of the National Scientific Council on the Developing Child, a multi-disciplinary, multi-university collaboration housed at the Center on the Developing Child at Harvard University. <http://www.developingchild.net>

About the Center on the Developing Child at Harvard University

The Center on the Developing Child at Harvard University was established in 2006 to leverage scientific knowledge to close the gap between what we know and what we do to build a strong foundation during childhood for a lifetime of successful learning, adaptive behavior, physical and mental health, and community well-being. For more information, go to <http://www.developingchild.harvard.edu>.

SUMMARY OF ESSENTIAL FINDINGS

**Neuroscience, Molecular Biology, and the Childhood Roots of Health Disparities:
Building a New Framework for Health Promotion and Disease Prevention**

Shonkoff, Boyce & McEwen (*JAMA*, June 3, 2009)

Advances in developmental biology are building a persuasive case for a new way of thinking about health promotion and disease prevention based on increasing evidence that the origins of many adult diseases can be found among adversities in the early years of life. These adversities establish biological “memories” that weaken physiological systems and produce latent vulnerabilities to problems that emerge well into the later adult years.

While adult conditions such as coronary artery disease, stroke, diabetes, and cancer have been regarded until recently as products solely of adult behavior and lifestyles, an extensive body of new evidence links adult chronic disease to processes and experiences occurring decades before, in some cases as early as intrauterine life. Early experience can affect adult health in at least two ways—by accumulating damage over time or by the biological embedding of adversities during sensitive developmental periods. If the damage occurs through a cumulative process, chronic diseases can be seen as the products of repeated encounters with both psychologically and physically stressful experiences. When exposures occur during sensitive periods of development, their effects can become permanently incorporated into regulatory physiological processes, and subsequent adult disease may be viewed as the latent outcome of critical events that occurred during early periods of special susceptibility.

Children from families and communities with low income and low education levels may be especially vulnerable to the biological embedding of disease risk because of their disproportionate exposure to highly stressful influences such as neighborhood violence, dysfunctional schools, household chaos, and absent parents. These risk factors are often compounded by limited access to healthful foods and high consumption of energy-dense products, which are contributing to the rising prevalence of obesity and diabetes among low-income children. In some cases, the cumulative burden of multiple risk factors early in life may limit the impact of later interventions, making it impossible to completely reverse the neurobiological and health consequences of growing up poor.

Although early adversity can lead to greater vulnerability later in life, positive experiences can decrease such risk, in some cases across generations. Alterations of stress systems across generations—caused not by genetic inheritance but by early

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experiences—are facilitated by epigenetic changes in response to environmental cues, which, in turn, influence how the next generation’s genes are expressed.

Notwithstanding the fundamental importance of high-quality medical care for those who are ill, the limited capacity of high-quality care to reduce socioeconomic and racial disparities in health outcomes is clear. Yet little attention has been paid to the development of health promotion and disease prevention strategies based on the reduction of significant stressors affecting everyday life for vulnerable, young children and their parents. It is important to distinguish among three kinds of stress:

Positive stress, caused by dealing with frustration, getting an immunization, and other normative experiences, is an important aspect of healthy development that is experienced in the context of stable and supportive relationships that facilitate adaptive responses.

Tolerable stress, from experiences such as the loss of a loved one, serious illness, or a natural disaster, occurs within a time-limited period, during which protective relationships help to bring the body’s stress-response systems back to baseline.

Toxic stress refers to strong, frequent, and/or prolonged activation of the body’s stress-response systems in the absence of the buffering protection of adult support. Major risk factors include extreme poverty, recurrent physical and/or emotional abuse, chronic neglect, severe maternal depression, parental substance abuse, and family violence. Toxic stress disrupts brain architecture, affects other organ systems, and leads to lower thresholds for responsiveness in stress-management systems, thereby increasing the risk for stress-related disease and cognitive impairment, well into the adult years.

Little attention has been paid to the development of health promotion and disease prevention strategies based on the reduction of significant stressors affecting everyday life for vulnerable, young children and their parents.

Generally, current health promotion and disease prevention efforts consist of individually-focused medical services for children, such as immunizations and early identification and management of problems, and programs to modify the behavior of adults, such as encouraging better nutrition and increased exercise or reducing smoking, substance abuse, and risk-taking sexual behaviors. The ultimate impact of adult-focused policies is limited by the increasing difficulty of changing behavior as people get older; by the need to overcome biological vulnerabilities that may have been embedded physiologically as a result of early adversity; and by shifting responsibility toward individuals and away from the modifiable circumstances that shaped them.

A fundamental transformation in the circumstances of children who face significant adversity early in life could not only affect their own individual well-being but also improve societal health and longevity. To that end, three promising directions in health policy and clinical practice are indicated by the integrated developmental sciences:

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- Adult disease prevention begins with reducing toxic stress in early childhood, as a reduction in the number and severity of early adverse experiences will lead to a decrease in the prevalence of a wide range of health problems.
- High-quality early care and education programs benefit lifelong health, not just learning, by providing safe, stable, responsive environments and evidence-based treatments for family mental health problems.
- Child welfare services represent an opportunity for lifelong health promotion by augmenting their exclusive focus on child safety and custody with comprehensive developmental assessments and appropriate interventions by skilled professionals.

Focusing on access problems and differential treatment in the health care system is certainly important, but confronting the early childhood origins of disparities in physical and mental health may offer far greater return on investment.

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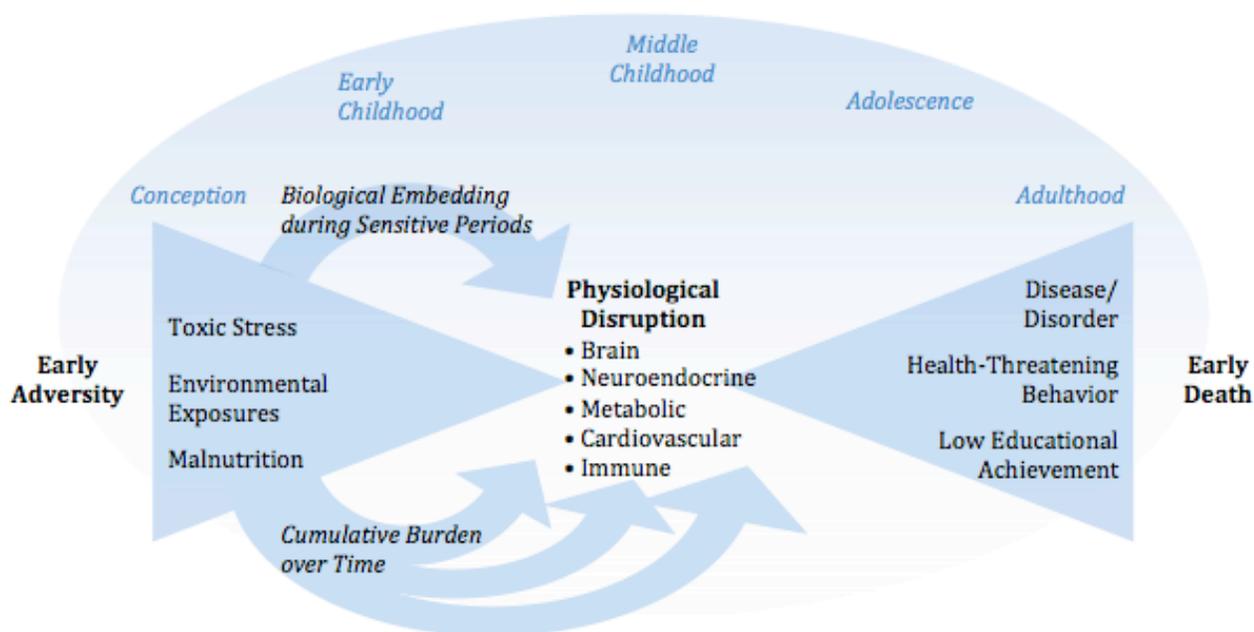


Fig. 1: The Childhood Roots of Health Disparities: How Adversity Is Built Into the Body

Q&A

Neuroscience, Molecular Biology, and the Childhood Roots of Health Disparities: Building a New Framework for Health Promotion and Disease Prevention

Shonkoff, Boyce & McEwen (*JAMA*, June 3, 2009)

Abstract: The origins of many adult diseases can be traced to negative experiences early in life, so confronting the causes of adversity before and shortly after birth may be a promising way to improve adult health and reduce premature deaths.

Q: What diseases have their origins in early childhood?

A: A variety of studies have shown that early childhood adverse experiences dramatically increase the risk, later in life, of diabetes, hypertension, cardiovascular disease, stroke, and certain cancers, as well as depression, anxiety disorders, and substance abuse.

Q: What early childhood experiences lead to the increased risk of these diseases?

A: Exposure to psychologically and physically stressful events, such as chronic neglect, family chaos, violence, mental illness and substance abuse, as well as exposure to toxins, prenatal drug and alcohol exposure, and malnutrition. Conditions such as these can either accumulate, leading to a “weathering” effect on the body, or, if they occur during sensitive periods in early brain development, can become embedded in the body, to be expressed years, or even decades, later.

Q: How does early childhood stress increase the risk of disease?

A: Not all stress is bad. “Positive stress,” from such experiences as learning a difficult new skill or meeting new people, is healthy and growth-promoting. It teaches our stress response systems how to activate and return to normal. “Tolerable stress” is caused by more serious events, such as the loss of a loved one, a natural disaster, or a serious illness or injury. With the buffering support of caring adults, a child’s stress response system can be brought back to normal and lasting damage (such as post-traumatic stress disorder) is prevented. But “toxic stress” refers to strong, frequent, and/or prolonged activation of the body’s stress response system due to extreme poverty, abuse, neglect, parental mental illness or substance abuse, and exposure to violence. Without the protective support of adults, this extreme, sustained activation of the stress response system disrupts brain architecture, affects other organ systems, and establishes a lower threshold for stress-response activation that persists throughout life. These effects can trigger a range of stress-related diseases.

Q: What does this have to do with government policies and programs?

A: Strategies for health promotion and disease prevention, currently focused on immunizations, early identification and treatment, and guidance toward health-promoting behaviors, can be effective, but also have serious limitations: They rely on changing behavior as individuals grow older, they must overcome biological vulnerabilities established early in life, and they shift responsibility onto individuals and away from the

conditions that shaped them in the first place. Instead, policies and programs could attack adult diseases at their roots by reducing the sources of toxic stress in early childhood, improving the quality and availability of early childhood programs, and focusing the child welfare system on improved child development, not just child safety.

Q: How widespread is toxic stress among children?

A: Some of the most common potential causes of toxic stress in young children include neglect and abuse, which occurs in 7.5 % of US children age 2-5; parental substance abuse, which occurs in 9.8 % of US households with children under age 5; serious post-partum depression, which occurs in 13% of new mothers; and continuing depression beyond the newborn period, which has been reported to affect 40-50 % of low-income mothers. Other possible precipitants include extreme poverty, emotional abuse, family violence, and other forms of parental mental illness. When there is strong, stable support from extended family and friends, other caregivers, and community services, these circumstances can be prevented from precipitating stress at levels that are toxic to brain development—and in other cases, early intervention targeting the specific sources of the stress must be provided for both parents and children.

Q: Why do some children experience adversity and grow up healthy, while others do not?

A: The trajectories of any individual child’s development are the result of a complex interaction between genes and experiences. Certain genes may make individuals more or less vulnerable to the effects of stress or other influences, but one’s experiences—particularly during critical and sensitive periods of brain development—determine whether or how those genes are expressed. There is no such thing as genetic “inevitability”—to the extent that we can control those experiences, we can affect how genetic differences are expressed.

Q: Are there any treatments that can help, or does the window of opportunity to reverse the effects of early adverse experiences close at some time?

A: It’s never too late to remediate—it just gets harder, and in extreme cases, it may not be possible to remediate fully. The brain keeps learning and adapting throughout life, but its ability to change decreases with age—and if damage is incurred during critical periods of brain and biological systems development, it may not be possible to reverse. That said, studies do show that more intensive and responsive caregiving can remediate the effects of early stress and neglect. There is some evidence from the burgeoning field of epigenetics that caregiving traits can, in fact, be transmitted across generations—so providing responsive caregiving to a child who has initially experienced neglect can result in benefits not only for that child, but for the future offspring of that child as well. *For a broader perspective on public health solutions, see the commentary by James Mercy and Janet Saul of the Centers for Disease Control and Prevention, “Creating a Healthier Future Through Early Interventions,” also in this issue of JAMA.*

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