



Three Trimesters to Three Years: Promoting Early Development

VOLUME 30 NUMBER 2 FALL 2020

3 Introducing the Issue

11 Maternal and Environmental Influences on Perinatal and Infant Development

35 Time On with Baby and Time Off from Work

53 Parental Sensitivity and Nurturance

71 Parental Language and Learning Directed to the Young Child

93 Chaos and Instability from Birth to Age Three

115 Supporting Development through Child Nutrition

143 Evolving Roles for Health Care in Supporting Healthy Child Development

165 Child Care and Early Education for Infants and Toddlers

191 Family Income and Young Children's Development

The Future of Children promotes effective policies and programs for children by providing timely, objective information based on the best available research.

Senior Editorial Staff

Editor-in-Chief

Sara McLanahan

Princeton University

Founding Director, Center for Research on
Child Wellbeing, and William S. Tod

Professor of Sociology and Public Affairs

Senior Editors

Janet M. Currie

Princeton University

Co-Director, Center for Health and Wellbeing

Henry Putnam Professor of Economics
and Public Affairs

Ron Haskins

Brookings Institution

Senior Fellow Emeritus

Melissa Kearney

University of Maryland

Professor, Department of Economics

Cecilia Elena Rouse

Princeton University

Dean, Woodrow Wilson School of Public
and International Affairs, Katzman-Ernst

Professor in the Economics of Education,

and Professor of Economics and Public Affairs

Isabel Sawhill

Brookings Institution

Senior Fellow

Journal Staff

Associate Editor

Kris McDonald

Princeton University

Managing Editor

Jon Wallace

Princeton University

Outreach Coordinator

Morgan Welch

Brookings Institution

Communications Coordinator

Regina Leidy

Princeton University

Administrator

Tracy Merone

Princeton University

The Future of Children would like to thank the Nicholson Foundation and Cynthia King Vance for their generous support.

ISSN: 1054-8289

ISBN: 978-0-9814705-1-1

The Future of Children

PRINCETON - BROOKINGS



VOLUME 30 NUMBER 2 FALL 2020

Three Trimesters to Three Years: Promoting Early Development

- 3 Introducing the Issue
by *Anna Aizer and Jeanne Brooks-Gunn*
 - 11 Maternal and Environmental Influences on Perinatal and Infant Development
by *Alexandra J. O'Sullivan and Catherine Monk*
 - 35 Time On with Baby and Time Off from Work
by *Maya Rossin-Slater and Jenna Stearns*
 - 53 Parental Sensitivity and Nurturance
by *Carrie E. DePasquale and Megan R. Gunnar*
 - 71 Parental Language and Learning Directed to the Young Child
by *Dina Kapengut and Kimberly G. Noble*
 - 93 Chaos and Instability from Birth to Age Three
by *Stacey N. Doan and Gary W. Evans*
 - 115 Supporting Development through Child Nutrition
by *Diane Whitmore Schanzenbach and Betsy Thorn*
 - 143 Evolving Roles for Health Care in Supporting Healthy Child Development
by *Adam Schickedanz and Neal Halfon*
 - 165 Child Care and Early Education for Infants and Toddlers
by *Ajay Chaudry and Heather Sandstrom*
 - 191 Family Income and Young Children's Development
by *Christopher Wimer and Sharon Wolf*
-

Introducing the Issue

Anna Aizer and Jeanne Brooks-Gunn

It is a pleasure to introduce this issue of the *Future of Children*, the first to focus on the first years of life starting with in utero experiences. Though a few previous issues have examined programs and services directed to the youngest children and their parents (home visiting programs, universal postnatal programs), none have taken a broader or more comprehensive look at the *prenatal to age three* period or, in our parlance, “Three Trimesters to Three Years.” These phrases signal the premise that prenatal experiences are part and parcel of the postnatal experience of mothers and their babies; in fact, the postnatal period is sometimes referred to as the fourth trimester, a way to highlight the fact that after a child’s birth, mothers themselves need continuing services and screening, rather than a somewhat myopic focus on the newborn alone. The title of this issue, “Three Trimesters to Three Years,” highlights continuity in development, the continuing intersection of mother and baby, and the rapid growth that occurs from conception to three years of age. Other common phrases, such as *the first 1,000 days* or *birth to three*, are in this sense limiting.

The *Future of Children* has not been alone in neglecting this age period, even though it is the one in which the most rapid growth of the brain and behavior occurs. Most researchers and policy makers have treated the nine months of development during pregnancy separately from the first three years of life. By tying the nine months of pregnancy to the first three years of life, we highlight the continuity of development. Similarly, obstetricians are now using the term fourth trimester to characterize the first postpartum months, when the health concerns of new mothers are often ignored. It is now clear that:

- life experiences begin before birth,
- the in utero environment affects later development,
- inequities in access to and quality of prenatal services begin during pregnancy, and
- discrimination, racism, and classism affect pregnant women, and thus affect their fetuses and young children in turn.

www.futureofchildren.org

Anna Aizer is a professor of economics and chair of the Department of Economics at Brown University. Jeanne Brooks-Gunn is the Virginia and Leonard Marx Professor of Child and Parent Development and Education and co-director of the National Center for Children and Families at Teachers College, Columbia University.

Plan of the Issue

We've organized this issue mainly along the lines of the inputs necessary for health and development during pregnancy and in the first three years. Another framework might have focused on outputs, or indicators such as cognitive, linguistic, motor, social, and emotional development, as well as behaviors reflecting curiosity, perseverance, empathy, and attention (which involve social, emotional, and cognitive skills). Health, another output, comprises many different indicators. Each of these outputs depends, in varying degrees, on multiple inputs, and possibly different inputs later in childhood than during the period we're examining. Consequently, each article would have had to consider some of the same inputs, which could have been repetitive (and difficult for authors to write!).

We selected nine inputs for consideration (realizing that not every input is covered, an impossibility in a single issue of *Future of Children*):

- pregnancy and fetal development: the child's first home;
- parental nurturance and sensitivity: the child's first relationships;
- parental language and cognitive activities: the child's first learning environment;
- stability and organization in the home and neighborhood: the child's experience of consistency;
- family income: the child's experience of material security;
- child nutrition: the child's experience of food security;

- health care: the universal service;
- parental leave to care for the baby: the balance between family and work; and
- child care and education: the first out-of-home caregivers and teachers.

The articles on these nine topics describe what we know about these inputs based on recent and rigorous research. They are not meant to constitute an exhaustive review. The authors highlight both observational studies that follow children and their parents over time and experimental evidence. Results that have been replicated across investigators and laboratories form the corpus of knowledge in these articles. Our intent is to highlight evidence from the most rigorous studies in which we are most confident that the relationships estimated are causal in nature, not simply correlational.

Whenever possible, the articles touch on biological mechanisms underlying the timely provision of love, teaching, stability, parental care, food, material goods, health care, and child care and education. All the articles also look at environmental constraints and conditions when it comes to providing for young children.

In 2000, the National Academy of Sciences published a landmark volume titled *From Neurons to Neighborhoods*, examining children's development with a particular focus on how biological and neurological processes interact. Since then, the integration of biological and environmental influences has progressed quickly. The fact that each article in this issue is able to address this integration is an indication of how far the research has come in the past two decades. When one of us, Jeanne

Brooks-Gunn, co-edited the first *Future of Children* issue completed by the Princeton University-Brookings Institution team, a single standalone article focused on brain development. Now, all nine articles speak to these neurological processes. (As an aside, the author of that standalone article, Kimberly Noble, is also an author in this issue.)

Overview of the Articles

To begin the issue, Alexandra O'Sullivan and Catherine Monk examine influences on perinatal and infant development. New research is charting the ways that environmental experiences influence the physical and psychological state of both the pregnant woman and her unborn child. Long-term effects are being studied as well, with a more nuanced view of how biological processes are shaped by the environment. The authors discuss policies to benefit the mother and child, including provision of paid leave, access to high quality health care, a focus on mental health and material hardship, and recognition of discriminatory obstetric practices.

Over half of US mothers with infants are employed. Yet we lack a national paid maternity leave policy—the only country without one except Papua New Guinea. Unlike other high-income countries, we also lack paid paternal, parental, or family leave. Maya Rossin-Slater and Jenna Stearns review what the research says about the benefits of paid leave policies for parents of infants, relying on information from other countries and from the few states that have implemented paid leave. Benefits accrue to mothers in terms of labor market participation and earnings. Young children are also favorably affected. And few costs to

employers are found. Clearly, the authors state, the time has come for a federal paid leave policy for new parents in the United States.

Parents provide the young child's first relationships, and sensitive and nurturing interactions promote healthy development. Carrie DePasquale (a promising young scholar who, tragically, died suddenly as this issue was going to press) and Megan Gunnar discuss how such care influences infants' physiology and, consequently, their ability to regulate their emotional states, which are the foundation for later social and emotional development. The authors review interventions that attempt to alter parent-child interactions based on theory and evidence. The successful ones are very targeted toward specific parenting behaviors, often in a predetermined sequence. These newer programs are quite different from previous ones that took a more general approach to parenting. They also seem to be more successful, suggesting that old approaches could benefit by incorporating the new research into their practices.

Parents also provide the child's first language experiences. Dina Kapengut and Kimberly Noble examine the home learning environment. They show how talking and other forms of stimulation in the home promote brain, language, and cognitive development, as well as how the early years set the stage for later learning. The authors review programs that aim to enhance learning in the home. A new generation of successful programs is helping parents monitor the language spoken to their children, sometimes using feedback from recorded interactions as well as specific stimulating play activities.

Infants and toddlers, as well as older children, benefit from stability in their lives—in their homes, in child care, in medical clinics, and in their neighborhoods. Stacey Doan and Gary Evans provide a compelling case that stability is important for social, emotional, cognitive, and physical development. They review many sources of instability, including parents moving in and out of the household, parents' conflicts with one another, overcrowding, noise inside and outside the home, exposure to chaos in general, evictions, residential moves, and, to a lesser extent, food insecurity and material hardship (both topics are covered by entire articles in this issue). They also describe how family routines for eating and sleeping can be a source of stability for young children. All of these aspects of stability are associated with healthy development, although much of the available evidence is based on studies of children over age three. The accumulation of various types of instability is a particular concern, yet programs and policies to address stability typically only focus on one aspect (as an example, food programs for food insecurity, couples counseling for parental relationships, or traffic management for noise pollution).

Adequate nutrition (meaning both nutrients and calories) is necessary for the growth of the fetus, infant, and toddler. Diane Whitmore Schanzenbach and Betsy Thorn examine early nutrition, especially in the fetal and infant months. They consider the benefits of breastfeeding, as well as the policy barriers that stand in its way. They also review the effects of the two major US programs to reduce food insecurity—the Supplemental Nutrition Assistance Program (SNAP) and the Special Supplemental Nutrition Program for Women, Infants and Children (WIC), which together serve about

one-third of US infants and toddlers each year—as well as the Earned Income Tax Credit (EITC), which gives families living in poverty money that can be used to buy food. They also propose ways to enhance these programs, for example, a “young child multiplier” that would provide more SNAP benefits to families with children under three.

Almost all US children are delivered in a hospital or health care setting and receive some form of pediatric care in the first three years of life. Adam Schickedanz and Neal Halfon analyze how well the current health systems serve young children. They argue that adherence to the traditional medical model in pediatrics has hampered efforts to identify and treat developmental delays. The authors provide a fascinating history of pediatric care, highlighting the need to go beyond focusing on physical illnesses to consider developmental outcomes and promote healthy development. They suggest how current systems might be altered to provide more consistent and coordinated services, and to address racial and class disparities in health care and in services. In addition to making recommendations for broad changes in pediatric care, the authors discuss several innovative programs that have been implemented and evaluated in pediatric clinics and practices.

Child care and, increasingly, early education, are part of young children's lives. Ajay Chaudry and Heather Sandstrom take an extensive look at the barriers to finding consistent, affordable, and quality care, especially for low-income families. The system of child care is fragmented, and most child care isn't regulated (center-based care and some family care centers are the exception). Overall, quality is not high

when compared to care and education for children over three. Few public programs exist, rendering child care primarily a family expense (although some families receive subsidized care vouchers, and a handful of Early Head Start programs exist nationwide). The authors examine programs and policies that could address the shortage of child care and early education programs, as well as their costs.

Family income is a crucial input for young children's healthy development. Chris Wimer and Sharon Wolf provide an excellent and succinct guide to how low income, persistent poverty, depth of poverty, and volatility of income influence parenting, nutrition, health care, child care and, ultimately, children. Then they probe the extent to which these effects are due to income versus other conditions correlated with income (such as parental education, family structure, or work opportunities). They also review the major federal programs, such as tax credits, that provide income to poorer families, as well as programs that provide in-kind benefits, such as SNAP, and to a lesser extent, child care and housing subsidies. Finally, Wimer and Wolf highlight some recently launched studies that will shed further light on the relationship between income and development in children's earliest years, and they suggest how policy might better provide income support to low-income families and their children.

Common Themes across the Articles

Three common themes emerge from the articles. The first is that children's wellbeing very much depends on their mothers' health and wellbeing. This is perhaps most immediately apparent in the opening article

on pregnancy and fetal development. Maternal mental and physical health directly impact the developing fetus and also set the stage for development in infancy. Yet the influence of maternal wellbeing on child wellbeing continues as the child grows older. Stability in the home helps parents provide a safe and nurturing environment for their children, thereby positively affecting children's brain development in important ways. Indeed, many of the programs we consider in these articles center on the parent: parental leave policies, incorporating parents as part of the focus of pediatric care, parenting programs, and housing and eviction policies.

A second theme that emerges across the articles is the importance of family income and the critical role that government plays in the lives of all families, especially families with fewer resources. Parents with more income can provide more stable living arrangements, and they can purchase higher-quality child care and more food. For families with fewer resources, direct income support via unconditional cash transfers is increasingly uncommon in the United States. More often, government programs offer in-kind benefits, such as food or child care subsidies. However, the evidence suggests that many programs either aren't sufficiently targeting children in need (in the case of nutrition programs) or aren't adequately funded (in the case of child care subsidies).

Beyond subsidies to low income families to purchase goods and services for their children, public policy can play an important role in promoting child health and development across many of the nine inputs. This could include, for example, mandating paid family leave, developing a comprehensive system for regulating

the quality of child care, promoting child health and nutrition through nutrient supplementation, and reimbursing medical care in a way that would promote coordinated care across both child physical health and developmental outcomes. This last point suggests a third common theme across the articles: the strong interrelationships across multiple domains of child development. Language acquisition, nutrition, health, and developmental delays shouldn't be considered separately. Not only are they affected by many of the same inputs, but development in one domain affects development in another. Greater coordination across multiple inputs and multiple domains of child wellbeing would likely require some government intervention—either via financial incentives or direct programming and regulation.

What's Missing?

What have we not covered adequately in this issue? We didn't focus as much as we might have liked on family forms other than the two most common ones (two-biological-parent and single-mother households), such as families with same-sex parents, with three generations living under the same roof, with adopted children, with foster children, with a father only, with stepparents, or with multiple parents. Research on infants and toddlers in these groups is much less robust, as are program evaluations. Whether current interventions would be equally effective for these types of families is not yet known.

In a related vein, we didn't include a separate article on fathering. Instead, whenever possible, the authors considered fathers separately, for example, in the article on family leave policies. Recent programs to enhance nurturance and learning for the

most part focus on mothers, although in principle they could be offered to fathers or other adult family members as well. Programs to enhance involvement of non-residential fathers do exist, although, in general, their effects are inconsistent. The issue also does not spend much time on nonresident fathers' material support of their young children. Most of the research on that topic examines child support in general but doesn't focus on the first three years.

Perhaps we could have paid more attention to neighborhoods and housing. We chose to include an article on stability more generally, which touches on community-level indicators. Likewise, we didn't commission an individual article on adverse childhood experiences (ACES). Instead, the articles highlight the inputs necessary for development. ACES in general make it more difficult for infants and toddlers to receive the love, learning, and stability that they need (in addition to food, housing, and material stability). The most studied ACES in the first three years might be termed the three Ms—missing parents (because of death, illness, incarceration, or nonresidence), mental health of parents (severe depression and/or anxiety, and substance or alcohol abuse), and maltreatment of the child (abuse and neglect).

These articles were prepared before the COVID-19 pandemic of 2020. Has the pandemic altered what our authors have written? Probably not substantively. However, the pandemic illustrates the stark reality of the vast majority of US families, especially those who have low income, who have lost their jobs, or who cannot obtain child care if they are employed. Federal

programs don't offer an adequate safety net for such families. And the burdens are disproportionately carried by low-income families and families of color—mortality, illness, job loss, lack of child care and education, anxiety, and violence.

What's Next?

For each issue of the *Future of Children*, the issue editors and Ron Haskins of the Brookings Institution write a policy brief to highlight a topic that has emerged from

the articles and from the discussions at our authors conference. The articles here provided many worthy topics. But given the devastating loss of jobs and consequently family income in 2020, our policy brief, to be released early in 2021, will focus on income, specifically policies to increase family income during the first three years of life. We'll be taking a look at guaranteed income, infant-toddler tax credits, baby bonds, paid family leave, the EITC, and Unemployment Insurance supplements.

Maternal and Environmental Influences on Perinatal and Infant Development

Alexandra O'Sullivan and Catherine Monk

Summary

Mother and child wellbeing are intimately connected during pregnancy and the first 12 months of the infant's life. The fetus and child directly experience the mother's life and are shaped by it. A mother's environmental experiences, physical health, and psychological distress affect her interactions with her infant, which in turn have physiological, neurological, and psychological consequences that extend far into the future.

In this article, Alexandra O'Sullivan and Catherine Monk explore the biological and behavioral pathways through which the physical and psychological toll of environmental experiences such as poverty, trauma, pollution, lack of access to good nutrition, and systemic disadvantage is transmitted from mother to child, thus impairing fetal and infant neurobiological and emotional development.

Fortunately, there are ways to buffer these risks and reorient both the child and the mother-child pair toward a strong developmental trajectory. The authors examine promising avenues for policy makers to pursue. Chief among these are policies that increase access to health care, including mental health care, and those that reduce family stress during pregnancy and the postpartum period, for example, by boosting family income or allowing parents to take paid leave to care for their newborn children.

www.futureofchildren.org

Alexandra O'Sullivan is a research coordinator in the Perinatal Pathways Lab at Columbia University Irving Medical Center. Catherine Monk is director of the Perinatal Pathways Lab and a professor in the departments of Obstetrics & Gynecology and Psychiatry at Columbia University Irving Medical Center and the New York State Psychiatric Institute.

Child development begins before birth, and the womb is an influential first home. The perinatal period, which spans pregnancy through the first nine months of an infant's life, is characterized by dramatic physical and neurobiological development. The mother also experiences significant physical, mental, biological, and social changes, all of which may affect the child. Mother and infant wellbeing are intimately connected. Research demonstrates that the fetus experiences the mother's life and is shaped by it. Through biological and social pathways, factors such as her emotional and physical health or experiences of discrimination and poverty influence infant brain-behavior development and contribute to long-term child psychiatric and social-emotional outcomes. Accordingly, clinical and policy interventions that aim to improve maternal health care and ease stress during the prenatal and postpartum periods—such as increased access to behavioral health screening and treatment, paid parental leave, and extended insurance coverage—can have positive downstream effects on child development. These are early first steps that can help to prevent the intergenerational transmission of psychiatric illness and disadvantage.

Developmental Origins of Health and Disease

In the 1980s, epidemiologist David Barker hypothesized that long-lasting health effects flow to a child from early environmental influences, even those experienced prenatally. Now known as the Barker hypothesis or prenatal programming, this concept of the developmental origins of health and disease (DOHaD for short) has more recently been

applied to the study of maternal mental health and children's neurobehavioral and neurocognitive development and long-term psychiatric outcomes, highlighting a third, potentially preventable pathway for the familial transmission of risk for future mental illness. That is, pregnant women's psychological and physical health may impact fetal brain development, with significant consequences for the child's future wellbeing. Using evolutionary theory as a framework, the DOHaD model describes the fetus as adapting to the in utero environment based on signals from the mother that foreshadow the postnatal environment to come, thereby promoting survival in the postnatal world. As the fetal brain continues to develop, these biological adaptations become programmed (and therefore long lasting), potentially placing the child at risk for psychological or developmental challenges if the prenatal and postnatal environments are misaligned.

The Brain's Beginnings: Fetal Neurodevelopment

The transformation of a cluster of cells into a nascent brain occurs in a mere nine months. Over this time, inherent genetic patterns and variations interact with characteristics of the fetus's environment to organize the different elements of the brain into one complex and remarkable organ. While the fetal brain is developing, it is learning. The fetal brain's plasticity allows it to learn from and adapt to environmental experiences. Though this dynamic process continues throughout a person's life, the fetal brain's heightened responsiveness to new experiences makes the prenatal period a time of great opportunity—but also vulnerability.

Fetal brain development is typically divided into three distinct phases: embryonic (from conception to the eighth gestational week), the early fetal period (up to mid-gestation), and the late fetal period (lasting until birth). By the end of the embryonic period, the basic structures of the brain and central nervous system, including the neural tube (responsible for future neuron production), are established—long before obvious signs that a woman is pregnant and often before even she knows. Because inadequate folic acid and vitamin B intake can cause neural tube defects leading to risks of serious birth malformations, vitamin supplementation is important for all women of childbearing age, as is a healthy lifestyle. During the early and late fetal periods, brain development centers on producing, connecting, and differentiating neurons. Fetal exposure to environmental toxins that influence the speed and accuracy of communication between neurons (such as drugs of abuse or prescription medications), inadequate nutrition, the effects of preterm birth, and maternal infection and inflammation all may impact the development of neural circuits and neurotransmitter systems, contributing to risk for poor neurobehavioral development. Fetal alcohol exposure is also linked to increased cell death in the developing brain.

Throughout this extensive period of brain development, fetal learning occurs. For example, by late in pregnancy, fetuses can distinguish different sounds, including music and their mother's voice. However, the communication of information from mother to fetus also includes biological signals related to aspects of the mother's life, such as relatively high levels of the stress hormone cortisol. Pregnancy is thus a period of dramatic fetal brain growth as well as developmental

vulnerability during which the genetic blueprint of the brain is altered through qualities in the mother's life that make up the fetus's environment.

Environmental Influences on Fetal Neurodevelopment

The phrase environmental exposures readily conjures adverse factors, such as pollution or physical illness, that affect the mother and her health. In DOHaD research, the concept of environmental exposures also extends to mothers' psychological distress, including depression, anxiety, and perceived stress, all of which are associated with biological changes in the mother that alter the fetus's environment.

Maternal Mental Health

In 2015, the World Health Organization declared maternal mental health a major public health concern, calling it one of the most overlooked aspects of pregnancy care. In the United States, the prevalence of depressive disorders and anxiety disorders during the perinatal period is estimated to be between 18 and 19 percent and 12 and 13 percent, respectively. These rates are more than twice as high in low-income and minority populations. An estimated 30 percent of pregnant women report some kind of stress in their daily lives. These statistics matter. Substantial evidence demonstrates that elevated maternal distress during pregnancy increases the future child's risk for mental health disorders, including anxiety, depression, attention deficit/hyperactivity disorder (ADHD), and schizophrenia.

For example, a study of nearly 8,000 British children found that children exposed to higher prenatal maternal anxiety were at

greater risk for overall behavioral problems (for example, ADHD and conduct problems) at age seven. These effects persisted: exposure to high levels of prenatal anxiety doubled the risk of having a mental health disorder at age 13. This influence on children's health was evident even when researchers also considered other adverse prenatal influences, such as maternal smoking and drinking, medical conditions during pregnancy, socioeconomic status, and the mother's mood postpartum. Similar outcomes were identified for prenatal maternal depression. This association between maternal distress during pregnancy and children's increased risk for social-emotional problems has been corroborated by research groups in many other countries.

Although these associations have been found in both male and female children, research suggests that male fetuses are more vulnerable. In a recent study comparing psychologically stressed, physically stressed, and healthy mothers, researchers found that the secondary sex ratio (in the general population, 105 male infants are born for every 100 female infants, for a ratio of 1.05:1) became 4:9 for physically stressed mothers, and 2:3 for mothers experiencing psychological distress; that is, highly stressed women were less likely to give birth to a male infant. This apparent heightened male vulnerability to adverse prenatal environments may be an evolutionary response to natural selection pressures—relatively few but healthy men are needed for species survival, whereas many women are needed to carry single pregnancies to term.

More recently, DOHaD researchers have turned their attention to the brain itself. Magnetic resonance imaging studies have

identified differences in newborns, older children, and even adults associated with prenatal exposure to maternal distress. A study that followed children from the prenatal period until they were six to nine years old found that higher maternal prenatal anxiety was associated with reduced gray matter volume (an indication of fewer neurons) in the brain's prefrontal cortex, a region integral to cognitive abilities such as reasoning, planning, attention, and working memory. Similar reductions have been found in adults exposed to maternal stress in the prenatal period, emphasizing the enduring nature of these changes. Other studies have related maternal prenatal depression to greater cortical thinning (a characteristic of people with depressive disorders) at age seven and child depressive symptoms at age 12. Each of these studies controlled for other possible influences, such as the mother's physical health in pregnancy. A recent imaging study confirmed that the prenatal environment is responsible for these brain changes: researchers found that resting state connectivity between the amygdala and the prefrontal cortex—a neural circuit that's key to regulating emotions—was different in the brains of newborns exposed to untreated prenatal depression compared to the newborns of healthy women. This suggests that the fetus adapts in anticipation of the unfavorable postnatal environment indicated by the mother's depression.

The association between maternal mental state and fetal neurodevelopment has even been shown in real time in studies that demonstrate fetal responsiveness to acute laboratory-induced stress at the moment the mother experiences it. These studies show that the fetuses of distressed women are more reactive to the biological cues of maternal acute stress,

with the magnitude of mid- to late-term fetal response varying based on maternal depression or stress levels, providing evidence that in the latter part of pregnancy the fetus is experiencing and being shaped by its mother's life. The public health significance of pregnant women's psychological wellbeing is thus clear. Pregnant women's mental health matters both for them and for their future children. Without access to timely and effective interventions to alleviate mothers' distress, the intergenerational cycle of psychiatric illness continues.

Other Environmental Factors Influencing Fetal Neurodevelopment

Pregnant women don't live in a vacuum. Every day, women are exposed to environmental and psychosocial sources of stress that impact both their own psychological and physical wellbeing and that of their unborn child.

Poverty and psychosocial factors. Major adverse life events, such as death or illness in the family or pregnancy-related health problems, can occur during any woman's pregnancy. However, chronic psychosocial stress factors such as poverty aren't randomly distributed throughout society. Poverty is associated with reduced access to prenatal care and to increased exposure to cigarette smoking, poor nutrition, and distressed, environmentally hazardous, or insecure housing, each of which contributes to compromised pregnancy outcomes, such as small size for a fetus's gestational age, preterm birth, and low birthweight.

In each case, factors such as reduced access to healthy food, transportation, and health care contribute to these negative birth outcomes. Opportunities to promote maternal

health and reduce stress in this context may include better access to medical facilities and public transport and adjustments to built environments, such as support for developing green spaces, which have been associated with increased infant birth weight.

Every day, women are exposed to environmental and physical sources of stress that impact both their own psychological and physical wellbeing and that of their unborn child.

Systemic racism in the United States also produces significant discrimination-related stress during pregnancy. A recent study compared stress related to discrimination experienced by non-Hispanic white and black pregnant women of similar socioeconomic level. Non-Hispanic black women reported higher levels of discrimination (and worry about discrimination); their blood samples, taken over the second and third trimesters, contained significantly higher levels of adrenocorticotrophic hormone (produced in response to stress), suggesting biological differences as a result of cumulative racial disadvantage.

Nutrition. The quality of a mother's diet can have long-term implications for her child's future health. Pregnant women with inadequate nutrition often experience symptoms of depression or stress. Thus high distress and poor nutrition are highly interrelated and associated with similar adverse neurobehavioral outcomes in children.

Financial and geographical barriers to the fresh foods and vitamins required for a healthy pregnancy often limit pregnant women's options, especially when they live in disadvantaged environments.

Although macronutrient deficiencies (such as reduced overall caloric intake) pose risks to the developing fetus, relatively easy access to processed foods in the United States today has meant that most pregnant women consume sufficient calories. Yet too often this increase in calories isn't associated with a corresponding increase in intake of micronutrients (such as zinc, iron, copper, or vitamins including choline, folate, and vitamin A). Both macro- and micronutrient deficiencies during pregnancy are associated with greater risks of neurobehavioral developmental outcomes, such as cognitive delays, ADHD, autism spectrum disorder, and schizophrenia. A lack of dark leafy greens, legumes, and oranges during pregnancy can have particularly devastating consequences for fetal neurodevelopment. These foods contain high amounts of the B vitamin folate, which plays a key role in DNA synthesis and function. Research relates varying levels of prenatal folate to subtle differences in brain development; low levels correlate with future developmental challenges. Further still, inadequate levels of folate during pregnancy, and even in the month before conception, dramatically increase the risk of neural tube defects, which can lead to severe physical disabilities such as spina bifida. Prenatal folate deficiency has also consistently been linked with infant and child emotional and behavioral problems, particularly social withdrawal, poor attention, and aggression.

Nutrition also plays a key role in mothers'

mental health. Deficiencies of folate, vitamin B12, calcium, iron, selenium, zinc, and magnesium have been associated with symptoms of depression. Studies have shown that people experiencing stress and depression are more likely to choose processed, high-fat, high-sugar foods at the expense of fresh, nutritious options. During pregnancy, poor nutrition affects two generations.

Research into the effects of prenatal nutrition underpinned the most effective pregnancy-related public health campaigns to date. Beginning in the 1990s—based on clinical trials demonstrating the benefits of dietary supplementation of folic acid, a synthetic form of folate—pregnant women were told about the relationship between their own health and their child's development. Since approximately half of US pregnancies are unplanned, the US Preventive Services Task Force now recommends that all women of childbearing age take a daily folate supplement. In addition, the US Food and Drug Administration approved folate supplementation for foods such as cereals and, more recently, corn masa flour. The effects of this campaign have been significant. From the early 1990s to the 2000s, the rate of neural tube defects dropped from 11 to seven cases per 10,000 live births. It's estimated that food fortification prevents about 1,300 neural tube defects a year. Nevertheless, rates of daily folate supplementation today are still low and falling. Between 2006 and 2016, daily vitamin supplementation decreased in women of childbearing age, falling from 32.7 to 23.6 percent. One reason for this decrease may be a lack of patient understanding of

the risks of neural tube defects; another might be the cost of daily multivitamins. Clearly, work remains to be done in both public education and increasing access to affordable prenatal vitamins and fortified foods.

Chemicals and pollution. The developing fetal brain is affected by maternal environmental exposure to chemicals and air pollution. Researchers who've collected mothers' blood, urine, and hair samples have revealed widespread exposure throughout pregnancy to numerous chemicals, many of which are known to have adverse health effects. For example, easily metabolized chemicals (such as the phthalates, parabens, and bisphenol A, found in plastics and personal care products) and heavy metals (such as lead and mercury, found in contaminated water or paint particles) are known to affect fetal growth and lead to poor birth outcomes, including low birthweight, preterm birth, and associated developmental delays.

Understandably, pregnant women diagnosed with a high risk-pregnancy complication are often anxious or suffer from depression.

Air pollution increasingly affects maternal and fetal health as large US cities continue to become more congested. Air pollutants commonly inhaled by pregnant mothers, such as nitrogen dioxide, carbon monoxide, sulfur dioxide, and ozone, pose risks to fetal and infant health and have been associated with

low birthweight, preterm birth, and future respiratory illnesses. Studies have shown that these adverse outcomes are heightened in more socially disadvantaged women. Policies to reduce traffic congestion and carbon emissions positively impact all citizens, including those not yet born.

Maternal physical health. Mothers' psychological distress in the form of anxiety, depression, or perceived stress is both a risk factor for and a consequence of chronic maternal diseases, such as diabetes and preeclampsia, a disorder causing sudden high blood pressure in pregnant women. Both diseases cause pregnancy complications and can affect infants' neurodevelopment.

Understandably, pregnant women diagnosed with a high risk-pregnancy complication are often anxious or suffer from depression related to the uncertainty surrounding their pregnancy and the associated risks to their child's future health. This distress is not unfounded. One study showed that the babies of "physically stressed" mothers (for example, pregnant women with elevated daily blood pressure or high caloric intake) are more than twice as likely than the babies of unstressed mothers to be born preterm (22 percent compared to 8 to 10 percent). Hypertensive disorders during pregnancy are also linked with higher risk for child behavioral problems, ADHD, mood disorders, and schizophrenia. Moreover, psychological distress and psychosocial stress factors can themselves induce gestational diabetes mellitus, which is associated with an increased risk for autism spectrum disorder.

Finally, many drugs of abuse cross the placenta and so reach the fetus. Prenatal drug exposure is related to prematurity,

low birth weight, and neonatal abstinence syndrome, a condition in which the baby goes through withdrawal. In the past two decades, neonatal abstinence syndrome diagnoses have increased nearly fivefold in the United States, resulting in estimated neonatal hospital costs in excess of \$1 billion per year. In addition to contributing to serious pregnancy complications, prenatal exposure to drugs of addiction is associated with severe behavioral dysregulation and cognitive impairment. For example, prenatal opiate exposure has been related to poor neurocognitive development from age six months on, worsening by school age and into adolescence. Similar neurocognitive deficits have been found in infants and toddlers exposed prenatally to cocaine, alcohol, tobacco, and marijuana, independent of risks associated with premature birth and socioeconomic status.

The Growing Mind: Neurodevelopment in Infancy

Birth brings considerable environmental change for the infant, yet continuity remains in the neurodevelopmental processes that commenced nine months earlier. The learning that began in the womb continues and accelerates significantly over the first 24 months as the infant becomes familiar with his or her new environment and the people in it. At birth, the neonatal brain weighs 400 grams, approximately 25 percent of its eventual adult size; by age two, the brain has grown to 75 percent of its adult size, indicating the importance of infancy and toddlerhood as developmental periods. During this further period of neural plasticity, the brain is highly malleable and constantly evolving, as it is custom built to reflect the child's experiences in the world.

Maternal Mental Health in the Infant's First Year

An infant's neurobehavioral development in the first year is exquisitely sensitive to the postnatal environment, including the mother's mood. In the United States, an estimated 20 percent of mothers will experience an episode of depression in the first three months after giving birth. Women with a history of depression, anxiety, or prenatal depression or anxiety are at significantly greater risk for postpartum depression. As we've noted, the incidence more than doubles in at-risk maternal populations, such as women in poverty. One study looking at young, low-income African American mothers between two weeks and 14 months after delivery found that 56 percent of the mothers met the criteria for either major (37 percent) or minor (19 percent) depressive disorders. These mothers' experiences play a significant role in early infant development. Maternal depression undermines mother-infant emotional communication and dyadic reciprocity (the sharing of emotional affect between mother and infant) and has profound consequences for an infant's social-emotional development. Laboratory studies show that infants are stressed when their mothers display a withdrawn affect. Using the well-established still face paradigm, in which the caregiver plays with and then emotionally withdraws from the infant—a simulation of the experience of maternal depression—studies demonstrate that infants of depressed mothers respond to the unpredictability of maternal engagement with reduced activity, greater behavioral dysregulation, and withdrawal.

The effects of maternal depression on child neurodevelopmental processes don't end in

infancy. Maternal postpartum depression is also associated with reduced social competence and compromised language development in early childhood. These effects are long lasting and stark. A large, recently published study followed the course of maternal depression and child outcomes for 18 years. The study found that mothers with severe postpartum depression at both two and eight months after delivery were more likely to still be depressed 11 years later, compared to mothers with nonpersistent depression. Their children, in turn, were four times more likely to exhibit behavioral problems when they were between three and four years old, twice as likely to have lower math scores at 16, and seven times more likely to have depression themselves at 18. These intergenerational effects of maternal depression show how important it is to screen for depression at all life stages and to promote a dyadic approach to identifying and treating maternal mood disorders.

However, maternal sensitivity—the mother’s ability to interpret and effectively respond to the infant’s signals—can mediate maternal depression’s effects on infants. On the one hand, insensitive maternal behavior during caregiving tasks is associated with increased infant neurobehavioral responsiveness to stress and child psychopathology. Maternal distress associated with depression and social disadvantage can diminish a mother’s ability to provide sensitive caregiving and a responsive home environment that stimulates early cognitive and language development. On the other hand, sensitive maternal behavior in infancy predicts better social-emotional outcomes in children. In addition—and importantly for intervention

purposes—sensitive maternal caregiving can buffer the neurobehavioral effects of prenatal distress. For example, only when the quality of postnatal care at age four months was low did the four-month-old infants of mothers diagnosed with anxiety or depression in the second trimester of pregnancy show significantly higher cortisol levels (a biomarker of stress) than the infants of healthy women. In short, sensitive maternal caregiving in the infant’s first year can enhance the developmental trajectories of infants exposed to maternal distress in the womb.

Biological Pathways for Transmission of Risk

How does maternal distress shape fetal and infant neurobiological and emotional development? Through which biological and behavioral pathways are environmental experiences transmitted from mother to child?

Mechanisms during Pregnancy

Several pathways have been associated with increased risk of autism spectrum disorder, schizophrenia, mood disorders, and ADHD in children. One is the hypothalamic–pituitary–adrenal (HPA) axis, which plays a central role in releasing stress hormones. Atypical functioning of the mother’s HPA axis is associated with maternal distress and increased circulating levels of the stress hormone cortisol. Cortisol can readily cross the placenta and thereby reach the fetus, affecting the development of the infant’s own HPA circuitry and brain development, which increases the risk of psychological distress in the future child. Another pathway is alterations in the mother’s immune system that can affect brain connectivity. Maternal immune activity—part of a stress experience

and/or response to infection—may cause placental inflammation or the release of cytokines (signaling molecules that affect the survival and differentiation of neurons in the brain) into the mother's system, where they can cross the placenta and affect the developing fetus.

Environmental influences also may alter fetal neurodevelopment by modifying the functioning of the placenta through a process called *epigenetics*, which can result in heritable modifications to gene expression (whether a particular gene is activated or suppressed). The most commonly studied epigenetic mechanism, DNA methylation, can change the activity of DNA without changing the underlying sequence itself. For example, the placenta regulates fetal exposure to cortisol in part by DNA methylation of certain genes. Changes to this placental function can lead to high arousal and poor self-regulation in newborns, each of which is an indicator of risk for future behavioral problems. Considerable research is under way to determine whether epigenetic processes in the placenta and other tissues that are key to development contribute to the intergenerational transmission of environmental experiences, such as poverty, trauma, and systemic disadvantage.

The maternal microbiome offers another possible way for prenatal maternal stress to influence fetal neurodevelopment. Prenatal distress is known to alter mothers' gut microbiota, and research shows the infant microbiome is developed perinatally during birth (for example, infants born vaginally show gut microbiota that resemble their mother's vaginal microbiome) and even prenatally via transmission through the placenta. The microbiota that colonize the infant gut affect important processes such as metabolism

and nutrient extraction. And because infant brain development exerts a high metabolic demand, microbial colonization may influence brain maturation in a long-lasting way. Animal studies that have found evidence of this pathway have suggested that probiotic supplementation, which alters gut microbiome, may reduce the symptoms of some psychiatric disorders, including autism spectrum disorder and depression. However, neither animal nor human studies have yet considered whether prenatal maternal stress, along with accompanying changes to the infant microbiome, have long-term behavioral and psychiatric implications.

But what of the role of shared genes? How can genetic traits shared between mother and child be disentangled from the mother's prenatal lifestyle factors and negative child outcomes, particularly for characteristics such as depression, known to run in families? Studies that consider the influence of both genes and environmental factors, such as maternal mood, have found that maternal distress remains a significant independent factor. For example, one study identified an independent effect of prenatal maternal distress on children's risk for behavioral problems and anxiety in both related children and unrelated children that were conceived with the egg of another woman via in vitro fertilization (that is, the risk was found in both related and unrelated children with prenatal exposures to their mothers' lives). Another study, which controlled for parental history of psychiatric symptoms as a marker for genetic predisposition, also found an independent effect of prenatal stress on children's psychiatric outcomes. Researchers are currently trying to learn more about the unique interactions between

prenatal maternal stress and infant genes and to identify how these interactions shape children's risk profiles for future psychopathology.

Mechanisms Extending beyond Pregnancy

Sensory experience, which is common to both the prenatal and postnatal periods, is another way that risk for future neurodevelopmental and social-behavioral problems is transmitted. Researchers in one animal study found that pig fetuses learned to associate a particular human voice with a negative (for example, painful) maternal experience; once born, the piglets emitted more distress calls upon hearing that voice. This suggests that the fetal brain may learn in the womb to associate maternal experiences (experienced by the fetus via maternal hormones or cardiorespiratory activations) with external sounds, including voices. One question for future research is whether children who are primed to associate their mother's angry or upset words with biological stress cues may be more sensitive to their mother's (or others') distress. Another is whether children be can primed to respond with similar sensitivity to sounds associated with intimate partner violence, learned before birth.

Studies have also shown that consistency in fetal and infant sensory experiences is important. Mere unpredictability of sensory signals (for example, disjointed maternal emotional states during pregnancy or unpredictable postnatal maternal care) may be a form of chronic stress to the offspring that affects the structural and functional development of the brain during a vulnerable period. In this context, "unpredictability" doesn't refer to how sensitive the mother is,

The fetal brain may learn in the womb to associate maternal experiences with external sounds, including voices.

but rather the consistency of her behavior. Remarkably, some researchers have found greater positive mental development in one-year-old children whose mothers experienced consistent pre- and postnatal depressive symptoms than in children with mothers whose emotional state improved postnatally. Scientists have since shown that the neurodevelopmental effects of unpredictable sensory experiences (including visual, auditory, and tactile signals) are associated with long-term emotional difficulties, poor cognitive outcomes, and immature executive function (associated with vulnerability to future mental illness) in both early and late childhood.

Opportunities for Intervention

A considerable body of evidence has established that the foundational experiences of the fetus during pregnancy and the infant postpartum are critical to early development. In particular, untreated maternal prenatal distress and poor mother/infant attachment can lead to long-term adverse cognitive and behavioral outcomes. Interventions aimed at easing maternal distress and improving maternal health care in both the prenatal and postpartum periods have downstream positive effects on child development. Here we review promising avenues for intervention and treatment; most of them focus on addressing maternal mood because stress, depression,

and anxiety independently affect outcomes or accompany other adverse experiences that affect mothers and their offspring.

Cognitive behavioral therapy and interpersonal psychotherapy are first-line behavioral treatments consistently found to reduce the symptoms of perinatal depression and anxiety. In 2019 the US Preventative Task Force recommended that at-risk pregnant and postpartum women be referred to these types of counseling.

In-home visiting programs have proven particularly successful as a means of reaching at-risk women during the perinatal period, and adding a cognitive behavioral therapy component to the home-visiting model has helped prevent perinatal depression. One such program is Mothers and Babies, a prenatal and postpartum cognitive behavioral therapy program that gives mothers a “toolkit” that encourages them to take part in enjoyable activities, gives them access to increased social support, and promotes healthier ways of thinking. A recent randomized controlled trial (RCT) found that adding the Mothers and Babies model to a regular perinatal home-visiting service for primarily single, low-income Latina or African American women reduced women's depressive and anxiety symptoms at six months after birth compared to women who received only the home visit.

Other in-home programs, such as Minding the Baby (MTB), are directed toward young first-time parents (ages 14 to 25) who are at heightened risk for difficulty adjusting to the postnatal period. These programs use an interdisciplinary, attachment-focused approach that aims to improve mothers' mental health and strengthen the

mother-infant relationship. An initial RCT of the MTB program demonstrated a range of beneficial health and attachment outcomes, including more child immunizations at one year, fewer reports to child protective services, an increased likelihood of secure attachment, and less likelihood of infant behavioral disorganization at 12–14 months. Follow-up studies have found significantly fewer externalizing behavioral problems in MTB mothers, and lower levels of obesity in Hispanic MTB toddlers relative to control groups. Recently, the second phase of the RCT found that the ability of mothers in the MTB group to understand their child's mental state (a mental process called “reflective functioning,” which is often impaired in stressed mothers but is essential for secure mother-infant attachment) increased over the course of the program compared to control mothers.

Recent work from our group has also shown that prenatal social support for the mother from family, friends, or community is important. A physically or psychologically stressed mother's social support can act as a protective factor against adverse birth outcomes, including preterm birth and younger gestational age at birth. Thus enhancing a mother's social support—for example, through home visits or mothers' group programs—may be an effective clinical intervention.

Finally, although much research on the developmental origins of health has focused on identifying the causes of negative outcomes and how to prevent them, researchers are increasingly exploring the beneficial consequences of positive maternal mental health. For example, the Growing Up in Singapore Towards Healthy Outcomes

project has established that self-reported maternal positive mood and sense of self is uniquely and positively associated with better cognitive, linguistic, and socioemotional development among two-year-olds. The potential beneficial downstream effects, for both the individual and society, of such adaptive developmental processes in early childhood should make positive maternal mental health a top public health priority.

Psychotherapy for Mother and Child

Despite the progress researchers have made in developing interventions to alleviate maternal distress, too few studies consider maternal and child outcomes together. Because improvements in pregnant women's mood and wellbeing can have a beneficial effect on the developing child, prenatal interventions can aim to treat at least two patients, the mother and her child. This kind of dyadic approach to treatment would take advantage of the profound bidirectional psychological and biological influences between them: as the infant brain develops before birth, so too does the parental brain.

It would be a grave perversion of science if research into the consequences of maternal experience were used to blame women for their children's development.

Increasingly, clinical researchers point to two factors that impact infant neurodevelopment: maternal depression (with associated risks

via prenatal programming of poor mother-infant attachment) and related dysfunctional parenting behaviors, which may be easier to target in the short term. RCTs in progress of two innovative programs—one of which offers women resources for effective parenting in the postpartum period and the other of which offers interpersonal therapy—ask the key question about prenatal parenting interventions, namely, whether reducing pregnant women's depression positively affects infants' neurobehavioral development, thus reducing the risk of later psychopathology. These trials will function as an experimental test of the fetal programming hypothesis, and the results will have direct implications for programs that seek to improve pregnant women's behavioral health and treat maternal distress.

How Not to Blame the Mother

It is clear that mothers' experiences are crucial to children's outcomes. Yet it would be a grave perversion of science if research into the consequences of maternal experience were used to blame women for their children's development. Women already feel intense pressure regarding the mothering role, particularly in the era of social media. DOHaD researchers and other developmental researchers therefore must stress that maternal health is one of a complex patchwork of factors that influence children's brain-behavior development. Others include shared genes, as well as paternal factors such as the quality of the father's sperm and his support for the mother's wellbeing during pregnancy. Broader social factors are also relevant. The maternal distress and exposures frequently associated with poor child outcomes, such as air pollution, lack of nutrition, and inadequate housing, are in many cases the products of

systemic disadvantage and discrimination. Such stress factors take a particularly heavy toll on racial minorities and low-income populations. Poverty is the magnet that attracts risk factors for toxic stress and other social determinants of health, thus perpetuating the cycle of disadvantage. Policy interventions to improve these psychosocial risk factors, as well as women's mental health, must be a priority if we are to make substantial progress in improving the lives of women and future generations.

Policies for Perinatal Success

Chief among policy proposals that mesh with the aims of clinical interventions are those that emphasize increasing access to health care, including mental health care, and reducing family stress during pregnancy and the postpartum period.

Improving Access to Behavioral Health Care

Complex issues of family, stigma, cost, and availability are common obstacles to women accessing mental health care services. Following recommendations from the American College of Obstetricians and Gynecologists, prenatal care increasingly includes mental health screening, particularly for anxiety and depression. Yet screening alone doesn't mean women will receive treatment. By helping women access the care they need, perinatal home-visiting programs have significantly improved family and child outcomes. But given their high cost, these programs should be reserved for the most vulnerable families. One proposal for increasing access is to embed cost-effective mental health care in primary obstetric offices. Pregnancy represents a unique period in

which nearly all women, including women from underserved communities, are both motivated and, via Medicaid for pregnant women, able to regularly see health care professionals for prenatal checkups. Even low-risk pregnancies typically involve 12–15 visits to obstetrics practices in less than a year. This increased contact offers an opportunity to screen for and treat prenatal psychological distress. Embedding behavioral health professionals in primary obstetric care reflects the collaborative care model developed at the University of Washington as part of its Advancing Integrated Mental Health Solutions program, which is designed to treat common but chronic mental health conditions such as anxiety and depression requiring systemic follow-up. RCTs in the United States and other countries have consistently found that collaborative care leads to better patient outcomes, greater patient and provider satisfaction, and reduced health care costs: in short, it works.

The Massachusetts Child Psychiatry Access Program for Moms (MCPAP for Moms) offers another approach to increasing access to mental health services. This program builds obstetrics practices' capacity to care for perinatal women's mental health by providing resources and training on depression screening and treatment, telephone access to perinatal psychiatric specialists, and the means to link women with individual psychotherapy and support groups. This low-cost model, funded by the Massachusetts legislature, was piloted in 2016. Since then, MCPAP for Moms has enrolled 145 obstetric practices and served 3,699 women and has received positive feedback from health care providers. The same group has recently designed a practice-specific program, the

Program In Support of Moms (PRISM), which incorporates MCPAP for Moms but aims to help obstetrics practitioners provide stepped care treatment for perinatal depression. In pilot trials, both programs reduced depressive symptoms, and a five-year RCT is now under way to further assess their effectiveness.

In 2018, following MCPAP for Moms' success, the Health Resources and Services Administration of the US Department of Health and Human Services announced a five-year grant program that aims to scale up this model in other states, with a focus on rural and medically underserved communities; Florida, Kansas, Louisiana, Montana, North Carolina, Rhode Island, and Vermont were awarded funds. It remains to be seen whether the MCPAP for Moms model can succeed in these states, which, unlike Massachusetts, lack enhanced state-based health care. We also need further research to see whether placing the management of perinatal behavioral health in the hands of time-poor obstetricians—as opposed to embedding behavioral health professionals in obstetrics practices—will result in an unwarranted emphasis on pharmacology. Evidence shows that the best model for mild to moderate depressive symptoms is psychotherapy, while a combination of psychotherapy and pharmacology works well for moderate to severe symptoms.

One successful example of embedded interdisciplinary care focuses on the crucial period from birth to toddlerhood. HealthySteps, a program of nonprofit Zero to Three, offers embedded behavioral health services in conjunction with standard primary care well-child visits. In pediatric

practices that include HealthySteps, a behavioral health professional can address common but complex family concerns such as sleeping, attachment, and parental depression, and social determinants of health such as insecure housing and lack of social support. A great deal of evidence supports the model's effectiveness. Select outcomes include substantial improvements in timely developmental assessments, continuity of care, and children's nutrition (including breastfeeding), along with reductions in children's emergency room visits.

Finally, economic policy can help to alleviate the psychological and biological effects of maternal stress. Researchers have found that the increased income from the dramatic expansion in the Earned Income Tax Credit (EITC)—a refundable tax credit providing cash payments to low-income families with children—after passage of the Omnibus Reconciliation Act of 1993 helped to protect mothers' health. Specifically, mothers who received higher EITC payments reported better health and fewer poor mental health days; their biomarkers of stress also decreased, particularly blood pressure and inflammation. Thus public policies that put more money in low-income families' pockets represent one clear way to address the intergenerational transmission of psychiatric illness. Although such redistributive programs are expensive, the public health costs of inaction on perinatal maternal distress may be higher. In the United States, research firm Mathematica recently estimated that over the six years from the beginning of pregnancy until children reach age five, the cost of untreated maternal mental health disorders for all US births is \$14.2 billion, or \$32,000 for every untreated but affected mother-child

pair. Most of these costs are incurred in the first year postpartum.

Improving Access to All Health Care

Financial barriers frequently impede adequate prenatal and postpartum health care, either directly through a lack of sufficient insurance coverage or indirectly through lack of time to attend medical appointments once family finances or lack of job security require the mother to return to work. Health insurance during pregnancy is essential to ensure that all women and their children have access to sufficient prenatal care. However, affordable access to health care before conception and during the postpartum period is also required to guarantee timely treatment of maternal conditions, such as diabetes, hypertension, and psychiatric illness, that put children's development at risk. In the United States, even women with insurance often lack coverage for mental health care, forcing a choice between forgoing treatment altogether or costly out-of-network care.

Today nearly 50 percent of births in the United States are covered by Medicaid, the government program for low-income families without health insurance, which has offered safety-net coverage for pregnant women since the 1980s. A recent study found that women receiving Medicaid during pregnancy had attended 75 percent fewer well-woman visits before conception than did privately insured women. They were also 18 percent more likely to receive late prenatal care and three times more likely to visit an emergency department for a pregnancy-related problem. Other comparable nations provide comprehensive health insurance for women before, during, and after pregnancy, but Medicaid pregnancy coverage ceases 60 days after delivery. Without

private insurance (often financially unrealistic) or Medicaid recertification (unavailable to many women due to family income levels, particularly in states that haven't expanded Medicaid), many women lose coverage altogether only two months after their child is born. The reform that would do the most to improve postpartum access to care, then, is the extension of pregnancy Medicaid coverage from two to 12 months postpartum. Proposals to extend Medicaid coverage are currently being advocated at both the state and federal level; one such proposal is contained in a bill—S.1343, or the MOMMIES Act—introduced by a number of US senators in May 2019. The 2020 Democratic presidential nominee, Joe Biden, has also released a proposal to expand Medicaid coverage to low-income individuals who are otherwise uninsured. Losing health care not only deprives new mothers of screening and treatment opportunities but also increases the risk that their children will suffer neurodevelopmental problems related to maternal health.

Problems with access to health care are also compounded by race, ethnicity, and citizenship status. In the United States, Black women are three to four times more likely to die of pregnancy-related causes than are non-Hispanic white women; they are also more likely to suffer life-threatening complications during pregnancy and childbirth. In addition to patient, community, and system-level factors that pregnant women may contend with, health care providers may have entrenched implicit or unconscious bias against minority groups that significantly affect patient-provider interactions, treatment decisions, and health outcomes. Implicit bias education and training for providers could

make culturally competent maternal health care more widely available.

Paid Parental Leave

Another way to reduce maternal stress and depression would be to build in a longer period of adjustment to the postpartum period for parents through a federal paid family leave policy. Parents need time to learn their infant's signals, facilitate breastfeeding (recommended until at least six months of age by the American Academy of Pediatrics and the World Health Organization), and attend well-child medical visits, while infants need time to learn their caregiver's voice, face, and smell. Close parental monitoring of infants in the early months also increases the likelihood that developmental delays, estimated to affect up to 13 percent of infants and toddlers, will be noticed and addressed early, preventing long-term impairments to social-emotional, cognitive, and language capabilities. Research supports these arguments. Studies of policies in California and New Jersey have found that paid family leave increases the likelihood of exclusive breastfeeding at six months and reduces hospitalizations for infections and illnesses that an infant with good preventative care is less likely to contract. Other outcomes include improved health in school-aged children through reductions in ADHD and hearing and weight problems, all of which improve the long-term bottom line of public health budgets.

Over four million babies are born in the United States each year, and almost 60 percent of mothers with infants are in the labor force. A comprehensive federal paid family leave policy of at least 12 weeks' duration would improve outcomes for these mothers and their children. Studies show an inverse relationship

between maternal depressive symptoms and leave duration up to six months postpartum. Although the Family and Medical Leave Act (FMLA) allows 12 weeks of unpaid, job-protected parental leave, 40 percent of workers are ineligible for the federal program because they work for employers with fewer than 50 employees, work part time, or have spent insufficient time on the job to qualify. And even among eligible employees, nearly half are unable to take it because it is unpaid. A welcome development is the Federal Employee Paid Leave Act, signed into law in December 2019 and effective as of October 2020, which provides 12 weeks' paid parental leave for federal employees eligible under the FMLA. But families that fall outside the reach of these laws need more help. The United States is the only country in the Organisation for Economic Co-operation and Development that doesn't provide paid leave for mothers employed in the private sector. Although corporate America has begun to recognize the benefits of strong family leave policy—many leading Fortune 500 companies, including Apple, Amazon, and Bank of America offer plans ranging from six to 16 weeks' paid leave—this progress often exclusively benefits relatively well-off, highly educated women rather than low-income, hourly employees. A national 12-week paid leave policy, such as that reflected in legislation introduced in the United States Senate in March 2019 (S.463, or the FAMILY Act), could reduce anticipatory and actual distress during pregnancy and the postpartum period and alleviate systemic racial disparities in maternal and child health outcomes (both of which, research suggests, can lead to reduced rates of preterm birth and low birthweight infants). Parents need time needed to build the foundational relationships and skills essential for developmental success.

Conclusions

The four trimesters that make up the perinatal and early postpartum period and the following nine months of a baby's life represent a time of both great vulnerability and opportunity for the mother and child. Almost one American woman in four will experience psychological distress during these periods, and increased exposure to health care providers would provide more opportunities to help women get mental health care, parenting help, and social

services. Similarly, though biological pathways for the transmission of risk for psychiatric illness emphasize the importance of the womb as the infant's influential first home, qualities of the mother's life, experiences of optimal early-infancy childcare, and other reinforcing social factors can buffer risks and reorient both the child and the mother-child pair toward a strong developmental trajectory. Maternal health and life experiences matter not just for the mother but for the health of the generation that follows.

Endnotes

1. David. J. Barker, "The Wellcome Foundation Lecture, 1994: The Fetal Origins of Adult Disease," *Proceedings of the Royal Society B* 262 (1995): 37–43, <https://doi.org/10.1098/rspb.1995.0173>.
2. Catherine Monk, Claudia Lugo-Candelas, and Caroline Truempff, "Prenatal Developmental Origins of Future Psychopathology: Mechanisms and Pathways," *Annual Review of Clinical Psychology* 15 (2019): 317–44, <https://doi.org/10.1146/annurev-clinpsy-050718-095539>.
3. Miia Artama et al., "Congenital Structural Anomalies in Offspring of Women with Epilepsy—A Population-Based Cohort Study in Finland," *International Journal of Epidemiology* 35 (2005): 280–87, <https://doi.org/10.1093/ije/dyi234>.
4. Gregory Z. Tau and Bradley S. Peterson, "Normal Development of Brain Circuits," *Neuropsychopharmacology* 35 (2010): 147–68, <https://doi.org/10.1038/npp.2009.115>.
5. Nuri B. Farber, Catherine E. Creeley, and John W. Olney, "Alcohol-Induced Neuroapoptosis in the Fetal Macaque Brain," *Neurobiology of Disease* 40 (2010): 200–206, <https://doi.org/10.1016/j.nbd.2010.05.025>.
6. Carolyn Granier-Deferre et al., "A Melodic Contour Repeatedly Experienced by Human Near-Term Fetuses Elicits a Profound Cardiac Reaction One Month after Birth," *PLOS One* 6 (2011): e17304, <https://doi.org/10.1371/journal.pone.0017304>.
7. Oriana Vesga-López et al., "Psychiatric Disorders in Pregnant and Postpartum Women in the United States," *Archives of General Psychiatry* 65 (2008): 805–15, <https://doi.org/10.1001/archpsyc.65.7.805>.
8. Linda H. Chaudron et al., "Accuracy of Depression Screening Tools for Identifying Postpartum Depression among Urban Mothers," *Pediatrics* 125, no. 3 (2010): e609–e17, <https://doi.org/10.1542/peds.2008-3261>.
9. Bea R. H. Van den Bergh et al., "Prenatal Developmental Origins of Behavior and Mental Health: The Influence of Maternal Stress in Pregnancy," *Neuroscience & Biobehavioral Reviews*, corrected proof, July 28, 2017, <https://doi.org/10.1016/j.neubiorev.2017.07.003>.
10. Kieran J. O'Donnell et al., "The Persisting Effect of Maternal Mood in Pregnancy on Childhood Psychopathology," *Development and Psychopathology* 26 (2014): 393–403, <https://doi.org/10.1017/S0954579414000029>.
11. Van den Bergh et al., "Prenatal Developmental Origins."
12. Kate Walsh et al., "Maternal Prenatal Stress Phenotypes Associate with Fetal Neurodevelopment and Birth Outcomes," *Proceedings of the National Academy of Sciences* 116 (2019): 23996–24005, <https://doi.org/10.1073/pnas.1905890116>.
13. Claudia Buss et al., "High Pregnancy Anxiety during Mid-Gestation Is Associated with Decreased Gray Matter Density in 6–9-Year-Old Children," *Psychoneuroendocrinology* 351 (2010): 141–53, <https://doi.org/10.1016/j.psyneuen.2009.07.010>.
14. Klára Marečková et al., "Perinatal Stress and Human Hippocampal Volume: Findings from Typically Developing Young Adults," *Scientific Reports* 8 (2018): 4696, <https://doi.org/10.1038/s41598-018-23046-6>.
15. Elysia Poggi Davis et al., "Prenatal Maternal Stress, Child Cortical Thickness, and Adolescent Depressive Symptoms," *Child Development* 91 (2019): e432–e50, <https://doi.org/10.1111/cdev.13252>.
16. Jonathan Posner et al., "Alterations in Amygdala–Prefrontal Circuits in Infants Exposed to Prenatal Maternal Depression," *Translational Psychiatry* 6 (2016): e935, <https://doi.org/10.1038/tp.2016.146>.

17. Colleen Doyle et al., "Pregnancy Distress Gets under Fetal Skin: Maternal Ambulatory Assessment and Sex Differences in Prenatal Development," *Developmental Psychobiology* 57 (2015): 607–25, <https://doi.org/10.1002/dev.21317>.
18. Amy M. Padula et al., "A Review of Maternal Prenatal Exposures to Environmental Chemicals and Psychosocial Stressors—Implications for Research on Perinatal Outcomes in the ECHO Program," *Journal of Perinatology* 40 (2019): 10–24, <https://doi.org/10.1038/s41372-019-0510-y>.
19. Payam Dadvand et al., "Inequality, Green Spaces, and Pregnant Women: Roles of Ethnicity and Individual and Neighbourhood Socioeconomic Status," *Environment International* 71 (2014): 101–8, <https://doi.org/10.1016/j.envint.2014.06.010>.
20. Ann Borders et al., "Racial/Ethnic Differences in Self-Reported and Biologic Measures of Chronic Stress in Pregnancy," *Journal of Perinatology* 35 (2015): 580–84, <https://doi.org/10.1038/jp.2015.18>.
21. Catherine Monk, Michael K. Georgieff, and Erin A. Osterholm, "Maternal Prenatal Distress and Poor Nutrition—Mutually Influencing Risk Factors Affecting Infant Neurocognitive Development," *Journal of Child Psychology and Psychiatry* 54 (2013): 115–30, <https://doi.org/10.1111/jcpp.12000>.
22. Monk, Georgieff, and Osterholm, "Maternal Prenatal Distress."
23. Sherry A. Ferguson et al., "Behavioral Effects of Prenatal Folate Deficiency in Mice," *Birth Defects Research Part A: Clinical and Molecular Teratology* 73 (2005): 249–52, <https://doi.org/10.1002/bdra.20111>.
24. Jill Jin, "Folic Acid Supplementation for Prevention of Neural Tube Defects," *JAMA* 317 (2017): 222, <https://doi.org/10.1001/jama.2016.19767>.
25. Robert Freedman, Sharon K. Hunter, and M. Camille Hoffman, "Prenatal Primary Prevention of Mental Illness by Micronutrient Supplements in Pregnancy," *American Journal of Psychiatry* 175 (2018): 607–19, <https://doi.org/10.1176/appi.ajp.2018.17070836>.
26. Angelie Singh et al., "Micronutrient Dietary Intake in Latina Pregnant Adolescents and Its Association with Level of Depression, Stress, and Social Support," *Nutrients* 9 (2017): 1212, <https://doi.org/10.3390/nu9111212>.
27. Rachel Baskin et al., "The Association between Diet Quality and Mental Health during the Perinatal Period: A Systematic Review," *Appetite* 91 (2015): 41–47, <https://doi.org/10.1016/j.appet.2015.03.017>.
28. US Preventive Services Task Force, "Folic Acid Supplementation for the Prevention of Neural Tube Defects: US Preventive Services Task Force Recommendation Statement," *JAMA* 317 (2017): 183–89, <https://doi.org/10.1001/jama.2016.19438>.
29. Eugene C. Wong et al., "Trends in Multivitamin Use Among Women of Reproductive Age: United States, 2006–2016," *Journal of Women's Health* 28 (2019): 37–45, <https://doi.org/10.1089/jwh.2018.7075>.
30. Padula et al., "Review of Maternal Prenatal Exposures."
31. David M. Stieb et al., "Ambient Air Pollution, Birth Weight, and Preterm Birth: A Systematic Review and Meta-Analysis," *Environmental Research* 117 (2012): 100–11, <https://doi.org/10.1016/j.envres.2012.05.007>.
32. Ariana Zeka, Steve J. Melly, and Joel Schwartz, "The Effects of Socioeconomic Status and Indices of Physical Environment on Reduced Birth Weight and Preterm Births in Eastern Massachusetts," *Environmental Health* 7 (2008): 60, <https://doi.org/10.1186/1476-069X-7-60>.
33. Ruth A. Hackett and Andrew Steptoe, "Type 2 Diabetes Mellitus and Psychological Stress—A Modifiable Risk Factor," *Nature Reviews Endocrinology* 13 (2017): 547–60, <https://doi.org/10.1038/nrendo.2017.64>.

34. Shanchun. Zhang et al., "Association between Mental Stress and Gestational Hypertension/Preeclampsia: A Meta-Analysis," *Obstetrical & Gynecological Survey* 68, no. 12 (2013): 825–34, <https://doi.org/10.1097/OGX.0000000000000009>.
35. Walsh et al., "Maternal Prenatal Stress Phenotypes."
36. Berihun Assefa Dachew et al., "Association between Hypertensive Disorders of Pregnancy and the Development of Offspring Mental and Behavioural Problems: A Systematic Review and Meta-Analysis," *Psychiatry Research* 260 (2018): 458–67, <https://doi.org/10.1016/j.psychres.2017.12.027>.
37. Anny H. Xiang et al., "Association of Maternal Diabetes with Autism in Offspring," *JAMA* 313 (2015): 1425–34, <https://doi.org/10.1001/jama.2015.2707>.
38. Stephen Patrick et al., "Increasing Incidence and Geographic Distribution of Neonatal Abstinence Syndrome: United States 2009 to 2012," *Journal of Perinatology* 35 (2015): 650–55, <https://doi.org/10.1038/jp.2015.36>.
39. Su Lynn Yeoh et al., "Cognitive and Motor Outcomes of Children with Prenatal Opioid Exposure: A Systematic Review and Meta-Analysis," *JAMA Network Open* 2 (2019): e197025, <https://doi.org/10.1001/jamanetworkopen.2019.7025>.
40. Jing Liu et al., "Neonatal Neurobehavior Predicts Medical and Behavioral Outcome," *Pediatrics* 125 (2010): e90–e98, <https://doi.org/10.1542/peds.2009-0204>.
41. Elizabeth Werner et al., "Preventing Postpartum Depression: Review and Recommendations," *Archives of Women's Mental Health* 18 (2015): 41–60, <https://doi.org/10.1007/s00737-014-0475-y>.
42. Miki Bloch et al., "Risk Factors for Early Postpartum Depressive Symptoms," *General Hospital Psychiatry* 28 (2006): 3–8, <https://doi.org/10.1016/j.genhosppsy.2005.08.006>.
43. Chaudron et al., "Accuracy of Depression Screening Tools."
44. Tiffany Field, "Postpartum Depression Effects on Early Interactions, Parenting, and Safety Practices: A Review," *Infant Behavior and Development* 33 (2010): 1–6, <https://doi.org/10.1016/j.infbeh.2009.10.005>.
45. Catherine Monk, Kristin L. Leight, and Yixin Fang, "The Relationship between Women's Attachment Style and Perinatal Mood Disturbance: Implications for Screening and Treatment," *Archives of Women's Mental Health* 11 (2008): 117–29, <https://doi.org/10.1007/s00737-008-0005-x>; Laurie A. Chapin and Shannon Altenhofen, "Neurocognitive Perspectives in Language Outcomes of Early Head Start: Language and Cognitive Stimulation and Maternal Depression," *Infant Mental Health Journal* 31 (2010): 486–98, <https://doi.org/10.1002/imhj.20268>.
46. Elena Netsi et al., "Association of Persistent and Severe Postnatal Depression with Child Outcomes," *JAMA Psychiatry* 75 (2018): 247–53, <https://doi.org/10.1001/jamapsychiatry.2017.4363>.
47. Amie Ashley Hane and Nathan A. Fox, "Ordinary Variations in Maternal Caregiving Influence Human Infants' Stress Reactivity," *Psychological Science* 17 (2006): 550–56, <https://doi.org/10.1111/j.1467-9280.2006.01742.x>.
48. Eric D. Finegood et al., "Parenting in Poverty: Attention Bias and Anxiety Interact to Predict Parents' Perceptions of Daily Parenting Hassles," *Journal of Family Psychology* 31 (2017): 51–60, <https://doi.org/10.1037/fam0000291>.
49. Esther M. Leerkes, A. Nayena Blankson, and Marion O'Brien, "Differential Effects of Maternal Sensitivity to Infant Distress and Nondistress on Social-Emotional Functioning," *Child Development* 80 (2009): 762–75, <https://doi.org/10.1111/j.1467-8624.2009.01296.x>.
50. Lauren A. Kaplan, Lynn Evans, and Catherine Monk, "Effects of Mothers' Prenatal Psychiatric Status and Postnatal Caregiving on Infant Biobehavioral Regulation: Can Prenatal Programming Be Modified?," *Early Human Development* 84 (2008): 249–56, <https://doi.org/10.1016/j.earlhumdev.2007.06.004>.

51. Catherine Monk et al., "Distress During Pregnancy: Epigenetic Regulation of Placenta Glucocorticoid-Related Genes and Fetal Neurobehavior," *American Journal of Psychiatry* 173 (2016): 705–13, <https://doi.org/10.1176/appi.ajp.2015.15091171>.
52. Zaneta M. Thayer et al., "Impact of Prenatal Stress on Offspring Glucocorticoid Levels: A Phylogenetic Meta-Analysis across 14 Vertebrate Species," *Scientific Reports* 8 (2018): 4942, <https://doi.org/10.1038/s41598-018-23169-w>.
53. Monk, Lugo-Candelas, and Trumpff, "Prenatal Developmental Origins."
54. Elisabeth Conradt et al., "The Roles of DNA Methylation of NR3C1 and 11 β -HSD2 and Exposure to Maternal Mood Disorder In Utero on Newborn Neurobehavior," *Epigenetics* 8 (2013): 1321–29, <https://doi.org/10.4161/epi.26634>.
55. Pamela Scorza et al., "Intergenerational Transmission of Disadvantage: Epigenetics and Parents' Childhoods as the First Exposure," *Journal of Child Psychology and Psychiatry* 60 (2019): 119–32, <https://doi.org/10.1111/jcpp.12877>.
56. Monk, Lugo-Candelas, and Trumpff, "Prenatal Developmental Origins."
57. Ibid.
58. Frances Rice et al., "The Links between Prenatal Stress and Offspring Development and Psychopathology: Disentangling Environmental and Inherited Influences," *Psychological Medicine* 40 (2010): 335–45, <https://doi.org/10.1017/S0033291709005911>.
59. Nathalie MacKinnon et al., "The Association between Prenatal Stress and Externalizing Symptoms in Childhood: Evidence From the Avon Longitudinal Study of Parents and Children," *Biological Psychiatry* 83 (2018): 100–108, <https://doi.org/10.1016/j.biopsych.2017.07.010>.
60. Céline Tallet et al., "Postnatal Auditory Preferences in Piglets Differ according to Maternal Emotional Experience with the Same Sounds during Gestation," *Scientific Reports* 6 (2016): 37238, <https://doi.org/10.1038/srep37238>.
61. Tallie Z. Baram et al., "Fragmentation and Unpredictability of Early-Life Experience in Mental Disorders," *American Journal of Psychiatry* 169 (2012): 907–15, <https://doi.org/10.1176/appi.ajp.2012.11091347>.
62. Ibid.
63. Elysia Poggi Davis et al., "Across Continents and Demographics, Unpredictable Maternal Signals Are Associated with Children's Cognitive Function," *EBioMedicine* 46 (2019): 256–63, <https://doi.org/10.1016/j.ebiom.2019.07.025>.
64. Nicole L. Letourneau et al., "The Effect of Perinatal Depression Treatment for Mothers on Parenting and Child Development: A Systematic Review," *Depression and Anxiety* 34 (2017): 928–66, <https://doi.org/10.1002/da.22687>.
65. Susan J. Curry et al., "Interventions to Prevent Perinatal Depression," *JAMA* 321 (2019): 580–87, <https://doi.org/10.1001/jama.2019.0007>.
66. Tamar Mendelson et al., "Impact of a Preventive Intervention for Perinatal Depression on Mood Regulation, Social Support, and Coping," *Archives Womens' Mental Health* 16 (2013): 211–18, <https://doi.org/10.1007/s00737-013-0332-4>.
67. S. Darius Tandon et al., "Perinatal Depression Prevention through Home Visitation: A Cluster Randomized Trial of Mothers and Babies 1-on-1," *Journal of Behavioral Medicine* 41 (2018): 641–52, <https://doi.org/10.1007/s10865-018-9934-7>.

68. Lois S. Sadler et al., "Minding the Baby: Enhancing Reflectiveness to Improve Early Health and Relationship Outcomes in an Interdisciplinary Home-Visiting Program," *Infant Mental Health Journal* 34 (2013): 391–405, <https://doi.org/10.1002/imhj.21406>.
69. Monica Roosa Ordway et al., "A Home Visiting Parenting Program and Child Obesity: A Randomized Trial," *Pediatrics* 141 (2018): e20171076, <https://doi.org/10.1542/peds.2017-1076>.
70. Arietta Slade et al., "Minding the Baby®: Enhancing Parental Reflective Functioning and Infant Attachment in an Attachment-Based, Interdisciplinary Home Visiting Program," *Development and Psychopathology* 32 (2020): 123–37, <https://doi.org/10.1017/S0954579418001463>.
71. Walsh et al., "Maternal Prenatal Stress Phenotypes."
72. Desiree Y. Phua et al., "Positive Maternal Mental Health during Pregnancy Associated with Specific Forms of Adaptive Development in Early Childhood: Evidence from a Longitudinal Study," *Development and Psychopathology* 29 (2017): 1573–87, <https://doi.org/10.1017/S0954579417001249>.
73. Vivette Glover and Lauren Capron, "Prenatal Parenting," *Current Opinion in Psychology* 15 (2017): 66–70, <https://doi.org/10.1016/j.copsyc.2017.02.007>.
74. Sherryl H. Goodman and Judy Garber, "Evidence-Based Interventions for Depressed Mothers and Their Young Children," *Child Development* 88 (2017): 368–77, <https://doi.org/10.1111/cdev.12732>.
75. Elizabeth A. Werner et al., "PREPP: Postpartum Depression Prevention through the Mother-Infant Dyad," *Archives of Women's Mental Health* 19 (2016): 229–42, <https://doi.org/10.1007/s00737-015-0549-5>; Elysia Poggi Davis et al., "An Experimental Test of the Fetal Programming Hypothesis: Can We Reduce Child Ontogenetic Vulnerability to Psychopathology by Decreasing Maternal Depression?," *Development and Psychopathology* 30 (2018): 787–806, <https://doi.org/10.1017/S0954579418000470>.
76. Claire Howorth, "Motherhood Is Hard to Get Wrong: So Why Do So Many Moms Feel So Bad About Themselves?," *Time*, October 19, 2017, <https://time.com/4989068/motherhood-is-hard-to-get-wrong/>.
77. Glover and Capron, "Prenatal Parenting."
78. Janine Archer et al., "Collaborative Care for Depression and Anxiety Problems," *Cochrane Database of Systematic Reviews* (2012): <https://doi.org/10.1002/14651858.cd006525.pub2>.
79. Nancy Byatt et al., "Improving Perinatal Depression Care: The Massachusetts Child Psychiatry Access Project for Moms," *General Hospital Psychiatry* 40 (2016): 12–17, <https://doi.org/10.1016/j.genhosppsych.2016.03.002>.
80. Nancy Byatt et al., "Massachusetts Child Psychiatry Access Program for Moms: Utilization and Quality Assessment," *Obstetrics & Gynecology* 132 (2018): 345–53, <https://doi.org/10.1097/aog.0000000000002688>.
81. Nancy Byatt et al., "PProgram In Support of Moms (PRISM): Development and Beta Testing," *Psychiatric Services* 67 (2016): 824–26, <https://doi.org/10.1176/appi.ps.201600049>.
82. Tiffany A. Moore Simas et al., "The PProgram in Support of Moms (PRISM): Study Protocol for a Cluster Randomized Controlled Trial of Two Active Interventions Addressing Perinatal Depression in Obstetric Settings," *BMC Pregnancy and Childbirth* 19 (2019): 256, <https://doi.org/10.1186/s12884-019-2387-3>.
83. Health Resources and Services Administration, "HRSA Awards over \$12M for Maternal & Child Mental Health Programs," news release, September 25, 2018, <https://www.hrsa.gov/about/news/press-releases/hrsa-awards-12-million-maternal-child-mental-health-programs>.
84. Kimberly Ann Yonkers, Simone Vigod, and Lori E. Ross, "Diagnosis, Pathophysiology, and Management of Mood Disorders in Pregnant and Postpartum Women," *Obstetrics & Gynecology* 117 (2011): 961–77, <https://doi.org/10.1097/AOG.0b013e31821187a7>.

85. "HealthySteps Evidence Summary," Zero to Three, 2017, https://ztt-healthysteps.s3.amazonaws.com/documents/5/attachments/HealthySteps_OutcomesSummary.FINAL.10.09.18.pdf?1539967621.
86. William N. Evans and Craig L. Garthwaite, "Giving Mom a Break: The Impact of Higher EITC Payments on Maternal Health," *American Economic Journal: Economic Policy* 6 (2014): 258–90, <https://doi.org/10.1257/pol.6.2.258>.
87. Mathematica, "New Study Uncovers the Heavy Financial Toll of Untreated Maternal Mental Health Conditions," April 29, 2019, <https://www.mathematica.org/news/new-study-uncovers-the-heavy-financial-toll-of-untreated-maternal-mental-health-conditions>.
88. Stephen P. Melek, Daniel Periman, and Stoddard Davenport, *Addiction and Mental Health vs. Physical Health: Analyzing Disparities in Network Use and Provider Reimbursement Rates*, Milliman (Seattle, WA: Milliman 2017), https://www.ncsl.org/documents/health/SPC19MKeller_study_34161.pdf.
89. Yhenneko J. Taylor, Tsai-Ling Liu, and Elizabeth A. Howell, "Insurance Differences in Preventive Care Use and Adverse Birth Outcomes Among Pregnant Women in a Medicaid Nonexpansion State: A Retrospective Cohort Study," *Journal of Womens Health* (2019): 29–37, <https://doi.org/10.1089/jwh.2019.7658>.
90. Jamie R. Daw, "Missed Opportunities to Support Women's Health: A Tale of a Medicaid Nonexpansion State," *Journal of Women's Health* (2019): 3–4, <https://doi.org/10.1089/jwh.2019.8071>.
91. Usha Ranji, Ivette Gomez, and Alina Salganicoff, "Expanding Postpartum Medicaid Coverage," *Women's Health Policy* (Kaiser Family Foundation), May 22, 2019, <https://www.kff.org/womens-health-policy/issue-brief/expanding-postpartum-medicaid-coverage/>.
92. Biden for President, "Health Care," *JoeBiden.com*, August 25, 2020, <https://joebiden.com/healthcare/#>.
93. Elizabeth A. Howell, "Reducing Disparities in Severe Maternal Morbidity and Mortality," *Clinical Obstetrics and Gynecology* 61 (2018): 387–99.
94. William J. Hall et al., "Implicit Racial/Ethnic Bias among Health Care Professionals and Its Influence on Health Care Outcomes: A Systematic Review," *American Journal of Public Health* 105 (2015): e60–e76, <https://doi.org/10.2105/ajph.2015.302903>.
95. Howell, "Reducing Disparities."
96. Zero to Three, *Early Intervention: A Critical Support for Infants, Toddlers, and Families* (Washington, DC: Zero to Three, 2017), <https://www.zerotothree.org/document/981>.
97. Ariel Marek Pihl and Gaetano Basso, "Did California Paid Family Leave Impact Infant Health?," *Journal of Policy Analysis and Management* 38 (2019): 155–80, <https://doi.org/10.1002/pam.22101>.
98. Lindsey Rose Bullinger, "The Effect of Paid Family Leave on Infant and Parental Health in the United States," *Journal of Health Economics* 66 (2019): 101–16, <https://doi.org/10.1016/j.jhealeco.2019.05.006>.
99. Rada K. Dagher, Patricia M. McGovern, and Bryan. E. Dowd, "Maternity Leave Duration and Postpartum Mental and Physical Health: Implications for Leave Policies," *Journal of Health Politics, Policy, and Law* 39 (2014): 369–416, <https://doi.org/10.1215/03616878-2416247>.
100. Matthew Melmed, "The Importance of Paid Family Leave for American Working Families," statement submitted to the US Senate Committee on Finance, Subcommittee on Social Security, Pensions, and Family Policy, July 11, 2018, <https://www.zerotothree.org/document/1096>.
101. Julia M. Goodman et al., "Analyzing Policies through a DOHaD Lens: What Can We Learn?," *International Journal of Environmental Research and Public Health* 15 (2018): 2906, <https://doi.org/10.3390/ijerph15122906>.

Time On with Baby and Time Off from Work

Maya Rossin-Slater and Jenna Stearns

Summary

Compared to unpaid leave, paid family leave may better help working parents balance the competing needs of job and family early in a child's life, among other advantages. Yet the United States remains one of only two countries in the world without a statutory national paid maternity leave policy, and one of the only high-income countries that doesn't provide access to paid paternity leave for new fathers at the federal level.

In theory, Maya Rossin-Slater and Jenna Stearns write, paid leave can benefit families in two ways: by changing the amount of income available in the household (and the amount of resources available for the child), and by increasing the amount of time parents spend with their children. Despite the lack of paid leave at the federal level, several US states have their own paid family leave programs, all of which provide partial wage replacement during leave to care for a newborn or newly adopted child, and aim to cover a broad segment of the workforce through minimal eligibility requirements. Rossin-Slater and Stearns review research about the effects of these state-level programs, as well as paid leave programs in other countries.

The authors find that paid family leave has a number of benefits. For one, compared to unpaid leave, paid family leave increases leave-taking rates and leave duration, especially among disadvantaged parents. Paid leave programs that range from a few months to up to a year in length also appear to improve both infants' health and mothers' outcomes in the job market. At the same time, the research finds that existing paid leave programs have minimal impacts on businesses, suggesting that these programs confer benefits to workers and their families at little to no cost to their employers.

Finally, because rising economic inequality in the United States is in part driven by disparities in early childhood, the authors argue that paid family leave may be one way to level the playing field for children from all backgrounds and help improve intergenerational mobility.

www.futureofchildren.org

Maya Rossin-Slater is an assistant professor of health policy at Stanford University School of Medicine, a faculty fellow at the Stanford Institute for Economic Policy Research, and a faculty research fellow at the National Bureau of Economic Research. Jenna Stearns is an assistant professor of economics at the University of California, Davis.

In the United States today, most parents of young children work outside the home. In 2018, over 71 percent of mothers and 93 percent of fathers with children under age 18 were in the labor force, and more than half of all mothers with infants were employed. Despite the rise in the share of working parents in recent decades, paid family leave and other family-friendly benefits have lagged those of other countries. Perhaps unsurprisingly, most working parents report that balancing work and family responsibilities is a significant challenge.¹

Maternity and family leave policies provide time off from work so women can prepare for and recover from childbirth, and so both mothers and fathers can care for their newborn or newly adopted children. These policies aim to help new parents balance work and family responsibilities, with the goal of improving the family's wellbeing and promoting career continuity. Because women typically take on more caregiving responsibilities than men, proponents of family leave argue that such policies may also reduce gender inequities both in the labor market and at home.

The United States is one of only two countries in the world without a statutory national paid maternity leave policy (the other is Papua New Guinea). It's also one of the only high-income countries that doesn't provide access to paid paternity leave for new fathers, parental leave that can be taken by both new mothers and fathers, or family leave that can be taken to care for ill family members in addition to new children. Paid leave policies vary substantially across countries on several key dimensions, including duration,

benefit amount, whether they include job protection (that is, a legal clause that ensures workers can return to their previous jobs following leave), eligibility requirements, and financing. However, the United States is clearly an outlier in its lack of access to paid leave at the national level. The federal 1993 Family and Medical Leave Act (FMLA) allows some workers to take 12 weeks of job-protected unpaid leave, but only about 60 percent of workers are eligible for this program.² Although we have no paid leave at the federal level, eight states and the District of Columbia have passed their own paid family leave legislation. In other states, the provision of leave is left to the discretion of individual employers. Employer-provided coverage is uncommon—only about 18 percent of private sector workers have access to employer-provided paid family leave.³

Paid family leave not only helps working parents balance the competing needs of job and family early in a child's life, it can also affect the health and wellbeing of parents and children alike. And paid family leave programs can bolster families' economic security through their effects on the parents' labor market outcomes. In this article, we first describe the current state of access to paid and unpaid leave in the United States; we then discuss what we know about its effects on families. The evidence suggests that paid family leave improves child health and development and maternal wellbeing, while causing minimal harm to employers. Therefore, a national paid family leave program may be an effective tool for improving early-life outcomes for children from all backgrounds, curbing the rise in inequality and boosting long-term economic growth and stability.

Paid Family Leave in the United States

Although the United States has no national paid family leave policy, paid leave is available to new parents in select states under two types of programs. Birth mothers in five states (California, Hawaii, New Jersey, New York, and Rhode Island) qualify for six to 10 weeks of paid leave under their state's temporary disability insurance (TDI) system. This leave has been available since the 1978 Pregnancy Discrimination Act mandated that states with TDI programs cover pregnancy as a disability, allowing women to take leave to prepare for and recover from childbirth.

More recently, several states have enacted their own paid family leave (PFL) programs. California was the first to do so, in 2004, followed by New Jersey (2009), Rhode Island (2014), New York (2018), and Washington and the District of Columbia (2020). Massachusetts, Connecticut, and Oregon recently passed laws to start providing paid family leave benefits in 2021, 2022, and 2023, respectively. At least 16 other states have introduced similar legislation.

These state-level PFL laws all provide partial wage replacement during leave to care for a newborn or newly adopted child, and aim to cover a broad segment of the workforce through minimal eligibility requirements. But the policies differ on several key dimensions, including the benefit duration, the wage replacement rate, whether job protection is included, the scope of use, and the funding mechanism (see table 1).

In all states, PFL benefits are paid as a percentage of a worker's average weekly earnings calculated over a base period, up to a weekly maximum. Both the wage replacement rate and the maximum benefit

vary significantly across states. Wage replacement rates range from 50 to 100 percent, while the maximum benefit amount ranges from \$667 to \$1,300 per week. PFL benefit duration also varies substantially—from four to 12 weeks, depending on the state. And while some states explicitly require that employers allow workers to return to the same jobs after their leave has ended, California, New Jersey, and the District of Columbia do not. Workers in these places can rely on job protection through the FMLA, but only if they're eligible for it.

All state PFL programs provide leave for the arrival of a new child through birth, adoption, or foster care, as well as leave to care for close family members with serious health conditions. The programs in Massachusetts and Washington also cover leaves related to the military deployment of a family member, and New Jersey and Oregon include provisions to cover victims of domestic violence and their caregivers. In this article, however, we focus specifically on parental leave.

Finally, most PFL programs are funded entirely through employee payroll taxes, though the District of Columbia imposes a payroll tax on employers, and the programs in Oregon and Washington are jointly financed by employers and employees. The payroll tax rate is between 0.1 and 1 percent of wages (up to an annual cap) across states.

Despite state differences in program design, most PFL policies are too recent to study, so we don't yet have compelling evidence on the causal effects of policy variations such as the wage replacement rate or leave duration. Most of the evidence on the effects of PFL comes from California, whose first-in-the-nation PFL policy took effect 15 years ago,

Table 1. State Paid Family Leave Policies

State	Effective Date	2020 Maximum Weekly Benefit	2020 Wage Replacement Rate	2020 Maximum Weeks of Leave	Job Protection	Eligibility Criterion
California	2004	\$1,300	60%–70%	8	No	Earned at least \$300 in taxable income over the base period.
New Jersey	2009	\$881	85%	12	No	Earned at least \$200 weekly for 20 weeks or \$10,000 in the year before taking leave.
Rhode Island	2014	\$867	60%	4	Yes	Earned at least \$12,000 in base period wages.
New York	2018	\$840.70	60%	10	Yes	Employed full-time for 26 weeks or part-time for 175 days.
Washington	2020	\$1,000	90%	12	Yes	Worked at least 820 hours in the year before taking a leave.
District of Columbia	July 2020	\$1,000	90%	8	No	Has been a covered employee (spending more than 50% of work time in DC) for at least one week in the year preceding the qualifying event.
Massachusetts	2021	\$850	80% of earnings equal to or less than 50% of the state average weekly wage and 50% of earnings in excess of 50%.	12	Yes	Received wages during the base period that total 30 times the weekly unemployment insurance benefit rate.
Connecticut	2022	\$780	95% of up to 40 times the minimum hourly wage and 60% of earnings above this amount	12	Yes	Worked for same employer for at least 12 weeks and earned \$2,325 during the base period.

Table 1 continued

State	Effective Date	2020 Maxium Weekly Benefit	2020 Wage Replacement Rate	2020 Maximum Weeks of Leave	Job Protection	Eligibility Criterion
Oregon	2023	\$1,254	100% of earnings for those earning less than 65% of the state average weekly wage; for those earning more, 65% of the state average weekly wage plus 50% of the amount by which the employee's average weekly wage exceeds the state average weekly wage.	12	Yes	Received \$1,000 in wages during the base year.

allowing us ample time to study its short- and medium-term effects.

Theoretical Effects of Paid Family Leave

How might PFL policies affect health and employment? Paid leave can benefit families in two ways: by changing the amount of income available in the household, and by increasing the amount of time parents spend with their children. For some parents who would take unpaid time off in the absence of a paid leave policy, PFL's main benefit is the increase in income. Additional income can translate into additional resources for the child, which may improve health as well as cognitive and socioemotional outcomes.

For families who either couldn't afford unpaid time off or would otherwise choose not to take it, PFL increases the amount of

time parents can spend with new children. Additional time spent with an infant may affect health through several channels. First, if mothers don't return to work immediately, they can breastfeed longer. Breastfeeding is correlated with reduced risk of health problems in children, including sudden infant death syndrome, obesity, diabetes, and asthma; it's also associated with a lower risk of breast and ovarian cancer in mothers.⁴ More time to spend with infants during PFL may affect health in other ways as well. For example, if parents have more time to visit the doctor, they may be more likely to stick to recommended immunization schedules and seek more timely or consistent medical care.

By increasing financial or job security, PFL may lower mothers' stress during pregnancy; such stress can lead to child health problems

at birth and later in life. PFL also gives mothers more time to physically recover from childbirth and to improve their mental health in the postpartum period.

Fathers' use of PFL may increase gender equity in the household and the labor market. When fathers take time off to engage in childcare and housework, mothers can return to work sooner than they otherwise would and invest more in their careers. Fathers who develop childcare skills early may also continue to invest more time in childcare even after the leave ends.⁵

PFL's effects on parents' work outcomes are theoretically ambiguous.⁶ With PFL, parents who would otherwise not take leave will spend more time away from work. And more time away from work can hinder their careers—their earnings may grow more slowly, and they may be less likely to be promoted. On the other hand, PFL may cause parents who would have quit their jobs to remain more attached to the labor force. Particularly when job protection is available, parents may find it easier to return to work after their leave ends. This effect can lead to higher employment rates not only in the period around the birth, but in the longer term as well.

Of course, when paid leave doesn't fully replace lost wages, parents face a tradeoff between time with the baby and income. Recently, researchers who examined the relationship between California's PFL program and mothers' poverty status found that mothers of one-year-olds are significantly less likely to be living in poverty if they have access to PFL at the time of birth.⁷ However, the research also suggests that due to the reduced earnings, PFL may increase the likelihood that mothers of infants live in

poverty. Paid leave can also affect eligibility for other benefits such as Temporary Assistance for Needy Families or the Supplemental Nutrition Assistance Program (SNAP, formerly the Food Stamp Program). Households eligible for wage subsidies such as the Earned Income Tax Credit may be less likely to use PFL because the loss of income when on PFL would lower the amount of tax credit they'd get.

To the extent that PFL affects employment decisions, it's also important to consider the availability of care for infants when their mothers return to work. Infant childcare is expensive in the United States, and its quality varies. Most infant care options are informal arrangements rather than child care centers. Such care isn't regulated, and caregivers often have little formal training in early childhood education. Informal care is also more likely to be unstable, which is an additional source of stress for working parents. Thus parents' decisions to take PFL may be influenced by the type of infant care they can find. (See Ajay Chaudry and Heather Sandstrom's article in this issue for more about research on childcare in the United States.⁸)

Availability and Take-Up

PFL affects children's and parents' outcomes only if parents use it. In this section, we review the research on leave take-up in the United States. Throughout this chapter, we limit our discussion to studies that use *natural experiment* research designs, which attempt to identify causal effects of leave programs using variation in access to leave from various policy changes. This is important because whether or not parents use leave isn't randomly assigned, so merely comparing the outcomes of families that do

and don't use leave can't separate the causal impacts of the leave itself from the many other possible differences between these families.

Research shows that US parents value being able to take both paid and unpaid leave. In earlier studies that focused on the impacts of the 1993 FMLA, which offers only unpaid leave, researchers examined the change in leave-taking outcomes of individuals living in states with no leave provisions before the FMLA. As a comparison group, they used individuals in states that already had unpaid leave provisions. These *difference-in-difference* analyses generated consistent evidence that access to unpaid, job-protected leave increased leave-taking around the time of a birth.⁹ Specifically, new mothers were 13 to 20 percent more likely to be on leave if they were covered by leave legislation.

The effects of paid leave policies on leave-taking are estimated to be even larger. Researchers have studied the introduction of California's PFL program using similar difference-in-difference methods. They examined changes in the leave-taking rate for new parents before and after the state implemented PFL, compared to the change in leave-taking among individuals unaffected by the policy (such as new parents in states without PFL, or parents of older children who are ineligible to make a PFL claim for purposes of bonding with a new child). They found that the introduction of California's PFL program substantially increased leave-taking rates for both mothers and fathers of infants.¹⁰ The policy had the largest impacts on relatively disadvantaged mothers, suggesting that access to paid leave may reduce socioeconomic disparities in leave use. Furthermore, in households where both

parents work, PFL increased the amount of time both parents were on leave together, as well as the amount of time fathers were on leave while the mother returned to work. This evidence suggests that PFL increases the total amount of time a parent stays home with a child more than a policy providing maternity leave alone would.

However, not all parents use the PFL benefits they're eligible for. For example, only 47 percent of employed new mothers and 12 percent of employed new fathers made a PFL claim in California in 2014.¹¹ What are the barriers to take-up? A recent report indicates that the amount of wage replacement isn't high enough for some mothers to take leave.¹² Information barriers and the lack of job protection may also restrict use.¹³ In states without explicit job protection built into their PFL policy, only about 60 percent of workers have access to job protection through the FMLA. Even a decade after PFL was introduced in California, awareness of the policy was still low. Also, many parents have trouble finding clear information about the program benefits and eligibility requirements, or find it difficult to submit a claim. These barriers may be especially high for workers in low-wage jobs, who are less likely to be eligible for job protection and to be able to afford to take partially paid leave.¹⁴ Peer effects (that is, whether one's co-workers, friends, or family members take leave) and the workplace culture may also affect program take-up, suggesting that both policy and non-policy factors can influence PFL take-up rates.¹⁵

Finally, PFL may affect fertility decisions. There's some evidence that the introduction of PFL may have changed the timing of pregnancies or increased the fertility rate in California.¹⁶ In general, however, evidence

across countries about whether these policies increase birth rates is mixed.¹⁷

PFL and Health

The empirical evidence on the effects of family leave in the United States suggests that both paid and unpaid leave can improve children's health, at least in the short term. Maya Rossin-Slater, a co-author of this article, examined how the FMLA affected infant health. She used a *triple-difference* research design, in which she compared counties with relatively high and low female labor force participation rates, in states with and without pre-FMLA unpaid leave provisions, both before and after the FMLA. The study found that the FMLA led to a small increase in average birth weight and a reduction in infant mortality.¹⁸ The impacts were concentrated entirely among children of highly educated and married mothers, who are the most likely to be eligible for FMLA leave and to be able to afford to take unpaid time off. Thus, access to unpaid leave may actually exacerbate socioeconomic disparities in infant health.

Paid and unpaid leave can improve children's health, at least in the short term.

Studies show that paid leave also has important effects on children's short-term health outcomes. Jenna Stearns, the other author of this article, studied the impacts of the original paid maternity leave provisions mandated by the 1978 Pregnancy Discrimination Act in five states with TDI systems. She compared the outcomes of children born in these states before and

after the law, relative to the change in outcomes in comparison states without TDI systems. Stearns found that paid maternity leave reduced the incidence of low birth weight (that is, less than 2,500 grams) by 3 percent and the likelihood of early-term birth (at 37 to 38 weeks of gestation) by almost 7 percent. In contrast to the effects of unpaid leave, these impacts were largest among disadvantaged black and unmarried mothers. This research implies that paid and unpaid leave policies effectively target different populations, and that wage replacement may be an important way to reduce inequality in access to and use of leave benefits.

Recent evidence suggests that California's PFL program led to improvements in other measures of infant health as well. PFL is associated with increased breastfeeding rates three to nine months after the birth of a child, which is important because breastfeeding may improve infant nutrition and strengthen the immune system.¹⁹ Using data from the National Immunization Survey, a new working paper shows that PFL reduced late vaccinations in California, with stronger effects for families below the poverty line.²⁰ Another study suggests that PFL also reduced hospitalizations for infants due to avoidable infections and illnesses.²¹ The study's authors argue that the decline in admissions is due to causes that can be affected by increased parental care (versus outside childcare) and increased breastfeeding; they find no change in hospitalizations for reasons unlikely to be affected by the existence of parental leave. And another study supports these findings, showing that PFL improved parent-reported measures of overall infant health.²²

Some evidence suggests that PFL is associated with improvements in mothers' mental health.²³ A recent study analyzed data on several measures of mental health from two survey data sets and found that California's PFL improved self-reported maternal mental health. However, the strength of the results depended on the empirical model that the researchers used, and which states were included in the analysis as controls.

Do improvements in child health persist over time? Although PFL laws in the United States are too recent to study the impacts into adulthood, we have some evidence on the effects of California's PFL on measures of child health in kindergarten. Using data from the Early Childhood Longitudinal Study, a recent study found that PFL was associated with lower rates of being overweight, reductions in the probability of being diagnosed with attention deficit/hyperactivity disorder, and fewer hearing problems.²⁴ These effects were driven by children from less advantaged backgrounds, and the outcomes are associated with benefits from breastfeeding. Other recent research found that PFL also increased the time mothers spent in childcare activities, suggesting that improvements in childhood health may be driven by both physiology and behavior.²⁵ Another possible cause for the larger effects among more disadvantaged families is that when parents don't have the option to take paid leave, their infants are more likely to experience lower-quality nonparental care.²⁶

Though we need more research to understand the long-term consequences of PFL in the United States, current evidence suggests that introducing short periods of paid and unpaid leave can improve children's health in both the short and medium term.

PFL and the Labor Market

Many researchers have explored the relationship between leave in the United States, both paid and unpaid, and mothers' short- and longer-term labor market outcomes. Being able to take relatively short periods of unpaid leave enables women to return to work after childbirth, with minimal detectable impacts on their labor market outcomes later in life. By exploiting variation in the timing of the FMLA's passage and that of earlier state-level unpaid leave laws, researchers have shown that being able to take job-protected unpaid leave increases the probability that mothers will return to the jobs they held before childbirth.²⁷ However, they've found no evidence that unpaid leave has significant positive or negative impacts on women's longer-term employment or wages.²⁸

Other researchers have focused on the labor market consequences of California's PFL program. Studies that used survey data to compare mothers' outcomes in California before and after PFL to the difference among mothers in other states without PFL have found that one year after childbirth, mothers who had access to six weeks of paid leave were more likely to be employed and were working more hours, on average.²⁹ But a word of caution is in order: a recent working paper that used administrative tax records data to compare California mothers who gave birth in the first quarter of 2004 (before PFL was available) to those who gave birth in the third quarter of 2004 (immediately after PFL became available), relative to the analogous difference in other years without a policy change, found that California's PFL had no impact or even small negative impacts on mothers' long-term employment and wages.³⁰ The discrepancy between these studies may reflect the fact that different research designs

are able to identify effects for different population subgroups (for example, the study using tax records identified effects for women who were immediate users of the policy right after it was implemented).

Because most of the evidence on PFL's effects in the United States comes from studying California's 2004 policy, it's difficult to say how much that policy's particular features (such as the duration of benefits or the wage replacement rate) may drive the results. Recent work co-authored by Maya Rossin-Slater sheds some light on the effects of the replacement rate, at least for high-earning women.³¹ Examining women whose earnings were high enough that they were eligible for almost the maximum weekly benefit in California, the authors analyzed administrative data to show that higher benefit amounts don't affect either the duration of leave or the probability of making a PFL claim. However, they found some evidence that higher benefit amounts may improve job continuity by increasing the likelihood that mothers return to the jobs they held before childbirth.

To the best of our knowledge, no studies have identified the effects of PFL on US fathers' labor market outcomes. This may stem from the fact that fathers take PFL relatively rarely, which implies that any labor market impacts are likely to be small when estimated across the entire population.

When considering how PFL might affect parents' labor market outcomes, it's also important to examine the employers' role. If PFL imposes large costs on employers, they may react by making different hiring decisions or creating an environment less conducive to leave-taking. Even if employers don't have to directly fund PFL, they may

face indirect costs when their workers take leave: they need to hire replacement workers, reassign work tasks across employees, and coordinate employee schedules. On the flip side, employers might save money if PFL reduces turnover rates by making it easier for new parents to keep their jobs. PFL might also improve worker morale, potentially affecting productivity.

The evidence on how PFL affects employers is quite limited. Several surveys of firms in California and New Jersey have found that most employers report either positive or neutral effects on employee productivity, morale, and costs.³² Though these studies haven't been able to compare changes in outcomes before and after PFL legislation was passed, the results don't offer much support for the idea that PFL imposes a large burden on firms and co-workers.

We aren't aware of any peer-reviewed studies that identify causal impacts of PFL on US employer outcomes. However, for a report prepared for the US Department of Labor, researchers surveyed small and medium-sized food service and manufacturing firms in Rhode Island, Connecticut, and Massachusetts both before and after Rhode Island's PFL law was instituted, in order to study the effects of PFL on these employers using a difference-in-difference framework.³³ They found that PFL had no significant impacts on employee turnover rates or employee productivity. However, small sample sizes limited the conclusions that could be drawn.

Another report, this one prepared for the California Employment Development Department, used administrative data on nearly all California employers to study how employee PFL claim rates affect employer

outcomes.³⁴ Examining within-employer changes in outcomes, the authors found no evidence that firms' turnover or wage costs increase when claim rates rise. But the analysis couldn't account for the fact that there may be significant differences in the costs of PFL for different firms, which could affect claim rates. In a recent working paper using the same administrative data from California, researchers found that take-up of paid leave was substantially higher in firms that pay relatively higher wages to workers with similar skills.³⁵ The authors argue that better-paying firms may have cultures that are more conducive to leave-taking, suggesting that if we wish to increase use of leave more broadly, firms' behavior and norms may need to change.

Though the evidence so far suggests that existing state-level PFL programs place only a small burden on employers, we need more research to solidify these conclusions. In particular, we need to better understand how particular attributes of employers or employees may affect employers' costs.

Evidence from Other Countries

We won't fully review the evidence on PFLs effects in other countries. But looking elsewhere can help overcome some limitations of the US research, particularly those that stem from the relatively recent implementation of PFL policies and the lack of policy variation within states over time. In this section, we briefly describe some key findings about PFLs effects on labor market and health outcomes beyond the United States, with an eye toward understanding why key results do or don't differ from those found in this country.

By exploiting variation in policy changes (that is, implementation of new policies and

extensions of existing policies), research on the effects of paid maternity leave in other countries generally finds that short leaves of up to about one year tend to have either no impact or small positive impacts on women's job continuity and medium- to long-term employment.³⁶ Longer leaves, on the other hand, can harm women's long-term wages, employment, and career advancement.³⁷ One explanation for this difference in labor market effects by the duration of paid leave is that long periods away from work may reduce job-related human capital or productivity during key times in one's career. Longer leaves are often not fully job-protected or have lower wage replacement rates, which may also explain some of the difference.³⁸

There's little evidence from outside the United States that extending the duration of paid maternity leave—for example, from one year to a year and a few months—improves children's wellbeing in the long term. Leave expansions in Canada, Sweden, Austria, and Germany had no significant impacts on children's cognitive development in early childhood, on teenage cognitive outcomes or test scores, on educational attainment, or on earnings in early adulthood.³⁹

The benefits of paid maternity leave on children's long-term health and cognition may be concentrated in the months immediately following birth.

However, in a recent study from Norway that examined the long-term impact on children of introducing (rather than extending) a four-month paid maternity

leave policy in 1977, the researchers found that the policy reduced the high school dropout rate and increased earnings at age 30.⁴⁰ These impacts were concentrated among children from more disadvantaged backgrounds. Another recent study of the same Norwegian policy found that it also improved indicators of mothers' mental and physical health, particularly for more disadvantaged women.⁴¹ Other evidence on how PFL affects mothers' health around the time of birth is mixed. Though one study in Denmark found that an increase in the duration of maternity leave reduced by almost 70 percent the probability that mothers would experience an inpatient hospital stay within a year of birth, two other studies, in Denmark and Canada, found that leave extensions had no significant effects on mothers' depression.⁴²

Consistent with early evidence from the more recent US policies, these studies suggest that any benefits of paid maternity leave on children's long-term health and cognition may be concentrated in the months immediately following birth. However, the research can't point conclusively to the optimal leave duration, nor can it rule out positive longer-term impacts on outcomes that are harder to measure. Most studies of the long-term impacts of paid maternity leave compare the outcomes of cohorts affected by the policy to those of unaffected cohorts (such as individuals born immediately before an extension of leave), but they can't directly compare individuals whose parents took (longer) leaves to those who didn't. The policy-based research design improves researchers' ability to identify causal impacts, since individuals who take longer leaves are different in many ways from those who take shorter leaves. Without identifying

direct users of the leave, however, the studies are limited in their ability to estimate very long-term effects.

Lastly, two recent working papers using administrative data from Denmark analyzed how paid parental leave affects employer-level outcomes.⁴³ This research suggests that paid leave has no measurable effects on firms' output, profitability, or survival overall, though some small firms may be less likely to survive. Just as in the United States, we need more research on employer outcomes in other countries to fully understand how PFL affects firms.

Conclusions

Support for paid family leave is growing among US workers. In a 2017 survey by the Pew Research Center, 82 percent of Americans said that mothers should be able to take paid leave from work following the birth or adoption of a child, and 69 percent supported paid leave for fathers.⁴⁴ Support for paid leave policies is also growing at state and federal levels. The FAMILY Act introduced in Congress in 2019, for example, proposes a federal program to provide 12 weeks of paid family leave to all workers in the United States. In addition to the District of Columbia and the eight states that have already passed PFL programs, many other states are currently considering legislation for similar state-level programs.

As PFL becomes more popular, we need to understand the costs and benefits of such programs. Though research on PFL in the United States has been growing rapidly, more work is necessary in several key areas. We know relatively little about PFL's health effects on parents, particularly fathers. Similarly, as the early cohorts of children exposed to PFL grow older, we

need to keep watching for longer-term effects on their health and wellbeing. Given rising US healthcare costs, quantifying any potential health effects is important. We also need research to better understand how PFL affects employers. Current evidence suggests a low employer burden, but we know little about potential differences in costs across different types of employers or how employers respond to PFL by changing their own benefit packages, hiring practices, workplace flexibility, or other job characteristics. Lastly, we need to examine the impacts of specific PFL policy features—including the wage replacement rate, leave duration, and availability of job protection—on health and employment outcomes. As more and more state-level policies go into effect in the coming years, it will be possible to examine differences across states to identify these effects and to guide recommendations about the best policy designs.

Nevertheless, the research so far on PFL in the United States already points to four important takeaways that may help guide future policy and research.

First, paid family leave increases leave-taking rates and leave duration, especially among disadvantaged parents who are the least likely to be able to afford unpaid time off. But barriers to take-up remain, even when PFL eligibility requirements are low. Universal job protection and higher wage replacement rates for low-wage workers may be important for increasing equity in leave take-up.

Second, relatively short periods of leave appear to have positive benefits for infant health as well as for mothers' labor market outcomes. Paid leave that lasts longer than a year may be more likely to have adverse effects on mothers' long-term career outcomes. Although a PFL program providing one year or more of benefits is unlikely in the United States, optimal leave duration remains an important policy consideration. There's little causal evidence to suggest that leave extensions beyond a few months lead to significant improvements in mothers' or children's health. As a whole, the research suggests that programs lasting up to about six months have positive effects on health and wellbeing without significant career costs.

Third, the evidence shows that existing state programs have minimal negative impacts on businesses, suggesting that paid family leave programs confer benefits to workers and their families at little to no cost to their employers. These benefits may be especially important for the least-advantaged families, in which workers are least likely to have access to any employer-provided paid leave.

Finally, much evidence indicates that rising economic inequality in the United States is driven by disparities in early childhood. The research suggests that paid family leave may be one way to level the playing field for children from all backgrounds and help improve intergenerational mobility.

Endnotes

1. See, for example, “Raising Kids and Running a Household: How Working Parents Share the Load,” Pew Research Center, Nov. 4, 2015, <http://www.pewsocialtrends.org/2015/11/04/raising-kids-and-running-a-household-how-working-parents-share-the-load/>.
2. Jacob Alex Klerman, Kelly Daley, and Alyssa Pozniak, “Family and Medical Leave in 2012: Technical Report,” US Department of Labor, Sept. 7, 2012 (revised April 18, 2014), <https://www.dol.gov/sites/dolgov/files/OASP/legacy/files/FMLA-2012-Technical-Report.pdf>.
3. See “National Compensation Survey,” US Bureau of Labor Statistics, March 2019, <https://www.bls.gov/nchs/ebs/benefits/2019/ownership/private/table31a.pdf>.
4. American Academy of Pediatrics, “Breastfeeding and Maternal and Infant Health Outcomes in Developed Countries,” *AAP Grand Rounds* 18, no. 2 (2007): 15–16, <https://doi.org/10.1542/gr.18-2-15>; Nancy K. Lowe, “The Surgeon General’s Call to Action to Support Breastfeeding,” *Journal of Obstetric, Gynecologic & Neonatal Nursing* 40 (2011): 387–9, <https://doi.org/10.1111/j.1552-6909.2011.01266.x>.
5. Ankita Patnaik, “Reserving Time for Daddy: The Consequences of Fathers’ Quotas,” *Journal of Labor Economics* 37 (2019): 1009–59, <https://doi.org/10.1086/703115>.
6. Claudia Olivetti and Barbara Petrongolo, “The Economic Consequences of Family Policies: Lessons from a Century of Legislation in High-Income Countries,” *Journal of Economic Perspectives* 31 (2017): 205–30, <https://doi.org/10.1257/jep.31.1.205>.
7. Alexandra Boyle Stanczyk, “Does Paid Family Leave Improve Household Economic Security Following a Birth? Evidence from California,” *Social Service Review* 93 (2019): 262–304, <https://doi.org/10.1086/703138>.
8. See also Elizabeth U. Cascio, “Public Investments in Child Care,” in *The 51%: Driving Growth through Women’s Economic Participation*, ed. Diane Whitmore Schanzenbach and Ryan Nunn (Washington, DC: Hamilton Project, 2017), 123–42, https://www.hamiltonproject.org/assets/files/public_investments_child_care_cascio.pdf.
9. Jane Waldfogel, “The Impact of the Family and Medical Leave Act,” *Journal of Policy Analysis and Management* 18 (1999): 281–302, [https://doi.org/10.1002/\(SICI\)1520-6688\(199921\)18:2<281::AID-PAM5>3.0.CO;2-J](https://doi.org/10.1002/(SICI)1520-6688(199921)18:2<281::AID-PAM5>3.0.CO;2-J); Wen-Jui Han, Christopher Ruhm, and Jane Waldfogel, “Parental Leave Policies and Parents’ Employment and Leave-Taking,” *Journal of Policy Analysis and Management* 28 (2009): 29–54, <https://doi.org/10.1002/pam.20398>.
10. Maya Rossin-Slater, Christopher J. Ruhm, and Jane Waldfogel, “The Effects of California’s Paid Family Leave Program on Mothers’ Leave-Taking and Subsequent Labor Market Outcomes,” *Journal of Policy Analysis and Management* 32 (2013): 224–45, <https://doi.org/10.1002/pam.21676>; Charles L. Baum II and Christopher J. Ruhm, “The Effects of Paid Family Leave in California on Labor Market Outcomes,” *Journal of Policy Analysis and Management* 35 (2016): 333–56, <https://doi.org/10.1002/pam.21894>; Ann P. Bartel et al., “Paid Family Leave, Fathers’ Leave-Taking, and Leave-Sharing in Dual-Earner Households,” *Journal of Policy Analysis and Management* 37 (2018): 10–37, <https://doi.org/10.1002/pam.22030>.
11. Sarah Bana, Kelly Bedard, and Maya Rossin-Slater, “Trends and Disparities in Leave Use under California’s Paid Family Leave Program: New Evidence from Administrative Data,” *AEA Papers and Proceedings* 108 (2018): 388–91, <https://doi.org/10.1257/pandp.20181113>.
12. Pamela Winston et al., *Supporting Employment among Lower-Income Mothers: The Role of Paid Family Leave* (Washington, DC: Office of the Assistant Secretary for Planning and Evaluation, US Department of Health and Human Services, May 2019), <https://aspe.hhs.gov/pdf-report/supporting-employment-among-lower-income-mothers-role-paid-family-leave>.

13. See, for example, Eileen Appelbaum and Ruth Milkman, *Leaves That Pay: Employer and Worker Experiences with Paid Family Leave in California* (Los Angeles: UCLA Institute for Research on Labor and Employment, 2011), <https://escholarship.org/uc/item/6bm118ss>; Ruth Milkman and Eileen Appelbaum, *Unfinished Business: Paid Family Leave in California and the Future of U.S. Work-Family Policy* (Ithaca, NY: ILR Press, 2013); Mark DiCamillo and Mervin Field, “Just 36% of Voters Aware of State’s Paid Family Leave Program,” Field Research Corporation and California Center for Research on Women and Families, 2014.
14. Sarah Fass, “Paid Leave in the States: A Critical Support for Low-wage Workers and Their Families” (New York: National Center for Children in Poverty, Mailman School of Public Health, Columbia University, March 2009), <https://doi.org/10.7916/D8XH00VS>.
15. Gordon B. Dahl, Katrine V. Løken, and Magne Mogstad, “Peer Effects in Program Participation,” *American Economic Review* 104 (2014): 2049–74, <https://doi.org/10.1257/aer.104.7.2049>; Sarah Bana et al., “Unequal Use of Social Insurance Benefits: The Role of Employers,” working paper, National Bureau of Economic Research, Cambridge, MA, 2018, <https://www.nber.org/papers/w25163>.
16. Shirlee Lichtman-Sadot, “The Value of Postponing Pregnancy: California’s Paid Family Leave and the Timing of Pregnancies,” *BE Journal of Economic Analysis & Policy* 4 (2014): 1467–1499, <https://doi.org/10.1515/bejeap-2013-0141>; Eleanor Golightly, “Is Paid Family Leave a Pro-Natal Policy? Evidence from California,” unpublished manuscript, University of Texas, Austin, Nov. 10, 2019, <https://drive.google.com/file/d/1U3YJDO0a9oOSqgVFq6xPfb6ZoW4Cagwz/view>.
17. See, for example, Rafael Lalive and Josef Zweimüller, “How Does Parental Leave Affect Fertility and Return to Work? Evidence from Two Natural Experiments,” *Quarterly Journal of Economics* 124 (2009): 1363–1402, <https://doi.org/10.1162/qjec.2009.124.3.1363>; Anna Raute, “Can Financial Incentives Reduce the Baby Gap? Evidence from a Reform in Maternity Leave Benefits,” *Journal of Public Economics* 169 (2019): 203–22, <https://doi.org/10.1016/j.jpubeco.2018.07.010>; and Gordon B. Dahl et al., “What is the Case for Paid Maternity Leave?,” *Review of Economics and Statistics* 98 (2016), 655–70, https://doi.org/10.1162/REST_a_00602.
18. Maya Rossin, “The Effects of Maternity Leave on Children’s Birth and Infant Health Outcomes in the United States,” *Journal of Health Economics* 30 (2011): 221–39, <https://doi.org/10.1016/j.jhealeco.2011.01.005>.
19. Rui Huang and Muzhe Yang, “Paid Maternity Leave and Breastfeeding Practice before and after California’s Implementation of the Nation’s First Paid Family Leave Program,” *Economics & Human Biology* 16 (2015): 45–59, <https://doi.org/10.1016/j.ehb.2013.12.009>.
20. Agnitra Roy Choudhury and Solomon Polachek, “The Impact of Paid Family Leave on the Timing of Infant Vaccinations,” working paper, Institute of Labor Economics (IZA), Bonn, Germany, 2019, <https://www.iza.org/publications/dp/12483/the-impact-of-paid-family-leave-on-the-timing-of-infant-vaccinations>.
21. Ariel Marek Pihl and Gaetano Basso, “Did California Paid Family Leave Impact Infant Health?,” *Journal of Policy Analysis and Management* 38 (2019): 155–80, <https://doi.org/10.1002/pam.22101>.
22. Lindsey Rose Bullinger, “The Effect of Paid Family Leave on Infant and Parental Health in the United States,” *Journal of Health Economics* 66 (2019): 101–16, <https://doi.org/10.1016/j.jhealeco.2019.05.006>.
23. Ibid.
24. Shirlee Lichtman-Sadot and Neryvia Pillay Bell, “Child Health in Elementary School following California’s Paid Family Leave Program,” *Journal of Policy Analysis and Management* 36 (2017): 790–827, <https://doi.org/10.1002/pam.22012>.
25. Samantha Trajkovski, “California Paid Family Leave and Parental Time Use,” unpublished manuscript, University of Connecticut, 2019, https://docs.wixstatic.com/ugd/c6de6e_7fcc7bf2b2ff47eca9fe9c7a9659ff34.pdf.

26. See Patrick Kline and Christopher R. Walters, “Evaluating Public Programs with Close Substitutes: The Case of Head Start,” *Quarterly Journal of Economics* 131 (2016), 1795–1848, <https://doi.org/10.1093/qje/qjw027>.
27. Charles L. Baum II, “The Effects of Maternity Leave Legislation on Mothers’ Labor Supply after Childbirth,” *Southern Economic Journal* 69 (2003): 772–99, <https://doi.org/doi:10.2307/1061651>.
28. Han, Ruhm, and Waldfogel, “Parental Leave Policies”; Waldfogel, “Impact.”
29. Rossin-Slater, Ruhm, and Waldfogel, “Effects of California’s Paid Family Leave”; Baum and Ruhm, “Effects of Paid Family Leave.”
30. Martha Bailey et al., “The Long-Term Effects of California’s 2004 Paid Family Leave Act on Women’s Careers: Evidence from U.S. Tax Data,” unpublished manuscript, University of Michigan, 2019.
31. Sarah Bana, Kelly Bedard, and Maya Rossin-Slater, “The Impacts of Paid Family Leave Benefits: Regression Kink Evidence from California Administrative Data,” working paper, National Bureau of Economic Research, Cambridge, MA, 2019, <https://www.nber.org/papers/w24438>.
32. Appelbaum and Milkman, *Leaves That Pay*; Miriam Ramirez, “The Impact of Paid Family Leave on New Jersey Businesses,” PowerPoint presentation, Bloustein School of Planning and Public Policy, Rutgers University, 2012, <https://bloustein.rutgers.edu/wp-content/uploads/2012/03/Ramirez.pdf>; Sharon Lerner and Eileen Appelbaum, “Business as Usual: New Jersey Employers’ Experiences with Family Leave Insurance,” report no. 2014-12, Center for Economic and Policy Research, Washington, DC, 2014, <https://ideas.repec.org/p/epo/papers/2014-12.html>.
33. Ann Bartel et al., *Assessing Rhode Island’s Temporary Caregiver Insurance Act: Insights from a Survey of Employers* (Washington, DC: U.S. Department of Labor, Chief Evaluation Office, 2016), https://digitalcommons.ilr.cornell.edu/key_workplace/1597/.
34. Kelly Bedard and Maya Rossin-Slater, “The Economic and Social Impacts of Paid Family Leave in California: Report for the California Employment Development Department,” State of California Employment Development Department, October 13, 2016, https://www.edd.ca.gov/disability/pdf/PFL_economic_and_social_impact_study.pdf.
35. Bana et al., “Unequal Use.”
36. Michael Baker and Kevin Milligan, “How Does Job-Protected Maternity Leave Affect Mothers’ Employment?,” *Journal of Labor Economics* 26 (2008): 655–91, <https://doi.org/10.1086/591955>; Jochen Kluge and Marcus Tamm, “Parental Leave Regulations, Mothers’ Labor Force Attachment and Fathers’ Childcare Involvement: Evidence from a Natural Experiment,” *Journal of Population Economics* 26 (2013): 983–1005, <https://doi.org/10.1007/s00148-012-0404-1>; Annette Bergemann and Regina T. Riphahn, “Maternal Employment Effects of Paid Parental Leave,” working paper, Institute of Labor Economics (IZA), Bonn, Germany, May 2015, <http://ftp.iza.org/dp9073.pdf>.
37. Schönberg and Johannes Ludsteck, “Expansions in Maternity Leave Coverage and Mothers’ Labor Market Outcomes after Childbirth,” *Journal of Labor Economics* 32 (2014): 469–505, <https://doi.org/10.1086/675078>; Laurent Lequien, “The Impact of Parental Leave Duration on Later Wages,” *Annals of Economics and Statistics*, no. 107/108 (2012): 267–85, <https://doi.org/10.2307/23646579>; Lalive and Zweimüller, “How Does Parental Leave Affect Fertility”; Dahl et al., “What is the Case?”
38. Jenna Stearns, “The Long-Run Effects of Wage Replacement and Job Protection: Evidence from Two Maternity Leave Reforms in Great Britain,” Social Science Research Network, Rochester, NY, May 7, 2018, <https://doi.org/10.2139/ssrn.3030808>.
39. Michael Baker and Kevin Milligan, “Evidence from Maternity Leave Expansions of the Impact of Maternal Care on Early Child Development,” *Journal of Human Resources* 45 (2010): 1–32, <https://doi.org/10.3368/jhr.45.1.1>; Michael Baker and Kevin Milligan, “Maternity Leave and Children’s Cognitive and

- Behavioral Development,” *Journal of Population Economics* 28 (2015): 373–91, <https://doi.org/10.1007/s00148-014-0529-5>; Qian Liu and Oskar Nordstrom Skans, “The Duration of Paid Parental Leave and Children’s Scholastic Performance,” *B.E. Journal of Economic Analysis & Policy* 10 (2010): 1–33, <https://doi.org/10.2202/1935-1682.2329>; Natalia Danzer and Victor Lavy, “Paid Parental Leave and Children’s Schooling Outcomes,” *Economic Journal* 128, no. 608 (2018): 81–117, <https://doi.org/10.1111/econj.12493>; Christian Dustmann and Uta Schönberg, “Expansions in Maternity Leave Coverage and Children’s Long-Term Outcomes,” *American Economic Journal: Applied Economics* 4 (2012): 190–224, <https://doi.org/10.1257/app.4.3.190>.
40. Pedro Carneiro, Katrine V. Løken, and Kjell G. Salvanes, “A Flying Start? Maternity Leave Benefits and Long-Run Outcomes of Children,” *Journal of Political Economy* 123 (2015): 365–412, <https://doi.org/10.1086/679627>.
 41. Aline Butikofer, Julie Riise, and Meghan M. Skira, “The Impact of Paid Maternity Leave on Maternal Health,” *American Economic Journal: Economic Policy* (forthcoming).
 42. Louise Voldby Beuchert, Maria Knoth Humlum, and Rune Vejlin, “The Length of Maternity Leave and Family Health,” *Labour Economics* 43 (2016): 55–71, <https://doi.org/10.1016/j.labeco.2016.06.007>; Michael Baker and Kevin Milligan, “Maternal Employment, Breastfeeding, and Health: Evidence from Maternity Leave Mandates,” *Journal of Health Economics* 27 (2008): 871–87, <https://doi.org/10.1016/j.jhealeco.2008.02.006>.
 43. Anne A. Brenøe et al., “Is Parental Leave Costly for Firms and Coworkers?,” working paper, National Bureau of Economic Research, Cambridge, MA, Jan. 2020 (revised June 2020), <https://www.nber.org/papers/w26622>; Yana Gallen, “The Effect of Parental Leave Extensions on Firms and Coworkers,” unpublished manuscript, University of Chicago, 2019, http://yanagallen.com/Gallen_ParentalLeave_2019.pdf
 44. See Juliana Menasce Horowitz et al., “Support for Paid Leave Policies,” Pew Research Center, March 23, 2017, <https://www.pewsocialtrends.org/2017/03/23/support-for-paid-leave-policies/>.

Parental Sensitivity and Nurturance

Carrie E. DePasquale and Megan R. Gunnar

Summary

Parental sensitivity and nurturance are important mechanisms for establishing biological, emotional, and social functioning in childhood. Sensitive, nurturing care is most critical during the first three years of life, when attachment relationships form and parental care shapes foundational neural and physiological systems, with lifelong consequences. Sensitive, nurturing care also buffers children from the negative effects of growing up in difficult circumstances such as poverty.

In this article, Carrie DePasquale and Megan Gunnar examine several interventions that directly or indirectly target parental sensitivity and nurturance, and demonstrate the causal role that this type of care plays in children's development, especially during the first three years of life. They note that even though sensitive, nurturing care is still helpful after infancy and early childhood, it doesn't completely mitigate the effects of not receiving this type of care early in life. And because sensitive care involves knowing when to respond and when to let the child manage more independently, excessive responsiveness, overinvolvement, and intrusiveness are also forms of insensitive care.

Sensitive and nurturing parent behaviors vary across cultures, and numerous other factors influence parental sensitivity as well. For example, children's temperament and emotional reactivity may affect parents' behavior and/or alter the effects of parenting behavior on children's development. Physiological, cognitive, and emotional self-regulatory capabilities, as well as socioeconomic and environmental factors, can also affect a parent's ability to provide sensitive, nurturing care. Based on the expansive research related to parental sensitivity and nurturance, the authors recommend that policy makers should aim to increase family and community access to programs that enhance sensitive, nurturing care and support parents so they can provide high-quality care to their children.

www.futureofchildren.org

Carrie E. DePasquale, now deceased, was a doctoral student at the University of Minnesota's College of Education and Human Development. Megan R. Gunnar is a professor of psychology, a Regents Professor, and a Distinguished McKnight University Professor at the University of Minnesota's College of Education and Human Development.

The parent-child relationship is critical for children's wellbeing. It's now clear that the period of early development, from before birth to approximately age three, sets the stage for long-term neurobiological, socioemotional, and psychological health. This is a time of rapid regulatory development, when neurobiological patterns are established and systems that coordinate interactions between physiology and behavior gradually become more organized. It's not that sensitive nurturing care isn't important after age three, but there appears to be more bang for the buck during these early years.

In this article, we use the term *parenting* to refer to the care provided by those responsible for a child's wellbeing. This might be a biological parent, but it could be anyone who has primary responsibility for a child's care for a relatively long time (for example, an adoptive parent, custodial relative, or child care provider). Parental sensitivity and nurturance provide a foundation of good neurobiological regulation in young children, which has cascading effects on many other aspects of socioemotional and psychological wellbeing. Strong evidence of parenting's widespread, causal impact already exists. What we must do now is identify when parental care needs to be improved and what intervention or combination of interventions works best for whom, when, and why. This will ensure that policy initiatives are as efficient and effective as possible.

Defining and Measuring Parental Sensitivity and Nurturance

Sensitive parental care means being finely attuned to a baby's signals. A sensitive

parent interprets signals accurately and responds promptly and appropriately. *Parental nurturance* describes sensitivity when the child's cues indicate distress. We use the term *parental sensitivity*, but other concepts are closely related (for example, synchrony, responsiveness, and supportiveness). Indeed, *parental synchrony* is defined similarly to sensitivity: "the matching of behavior, [emotional] states, and biological rhythms between parent and child that together form a single relational unit." Thus we discuss findings from studies using these related terms as well. And although we talk about sensitivity and nurturance together, some evidence suggests that the two can have separate effects. For example, one study found that nurturance predicted greater empathy among children, mediated by the child's ability to regulate negative emotions, while sensitivity predicted greater peer acceptance (though only in boys), mediated by the child's ability to regulate positive emotions. Still, sensitivity and nurturance overlap significantly in the types of behaviors they describe, and usually differ only in terms of the context in which they're expressed. It's likely that parental sensitivity and nurturance have similar impacts on all of the child characteristics mentioned above, and more.

Researchers employ a number of methods to measure parental sensitivity and nurturance. Some use self-reporting by parents; others use a variety of observational methods. Due to the inherent limitations of self-reporting, including the subconscious desire to respond in socially appropriate ways and individual differences in awareness of one's own behaviors, here we prioritize data from observational studies. Observational methods typically involve teams of raters who are unaware of

participant characteristics that might bias their ratings (for example, the intervention condition) and are trained in a particular scoring system of parental sensitivity, usually on a five- to 10-point scale. The parent and child being rated are recorded as they complete one or more brief tasks, and the raters then use the recording to determine a parental sensitivity score for the parent. Other methods involve observing parent and child for several hours as they go about their everyday lives and then sorting descriptions of parental behavior based on how similar the description is to the behavior of the observed parent.

The children of sensitive, nurturing parents have fewer mental health problems, better social competence, and higher cognitive functioning.

Tasks used to measure parental sensitivity and nurturance vary widely. A common task in infancy and early childhood is free play, in which parent and child are typically given a set of age-appropriate toys and told to play as they normally would. Another is a teaching task, where the parent is told to help the child complete, say, a moderately difficult puzzle. Other tasks are used to measure parental sensitivity to children's distress (that is, nurturance). One of these is the finger-prick blood draw; another is the *Strange Situation*, in which the parent is told to leave the room briefly while a stranger (a trained experimenter) remains with the child (this is also the gold-standard laboratory method for determining an infant's attachment classification).

Importance of Sensitive, Nurturing Care

Parental sensitivity and nurturance influence several aspects of children's functioning. The children of sensitive, nurturing parents have fewer mental health problems, better social competence, and higher cognitive functioning. These associations don't appear to be due to genetics, as they're also seen in adoptive families. Parents' sensitive and nurturing behaviors also predict brain development—specifically, greater gray matter volume and white matter connectivity, both indicators of neuronal density and signaling capacity that have implications for even the most basic brain functions. These associations with brain development likely underlie parental sensitivity's association with greater flexibility in solving problems (*cognitive flexibility*), better ability to shift from responding by habit to novel problem solutions (*cognitive inhibitory control*), and better ability to keep multiple things in mind at one time (*working memory*). Together these skills are called *executive function*, a core developmental competence that drives the attentional, cognitive, and behavioral processes needed to overcome challenges and changing circumstances throughout life.

Several studies have shown that sensitivity and nurturance have a disproportionate impact during the first few years of life (that is, up to age three) for outcomes across the lifespan. But parenting quality tends to be quite stable across a child's life, so a considerable challenge for this research is disentangling the impact of early parenting from that of later. In other words, if studies find a significant effect of early parenting on child wellbeing several years later, the effect

could be due to parenting quality at the later point in time, which is similar to parenting quality earlier in the child's life. To tease apart these two possibilities, researchers measure parents' behavior and a given functional outcome in the child several times across childhood. Then, if early measures of the parents' behavior predict later child functioning regardless of (that is, accounting for) later measures of parents' behavior, we can infer that early parenting plays a critical role in children's health and wellbeing over and above the quality of later parenting.

Large-scale studies like the Study of Early Child Care and Youth Development (SECCYD) and the Minnesota Longitudinal Study of Risk and Adaptation (MLSRA), both funded by the National Institute of Child Health and Human Development, have been able to investigate this question. One analysis of SECCYD data determined that greater parental sensitivity at age three predicted fewer teacher-reported mental health symptoms across five assessments up to age 15, even when controlling for parental sensitivity at all later assessments. An analysis of the MLSRA showed an enduring association between maternal sensitivity in the first three years and social and academic competence through age 32. However, when both "early" and "later" parenting are measured before age three (for example, at 15 and 24 months), the earlier measure of parenting doesn't always show a stronger effect. These studies clearly support the idea that parental sensitivity before age three, over and above parenting behaviors years later, is crucial for children's long-term adaptive functioning.

A number of studies provide likely explanations of why parenting behaviors

are so important in the first few years of life. Dramatic brain development and organization occur during these years. Neural processes are especially plastic, or malleable, at this time, so experiences that occur during this period may engender larger changes in a child's brain structure and function compared to similar experiences later in life, when the brain is less malleable. In early life, many biological systems calibrate to the context in which the individual is living, particularly regarding the amount of material, social, and metabolic resources available to the child. This calibration is hypothesized to influence the later activity of these biological systems, such as the magnitude and frequency of activation of the stress response. The early calibration of the stress response and other biological systems can have long-term consequences for many aspects of physical and psychological health.

Relatedly, a child's primary attachment relationship is typically established in the first year of life, and this relationship holds special importance as a social buffer against stress during infancy and early childhood. Thus parents' behaviors during this time are critical. Sensitive, nurturing care demonstrates to children that they have sufficient social resources to support them during stress or challenge, promoting better regulation of the stress response and avoiding longer-term dysregulation or dysfunction. As a result, parental sensitivity and nurturance have been shown to support secure attachment relationships. When attachment is secure, the child uses the parent as a base from which to explore and a safe haven to return to when threatened or frightened. Having a secure attachment, in turn, is associated

with a host of positive outcomes across the lifespan.

It's evident that the period from before birth to age three is a critical time during which parents can have a large impact on their children's future success. Public health initiatives should direct a large proportion of resources to this period in children's lives to ensure compounding downstream impacts on child and family wellbeing.

Sensitivity and Nurturance Buffer Stress and Adversity

Besides the general benefits of sensitive, nurturing parental care, these parenting behaviors can also buffer the negative effects of stress and adversity. Poverty is associated with risk for major sources of stress that can harm children's development, such as housing instability, food insecurity, and neighborhood violence. Children who experience these adversities do better if their parents are sensitive and nurturing. For example, measures of brain functioning like resting state functional connectivity in the key brain networks responsible for self-regulation are impaired in those who live in poverty during adolescence, unless they experience sensitive parental care. Compared to children born to adult mothers, children born to adolescent mothers show cognitive deficits by age two, an effect explained in part by poorer maternal sensitivity along with socioeconomic risk. Presumably, greater maternal sensitivity could prevent this effect among such children. Parental sensitivity has also been shown to reduce the association between exposure to and perceptions of racial discrimination in ethnic-minority youth and violence in African American adolescent boys.

Thus, parental sensitivity in infancy may be critically important for reducing the intergenerational transmission of socioeconomic disadvantage and for buffering children from some of the negative consequences of racial disparities in socioeconomic status. However, socioeconomic stress is known to impair parental sensitivity and nurturance. Thus, unless parents living in poverty are offered some external help and support, it may be unrealistic to expect them to provide the sensitive care their children need to buffer them from poverty's pernicious impacts.

Poverty is associated with risk for major sources of stress that can harm children's development, such as housing instability, food insecurity, and neighborhood violence. Children who experience these adversities do better if their parents are sensitive and nurturing.

Children's characteristics can also predict poorer outcomes, but many of these can be buffered by parental sensitivity. Such risk factors (atypical brain development, genetic abnormalities, high anger reactivity, or very low birthweight) tend to have smaller effects if parents are sensitive and nurturing. Maternal insensitivity can also magnify the degree to which other risk factors, like iron insufficiency, predict poor outcomes. Findings like these demonstrate the extent to which parental sensitivity can

reduce the harm associated with a variety of both physical and psychological risk factors, with broad public health implications.

Because of the outsize role parents play in their children's biological, emotional, and social development, it's possible that the most pernicious form of adversity comes from parents themselves. Maltreatment (neglect or abuse) by caregivers is associated with widespread deficits in children's mental health and psychosocial adjustment. When parental care is the source of stress, dysfunctional outcomes may be particularly difficult to avoid. For example, living in a sensitive, nurturing environment allows a child to mature slowly, with time to develop certain skills. When life is harsh, growing up faster may improve chances of survival, but this comes with trade-offs: skills like emotional reactivity don't have the time to develop well. The brain regions that regulate emotional reactivity seem to mature faster among children deprived of parental care in infancy, even if the children were placed with supportive families before age two. Early differences in this emotion-related neural circuitry, which is more open to environmental influences in the first few years of life, may bring about emotion regulation deficits that persist for years, ultimately resulting in an increased risk of mental health disorders.

Interestingly, though, one parent's sensitivity can also buffer the negative effects of harsh discipline by the same parent and depressive symptoms in the other parent. And, although having two sensitive parents is associated with the best cognitive functioning, one study found that having at least one sensitive parent is better than having none. Thus

one parent's sensitivity can mitigate the negative consequences of maltreatment and abuse committed by the other parent. Similarly, though child care workers can't replace a sensitive parent, they're still considered caregivers and can also have a positive influence on child development that counters some of the impact of parental maltreatment (see the article in this issue by Ajay Chaudry and Heather Sandstrom for more about early child care).

Insensitive Care: Both Ends of the Spectrum

Parental *insensitivity* is commonly described as harshness or a lack of responsiveness. However, insensitivity also exists at the opposite end of the spectrum. Indeed, a parent can be too responsive (for example, through overinvolvement, intrusiveness, or overstimulation). Too much responsiveness has also been associated with negative child outcomes, such as heightened stress reactivity and poor emotion regulation. Parenting behaviors that support autonomy, like acknowledging a child's own volition and perspective, are similar to sensitivity and predict similar aspects of child functioning. These findings help us understand what it means to be a sensitive parent. It's not enough to simply be responsive and involved. Parents also need to support a child's autonomy and agency and provide enough, but not too much, verbal and physical stimulation. The timing and appropriateness of parental behaviors are just as critical as the behaviors themselves. Furthermore, sensitive care adapts to the needs of different children, so it doesn't mean treating all children alike.

Being sensitive also means adapting to different levels and types of risk in the environment. For example, sensitive

parents living in poorer neighborhoods may engage in more parental monitoring and involvement to support academic achievement. But the same level of parental monitoring and involvement could be overly responsive for a child in a wealthier neighborhood (that is, it could be considered “helicopter parenting”). Thus, supporting autonomy and other sensitive parenting behaviors may have different consequences for children’s development depending on where a child lives. But it’s still unclear whether the benefits of parental monitoring and involvement in higher-risk environments occur only in the short term. We need more research to determine the relative short- and long-term benefits of sensitive parenting in high-risk contexts. Increased parental involvement and monitoring may bring short-term benefits in a high-stress environment, but sensitive parenting behaviors could still provide the longest-term benefits for physical and psychosocial functioning. This has yet to be investigated.

Interventions

A number of interventions have shown a causal link between parental sensitivity and positive aspects of child wellbeing. The gold standard for causal evidence is a randomized controlled trial, where some families are randomly assigned to the intervention and others (the control group) are not. The fact that participants are randomly assigned should negate any preexisting differences between families in the intervention and control groups that are unrelated to the intervention and might affect the outcomes of interest (in other words, selection bias). Thus, if an intervention treatment increases parental sensitivity, and this increase explains

improvements in children’s functioning, we can more confidently claim that the change in parental sensitivity caused the improvements. Causal evidence is important, as it increases the likelihood that manipulating this variable (for example, via public health prevention and intervention initiatives) will produce desirable outcomes for children and families.

Several interventions have accumulated strong evidence for their effectiveness in promoting child and family wellbeing. Many of them explicitly draw on theories about parent-child attachment relationships in their core principles. Two such interventions, one called Parent-Child Interaction Therapy and another called Attachment and Biobehavioral Catch-Up, use real-time feedback given to parents during their interactions with their children to increase parental sensitivity (among other things) and to reduce harsh discipline. The Positive Parenting Program (Triple P) uses media resources, professional consultation, and self-directed modules to promote similar parenting behaviors. All three have demonstrated consistent positive effects on child behavior and have the potential to reduce harsh discipline and maltreatment.

Notably, many home-visiting programs aim to increase parents’ sensitivity and reduce harshness, but some don’t focus on actual interactions in a directed way. (Indeed, a variety of delivery methods can be used to attempt to increase sensitivity, including group information sessions, individual family consultation, and population-level public awareness campaigns.) It’s also true that existing programs may support families better when they add components to address parental sensitivity and nurturance.

Having several successful methods for promoting sensitive and nurturing parenting offers flexibility and ensures that effective options can be implemented in settings that have different needs and capabilities.

As we said above, many interventions aim both to improve sensitivity and to reduce harsh, intrusive parenting. So is it increasing parental sensitivity or decreasing harsh and abusive parenting behaviors that explains intervention-related improvements in child wellbeing? The answer is likely both. To our knowledge, no intervention study has examined either the relative importance of increasing sensitivity versus reducing harshness for changes in child functioning, or whether these associations vary across development. However, correlational studies suggest that parental sensitivity is associated with child outcomes separately from harsh parenting, and vice versa.

One way that sensitive parenting might exert unique effects is through greater predictability. Predictability is critical to learning, which may be why one longitudinal study of brain development found that maternal support (similar to sensitivity) in the preschool years predicted the development of brain regions involved in learning and memory. On the other hand, when harsh discipline controls behavior, it does so by evoking fear—which, in the context of low parental sensitivity, has been shown to increase aggressive behavior.

Intervention studies can also help identify normative and atypical developmental processes that produce variations in children's biology and behavior. As we've said, many sensitivity interventions are derived from attachment theory. Effectiveness studies of these interventions

offer: (1) empirical support for attachment theory; (2) evidence that a history of sensitive care forms the basis of attachment security; and (3) causal support for the idea that attachment security is important for children's later biological, behavioral, and socioemotional functioning. Furthermore, intervention effects on children's biological regulation can help us understand the intervention's mechanism of action, as well as the role of specific biological functions in other aspects of children's cognitive, social, and emotional wellbeing. In these ways, basic science, intervention practice, and policy initiatives all build on one another, and each is critical to developing and implementing interventions that improve the lives of the families and children who need it most.

Parental sensitivity interventions also guide theories about developmental timing, with regard to both when certain developmental processes occur and at what point in time development intervention is most effective. Most sensitivity interventions occur when children are infants, because that's typically when primary attachment relationships are consolidated. Some researchers have also proposed that infancy, and specifically the weeks soon after birth, is an ideal time for intervention because it involves a substantial shift in the family system, triggering increased flexibility and reorganization. An intervention that takes place during this reorganizational period could have a larger impact on parents' behavior and children's functioning than the same intervention conducted in a more stable family system. Alternatively, different parenting behaviors and child outcomes may benefit from different interventions occurring at different times in development. To investigate these types

of questions, researchers use study designs that are more sophisticated than typical randomized controlled trials. These designs include sequential multiple-assignment randomized trials (SMARTs), in which families are randomized at several intervals to receive different combinations of interventions that vary in type, timing, and duration (which researchers call *dosage*). A Multiphase Optimization Strategy (MOST) is another technique for refining intervention delivery method, dosage, and content for individual participants based on their treatment response (or lack thereof) at predetermined “checkpoints” throughout the treatment.

In one compellingly designed SMART, families were assigned to receive an intervention called Playing and Learning Strategies (PALS) in their child’s infancy and/or toddlerhood. Families received the intervention in varying dosages and with different developmental timing, which helped tease apart the impact of different aspects of the intervention and its differential effectiveness across the two developmental periods. Ultimately, the intervention produced positive effects for parents and children regardless of when the families received it, but parent behaviors and child outcomes varied with timing and dosage. Parental sensitivity behaviors that support more sophisticated child skills like language comprehension (for example, verbal scaffolding and encouragement) showed larger improvements for families who received PALS in the child’s toddlerhood, regardless of whether they received PALS in infancy. Generally supportive behaviors, such as warmth and positive affect, showed more improvement with PALS in infancy, whether or not the families

received PALS in toddlerhood. Other, more complex behaviors that are central to parental sensitivity (such as predictable and appropriate responsiveness to children’s cues) required a larger dose of intervention (PALS at both infancy and toddlerhood) to produce significant improvements. These findings are useful for future successful implementation of PALS, but they can also help guide the timing and dosage of other interventions that aim to change particular parent behaviors and child outcomes.

Contextual Factors

Several environmental, familial, and child factors can affect the relation between children’s wellbeing and parental sensitivity and nurturance. As we’ve noted, socioeconomic and sociodemographic characteristics strongly influence sensitive parenting’s outcomes. Poverty during adolescence predicts lower resting-state functional connectivity in neural networks associated with cognitive control and emotion regulation, but only for adolescents who also experienced less-supportive parental care. And though poverty tends to predict less-sensitive parenting, sensitive and nurturing parenting behaviors can also protect children from the biological and behavioral consequences of poverty. What’s more, community violence and experiences of racial discrimination may alter the meaning and consequences of parental sensitivity. One great concern today is how cell phones and social media apps affect parenting and child development. Correlational evidence suggests that when parents use these devices while they’re with their children, parent-child interactions decrease and children learn and remember less from those interactions. However, we need

intervention studies to understand whether this association is causal.

Parenting behaviors that engender attachment security may differ across countries and cultures.

Different cultural perspectives and traditions surrounding caregiving also affect parents' sensitivity, in both how they display sensitivity behaviorally and the child characteristics parental sensitivity is associated with. Attachment security, a characteristic of the parent-child relationship that's commonly associated with parental sensitivity, is present at similar rates in many countries. But the parenting behaviors that engender attachment security may differ across countries and cultures. Families that embrace particular cultural values tend to display different parenting styles, and these different styles may predict positive child wellbeing based on a given family's cultural perspectives and values. Still, parental sensitivity has been similarly associated with positive outcomes in children across racial and ethnic groups. Results may vary based on whether a given racial/ethnic group is a majority or minority group in the region in which it's assessed. For racial/ethnic minorities, the stress of poverty and discrimination may affect parents' ability to provide sensitive, nurturing care; it may also shift priorities to different parenting strategies. To accurately evaluate and interpret associations between parenting behaviors and child wellbeing, we must consider

demographic, cultural, and socioeconomic aspects of the children's environments without assuming that Western majority-culture parenting is the baseline from which other cultures diverge.

Aside from socioeconomic and cultural factors, characteristics of the parents themselves—such as self-regulation, mental health, and history of trauma or adversity—can affect their ability to provide sensitive, nurturing care. For example, depressed parents as well as their partners are less likely to display sensitivity and nurturance, which can affect children's own mental health. We see similar patterns for parents who were maltreated in their own childhood. This intergenerational transmission of adversity and mental disorder seems to be due, at least in part, to the impact of early adversity and mental health problems on parents' ability to provide sensitive, nurturing care. Also, parents with poor self-regulation skills—such as lower executive function, poor emotion regulation, or excessive or dysregulated stress reactivity—are less able to respond sensitively and appropriately to their children's cues, especially when they themselves are under stress. Both trauma history and mental health symptoms can lead to poor self-regulation in parents, and these stress-related parental factors likely influence one another, increasing the risk of displaying insensitive, non-nurturing parenting. Policies that don't adequately mitigate parent stress, like insufficient paid family leave (see the article in this issue by Maya Rossin-Slater and Jenna Stearns) or ineffective involvement by child protective services (for example, through unstable child placements) exacerbate these risk factors and increase the risk of displaying insensitive parenting.

Children's personal characteristics also affect parenting and, at the same time, affect a child's susceptibility to different degrees of parental sensitivity. Children with difficult temperaments (for example, high negative emotionality and relatively low flexibility/adaptability in the face of change) tend to elicit less sensitive parenting and more harsh parenting. At the same time, the cognitive and social competence outcomes of those children are more dependent on parental sensitivity. Furthermore, though harsh and insensitive parenting tends to predict difficult temperament, impulsivity, and general tendencies toward negative emotionality, the reverse is also true: infants with difficult temperaments, impulsivity, and negative emotionality seem to elicit less sensitive, nurturing care from parents. Aside from temperamental traits, evidence also suggests that excessive or prolonged physiological stress reactivity increases children's risk for behavior problems if they also experience insensitive caregiving, such as maltreatment or intrusive parenting. And though one study showed that earlier maternal sensitivity (measured when children were 54 months old) predicted later child prosocial behavior, it also showed that prosocial behavior in turn predicted future maternal sensitivity. These studies demonstrate that the parent not only influences the child, the child influences the parent as well. The parent-child relationship is shaped not just by sociocultural factors, but also by dynamic, bidirectional processes that exert lifelong impacts on children's health and wellbeing.

Policy Implications

First, we must take advantage of existing parental sensitivity interventions that have demonstrated significant positive

effects for children and families. At a basic level, these interventions should be made available in as many communities as possible, with an eye toward personalization so that each family receives the services that will be most effective for them, and at the right time. Policies tailored to the specific demographic, socioeconomic, and cultural makeup of each community may have the most meaningful public health impacts. Using a variety of delivery methods, ranging from real-time individualized feedback during parent-child interactions to broader population-level public awareness campaigns, will likely increase uptake by community organizations and families. Communities can also capitalize on existing infrastructure by incorporating more potent real-time feedback interventions into programs like Head Start and other social services. Finally, policies that improve parents' wellbeing can be expected to initiate cascading positive effects for children, families, and communities. These policies might include, but aren't limited to, improved paid family leave, better-coordinated child protective services involvement, screening and treatment of postpartum/parent depression and other mental health disorders, and efforts to reduce stress related to poverty and discrimination.

Conclusions

Clearly, parental sensitivity and nurturance have a strong impact on children's biological, behavioral, and socioemotional wellbeing. Sensitive, nurturing care means prompt, contingent, appropriate, child-directed behaviors that are matched to the child's cues. Thus insensitivity can refer both to overcontrolling, intrusive

behaviors and to neglectful, unsupportive behaviors. Parental sensitivity predicts a host of positive child outcomes, and increasingly positive outcomes over time. And when it's applied during the earliest years of a child's life—from before birth to age three—parental sensitivity seems to have the largest impact over time, even when accounting for later parenting behaviors. Sensitive, nurturing care can also buffer the effects of early stress and trauma on children's physiological

and psychological health. Intervening to enhance parental sensitivity has provided strong evidence supporting the causal, not just correlational, link between parental sensitivity and child wellbeing. The time has come to use these well-documented findings to implement bold policies and prevention/intervention initiatives that best support families and communities at risk of poor physiological and psychological health.

Endnotes

1. Sarah Cusick and Michael K. Georgieff, "The First 1,000 Days of Life: The Brain's Window of Opportunity," UNICEF Office of Research–Innocenti, <https://www.unicef-irc.org/article/958-the-first-1000-days-of-life-the-brains-window-of-opportunity.html>.
2. Donelda J. Stayton and Mary D. Ainsworth, "Individual Differences in Infant Responses to Brief, Everyday Separations as Related to Other Infant and Maternal Behaviors," *Developmental Psychology* 9 (1973): 226–35 (quote p. 228), <https://doi.org/10.1037/h0035089>.
3. Kristin Bernard, E. B. Meade, and Mary Dozier, "Parental Synchrony and Nurturance as Targets in an Attachment Based Intervention: Building upon Mary Ainsworth's Insights about Mother-Infant Interaction," *Attachment & Human Development* 15 (2013): 507–23, <https://doi.org/10.1080/14616734.2013.820920>.
4. Ruth Feldman, "Parent-Infant Synchrony and the Construction of Shared Timing: Physiological Precursors, Developmental Outcomes, and Risk Conditions," *Journal of Child Psychology and Psychiatry* 48 (2007): 329–54 (quote p. 329), <https://doi.org/10.1111/j.1469-7610.2006.01701.x>.
5. Maayan Davidov and Joan E. Grusec, "Untangling the Links of Parental Responsiveness to Distress and Warmth to Child Outcomes," *Child Development* 77 (2006): 44–58, <https://doi.org/10.1111/j.1467-8624.2006.00855.x>.
6. For example, Mary D. Salter Ainsworth, Silvia M. V. Bell, and Donelda J. Stayton, "Individual Differences in Strange-Situational Behaviour of One-Year-Olds," in *The Origins of Human Social Relations*, ed. H. Rudolph Shaffer (London: Academic Press, 1971), 17–57.
7. For example, Greg Moran et al., "Both Maternal Sensitivity and Atypical Maternal Behavior Independently Predict Attachment Security and Disorganization in Adolescent Mother–Infant Relationships," *Infant Behavior and Development* 31 (2008): 321–5, <https://doi.org/10.1016/j.infbeh.2007.12.012>.
8. For example, Vandhana Choenni et al., "The Longitudinal Relation between Observed Maternal Parenting in the Preschool Period and the Occurrence of Child ADHD Symptoms in Middle Childhood," *Journal of Abnormal Child Psychology* 47 (2019): 755–64, <https://doi.org/10.1007/s10802-018-0492-9>; Elizabeth Meins et al., "Rethinking Maternal Sensitivity: Mothers' Comments on Infants' Mental Processes Predict Security of Attachment at 12 Months," *Journal of Child Psychology and Psychiatry and Allied Disciplines* 42 (2001): 637–48.
9. For example, Kristin Bernard et al., "CPS-Referred Mothers' Psychophysiological Responses to Own versus Other Child Predict Sensitivity to Child Distress," *Developmental Psychology* 54, no. 7 (2018): 1255–64, <https://doi.org/10.1037/dev0000508>; Franziska Köhler-Dauner et al., "Maternal Behavior Affects Child's Attachment-Related Cortisol Stress Response," *Journal of Child and Adolescent Psychiatry* 1 (2019): 46–60, <https://doi.org/10.14302/issn.2643-6655.jcap-19-2737>.
10. John D. Haltigan, Glenn I. Roisman, and R. Chris Fraley, "The Predictive Significance of Early Caregiving Experiences for Symptoms of Psychopathology through Midadolescence: Enduring or Transient Effects?" *Development and Psychopathology* 25 (2013): 209–21, <https://doi.org/10.1017/S0954579412000260>; Rianne Kok et al., "Parenting, Corpus Callosum, and Executive Function in Preschool Children," *Child Neuropsychology* 20 (2014): 583–606, <https://doi.org/10.1080/09297049.2013.832741>; K. Lee Raby et al., "The Enduring Predictive Significance of Early Maternal Sensitivity: Social and Academic Competence through Age 32 Years," *Child Development* 86 (2015): 695–708, <https://doi.org/10.1111/cdev.12325>; Catherine S. Tamis-LeMonda, Marc H. Bornstein, and Lisa Baumwell, "Maternal Responsiveness and Children's Achievement of Language Milestones," *Child Development* 72 (2001): 748–67, <https://doi.org/10.1111/1467-8624.00313>.

11. Carrie E. DePasquale et al., "Parenting Predicts Strange Situation Cortisol Reactivity among Children Adopted Internationally," *Psychoneuroendocrinology* 89 (2018): 86–91, <https://doi.org/10.1016/j.psyneuen.2018.01.003>; Anja van der Voort et al., "The Development of Adolescents' Internalizing Behavior: Longitudinal Effects of Maternal Sensitivity and Child Inhibition," *Journal of Youth and Adolescence* 43 (2014): 528–40, <https://doi.org/10.1007/s10964-013-9976-7>.
12. Rianne Kok et al., "Normal Variation in Early Parental Sensitivity Predicts Child Structural Brain Development," *Journal of the American Academy of Child & Adolescent Psychiatry* 54 (2015): 824–31, <https://doi.org/10.1016/j.jaac.2015.07.009>; Jeannette Milgrom et al., "Early Sensitivity Training for Parents of Preterm Infants: Impact on the Developing Brain," *Pediatric Research* 67 (2010): 330–5, <https://doi.org/10.1203/PDR.0b013e3181cb8e2f>.
13. Clancy Blair et al., "Salivary Cortisol Mediates Effects of Poverty and Parenting on Executive Functions in Early Childhood," *Child Development* 82 (2011): 1970–84, <https://doi.org/10.1111/j.1467-8624.2011.01643.x>.
14. Haltigan et al., "Predictive Significance."
15. et al., "Enduring Predictive Significance."
16. Jay Belsky and R. M. Pasco Fearon, "Early Attachment Security, Subsequent Maternal Sensitivity, and Later Child Development: Does Continuity in Development Depend upon Continuity of Caregiving?," *Attachment & Human Development* 4 (2002): 361–87, <https://doi.org/10.1080/14616730210167267>.
17. Bryan Kolb and Robbin Gibb, "Brain Plasticity and Behaviour in the Developing Brain," *Journal of the Canadian Academy of Child and Adolescent Psychiatry* 20 (2011): 265–76.
18. Marco Del Giudice, Bruce J. Ellis, and Elizabeth A. Shirtcliff, "The Adaptive Calibration Model of Stress Responsivity," *Neuroscience & Biobehavioral Reviews* 35 (2011): 1562–92, <https://doi.org/10.1016/j.neubiorev.2010.11.007>; Bruce J. Ellis, Albertine J. Oldehinkel, and Esther Nederhof, "The Adaptive Calibration Model of Stress Responsivity: An Empirical Test in the Tracking Adolescents' Individual Lives Survey Study," *Development and Psychopathology* 29 (2017): 1001–21, <https://doi.org/10.1017/S0954579416000985>.
19. Carrie E. DePasquale and Megan R. Gunnar, "Stress, Development, and Well-Being," in *Handbook of Well-Being*, ed. Ed Diener, Shigehiro Oishi, and Louis Tay (Salt Lake City, UT: DEF Publishers, 2018), <https://www.nobascholar.com/chapters/23>.
20. L. Alan Sroufe and Everett Waters, "Attachment as an Organizational Construct," *Child Development* 48 (1977): 1184–99; Camelia E. Hostinar, Regina M. Sullivan, and Megan R. Gunnar, "Psychobiological Mechanisms Underlying the Social Buffering of the Hypothalamic-Pituitary-Adrenocortical Axis: A Review of Animal Models and Human Studies across Development," *Psychological Bulletin* 140 (2014): 256–82, <https://doi.org/10.1037/a0032671>.
21. DePasquale and Gunnar, "Stress, Development, and Well-Being"; Ellis, Oldehinkel, and Nederhof, "Adaptive Calibration Model"; Hostinar, Sullivan, and Gunnar, "Psychobiological Mechanisms."
22. Marianne S. De Wolff and Marinus H. van IJzendoorn, "Sensitivity and Attachment: A Meta-Analysis on Parental Antecedents of Infant Attachment," *Child Development* 68 (1997): 571–91, <https://doi.org/10.1111/j.1467-8624.1997.tb04218.x>.
23. For a review, see Kenna E. Ranson and Liana J. Urichuk, "The Effect of Parent-Child Attachment Relationships on Child Biopsychosocial Outcomes: A Review," *Early Child Development and Care* 178 (2008): 129–52, <https://doi.org/10.1080/03004430600685282>.
24. Galit Halevi et al., "The Social Transmission of Risk: Maternal Stress Physiology, Synchronous Parenting, and Well-Being Mediate the Effects of War Exposure on Child Psychopathology," *Journal of Abnormal Psychology* 126 (2017): 1087–1103, <https://doi.org/10.1037/abn0000307>; Amanda Sheffield Morris et al.,

- “Targeting Parenting in Early Childhood: A Public Health Approach to Improve Outcomes for Children Living in Poverty,” *Child Development* 88 (2017): 388–97, <https://doi.org/10.1111/cdev.12743>.
25. H. Brody et al., “The Protective Effects of Supportive Parenting on the Relationship between Adolescent Poverty and Resting-State Functional Brain Connectivity during Adulthood,” *Psychological Science* 30 (2019): 1040–9, <https://doi.org/10.1177/0956797619847989>.
26. Christine Firk et al., “Cognitive Development in Children of Adolescent Mothers: The Impact of Socioeconomic Risk and Maternal Sensitivity,” *Infant Behavior & Development* 50 (2018): 238–46, <https://doi.org/10.1016/j.infbeh.2018.02.002>.
27. Ronald L. Simons et al., “Supportive Parenting Moderates the Effect of Discrimination upon Anger, Hostile View of Relationships, and Violence among African American Boys,” *Journal of Health and Social Behavior* 47, no. 4 (2006): 373–89, <https://doi.org/10.1177/002214650604700405>.
28. Judi Mesman, Marinus H. van IJzendoorn, and Marian J. Bakermans-Kranenburg, “Unequal in Opportunity, Equal in Process: Parental Sensitivity Promotes Positive Child Development in Ethnic Minority Families,” *Child Development Perspectives* 6 (2012): 239–50, <https://doi.org/10.1111/j.1750-8606.2011.00223.x>.
29. Rita Baião et al., “Child’s Oxytocin Response to Mother-Child Interaction: The Contribution of Child Genetics and Maternal Behavior,” *Psychoneuroendocrinology* 102 (2019): 79–83, <https://doi.org/10.1016/j.psyneuen.2018.11.022>; Kok et al., “Parenting, Corpus Callosum”; Susan H. Landry, Karen E. Smith, and Paul R. Swank, “Responsive Parenting: Establishing Early Foundations for Social, Communication, and Independent Problem-Solving Skills,” *Developmental Psychology* 42 (July 06, 2006): 627–42, <https://doi.org/10.1037/0012-1649.42.4.627>; Natalie V. Miller et al., “Investigation of a Developmental Pathway from Infant Anger Reactivity to Childhood Inhibitory Control and ADHD Symptoms: Interactive Effects of Early Maternal Caregiving,” *Journal of Child Psychology and Psychiatry* 60 (2019): 762–72, <https://doi.org/10.1111/jcpp.13047>.
30. Jenalee R. Doom et al., “Adolescent Internalizing, Externalizing, and Social Problems Following Iron Deficiency at 12–18 Months: The Role of Maternal Responsiveness,” *Child Development* 91 (2020): e545–62, <https://doi.org/10.1111/cdev.13266>.
31. Alan Carr, Hollie Duff, and Fiona Craddock, “A Systematic Review of the Outcome of Child Abuse in Long-Term Care,” *Trauma, Violence, & Abuse* 21 (2020): 660–77, <https://doi.org/10.1177/1524838018789154>.
32. Dylan G. Gee et al., “Early Developmental Emergence of Human Amygdala–Prefrontal Connectivity after Maternal Deprivation,” *Proceedings of the National Academy of Sciences* 110 (2013): 15638–43, <https://doi.org/10.1073/pnas.1307893110>.
33. Michelle R. VanTieghem and Nim Tottenham, “Neurobiological Programming of Early Life Stress: Functional Development of Amygdala–Prefrontal Circuitry and Vulnerability for Stress-Related Psychopathology,” in *Behavioral Neurobiology of PTSD*, ed. Eric Vermetten, Dewleen G. Baker, and Victoria B. Risbrough, Current Topics in Behavioral Neurosciences 38 (Cham, Switzerland: Springer, 2018), 117–36, https://doi.org/10.1007/7854_2016_42.
34. Lenneke Alink et al., “Maternal Sensitivity Moderates the Relation between Negative Discipline and Aggression in Early Childhood,” *Social Development* 18 (2009): 99–120, <https://doi.org/10.1111/j.1467-9507.2008.00478.x>; Vonnie C. McLoyd and Julia Smith, “Physical Discipline and Behavior Problems in African American, European American, and Hispanic Children: Emotional Support as a Moderator,” *Journal of Marriage and Family* 64 (2002): 40–53, <https://doi.org/10.1111/j.1741-3737.2002.00040.x>; Adam Vakrat, Yael Apter-Levy, and Ruth Feldman, “Sensitive Fathering Buffers the Effects of Chronic Maternal Depression on Child Psychopathology,” *Child Psychiatry and Human Development* 49 (2018): 779–85, <https://doi.org/10.1007/s10578-018-0795-7>.

35. Rebecca M. Ryan, Anne Martin, and Jeanne Brooks-Gunn, "Is One Good Parent Good Enough? Patterns of Mother and Father Parenting and Child Cognitive Outcomes at 24 and 36 Months," *Parenting: Science and Practice* 6 (2006): 211–28, https://doi.org/10.1207/s15327922par0602&3_5.
36. Leah C. Hibbel et al., "Maternal Sensitivity Buffers the Adrenocortical Implications of Intimate Partner Violence Exposure during Early Childhood," *Development and Psychopathology* 23 (2011): 689–701, <https://doi.org/10.1017/S0954579411000010>; Nan Zhou, Hongjian Cao, and Esther M. Leerkes, "Interparental Conflict and Infants' Behavior Problems: The Mediating Role of Maternal Sensitivity," *Journal of Family Psychology* 31 (2017): 464–74, <https://doi.org/10.1037/fam0000288>.
37. Jennifer A. Mortensen and Melissa A. Barnett, "Intrusive Parenting, Teacher Sensitivity, and Negative Emotionality on the Development of Emotion Regulation in Early Head Start Toddlers," *Infant Behavior & Development* 55 (2019): 10–21, <https://doi.org/10.1016/j.infbeh.2019.01.004>; Lindsey C. Partington et al., "Parental Overcontrol x *OPRM1* Genotype Interaction Predicts School-Aged Children's Sympathetic Nervous System Activation in Response to Performance Challenge," *Research in Developmental Disabilities* 82 (2018): 39–52, <https://doi.org/10.1016/j.ridd.2018.04.011>.
38. Guy Roth et al., "The Emotional and Academic Consequences of Parental Conditional Regard: Comparing Conditional Positive Regard, Conditional Negative Regard, and Autonomy Support as Parenting Practices," *Developmental Psychology* 45 (2009): 1119–42, <https://doi.org/10.1037/a0015272>.
39. M. Dotterer and Katie Lowe, "Perceived Discrimination, Parenting, and Academic Adjustment among Racial/Ethnic Minority Adolescents," *Journal of Applied Developmental Psychology* 41 (2015): 71–7, <https://doi.org/10.1016/j.appdev.2015.08.003>; Brenda Harvey et al., "Risk and Protective Factors for Autonomy-Supportive and Controlling Parenting in High-Risk Families," *Journal of Applied Developmental Psychology* 43 (2016): 18–28, <https://doi.org/10.1016/j.appdev.2015.12.004>.
40. Juffer et al., "Early Intervention in Adoptive Families: Supporting Maternal Sensitive Responsiveness, Infant–Mother Attachment, and Infant Competence," *Journal of Child Psychology and Psychiatry* 38 (1997): 1039–50, <https://doi.org/10.1111/j.1469-7610.1997.tb01620.x>; Monica Kim, Susan S. Woodhouse, and Chenchen Dai, "Learning to Provide Children with a Secure Base and a Safe Haven: The Circle of Security-Parenting (COS-P) Group Intervention," *Journal of Clinical Psychology* 74 (2018): 1319–32, <https://doi.org/10.1002/jclp.22643>; Ellen Moss et al., "Efficacy of a Home-Visiting Intervention Aimed at Improving Maternal Sensitivity, Child Attachment, and Behavioral Outcomes for Maltreated Children: A Randomized Control Trial," *Development and Psychopathology* 23 (2011): 195–210, <https://doi.org/10.1017/S0954579410000738>; Rae Thomas and Melanie J. Zimmer-Gembeck, "Behavioral Outcomes of Parent-Child Interaction Therapy and Triple P—Positive Parenting Program: A Review and Meta-Analysis," *Journal of Abnormal Child Psychology* 35 (2007): 475–95, <https://doi.org/10.1007/s10802-007-9104-9>; Jantien Van Zeijl et al., "Attachment-Based Intervention for Enhancing Sensitive Discipline in Mothers of 1- to 3-Year-Old Children at Risk for Externalizing Behavior Problems: A Randomized Controlled Trial," *Journal of Consulting and Clinical Psychology* 74 (2006): 994–1005, <https://doi.org/10.1037/0022-006X.74.6.994>.
41. Mark Chaffin et al., "Parent-Child Interaction Therapy with Physically Abusive Parents: Efficacy for Reducing Future Abuse Reports," *Journal of Consulting and Clinical Psychology* 72 (2004): 500–10, <https://doi.org/10.1037/0022-006X.72.3.500>; Matthew Sanders and Aileen Pidgeon, "The Role of Parenting Programmes in the Prevention of Child Maltreatment," *Australian Psychologist* 46 (2011): 199–209, <https://doi.org/10.1111/j.1742-9544.2010.00012.x>; Thomas and Zimmer-Gembeck, "Behavioral Outcomes."
42. Kimberly S. Howard and Jeanne Brooks-Gunn, "The Role of Home-Visiting Programs in Preventing Child Abuse and Neglect," *Future of Children* 19, no. 2 (2009): 119–46, <https://doi.org/10.1353/foc.0.0032>.
43. Mary Dozier, Elizabeth Meade, and Kristin Bernard, "Attachment and Biobehavioral Catch-Up: An Intervention for Parents at Risk of Maltreating Their Infants and Toddlers," in *Evidence-Based Approaches for the Treatment of Maltreated Children*, ed. Susan Timmer and Anthony Urquiza

- (Dordrecht, Netherlands: Springer, 2014), 43–59; Ronald J. Prinz et al., “Population-Based Prevention of Child Maltreatment: The U.S. Triple P System Population Trial,” *Prevention Science* 10 (2009): 1–12, <https://doi.org/10.1007/s11121-009-0123-3>; Thomas and Zimmer-Gembeck, “Behavioral Outcomes.”
44. Lisa J. Berlin, Tiffany L. Martoccio, and Brenda Jones Harden, “Improving Early Head Start’s Impacts on Parenting through Attachment-Based Intervention: A Randomized Controlled Trial,” *Developmental Psychology* 54 (2018): 2316–27, <https://doi.org/10.1037/dev0000592>.
 45. Robert H. Bradley and Robert F. Corwyn, “Externalizing Problems in Fifth Grade: Relations with Productive Activity, Maternal Sensitivity, and Harsh Parenting from Infancy through Middle Childhood,” *Developmental Psychology* 43 (2007): 1390–1401, <https://doi.org/10.1037/0012-1649.43.6.1390>; Catherine S. Tamis-LeMonda et al., “Maternal Control and Sensitivity, Child Gender, and Maternal Education in Relation to Children’s Behavioral Outcomes in African American Families,” *Journal of Applied Developmental Psychology* 30 (2009): 321–31, <https://doi.org/10.1016/j.appdev.2008.12.018>.
 46. Elysia Poggi Davis et al., “Exposure to Unpredictable Maternal Sensory Signals Influences Cognitive Development across Species,” *Proceedings of the National Academy of Sciences* 114 (2017): 10390–5, <https://doi.org/10.1073/pnas.1703444114>; Joan L. Luby et al., “Preschool Is a Sensitive Period for the Influence of Maternal Support on the Trajectory of Hippocampal Development,” *Proceedings of the National Academy of Sciences* 113 (2016): 5742–7, <https://doi.org/10.1073/pnas.1601443113>.
 47. Lenneke et al., “Maternal Sensitivity.”
 48. Dante Cicchetti and Sheree L. Toth, “Child Maltreatment and Developmental Psychopathology: A Multilevel Perspective,” in *Developmental Psychopathology Vol. 3: Maladaptation and Psychopathology*, ed. Dante Cicchetti (Hoboken, NJ: John Wiley & Sons, 2016), 457–512.
 49. Isabela Granic, “Timing Is Everything: Developmental Psychopathology from a Dynamic Systems Perspective,” *Developmental Review* 25 (2005): 386–407, <https://doi.org/10.1016/j.dr.2005.10.005>.
 50. Linda M. Collins, Susan A. Murphy, and Victor Strecher, “The Multiphase Optimization Strategy (MOST) and the Sequential Multiple Assignment Randomized Trial (SMART): New Methods for More Potent eHealth Interventions,” *American Journal of Preventive Medicine* 32 (2007): S112–18, <https://doi.org/10.1016/j.amepre.2007.01.022>.
 51. Susan H. Landry et al., “A Responsive Parenting Intervention: The Optimal Timing across Early Childhood for Impacting Maternal Behaviors and Child Outcomes,” *Developmental Psychology* 44 (2008): 1335–53, <https://doi.org/10.1037/a0013030>.
 52. Brody et al., “Protective Effects.”
 53. Blair et al., “Salivary Cortisol”; Joan Luby et al., “The Effects of Poverty on Childhood Brain Development: The Mediating Effect of Caregiving and Stressful Life Events,” *JAMA Pediatrics* 167 (2013): 1135–42, <https://doi.org/10.1001/jamapediatrics.2013.3139>; Morris et al., “Targeting Parenting.”
 54. Riana E. Anderson et al., “Pathways to Pain: Racial Discrimination and Relations between Parental Functioning and Child Psychosocial Well-Being,” *Journal of Black Psychology* 41 (2015): 491–512, <https://doi.org/10.1177/0095798414548511>; Dotterer and Lowe, “Perceived Discrimination.”
 55. Cory A. Kildare and Wendy Middlemiss, “Impact of Parents’ Mobile Device Use on Parent-Child Interaction: A Literature Review,” *Computers in Human Behavior* 75 (2017): 579–93, <https://doi.org/10.1016/j.chb.2017.06.003>; Jessa Reed, Kathy Hirsh-Pasek, and Roberta M. Golinkoff, “Learning on Hold: Cell Phones Sidetrack Parent-Child Interactions,” *Developmental Psychology* 53 (2017): 1428–36, <https://doi.org/10.1037/dev0000292>.
 56. Judi Mesman, Marinus H. van IJzendoorn, and Abraham Sagi-Schwartz, “Cross-Cultural Patterns of Attachment: Universal and Contextual Dimensions,” in *Handbook of Attachment: Theory, Research, and Clinical Applications*, ed. Jude Cassidy and Phillip R. Shaver (New York: Guilford, 2016), 852–877.

57. Nicole E. Mahrer et al., "Parenting Style, Familism, and Youth Adjustment in Mexican American and European American Families," *Journal of Cross-Cultural Psychology* 50 (2019): 659–75, <https://doi.org/10.1177/0022022119839153>.
58. Betty Lin et al., "Ontogeny of Emotional and Behavioral Problems in a Low-Income, Mexican American Sample," *Developmental Psychology* 53 (2017): 2245–60, <https://doi.org/10.1037/dev0000391>; Elissa Scherer et al., "The Relationship between Responsive Caregiving and Child Outcomes: Evidence from Direct Observations of Mother-Child Dyads in Pakistan," *BMC Public Health* 19 (2019): 252, <https://doi.org/10.1186/s12889-019-6571-1>; Tamis-LeMonda et al., "Maternal Control."
59. Anderson et al., "Pathways to Pain."
60. Vakrat, Apter-Levy, and Feldman, "Sensitive Fathering."
61. Jessica Pereira et al., "Parenting Stress Mediates between Maternal Maltreatment History and Maternal Sensitivity in a Community Sample," *Child Abuse & Neglect* 36 (2012): 433–7, <https://doi.org/10.1016/j.chiabu.2012.01.006>.
62. Katja Bödeker et al., "Impact of Maternal Early Life Maltreatment and Maternal History of Depression on Child Psychopathology: Mediating Role of Maternal Sensitivity?," *Child Psychiatry and Human Development* 50 (2019): 278–90, <https://doi.org/10.1007/s10578-018-0839-z>; Jolien Rijlaarsdam et al., "Maternal Childhood Maltreatment and Offspring Emotional and Behavioral Problems: Maternal and Paternal Mechanisms of Risk Transmission," *Child Maltreatment* 19 (2014): 67–78, <https://doi.org/10.1177/1077559514527639>.
63. David J. Bridgett et al., "Maternal Executive Functioning as a Mechanism in the Intergenerational Transmission of Parenting: Preliminary Evidence," *Journal of Family Psychology* 31 (2017): 19–29, <https://doi.org/10.1037/fam0000264>; W. Roger Mills-Koonce et al., "Psychophysiological Correlates of Parenting Behavior in Mothers of Young Children," *Developmental Psychobiology* 51 (2009): 650–61, <https://doi.org/10.1002/dev.20400>; Diana Morelen, Anne Shaffer, and Cynthia Suveg, "Maternal Emotion Regulation: Links to Emotion Parenting and Child Emotion Regulation," *Journal of Family Issues* 37 (2016): 1891–1916, <https://doi.org/10.1177/0192513X14546720>; Melissa L. Sturge-Apple et al., "The Impact of Allostatic Load on Maternal Sympathovagal Functioning in Stressful Child Contexts: Implications for Problematic Parenting," *Development and Psychopathology* 23 (2011): 831–44, <https://doi.org/10.1017/S0954579411000332>.
64. Robert H. Bradley and Robert F. Corwyn, "Infant Temperament, Parenting, and Externalizing Behavior in First Grade: A Test of the Differential Susceptibility Hypothesis," *Journal of Child Psychology and Psychiatry* 49 (2008): 124–31, <https://doi.org/10.1111/j.1469-7610.2007.01829.x>; Anne Dopkins Stright, Kathleen Cranley Gallagher, and Ken Kelley, "Infant Temperament Moderates Relations between Maternal Parenting in Early Childhood and Children's Adjustment in First Grade," *Child Development* 79 (2008): 186–200, <https://doi.org/10.1111/j.1467-8624.2007.01119.x>.
65. Cara J. Kiff, Liliana J. Lengua, and Maureen Zalewski, "Nature and Nurturing: Parenting in the Context of Child Temperament," *Clinical Child and Family Psychology Review* 14, (2011): 251–301, <https://doi.org/10.1007/s10567-011-0093-4>.
66. Kristen L. Rudd, Abbey Alkon, and Tuppett M. Yates, "Prospective Relations between Intrusive Parenting and Child Behavior Problems: Differential Moderation by Parasympathetic Nervous System Regulation and Child Sex," *Physiology & Behavior* 180 (2017): 120–30, <https://doi.org/10.1016/j.physbeh.2017.08.014>; Elizabeth A. Skowron et al., "Early Adversity, RSA, and Inhibitory Control: Evidence of Children's Neurobiological Sensitivity to Social Context," *Developmental Psychobiology* 56 (2014): 964–78, <https://doi.org/10.1002/dev.21175>.
67. Emily K. Newton et al., "Do Sensitive Parents Foster Kind Children, or Vice Versa? Bidirectional Influences Between Children's Prosocial Behavior and Parental Sensitivity," *Developmental Psychology* 50 (2014): 1808–16, <https://doi.org/10.1037/a0036495>.

Parental Language and Learning Directed to the Young Child

Dina Kapengut and Kimberly G. Noble

Summary

The early home language environment, and parents in particular, form the foundation of children's language development. In this article, Dina Kapengut and Kimberly Noble explore the intersection of neuroscience and developmental psychology to explain how language experiences in the home, and the *home learning environment* more broadly, shape young children's brains and, ultimately, their developmental and academic outcomes.

Brain plasticity during childhood makes the brain particularly sensitive to environmental influence. Because socioeconomic inequality is associated with variation in environmental exposures and experiences that are particularly powerful in predicting children's outcomes, the authors write, children from socially and economically disadvantaged backgrounds are at a profoundly increased risk for negative physical, socioemotional, cognitive, and academic outcomes. This harmful pattern emerges early, compounds over time, and persists into adulthood.

Fortunately, a number of interventions show promise for helping parents improve the home learning environment. Kapengut and Noble highlight several evidence-based programs, most of which focus on the concept of *language nutrition*—a term created by pediatricians to explain to caregivers that exposure to language that's rich in quality and quantity and delivered in the context of social interactions is crucial for children's development and health. They also note the limitations of existing programs and of the research behind them, and they suggest where policy makers, practitioners, and researchers could look to narrow socioeconomic-related differences in home learning environments.

www.futureofchildren.org

Dina Kapengut received her PhD in developmental psychology from Teachers College, Columbia University in May 2020. Kimberly G. Noble, a board-certified pediatrician, is a professor of neuroscience and education at Teachers College, Columbia University, where she directs the Neurocognition, Early Experience and Development (NEED) lab.

Child development is the product of the continuous dynamic interplay of biological factors, environmental contexts, and social relationships that a child experiences from the beginning of life. Parents are children's first and most important teachers, providing the at-home context through which children investigate the world, thereby creating a blueprint for learning and behavior. This *home learning environment* reflects a child's interactions in and around the home and contributes substantially to children's learning and overall development. Differences in the home learning environment, especially differences between lower- and higher-income families, play an important role in children's academic and eventual economic success.

The incorporation of neuroscience into developmental science has helped us better understand the link between experience and development. The young brain is physiologically predisposed to attend to certain aspects of the environment, particularly interactions with caregivers. The influence of the home learning environment on children's learning and achievement likely arises from specific downstream experiential effects on structural brain development. That is, the home learning environment comprises parenting and family experiences, which ultimately shape the young child's brain.

Examining the early influences on academic achievement that occur before the start of school can help policy makers, professionals, and parents understand how the home learning environment and

interactions with young children affect language development and overall school readiness.

The Importance of the Home Learning Environment

The home learning environment encompasses an array of characteristics, including hands-on parenting behaviors such as reading to children or exhibiting responsiveness and warmth in interactions, as well as more indirect practices such as making learning materials available in the home. We focus here on literacy and language development, as language skills are among the best predictors of school readiness and academic outcomes. Moreover, linguistic stimulation is a prime candidate mechanism that may link the home environment with children's language-related brain structure and academic outcomes.

Much of the research on language and learning in the home is based on school-age children. We therefore primarily examine parental practices associated with fostering language and emerging literacy skills, while highlighting the rarer findings from research on infants and toddlers. It's important to note that parent-child learning activities may foster development both by helping children with specific skills and by developing the motivation necessary for learning and achievement generally.

Parent-Child Communication and the Home Learning Environment

Language acquisition is a dynamic process by which children construct meaning out of interactions with caregivers. To do so, children must come to recognize that language is a social tool that

enables them to share intentions with those around them. Yet infants aren't inherently aware of social pragmatics, nor are they inherently equipped with the understanding that language is a communication tool. As infants learn that meanings have shared intentionality, they engage in actions that elicit their caregiver's attention and knowledge. They look where their parents look, refer to and seek guidance from parents in ambiguous situations, and use gestures and words to share experiences. Moreover, from birth, infants prefer to listen to infant-directed speech over adult-directed speech, and the perceptual-attentional effects of infant-directed speech are linked to children's later language outcomes. In this way, social interactions with caregivers teach infants that language is socially shared, thereby facilitating their possibilities for and achievement of language acquisition. As such, the social brain is said to "gate" language learning, underscoring the transformational role that parents play in promoting the underlying neural systems needed to acquire language.

University of Kansas researchers Betty Hart and Todd Risley famously estimated that by the age of four, children in lower-income families have heard 30 million fewer words than their more affluent peers. The researchers found that this word gap was strongly associated with children's language outcomes. Three-year-olds in lower-income families had less than half the vocabulary of their counterparts in higher-income families, and the amount of speech that parents directed to their children in the first three years of life accounted for over half of the variance in children's cognitive performance and vocabulary at three and nine years of age.

Furthermore, these at-home differences in linguistic stimulation predicted differences in cognitive development and vocabulary scores, which later translated to differences in academic trajectories.

Children benefit from exposure to frequent, varied, and complex adult speech.

The association between socioeconomic factors and quantity of linguistic stimulation in the home has been extensively investigated. Parents from wealthier backgrounds are likely to talk more with their children, and tend to use more extensive vocabulary, longer sentences, and more complex grammar, than do parents from disadvantaged backgrounds. Longitudinal studies, in which researchers repeatedly observe participants over months or years, further the notion that children benefit from exposure to frequent, varied, and complex adult speech. Comprehensive longitudinal studies have found that the *quality* of language input is often an even stronger predictor of children's language skills. Both the quantity and quality of adult speech that children hear have been found to mediate associations between family socioeconomic status (SES) and children's language skills.

Early communication quality differs within income groups as well. Among low-income families, the quality of language input at age two has been used to predict children's language development at age three. Although a small association has been reported between the quantity of language input and the number of adults with whom

children interact, descriptive studies haven't found a significant difference in language input between single-parent and multiple-parent households, after controlling for socioeconomic factors.

In an analysis of thousands of homes from the 1979 Children of the National Longitudinal Survey of Youth, differences in children's vocabulary were related to the home language environment at age three, and these differences remained stable through the age of 13. Recent research has found further links between infant-directed speech and later language skills. One small study found that even among preterm infants, a greater adult word count in the first months of infancy was associated with higher cognitive and language scores in the first and second years of life. Simply put, differences in the home language environment lead to early differences in language and reading-related skills, which in turn serve as precursors of later academic achievement. One longitudinal investigation of child-directed speech among 50 pairs of parents and children found that quantity of parental input was most important during the child's second year of life, while diversity of parental vocabulary was more important in the third year and the use of abstract language was most important in the fourth year.

Literacy Activities and the Home Learning Environment

Early reciprocal verbal interactions occur through games, nursery rhymes, songs, daily conversations, and book reading, all of which promote foundational literacy skills. This effect may begin as early as the prenatal period: An investigation of 33 mother-infant pairs reported that newborns

preferred a passage that their mothers had read aloud each day during the last six weeks of pregnancy over a novel passage. As infants get older, shared book reading and exposure to print help them learn letters, which affects their later ability to decode words. A review of dozens of published studies on the frequency of shared reading found that joint book reading in the home is associated with children's vocabulary size, phonemic awareness, and overall reading achievement.

In a large-scale study of Early Head Start families, researchers found that daily reading to children in the first, second, and third year of life predicted children's language and cognition at age three. Specifically, analyses suggested a reciprocal and snowballing relationship between mothers' book reading and children's vocabulary—early reading was linked with increased vocabulary, which in turn was associated with more reading. In a similar large-scale investigation of more than three hundred Head Start families, the frequency of shared book reading, earliest age of picture book reading, number of picture books in the home, children's requests for book reading and their play with books, shared trips to the library, and parents' own personal reading habits all accounted for variability in young children's language skills, suggesting that these aspects of the home literacy environment may be prime targets for intervention.

Parental Engagement in the Home Learning Environment

Among infants and young children, exposure to language from television isn't associated with beneficial effects, suggesting that the social element of human interaction is

integral to positive language development. Yet findings show that toddlers can learn new words over video calls, which demonstrates that the key factor of social interaction isn't physical presence, but social contingency. Specifically, toddlers can learn new words over video calls if the conversation is contingent and meaningful, as opposed to noncontingent video. In another study, the quality of infants' vocalizations was directly related to a mother's contingent response, as opposed to a delayed one. Research extends this contingency to newborns, who demonstrably prefer the sound of their mother's voice. These studies suggest that social behaviors associated with infant- and child-directed speech, such as pitch, parental speech characteristics, and responsiveness, likely play a significant role in language development.

One small longitudinal study of parent-child interactions found that the quality of such interactions more closely predicted early literacy skills than did reported home literacy experiences. Recent research corroborates the notion that differences in early language environments aren't limited to the quantity of input but extend to the quality of social interactions and exchange as well. For example, in the same study that identified a 30-million-word gap, Hart and Risley found that children in low-income households heard twice as many prohibitions as affirmative statements from their parents than did children in middle- and upper-income households. Additionally, children in higher-SES families tend to experience more gestures by their caregivers, and differences in early gestures accounted for socioeconomic disparities in children's later vocabulary knowledge. One recent study reported

that the quality of the home language environment, but not SES, predicted infant's early language skills.

Thus, although the overall number of words children hear varies widely and is important, the quality of social language interactions may be an even more powerful predictor of developmental outcomes. (The following section touches on how parental engagement may be the catalyst for children's language acquisition, but see Megan Gunnar and Carrie DePasquale's article in this issue for a more comprehensive review of the effects of parental sensitivity and nurturance.)

Parental responsiveness promotes and modulates infants' communication skills even before the infants produce conventional words. When they begin to babble and then speak simple phrases, responsiveness predicts the size of infants' vocabularies, the diversity of infant communications, and the timing of language milestones. Longitudinal studies have suggested that regardless of socioeconomic background, infants who have highly responsive mothers achieve language milestones—including first words, vocabulary spurt, and combinatorial speech—four to six months earlier than infants of mothers who are less responsive or inconsistently so. Notably, these developmental differences persisted through age eight.

Affective aspects of parent-child interactions and communication, including emotional tone and parental warmth, also relate to child development. A longitudinal investigation of 40 mother-infant pairs found positive associations between warm, sensitive parenting and children's language abilities in infancy. One study of over a hundred families found that one- and two-year-old

children of mothers who were observed to be more sensitive experienced faster rates of development of expressive and receptive language from 18 to 36 months. In early childhood, maternal sensitivity and sensitive parenting have repeatedly been found to be significantly associated with expressive and receptive language and vocabulary scores. Importantly, parental sensitivity isn't simply a measure of cognitive stimulation; in fact, maternal sensitivity and cognitive stimulation are independently related to children's language outcomes at age four.

Among children in lower-SES households, sensitive parenting—or the presence of a supportive caregiver—has consistently been shown to promote more resilient long-term outcomes.

Responsive caregiver-child interactions may facilitate language learning by motivating infants to engage in social interaction. A positive affect on the parents' part promotes learning, whether by increasing attention, fostering enthusiasm in the child, or another mechanism; a negative affect deters learning. Thus parents' strategies that support children's early language skills include a number of language-specific scaffolding behaviors—that is, behaviors that support the child's development and taper off as the support becomes unnecessary, such as emphasizing the names of letters. But these strategies also include behaviors such as positive affect, expressions of warmth through

physical closeness, sensitive voice tones, and appropriate pacing. Given the substantial evidence that sensitive interactions, defined by warmth and responsiveness, predict language abilities, parenting interventions have also promoted parental engagement in the home.

Among children in lower-SES households, sensitive parenting—or the presence of a supportive caregiver—has consistently been shown to promote more resilient long-term outcomes. Specifically, parental warmth and sensitivity can promote reading acquisition in children from low-SES homes, potentially buffering against risk for delays in language skills. A recent study of 145 children found that nurturing care and certain interactive and supportive features of communication (for instance, praise) serve as a buffer against poverty by promoting healthy brain development. Moreover, a study of over four hundred children found that positive caregiver-child language interactions in childcare settings that serve children from disadvantaged backgrounds can buffer against poor language outcomes. This buffering effect was especially strong for children who received limited language input at home.

Critically, the benefits of parenting aren't merely epiphenomena of genetic heritability. Parental sensitivity affects the verbal skills of adopted children, predicts infant learning under laboratory manipulations, and enhances children's language skills in interventions that target responsiveness. Collectively, caregiving drives children's language development; moreover, caregiving is linked with early academic achievement. As such, we need to investigate the paths by which caregiving impacts child outcomes.

Learning Materials in the Home Learning Environment

The home learning environment includes factors beyond direct interactions with parents. For instance, a broad investigation of four-year-olds attending Head Start found that the number of picture books in the home predicted children's language skills and vocabulary. Furthermore, early exposure to toys that promote symbolic or pretend play (such as cooking sets) and fine motor skills (such as blocks) is linked to children's early receptive language skills. Resources that can provide cognitive stimulation or extend the home learning environment into other venues, such as outings to libraries, museums, or parks, have also been linked to improved child outcomes. But compared to research on the role of parental engagement, communication, and early literacy experiences, the research on the effect of learning materials is relatively limited.

Given the ubiquity of digital technologies, learning materials today may include computers, mobile devices, and other electronics, though a full review of the developmental impacts of media is outside the scope of this article. The advantages and disadvantages of media and technology are numerous and hotly debated. But here we're concerned with how technology affects child-directed speech and parental engagement as it relates to the home learning environment. A large investigation based on parental reports found that increased use of digital technology by parents predicted more technology-based interruptions in both mother-child and father-child interactions; in turn, interruptions in mother-child interactions predicted children's conduct,

both emotional and behavioral. In addition, several small studies have linked early television exposure with substantial reductions in the quantity and quality of parent-child interactions, which in turn may be what underlies findings that increased media exposure during childhood is associated with lower language skills. If frequent media exposure disrupts language development by reducing the quality and quantity of parent-child verbal interactions, the rising ubiquity and ever-increasing role of technology in families' lives demands further research on how early technology exposure impacts children's long-term developmental and neural outcomes.

Children's Language Experiences and the Developing Brain

The developing brain undergoes a competitive neural process. Neuronal connections that remain inactive or are rarely activated are eliminated, whereas those that are actively stimulated by experience are strengthened and maintained. In this way the developing brain is remarkably responsive to interactions with the environment, and its structure is altered by such experiences in measurable ways. Simply put, each person's brain comes to reflect a unique experiential history. Thus children's early environmental experiences, including parenting and the home environment, are critical to neurodevelopment. Brain plasticity during childhood makes the brain particularly sensitive to environmental influence, especially that of the social-affective or caregiving environment. In this section we discuss how the home language environment, literacy activities, parental engagement, and learning materials have been associated with changes in both neural

activity and neural structure related to language acquisition.

Much of what we know about how variations in caregiving can affect brain development and behavior is based on animal research. For example, studies show that rats raised in enriched conditions—with numerous toys and cognitively stimulating tunnels and ladders—have greater neural complexity in a number of brain regions than do animals raised in impoverished environments. These changes persist well beyond exposure to the enriched environment.

In infancy, variations in maternal care and parent-child interactions are thought to help shape neural structures and circuits by influencing epigenetic programming—that is, they serve as nongenetic, environmental influences on gene expression. In rodents, for example, increased maternal grooming, which is an attentive and nurturing parental behavior, has been linked with epigenetic and neural changes. Animal studies further suggest that certain effects of life experiences on myelination—a process that speeds the transmission of neural signals—are not found in mature rats, suggesting that there may be a critical period during which alterations in parenting and environment particularly influence specific aspects of brain development. Overall, evidence across species demonstrates that caregivers regulate the neurodevelopment of those in their care.

In humans, family experiences and the home environment influence children's developmental outcomes, and research has shown that the developing brain is especially sensitive to environmental

factors. Socioeconomic inequality is associated with variation in environmental exposures and experiences that are particularly powerful in predicting children's outcomes. Children from socially and economically disadvantaged backgrounds are at a profoundly increased risk for negative physical, socioemotional, cognitive, and academic outcomes. This harmful pattern emerges early, compounds over time, and persists into adulthood.

Socioeconomic factors, including parental education and family income, exert their effects on child development via psychological, social, and environmental contexts, which may then impact brain regions related to cognitive, academic, and social functioning. Recent research shows that socioeconomic background plays a role in shaping children's brain structure and function. For example, socioeconomic disadvantage has been associated with reduced cortical gray matter, as measured in terms of volume, thickness, and surface area. Indeed, poverty has been linked to structural differences in numerous areas of the brain associated with school readiness skills and learning—as much as 20 percent of the observed SES gap in student test scores may be explained by lags in children's neurodevelopment. Such SES-linked changes don't suggest damage; rather, they reveal evidence of neuroplasticity, or the brain's ability to adapt in response to environmental differences, especially during childhood. Thus many neural changes may be not only preventable but also reversible.

Socioeconomic disparities are especially prominent in certain brain structures and circuits. Cortical structures underlying language comprehension, language

production, and reading are among the brain regions most commonly reported to vary by family socioeconomic circumstance.

What experiences account for links between socioeconomic disparities and children's brain structure and function, particularly with regard to regions of the brain that support language and literacy? Parent-child verbal interactions represent a key environmental mechanism that has been repeatedly linked with both family socioeconomic circumstance and children's language development.

One small study found that greater language input was associated with infants' brain responses during a phonological task. Another study reported a relation between children's videotaped home language and neural activation during a complex, nonverbal task. More recently, a functional neuroimaging study of 36 four- to six-year-old children found that at all SES levels, adult-child "conversational turns," in which the adult and child take turns speaking in a back-and-forth interaction, were associated with greater activation of a language-related brain region during a story listening task, but that higher SES was associated with more such turns. At a structural level, a greater number of adult-child conversational turns was related to stronger, more-coherent connectivity in the brain's white matter, even when controlling for SES and the overall amount of adult language input. In a study of gray matter structure among 42 five- to nine-year-olds, children who experienced more conversational turns per hour had significantly greater surface area in language-related brain regions, with a 15 percent larger effect than seen with the number of words spoken hourly by adults. Furthermore, this effect wasn't

driven by the number of vocalizations made by the children on their own, suggesting that the association between conversational turns and children's brain structure didn't merely reflect a mechanism by which talkative children engendered more parental conversation. Taken together, these findings suggest that the reciprocal, back-and-forth nature of conversational turns is notably more important for language development than just the quantity of adult speech.

Reciprocal adult-child interactions seem to be especially important for language development, representing a cornerstone of children's language-related neurobiological development.

Reciprocal adult-child interactions thus seem to be especially important for language development, representing a cornerstone of children's language-related neurobiological development. This effect may occur at least partly because such communicative exchanges increase the opportunities for children to practice language and receive feedback from adults. In turn, this creates a feedback loop to help adults hone their own speech to the level of complexity that best supports children's language development. Moreover, at-home language input has been found to significantly mediate the association between parents' education and children's language-related cortical surface area, and to be indirectly associated with children's reading skills, thereby illustrating a potential mechanism

underlying socioeconomic disparities in children's reading and language. Together, these findings provide support at the neural level for hypotheses about how children's early language experiences at home may alter language-supporting brain structure, affecting children's language and reading outcomes.

SES has been reported to moderate the relationship between phonological awareness and brain activity in language-related regions. Here, the findings suggest that decreased access to resources may amplify risk factors for poor reading, whereas children with greater access to resources had stronger reading skills, irrespective of their phonological awareness scores. Thus language and literacy practices likely have a buffering effect among children with weaker phonological awareness.

Less research has examined how the quality of the physical home environment influences neurodevelopment. But one recent study found that adolescents who faced more physical problems in the home (such as structural hazards, crowding, excessive noise, or poor lighting) had a thinner brain cortex in regions critical to reading and language skills. And, indeed, these neurobiological differences were associated with lower levels of reading achievement, independent of SES and psychosocial factors.

Finally, social interaction is also closely tied to the neural mediators of language learning. Some studies suggest that neuroanatomical maturation may rely critically on social exchanges of linguistic information, rather than purely passive exposure to speech. For instance, engagement with tutors, as shown through shifting eye gaze from the tutor's eyes to newly introduced toys, is

correlated with the brain activation related to language learning. Another recent study with a few dozen nine-month-olds found neural evidence that learning is enhanced in the presence of a peer, even when the learning comes from a video screen. Collectively, these findings suggest that children are motivated by, attend to, and benefit from interactions with attuned, engaging social partners, and that this phenomenon is reflected in the developing brain.

Emerging research also suggests that everyday variation in parenting quality relates to children's brain structure. For example, higher levels of parental sensitivity and parent-child attachment security have been linked with larger total brain and grey matter volumes in children. Most studies investigating the association between parental sensitivity and brain development have examined the hippocampus and other subcortical structures, which aren't directly responsible for language development. But differences in these structures may explain the links between parental sensitivity, on the one hand, and the overall learning and memory needed to succeed in school, on the other. Such findings suggest that children's early caregiving environments could be a crucial target for early intervention programs that seek to close the achievement gap, because efforts to increase children's exposure to conversation may capitalize on the neural plasticity that underlies cognitive development.

Parent-Directed Interventions

Parenting and, more broadly, the early caregiving environment lie at the heart of children's language development trajectories. Thus parents are positioned as principal agents of change in their children's

development, and evidence suggests that parent-directed interventions can effectively enhance child outcomes. This section explores the efficacy of parent-directed interventions and their potential to bridge the achievement gap between children from lower- and higher-SES homes.

One of the most notable such interventions is Early Head Start, which includes programming that encourages parents to read to and communicate more with their children. Mothers in the program have reported conducting more stimulating activities with their children than did mothers in control groups, and participation enhanced children's language skills at two, three, and five years of age. Moreover, mothers participating in Early Head Start were more likely to read to their children daily and to initiate teaching activities at home. Older home-visiting programs also featured a language component. (See a previous *Future of Children* issue for a review.) Although several large-scale interventions included a child-language component, here we focus on interventions that target parent-child communication and, specifically, on language as an outcome of interest.

Interventions generally fall into one or more of five categories:

1. Book distribution programs with anticipatory guidance for shared book reading and increasing the physical environment quality in the home;
2. Teaching dialogic reading techniques;
3. Coaching parents to talk more with their children;

4. Training parents to be responsive when their children initiate communication; and
5. Public awareness campaigns geared toward increasing parental knowledge of child development.

We highlight several evidence-based programs, most of which focus on the concept of *language nutrition*, a term created by pediatricians to explain to caregivers that exposure to language that's rich in quality and quantity and delivered in the context of social interactions is crucial for child development and health. Moreover, health care professionals have used their positions on the front lines of caregiving to provide parenting interventions in pediatric primary care. As trusted sources of information for families, pediatricians are well positioned to deliver evidence-based information about development before children enter school. Such programs have, for instance, promoted positive parenting through reading aloud and play from birth to five, and they've demonstrated positive and sustained impacts on behavioral and social-emotional development.

In fact, several initiatives have used the concepts of language nutrition and *quantitative linguistic feedback* as key components. Because it's the combination of quantity and quality in a child's early language environment that leads to optimal cognitive and educational outcomes, linguistic feedback interventions are typically designed to significantly increase adult language quantity to provide a foundation on which to layer qualitative behavioral strategies. Quantitative linguistic feedback is a behavioral strategy

that uses the Language Environment Analysis (LENA) technology as a sort of “linguistic pedometer.” The LENA, a digital recording device and software package, tracks the number of words a child is exposed to, along with the number of conversational turns the child takes with adults, for up to 16 hours. Many interventions targeting parent-child communication quantity and quality use the measures of parent speech obtained from LENA to give parents concrete feedback about their home language environment. In this way, the LENA measures can serve as a type of biofeedback, helping parents establish concrete goals and monitor their progress toward achieving those goals.

One such evidence-based parent-directed intervention, named TMW after the 30-million-word gap described above, aims to encourage children’s language development by narrowing that gap and increasing child-directed speech. The initiative not only relies on interpreting feedback from LENA recordings, it also combines education, technology, and behavioral strategies to lay the foundation for parents to enhance their linguistic interactions with their children. Specifically, the initiative teaches parents about three primary practices called “the 3Ts”—tune in, talk more, and take turns—mirroring scientific findings that parental responsiveness, quantity of language input, and quality of communication interaction, respectively, are all integral to language development. The TMW program was born out of a small randomized controlled pilot study, which found that the intervention significantly increased parents’ knowledge about how their language input scaffolds their child’s language development.

Moreover, parents’ linguistic interactions with their children also significantly increased during the intervention, measured in part both by adult word count and by conversational turn count. Importantly, although behavioral changes were observed only in the short term (that is, during the intervention), parents’ increased knowledge of child development persisted for several months after the intervention ended.

Because parents’ own knowledge of child development is a critical predictor of their linguistic interactions with their children and may partially mediate the relationship between a family’s SES and the quantity of child-directed speech, many interventions target parents’ knowledge to increase their language input. In one such recent study, researchers at the University of Washington conducted a randomized controlled trial to evaluate the effects of a parent coaching intervention among infants aged six to 14 months. The researchers used LENA recordings; parents in the intervention group received individual coaching appointments to get feedback, listen to their own language input recordings, and discuss age-appropriate activities that promote language growth. Results showed that the intervention increased infant-appropriate language use and parent-child turn-taking, and that both variables were significantly correlated with children’s language growth and outcomes at 18 months. Although sustaining parental post-intervention behavior change is a persistent challenge throughout intervention work, the success of such parent-directed language interventions demonstrates that increasing parents’ knowledge of child development and targeting social aspects of home language input can notably improve children’s developmental outcomes.

Beyond such small-scale studies, researchers have conceived population-level public health prevention and intervention approaches to improving the early home language environment. The first such initiative, *Providence Talks*, was launched in 2013 in Providence, RI, and gave families LENA devices along with coaching. Among families participating in the citywide pilot who completed at least four coaching sessions, the quantity of language spoken in the home increased by nearly 10 percent. The pilot also found that families who started out at the lowest word count level made the most significant progress, increasing words spoken in the home by 50 percent. Since then, five more cities were selected to replicate the government-led initiative, launching interventions including *Say and Play with Words* in Louisville, KY, and *313 Speaks* in Detroit, MI.

Interventions that target parenting practices such as sensitivity and responsiveness have also furthered our understanding of how high-quality parent-child interactions support language development. Dozens of studies have documented the effectiveness of Play and Learning Strategies (PALS), an intervention that trains low-income mothers to respond to their infants' communication signals in a sensitive, warm, and contingent manner. One study of PALS showed that children in the intervention group had greater receptive vocabulary, initiated conversations more often, and produced more words during mother-child interactions, compared with children in the control group. Together, these findings suggest that responsive and engaging caregiver-child communication modulates the effects of adversity on child development.

Thus positive caregiving practices can be a protective factor against adversity, though researchers need to identify further how such protective factors influence neural development. Yet few studies of interventions seeking to improve children's environments have included measures of brain structure or function. In one study of more than a hundred Head Start families, sessions to improve children's attention, when coupled with sessions to teach parents how to support children's attention and reduce family stress, led to enhanced brain function in preschoolers. In a large study of a program called Strong African American Families, black families from lower-SES backgrounds were randomly assigned to either a multisession intervention focused on parenting skills or a control group that only received information on children's development, stress management, and exercise. Among children in the control group, a longer period of living in poverty was associated with smaller brain volume in areas related to memory. But among children whose parents participated in the intervention, the duration of childhood poverty wasn't linked to brain structure, suggesting that the intervention mitigated poverty's harmful effects on neural development. Thus, prevention and intervention programs may ameliorate the damage that socioeconomic disadvantage can do to language and executive function skills at the neural level.

Although few studies have included technology-based solutions, such as mobile phones, smartphone applications, or game-play, an increasing number of interventions rely on mobile phones as a means to share information with caregivers and directly influence their

behavior. The evidence so far suggests that interventions delivered through mobile devices can impact health behaviors and may be able to support parents in activities that promote language development. For instance, a recent six-week intervention called the Parents and Children Together (PACT) program, administered via electronic tablet, relied on behavioral tools such as reminders, goal setting, and social rewards; low-income parents who participated more than doubled the amount of time spent reading to their three- to five-year-old children. Such *light-touch* interventions may produce behavioral change at a lower cost per child, compared with large-scale in-person interventions. Similarly, smartphone apps, such as one called Vroom, offer parents brain-building activities designed to be incorporated easily into daily routines. A recent study successfully used Vroom's "brain building moments" to encourage parents to think of daily opportunities for engaging their infants in increased language and social interactions. Though such platforms hold promise for promoting positive parenting behaviors and enhancing language outcomes, as of yet we have little evidence of their long-term efficacy.

The programs we've discussed represent first steps toward developing parent-directed interventions that could improve children's language learning trajectories, especially those of children in lower-SES homes. These programs demonstrate that parent-directed interventions can change home environments, at least in the short term. Though the ultimate goal is sustained parental behavior change and sustained positive impacts on child outcomes, the short-term results still provide cause for optimism, as the findings

so far support the hypothesis that parental linguistic behavior is malleable.

Despite the success of initiatives aimed at harnessing the role of parents and caregivers in children's language development, several challenges persist. Most prominently, the limited follow-up and tracking in much of the research to date means that we lack a complete assessment of behavioral sustainability to show whether the changes we see in children in the short term translate into positive longer-term child outcomes. Additionally, we know little about whether particular aspects of interventions are more important than others for affecting behavioral change, or whether synergy among linguistic feedback, parental sensitivity, and parental education, among other factors, is needed for interventions to be effective. Although results suggest that it's easier to change parents' knowledge than parents' language behaviors, a long-term increase in parents' knowledge on its own isn't sufficient to create long-term behavior change—though it may be a good starting point. We must continue trying to improve children's early home language environment, especially among low-SES families that are vulnerable to compounding hardships of increased physical and psychosocial stress. Ultimately, parent-focused interventions have demonstrated promise by affecting behavior and neural change. Moreover, these interventions have shown that when parents are given the proper tools, insight into their own importance in their children's development, and support to help their children reach full potential, they are critical agents in changing their children's language learning trajectories.

Conclusions

Research clearly shows that the early home language environment, and parents in particular, form the foundation of children's language development. The integration of neuroscience with developmental psychology theories has helped us understand the long-lasting effects of how parents shape the home learning environment and how they communicate with their children. Research findings support a social-relational approach by which caregiver-child interactions—the most pervasive and potent relational experiences of childhood—can be seen as a primary mechanism behind experience-driven differences in children's neural development and academic readiness. In short, the way caregivers communicate with children affects children's developmental outcomes. Given the evidence that attuned and responsive care promotes optimal development, we need to explore the links between caregivers' interactions with children and children's subsequent brain

development. Interventions promoting child language input must focus on talking, reading, and labeling objects and emotions early in life.

The policy and education sectors have made strides in promoting parents' reading and talking with school-age children; now we should further encourage such practices with infants and toddlers. When it comes to policy, it will be important to narrow socioeconomic-related differences in home learning environments—for instance, by making books, toys, and other learning materials more accessible in the home, beginning in infancy. Other supports could include large-scale parent education programs and advocacy interventions through platforms that families already interact with, including primary care, early childcare, and home visiting. Such programs could further impart the message that parents construct a child's home learning environment and are therefore the principal agents of developmental change in their children's lives.

Endnotes

1. Urie Bronfenbrenner, "Ecology of the Family as a Context for Human Development: Research Perspectives," *Developmental Psychology* 22 (1986): 723–42, <https://doi.org/10.1037/0012-1649.22.6.723>.
2. Eileen T. Rodriguez and Catherine S. Tamis-LeMonda, "Trajectories of the Home Learning Environment across the First 5 Years: Associations with Children's Vocabulary and Literacy Skills at Prekindergarten," *Child Development* 82 (2011): 1058–75, <https://doi.org/10.1111/j.1467-8624.2011.01614.x>.
3. Nicole L. Hair et al., "Association of Child Poverty, Brain Development, and Academic Achievement," *JAMA Pediatrics* 169 (2015): 822–9, <https://doi.org/10.1001/jamapediatrics.2015.1475>.
4. Jay Belsky and Michelle de Haan, "Annual Research Review: Parenting and Children's Brain Development: The End of the Beginning," *Journal of Child Psychology and Psychiatry* 52 (2011): 409–28, <https://doi.org/10.1111/j.1469-7610.2010.02281.x>.
5. Faith Lamb Parker et al., "Parent-Child Relationship, Home Learning Environment, and School Readiness," *School Psychology Review* 28 (1999): 413–25, <https://doi.org/10.1080/02796015.1999.12085974>.
6. Erika Hoff, *Language Development*, 5th ed. (Belmont, CA: Wadsworth [Cengage Learning], 2013).
7. Natalie H. Brito, "Influence of the Home Linguistic Environment on Early Language Development," *Policy Insights from the Behavioral and Brain Sciences* 4 (2017): 155–62, <https://doi.org/10.1177/2372732217720699>.
8. Sarah Roseberry Lytle and Patricia K. Kuhl, "Social Interaction and Language Acquisition: Toward a Neurobiological View," in *The Handbook of Psycholinguistics*, ed. Eva M. Fernández and Helen Smith Cairns (Hoboken, NJ: John Wiley & Sons, 2018), 615–34; Patricia K. Kuhl, "Cracking the Speech Code: How Infants Learn Language," *Acoustical Science and Technology* 28 (2007): 71–83, <https://doi.org/10.1250/ast.28.71>.
9. Jerome Bruner, *Child's Talk: Learning to Use Language* (Oxford, UK: Oxford University Press, 1983).
10. Michael Tomasello and Malinda Carpenter, "Shared Intentionality," *Developmental Science* 10 (2006): 121–5, <https://doi.org/10.1111/j.1467-7687.2007.00573.x>.
11. Roberta Michnick Golinkoff et al., "(Baby) Talk to Me: The Social Context of Infant-Directed Speech and Its Effects on Early Language Acquisition," *Current Directions in Psychological Science* 24, no. 5 (2015): 339–44, <https://doi.org/10.1177/0963721415595345>.
12. Susan H. Landry et al., "Does Early Responsive Parenting Have a Special Importance for Children's Development or Is Consistency Across Early Childhood Necessary?," *Developmental Psychology* 37 (2001): 387–403, <https://doi.org/10.1037/0012-1649.37.3.387>; Catherine S. Tamis-LeMonda and Marc H. Bornstein, "Maternal Responsiveness and Early Language Acquisition," *Advances in Child Development and Behavior* 29 (2002): 89–127, [https://doi.org/10.1016/S0065-2407\(02\)80052-0](https://doi.org/10.1016/S0065-2407(02)80052-0).
13. Patricia K. Kuhl, "Is Speech Learning 'Gated' By the Social Brain?," *Developmental Science* 10 (2007): 110–20, <https://doi.org/10.1111/j.1467-7687.2007.00572.x>.
14. Betty Hart and Todd R. Risley, *Meaningful Differences in the Everyday Experience of Young American Children* (Baltimore: Paul H. Brookes Publishing, 1995).
15. Emily C. Merz, Cynthia A. Wiltshire, and Kimberly G. Noble, "Socioeconomic Inequality and the Developing Brain: Spotlight on Language and Executive Function," *Child Development Perspectives* 13 (2019): 15–20, <https://doi.org/10.1111/cdep.12305>; Adriana Weisleder and Anne Fernald, "Talking to Children Matters: Early Language Experience Strengthens Processing and Builds Vocabulary," *Psychological Science* 24 (2013): 2143–52, <https://doi.org/10.1177/0956797613488145>.

16. Janelle Huttenlocher et al., "Sources of Variability in Children's Language Growth," *Cognitive Psychology* 61 (2010): 343–65, <https://doi.org/10.1016/j.cogpsych.2010.08.002>.
17. Kathy Hirsh-Pasek et al., "The Contribution of Early Communication Quality to Low-Income Children's Language Success," *Psychological Science* 26 (2015): 1071–83, <https://doi.org/10.1177/0956797615581493>.
18. Meredith L. Rowe, "A Longitudinal Investigation of the Role of Quantity and Quality of Child-Directed Speech in Vocabulary Development," *Child Development* 83 (2012): 1762–74, <https://doi.org/10.1111/j.1467-8624.2012.01805.x>.
19. Hirsh-Pasek et al., "Contribution."
20. Jill Gilkerson et al., "Mapping the Early Language Environment Using All-Day Recordings and Automated Analysis," *American Journal of Speech-Language Pathology* 26 (2017): 248–65, https://doi.org/10.1044/2016_AJSLP-15-0169.
21. George Farkas and Kurt Beron, "The Detailed Age Trajectory of Oral Vocabulary Knowledge: Differences By Class and Race," *Social Science Research* 33 (2004): 464–97, <https://doi.org/10.1016/j.ssresearch.2003.08.001>.
22. Melinda Caskey et al., "Adult Talk in the NICU with Preterm Infants and Developmental Outcomes," *Pediatrics* 133 (2014): e578–84, <https://doi.org/10.1542/peds.2013-0104>.
23. Greg J. Duncan et al., "School Readiness and Later Achievement," *Developmental Psychology* 43 (2007): 1428–46, <https://doi.org/10.1037/0012-1649.43.6.1428>.
24. Rowe, "Longitudinal Investigation."
25. Anthony J. DeCasper and Melanie J. Spence, "Prenatal Maternal Speech Influences Newborns' Perception of Speech Sounds," *Infant Behavior and Development* 9 (1986): 133–50, [https://doi.org/10.1016/0163-6383\(86\)90025-1](https://doi.org/10.1016/0163-6383(86)90025-1).
26. Adriana G. Bus, Marinus H. van IJzendoorn, and Anthony D. Pellegrini, "Joint Book Reading Makes for Success in Learning to Read: A Meta-Analysis on Intergenerational Transmission of Literacy," *Review of Educational Research* 65 (1995): 1–21, <https://doi.org/10.3102/00346543065001001>.
27. Helen Raikes et al., "Mother-Child Bookreading in Low-Income Families: Correlates and Outcomes During the First Three Years of Life," *Child Development* 77 (2006): 924–53, <https://doi.org/10.1111/j.1467-8624.2006.00911.x>.
28. Adam C. Payne, Grover J. Whitehurst, and Andrea L. Angell, "The Role of Home Literacy Environment in the Development of Language Ability in Preschool Children from Low-Income Families," *Early Childhood Research Quarterly* 9 (1994): 427–40, [https://doi.org/10.1016/0885-2006\(94\)90018-3](https://doi.org/10.1016/0885-2006(94)90018-3).
29. Patricia K. Kuhl, Feng-Ming Tsao, and Huei-Mei Liu, "Foreign-Language Experience in Infancy: Effects of Short-Term Exposure and Social Interaction on Phonetic Learning," *Proceedings of the National Academy of Sciences* 100 (2003): 9096–101, <https://doi.org/10.1073/pnas.1532872100>.
30. Sarah Roseberry, Kathy Hirsh-Pasek, and Roberta M. Golinkoff, "Skype Me! Socially Contingent Interactions Help Toddlers Learn Language," *Child Development* 85 (2014): 956–70, <https://doi.org/10.1111/cdev.12166>.
31. Michael H. Goldstein and Jennifer A. Schwade, "Social Feedback to Infants' Babbling Facilitates Rapid Phonological Learning," *Psychological Science* 19 (2008): 515–23, <https://doi.org/10.1111/j.1467-9280.2008.02117.x>.
32. William P. Fifer and Christine M. Moon, "The Role of Mother's Voice in the Organization of Brain Function in the Newborn," *Acta Paediatrica* 83 (1994): 86–93, <https://doi.org/10.1111/j.1651-2227.1994.tb13270.x>.

33. Beverly J. Dodici, Dianne C. Draper, and Carla A. Peterson, "Early Parent-Child Interactions and Early Literacy Development," *Topics in Early Childhood Special Education* 23, no. 3 (2003): 124–136, <https://doi.org/10.1177/02711214030230030301>.
34. Erica A. Cartmill et al., "Quality of Early Parent Input Predicts Child Vocabulary 3 Years Later," *Proceedings of the National Academy of Sciences* 110 (2013): 11278–83, <https://doi.org/10.1073/pnas.1309518110>.
35. Meredith L. Rowe and Susan Goldin-Meadow, "Differences in Early Gesture Explain SES Disparities in Child Vocabulary Size at School Entry," *Science* 323, no. 5916 (2009): 951–3, <https://doi.org/10.1126/science.1167025>.
36. Samantha A. Melvin et al., "Home Environment, but not Socioeconomic Status, Is Linked to Differences in Early Phonetic Perception Ability," *Infancy* 22 (2017): 42–55, <https://doi.org/10.1111/inf.12145>.
37. Catherine S. Tamis-LeMonda, Yana Kuchirko, and Lulu Song, "Why Is Infant Language Learning Facilitated by Parental Responsiveness?," *Current Directions in Psychological Science* 23 (2014): 121–6, <https://doi.org/10.1177/0963721414522813>.
38. Megan Gunnar and Carrie DePasquale, "Parental Sensitivity and Nurturance," *Future of Children* 30, no. 2 (2020): XX–XX.
39. Goldstein and Schwade, "Social Feedback."
40. Catherine S. Tamis-LeMonda et al., "Predicting Variation in the Timing of Language Milestones in the Second Year: An Events History Approach," *Journal of Child Language* 25 (1998): 675–700, <https://doi.org/10.1017/S0305000998003572>.
41. Catherine S. Tamis LeMonda, Marc H. Bornstein, and Lisa Baumwell, "Maternal Responsiveness and Children's Achievement of Language Milestones," *Child Development* 72 (2001): 748–67, <https://doi.org/10.1111/1467-8624.00313>.
42. Susan H. Landry, Karen E. Smith, and Paul R. Swank, "The Importance of Parenting during Early Childhood for School-Age Development," *Developmental Neuropsychology* 24 (2003): 559–91, <https://doi.org/10.1080/87565641.2003.9651911>.
43. Peggy Estrada et al., "Affective Quality of the Mother-Child Relationship: Longitudinal Consequences for Children's School-Relevant Cognitive Functioning," *Developmental Psychology* 23 (1987): 210–15, <https://doi.org/10.1037/0012-1649.23.2.210>.
44. Lisa Baumwell, Catherine S. Tamis-LeMonda, and Marc H. Bornstein, "Maternal Verbal Sensitivity and Child Language Comprehension," *Infant Behavior and Development* 20 (1997): 247–58, [https://doi.org/10.1016/S0163-6383\(97\)90026-6](https://doi.org/10.1016/S0163-6383(97)90026-6).
45. Elizabeth P. Pungello et al., "The Effects of Socioeconomic Status, Race, and Parenting on Language Development in Early Childhood," *Developmental Psychology* 45 (2009): 544–57, <https://doi.org/10.1037/a0013917>.
46. Melissa A. Barnett et al., "Bidirectional Associations among Sensitive Parenting, Language Development, and Social Competence," *Infant and Child Development* 21 (2012): 374–93, <https://doi.org/10.1002/icd.1750>; Hart and Risley, *Meaningful Differences*; Dodici, Draper, and Peterson, "Early Parent-Child Interactions"; Laura Hubbs-Tait et al., "Relation of Maternal Cognitive Stimulation, Emotional Support, and Intrusive Behavior during Head Start to Children's Kindergarten Cognitive Abilities," *Child Development* 73 (2002): 110–31, <https://doi.org/10.1111/1467-8624.00395>.
47. Tali Raviv, Maureen Kessenich, and Frederick J. Morrison, "A Mediation Model of the Association between Socioeconomic Status and Three-Year-Old Language Abilities: The Role of Parenting Factors," *Early Childhood Research Quarterly* 19 (2004): 528–47, <https://doi.org/10.1016/j.ecresq.2004.10.007>.

48. Hubbs-Tait et al., "Maternal Cognitive Stimulation."
49. Susan H. Landry et al., "A Responsive Parenting Intervention: The Optimal Timing Across Early Childhood for Impacting Maternal Behaviors and Child Outcomes," *Developmental Psychology* 44 (2008): 1335–53, <https://doi.org/10.1037/a0013030>.
50. Emmy E. Werner and Ruth S. Smith, *Overcoming the Odds: High Risk Children from Birth to Adulthood* (Ithaca, NY: Cornell University Press, 1992); Ann S. Masten, Karin M. Best, and Norman Garmezy, "Resilience and Development: Contributions from the Study of Children Who Overcome Adversity," *Development and Psychopathology* 2 (1990): 425–44, <https://doi.org/10.1017/S0954579400005812>; Vonnie C. McLoyd, "Socioeconomic Disadvantage and Child Development," *American Psychologist* 53 (1998): 185–204, <https://doi.org/10.1037/0003-066X.53.2.185>.
51. Lisa J. Merlo, Margo Bowman, and Douglas Barnett, "Parental Nurturance Promotes Reading Acquisition in Low Socioeconomic Status Children," *Early Education and Development* 18 (2007): 51–69, <https://doi.org/10.1080/10409280701274717>; Kimberly G. Noble et al., "Socioeconomic Disparities in Neurocognitive Development in the First Two Years of Life," *Developmental Psychobiology* 57 (2015): 535–51, <https://doi.org/10.1002/dev.21303>.
52. Joan Luby et al., "The Effects of Poverty on Childhood Brain Development: The Mediating Effect of Caregiving and Stressful Life Events," *JAMA Pediatrics* 167 (2013): 1135–42, <https://doi.org/10.1001/jamapediatrics.2013.3139>.
53. Lynne Vernon-Feagans and Mary E. Bratsch-Hines, "Caregiver-Child Verbal Interactions in Child Care: A Buffer Against Poor Language Outcomes When Maternal Language Input Is Less," *Early Childhood Research Quarterly* 28 (2013): 858–73, <https://doi.org/10.1016/j.ecresq.2013.08.002>.
54. Michael H. Goldstein, Andrew P. King, and Meredith J. West, "Social Interaction Shapes Babbling: Testing Parallels between Birdsong and Speech," *Proceedings of the National Academy of Sciences* 100 (2003): 8030–5, <https://doi.org/10.1073/pnas.1332441100>; Geert-Jan J. M. Stams, Femmie Juffer, and Marinus H. van IJzendoorn, "Maternal Sensitivity, Infant Attachment, and Temperament in Early Childhood Predict Adjustment in Middle Childhood: The Case of Adopted Children and Their Biologically Unrelated Parents," *Developmental Psychology* 38 (2002): 806–21, <https://doi.org/10.1037/0012-1649.38.5.806>; Landry et al., "Responsive Parenting Intervention."
55. Payne, Whitehurst, and Angell, "Home Literacy Environment"; Monique Sénéchal et al., "Knowledge of Storybooks as a Predictor of Young Children's Vocabulary," *Journal of Educational Psychology* 88 (1996): 520–36, <https://doi.org/10.1037/0022-0663.88.3.520>.
56. Suzy Tomopoulos et al., "Books, Toys, Parent-Child Interaction, and Development in Young Latino Children," *Ambulatory Pediatrics* 6, no. 2 (2006): 72–8, <https://doi.org/10.1016/j.ambp.2005.10.001>.
57. Brandon T. McDaniel and Jenny S. Radesky, "Technoference: Parent Distraction with Technology and Associations with Child Behavior Problems," *Child Development* 89 (2018): 100–9, <https://doi.org/10.1111/cdev.12822>.
58. Tiffany A. Pempek, Heather L. Kirkorian, and Daniel R. Anderson, "The Effects of Background Television on the Quantity and Quality of Child-Directed Speech by Parents," *Journal of Children and Media* 8 (2014): 211–22, <https://doi.org/10.1080/17482798.2014.920715>; Elise Frank Masur, Valerie Flynn, and Janet Olson, "Infants' Background Television Exposure during Play: Negative Relations to the Quantity and Quality of Mothers' Speech and Infants' Vocabulary Acquisition," *First Language* 36 (2016): 109–23, <https://doi.org/10.1177/0142723716639499>.
59. William T. Greenough, James E. Black, and Christopher S. Wallace, "Experience and Brain Development," *Child Development* 58 (1987): 539–59, <https://doi.org/10.2307/1130197>.
60. Belsky and de Haan, "The End of the Beginning."

61. Julie A. Markham and William T. Greenough, "Experience-Driven Brain Plasticity: Beyond the Synapse," *Neuron Glia Biology* 1 (2004): 351–63, <https://doi.org/10.1017/S1740925X05000219>.
62. Tania L. Roth and J. David Sweatt, "Annual Research Review: Epigenetic Mechanisms and Environmental Shaping of the Brain during Sensitive Periods of Development," *Journal of Child Psychology and Psychiatry* 52 (2011): 398–408, <https://doi.org/10.1111/j.1469-7610.2010.02282.x>; Vaheshta Sethna et al., "Mother-Infant Interactions and Regional Brain Volumes in Infancy: An MRI Study," *Brain Structure and Function* 222 (2017): 2379–88, <https://doi.org/10.1007/s00429-016-1347-1>.
63. Frances A. Champagne, "Epigenetic Mechanisms and the Transgenerational Effects of Maternal Care," *Frontiers in Neuroendocrinology* 29 (2008): 386–97, <https://doi.org/10.1016/j.yfrne.2008.03.003>.
64. Robert H. Bradley and Robert F. Corwyn, "Socioeconomic Status and Child Development," *Annual Review of Psychology* 53 (2002): 371–99, <https://doi.org/10.1146/annurev.psych.53.100901.135233>.
65. Jeanne Brooks-Gunn and Greg J. Duncan, "The Effects of Poverty on Children," *Future of Children* 7, no. 2 (1997): 55–71, <https://doi.org/10.2307/1602387>; Greg J. Duncan et al., "The Importance of Early Childhood Poverty," *Social Indicators Research* 108 (2012): 87–98, <https://doi.org/10.1007/s11205-011-9867-9>.
66. Natalie H. Brito and Kimberly G. Noble, "Socioeconomic Status and Structural Brain Development," *Frontiers in Neuroscience* 8 (2014): article 276, <https://doi.org/10.3389/fnins.2014.00276>; Martha J. Farah, "The Neuroscience of Socioeconomic Status: Correlates, Causes, and Consequences," *Neuron* 96 (2017): 56–71, <https://doi.org/10.1016/j.neuron.2017.08.034>; Sara B. Johnson, Jenna L. Riis, and Kimberly G. Noble, "State of the Art Review: Poverty and the Developing Brain," *Pediatrics* 137 (2016): e20153075, <https://doi.org/10.1542/peds.2015-3075>; Kimberly G. Noble et al., "Brain-Behavior Relationships in Reading Acquisition Are Modulated by Socioeconomic Factors," *Developmental Science* 9 (2006): 642–54, <https://doi.org/10.1111/j.1467-7687.2006.00542.x>; Margaret A. Sheridan et al., "The Impact of Social Disparity on Prefrontal Function in Childhood," *PloS one* 7, no. 4 (2012): e35744, <https://doi.org/10.1371/journal.pone.0035744>.
67. Allyson P. Mackey et al., "Neuroanatomical Correlates of the Income-Achievement Gap," *Psychological Science* 26 (2015): 925–33, <https://doi.org/10.1177/0956797615572233>; Hair et al., "Association of Child Poverty"; Kimberly G. Noble et al., "Family Income, Parental Education and Brain Structure in Children and Adolescents," *Nature Neuroscience* 18 (2015): 773–8, <https://doi.org/10.1038/nn.3983>.
68. Hair et al., "Association of Child Poverty"; Jamie L. Hanson et al., "Association between Income and the Hippocampus," *PloS one* 6 (2011): e18712, <https://doi.org/10.1371/journal.pone.0018712>.
69. C. Cybele Raver and Clancy Blair, "Developmental Science Aimed at Reducing Inequality: Maximizing the Social Impact of Research on Executive Function in Context," *Infant and Child Development* 29 (2020): e2175, <https://doi.org/10.1002/icd.2175>.
70. Kimberly G. Noble, "What Inequality Does to the Brain," *Scientific American* 316, no. 3 (2017): 44–9.
71. Kimberly G. Noble, Bruce D. McCandliss, and Martha J. Farah, "Socioeconomic Gradients Predict Individual Differences in Neurocognitive Abilities," *Developmental Science* 10 (2007): 464–80, <https://doi.org/10.1111/j.1467-7687.2007.00600.x>; Noble et al., "Brain-Behavior Relationships"; Angela D. Friederici and Isabell Wartenburger, "Language and Brain," *Wiley Interdisciplinary Reviews: Cognitive Science* 1 (2010): 150–9, <https://doi.org/10.1002/wcs.9>; Mackey et al., "Neuroanatomical Correlates."
72. Julieta Lugo-Gil and Catherine S. Tamis-LeMonda, "Family Resources and Parenting Quality: Links to Children's Cognitive Development across the First 3 Years," *Child Development* 79 (2008): 1065–85, <https://doi.org/10.1111/j.1467-8624.2008.01176.x>.
73. Adrian Garcia-Sierra, Nairan Ramírez-Esparza, and Patricia K. Kuhl, "Relationships between Quantity of Language Input and Brain Responses in Bilingual and Monolingual Infants," *International Journal of Psychophysiology* 110 (2016): 1–17, <https://doi.org/10.1016/j.ijpsycho.2016.10.004>.

74. Margaret A. Sheridan et al., "Impact of Social Disparity."
75. R. Romeo et al., "Beyond the 30-Million-Word Gap: Children's Conversational Exposure Is Associated with Language-Related Brain Function," *Psychological Science* 29 (2018): 700-10, <https://doi.org/10.1177/0956797617742725>.
76. Rachel R. Romeo et al., "Language Exposure Relates to Structural Neural Connectivity in Childhood," *Journal of Neuroscience* 38 (2018): 7870-7, <https://doi.org/10.1523/JNEUROSCI.0484-18.2018>.
77. Merz, Wiltshire, and Noble, "Socioeconomic Inequality."
78. J. Zimmerman et al., "Teaching by Listening: The Importance of Adult-Child Conversations to Language Development," *Pediatrics* 124 (2009): 342-9, <https://doi.org/10.1542/peds.2008-2267>.
79. Merz, Wiltshire, and Noble, "Socioeconomic Inequality."
80. Kimberly G. Noble, Martha J. Farah, and Bruce D. McCandliss, "Socioeconomic Background Modulates Cognition-Achievement Relationships in Reading," *Cognitive Development* 21 (2006): 349-68, <https://doi.org/10.1016/j.cogdev.2006.01.007>.
81. Jessica P. Uy et al., "Physical Home Environment Is Associated with Prefrontal Cortical Thickness in Adolescents," *Developmental Science* 22 (2019): e12834, <https://doi.org/10.1111/desc.12834>.
82. Kuhl, "Is Speech Learning 'Gated'?"
83. Barbara T. Conboy and Patricia K. Kuhl, "Impact of Second-Language Experience in Infancy: Brain Measures of First- and Second-Language Speech Perception," *Developmental Science* 14 (2011): 242-8, <https://doi.org/10.1111/j.1467-7687.2010.00973.x>.
84. Sarah Roseberry Lytle, Adrian Garcia-Sierra, and Patricia K. Kuhl, "Two Are Better than One: Infant Language Learning from Video Improves in the Presence of Peers," *Proceedings of the National Academy of Sciences* 115 (2018): 9859-66, <https://doi.org/10.1073/pnas.1611621115>.
85. Annie Bernier et al., "Mother-Infant Interaction and Child Brain Morphology: A Multidimensional Approach to Maternal Sensitivity," *Infancy* 24 (2019): 120-38, <https://doi.org/10.1111/inf.12270>; Richard E. Frye et al., "Preterm Birth and Maternal Responsiveness during Childhood Are Associated with Brain Morphology in Adolescence," *Journal of the International Neuropsychological Society* 16 (2010): 784-94, <https://doi.org/10.1017/S1355617710000585>; Joan L. Luby et al., "Preschool Is a Sensitive Period for the Influence of Maternal Support on the Trajectory of Hippocampal Development," *Proceedings of the National Academy of Sciences* 113 (2016): 5742-7, <https://doi.org/10.1073/pnas.1601443113>; Christina Moutsiana et al., "Insecure Attachment during Infancy Predicts Greater Amygdala Volumes in Early Adulthood," *Journal of Child Psychology and Psychiatry* 56 (2015): 540-8, <https://doi.org/10.1111/jcpp.12317>; Hengyi Rao et al., "Early Parental Care is Important for Hippocampal Maturation: Evidence from Brain Morphology in Humans," *NeuroImage* 49 (2010): 1144-50, <https://doi.org/10.1016/j.neuroimage.2009.07.003>; Anne Rifkin-Graboi et al., "Maternal Sensitivity, Infant Limbic Structure Volume and Functional Connectivity: A Preliminary Study," *Translational Psychiatry* 5 (2015): e668, <https://doi.org/10.1038/tp.2015.133>; Sarah Whittle et al., "Positive Parenting Predicts the Development of Adolescent Brain Structure: A Longitudinal Study," *Developmental Cognitive Neuroscience* 8 (2014): 7-17, <https://doi.org/10.1016/j.dcn.2013.10.006>; Sarah Whittle et al., "Observed Measures of Negative Parenting Predict Brain Development during Adolescence," *PloS one* 11 (2016): e0147774, <https://doi.org/10.1371/journal.pone.0147774>.
86. Rianne Kok et al., "Normal Variation in Early Parental Sensitivity Predicts Child Structural Brain Development," *Journal of the American Academy of Child & Adolescent Psychiatry* 54 (2015): 824-31, e1, <https://doi.org/10.1016/j.jaac.2015.07.009>; Élizabel Leblanc et al., "Attachment Security in Infancy: A Preliminary Study of Prospective Links to Brain Morphometry in Late Childhood," *Frontiers in Psychology* 8 (2017): article 2141, <https://doi.org/10.3389/fpsyg.2017.02141>.

87. Cheri Vogel et al., “Impacts of Early Head Start Participation on Child and Parent Outcomes at Ages 2, 3, and 5,” *Monographs of the Society for Research in Child Development* 78, no. 1 (2013): 36–63, <https://doi.org/10.1111/j.1540-5834.2012.00702.x>.
88. Kimberly S. Howard and Jeanne Brooks-Gunn, “The Role of Home-Visiting Programs in Preventing Child Abuse and Neglect,” *Future of Children* 19, no. 2 (2009): 119–46, <https://doi.org/10.1353/foc.0.0032>.
89. Lauren Head Zauche et al., “The Power of Language Nutrition for Children’s Brain Development, Health, and Future Academic Achievement,” *Journal of Pediatric Health Care* 31 (2017): 493–503, <https://doi.org/10.1016/j.pedhc.2017.01.007>.
90. Alan L. Mendelsohn et al., “Reading Aloud, Play, and Social-Emotional Development,” *Pediatrics* 141 (2018): e20173393, <https://doi.org/10.1542/peds.2017-3393>.
91. Jill Gilkerson and Jeffrey A. Richards, *The LENA Natural Language Study* (Boulder, CO: LENA Foundation, 2008); Dana L. Suskind et al., “An Exploratory Study of ‘Quantitative Linguistic Feedback’: Effect of LENA Feedback on Adult Language Production,” *Communication Disorders Quarterly* 34 (2013): 199–209, <https://doi.org/10.1177/1525740112473146>.
92. Dana L. Suskind et al., “A Parent-Directed Language Intervention for Children of Low Socioeconomic Status: A Randomized Controlled Pilot Study,” *Journal of Child Language* 43 (2016): 366–406, <https://doi.org/10.1017/S0305000915000033>.
93. Rowe, “Longitudinal Investigation.”
94. Naja Ferjan Ramírez, Sarah Roseberry Lytle, and Patricia K. Kuhl, “Parent Coaching Increases Conversational Turns and Advances Infant Language Development,” *Proceedings of the National Academy of Sciences* 117 (2020): 3484–91, <https://doi.org/10.1073/pnas.1921653117>.
95. Charles R. Greenwood et al., “Conceptualizing a Public Health Prevention Intervention for Bridging the 30 Million Word Gap,” *Clinical Child and Family Psychology Review* 20 (2017): 3–24, <https://doi.org/10.1007/s10567-017-0223-8>.
96. *Providence Talks: Pilot Findings & Next Steps* (Providence, RI: Providence Talks, 2015), <http://www.providencetalks.org/wp-content/uploads/2015/10/Providence-Talks-Pilot-Findings-Next-Steps.pdf>.
97. Mary Dozier et al., “Effects of a Foster Parent Training Program on Young Children’s Attachment Behaviors: Preliminary Evidence from a Randomized Clinical Trial,” *Child and Adolescent Social Work Journal* 26 (2009): 321–32, <https://doi.org/10.1007/s10560-009-0165-1>.
98. Landry et al., “Responsive Parenting Intervention.”
99. Camelia E. Hostinar, Anna E. Johnson, and Megan R. Gunnar, “Early Social Deprivation and the Social Buffering of Cortisol Stress Responses in Late Childhood: An Experimental Study,” *Developmental Psychology* 51 (2015): 1597–1608, <https://doi.org/10.1037/dev0000029>.
100. Helen J. Neville et al., “Family-Based Training Program Improves Brain Function, Cognition, and Behavior in Lower Socioeconomic Status Preschoolers,” *Proceedings of the National Academy of Sciences* 110 (2013): 12138–43, <https://doi.org/10.1073/pnas.1304437110>.
101. Gene H. Brody et al., “Protective Prevention Effects on the Association of Poverty with Brain Development,” *JAMA Pediatrics* 171 (2017): 46–52, <https://doi.org/10.1001/jamapediatrics.2016.2988>.
102. Susan E. Mayer et al., “Using Behavioral Insights to Increase Parental Engagement: The Parents and Children Together (PACT) Intervention,” Working Paper No. 21602, National Bureau of Economic Research, Cambridge, MA, 2015, <https://doi.org/10.3386/w21602>.
103. Ferjan Ramírez, Lytle, and Kuhl, “Parent Coaching.”

Chaos and Instability from Birth to Age Three

Stacey N. Doan and Gary W. Evans

Summary

Many children, especially those from lower-income families, face considerable instability early in their lives. This may include changes in family structure, irregular family routines, frequent moves, fluctuating daycare arrangements, and noisy, crowded, or generally chaotic environments. Moreover, instability and chaos affect young children's development both directly and, via their parents' and other caregivers' exposure to it, indirectly.

Unstable, chaotic environments make it more difficult for children to acquire self-regulatory skills, including self-control and planning, that help them manage their emotions and behaviors, write Stacey Doan and Gary Evans. And when caregivers themselves confront unpredictable events and unreliable circumstances that strain their own adaptive capacities, their ability to provide sensitive, nurturing care may be compromised.

In this article, Doan and Evans show us how social and physical chaos can influence early child development. They focus not only on micro-level factors in families and their immediate surroundings, but also on macro-level processes such as public policy. For example, social safety net programs that are designed to help families from disadvantaged backgrounds can sometimes inadvertently increase the instability and chaos in children's lives. The authors suggest how such programs could be redesigned to decrease rather than exacerbate instability. They also review promising interventions such as parenting programs that may help to reduce instability in children's home lives.

www.futureofchildren.org

Stacey N. Doan is an associate professor of psychology and director of the Berger Institute at Claremont McKenna College, and an adjunct associate professor of population health sciences at City of Hope National Medical Center. Gary W. Evans is the Elizabeth Lee Vincent Professor of design and environmental analysis and of human development at Cornell University's College of Human Ecology.

In characterizing environmental impacts on children's development, researchers distinguish between harshness and predictability.¹ *Harshness* refers to insufficient resources or threat, whereas *predictability* and *instability* refer to variation and consistency in experiences. Many researchers have focused on harshness in children's environments, but fewer have examined instability and unpredictability. Unpredictability operates at many levels of development, from everyday interactions with a primary caregiver to labor market instability that directly affects parents and communities. Moreover, in addition to its direct effects, instability can indirectly influence children's outcomes by compromising caregivers' ability to provide sensitive, nurturing care. To understand the role of unpredictability, researchers examine various types of social instability, including changes in marital status, residential changes, and the predictability and consistency of caregiving. They also look at chaotic environments characterized by noise, crowding, disorganization, and instability.² In this article, we detail how unpredictability at different levels affects children's development. The examples we've chosen aren't exhaustive, but they do illustrate the varied ways in which unpredictability shapes children's lives. (We don't include income instability, despite its great importance, because Christopher Wimer and Sharon Wolf cover that topic elsewhere in this issue.)

Theoretical Background

Chaos and instability influence early child development, both directly and indirectly. Being able to accurately predict the environment is fundamental to comprehending cause and consequence, and

to developing self-efficacy or mastery—the belief that you can shape your surroundings to meet your needs. An environment that's consistent and predictable is needed to acquire self-regulatory skills, including self-control and planning, that help you manage your emotions and behaviors. Developmentally effective exchanges of energy between children and their surroundings require progressively more complex, reciprocal interactions. Routines and structure are a fundamental platform for circadian rhythm and adequate sleep.

Indirectly, when caregivers must themselves confront unreliable events and circumstances that strain their own adaptive capacities, their ability to sustain responsive and nurturing care of children is challenged. By definition, chaos and instability make it hard to depend on the resources required for personal equanimity and daily functioning. For children from birth to three, parenting behaviors and parent predictability may be some of the most crucial factors for healthy development.

Parenting Behaviors

Primary caregivers exert an inordinate amount of influence on children from birth to age three. Unpredictability in parenting behaviors can be described at the level of basic social interactions. Infants expect their mothers' responses to be predictable and sensitive to their own behavior. When maternal behavior is erratic or unpredictable, children tend to suffer. In one study, researchers examined the extent to which parental behavior is regular, systematic, and organized in moment-to-moment interactions. Unpredictable maternal behaviors when children were one year old was associated with worse cognitive

outcomes.³ The study with humans was correlational rather than experimental, but when the authors conducted an analogous experiment with rats, they found impaired memory performance among rats that were exposed to higher levels of unpredictable maternal behavior (manipulated by limiting bedding and nesting material).

Predictability of maternal behavior also influences mother-child relationships. The quality of the relationship between infant and primary caregiver is often characterized in terms of attachment styles, with children who are securely attached having the best outcomes.⁴ Unpredictable maternal behavior appears to disrupt the development of this bond.⁵ Because attachment style develops in early childhood and is crucial to a wide range of outcomes—including physical health, social functioning, and coping mechanisms—this disruption is particularly problematic.⁶

Parents' predictability also affects children's behavior. For example, one experiment found that toddlers whose mothers disciplined them inconsistently—by both reprimanding them and providing positive attention for the same behavior—were most likely to misbehave and have higher levels of negative affect.⁷ In another experimental study, schoolchildren hit one another less often when this behavior was met with consistent disapproval.⁸ These experiments suggest that when parental discipline is inconsistent or variable, children are more likely to act out.

Finally, when parents' interactions in semi-structured play with their two-year-olds were more coordinated—for example, using familiar play routines such as taking turns or relying on familiar scripts such as reading at bedtime—children had better language skills both at the time and a year later, at

36 months.⁹ This result was independent of the amount of mothers' speech or their sensitivity. It's likely that when children know what to expect, they can focus better and direct their attention to new information. Consistent routines and rituals lead to familiarity, which in turn leads to better learning outcomes in children.

Another way to think about parent predictability is whether children can expect adults to be reliable. In one experiment, researchers manipulated the reliability of the social context before engaging three-year-olds in the classic delayed gratification marshmallow task.¹⁰ The children were given an art project for which they could either use materials that were merely adequate or wait a short time while the experimenter retrieved nicer materials. Half the children randomly then received the better option, and half were told that the experimenter had made a mistake and the other art supplies weren't available. The children were then instructed to go ahead and work on the art project. Subsequently, the children whose experimenter had been reliable waited four times longer when given the marshmallow task than did those who had the unreliable experimenter.

In addition to variability in behavior, variability in caregivers' mood influences early development. One study examined the link between predictability of mothers' mood during the prenatal period and its associations with children's negative affectivity over time. Higher entropy with regard to prenatal maternal mood was associated with a higher level of child negative affectivity at one, two, and seven years of age. These effects remained after controlling for pre- and postnatal mood levels, socioeconomic status, gestational age

at birth, and cohabitation with the child's father.¹¹

Family Routines

Regular routines (such as consistent meal- and bedtimes) lead to positive developmental outcomes. But most research on this subject has been conducted with older children and, to the best of our knowledge, there are no experimental studies.¹² Family routines are thought to benefit children by providing organization and predictability and by reducing chaos. Regular routines and schedules likely help organize infants' daily biological rhythms, which in turn lay the foundation for higher-level learning.

Having basic physiological needs met is fundamental to children's development, and sleep is especially important both for physical health and growth and for psychological wellbeing.¹³ For example, among 12-month-old boys, regular naptimes were positively correlated to mastery-oriented behaviors during a standard toy task.¹⁴ Family routines appear to be crucial for children's sleep. Research suggests that such routines are inversely linked to nighttime waking among two- to 13-month-old infants.¹⁵ Adherence to bedtime routines has also been associated with more nighttime sleep at 36 and 42 months; the effect was particularly strong when parents' discipline practices were consistent during the day.¹⁶

Moreover, a lack of sleep routines at age three is associated with greater body fat both at the time and eight years later.¹⁷ On the other hand, a lack of mealtime routines, namely distraction (noise, people coming to and leaving the table, or the presence of toys or books), can alter parents' healthy dietary practices. Such practices may include serving

healthy foods at the dinner table as well as maternal feeding responsiveness during meals (for example, encouraging children to eat healthy food).¹⁸ Taken together, then, the research suggests that family routines are important for behavioral development and physical health, perhaps because they add stability to children's lives.

Changes in Family Structure

The structure of American families has changed in the past few decades, with divorce and cohabitation becoming more common.¹⁹ Though most children still live with two biological parents at any given time, more than half will experience an alternative family structure by the time they're 18 years old.²⁰ In general, research suggests that major transitional events like divorce play a pivotal, causal role in children's behavior, particularly regarding such outcomes as high school graduation, social-emotional adjustment, and mental health as adults.²¹

Though most children still live with two biological parents at any given time, more than half will experience an alternative family structure by the time they're 18 years old.

The nature, frequency, and timing of changes in family structure all interact to impact children's development more than the actual family structure itself. When biological fathers leave the family, they most commonly do so when a child is in the first

year of life; when they join the family, they typically do so in the child's first three years.²² Exits and entrances of nonbiological fathers are associated with increases in antisocial behavior among children, while entrances of biological fathers reduce antisocial behavior among boys. And national birth cohort data suggest that when nine- to 24-month-olds in single-parent households gain either grandparents or a biological parent in the household, their cognitive abilities improve over time.²³ These findings suggest that the type of transition matters more than the transition itself.

In addition to the type of changes, timing matters. One study examined children who experienced instability at different points in their lives: between birth and the end of kindergarten (early childhood only), between first grade and the end of fourth grade (middle childhood only), and in both early and middle childhood. The study compared these children with others who experienced no instability (serving as the reference group).²⁴ Family instability in early childhood consistently predicted adverse outcomes, including greater loneliness, lower social competence, less popularity with peers, and more acting out. In contrast, family instability during middle childhood, or instability that occurred during both early and middle childhood, had little effect.

A study that examined cumulative family transitions during three development stages—early childhood, middle childhood, and early adolescence—found that instability in early childhood and in adolescence was associated with adolescent marijuana use.²⁵ Children who experienced parental relationship instability before age five were more likely at 16 years of age to report having had sexual partnerships or an episode of

major depression during adolescence.²⁶ Other researchers used national data to examine family structural changes at ages zero to three years, four to six, six to eight, and nine to 12. They found that family structure changes in the first three years of life were more consistently related to children's behavior problems than were changes that occurred later.²⁷

In sum, though some evidence suggests that instability in family structure can have negative outcomes for young children, the findings depend on a complex variety of factors, including the type of change and the timing. It's likely that the effects of these changes depend on the extent to which they compromise or promote the primary caregiver's ability to provide quality care for the child.

Changes in family structure can also lead to a host of other alterations in children's lives, including but not limited to residential instability.

Residential Instability

While moving isn't uncommon among US families, frequent changes in residence create instability that's associated with detrimental outcomes in children.²⁸

Residential instability can lead to other sources of instability, including changes in caregivers, schools, and neighborhoods, thus increasing the overall chaotic nature of children's primary environments. Like many risk factors, higher rates of mobility are more likely to affect families from disadvantaged backgrounds, due to forced displacement.²⁹ The effects of residential moves on children's development stem from a range of factors, including disrupted routines, loss of social support networks, disrupted school experiences, and increased

parenting stress accompanied by diminished parenting quality.³⁰

There's little research on how residential instability affects children in their earliest years, but the data we do have suggest negative effects. Moving during the first trimester of pregnancy appears to be a risk factor for adverse birth outcomes, including low birth weight, preterm birth, and being small for gestational age.³¹ Children who experience more than three moves before age four tend to have a higher body mass index (BMI), an indicator of body fat, than do children who experience no moves, even after controlling for a variety of potential confounding factors such as mothers' education, family income, parity, and mother's BMI before pregnancy.³² The effects of residential mobility are likely moderated by individual personality characteristics: the effects are worse for children with high levels of emotionality, and for girls.³³ Family-level variables such as social support can also play a moderating role.³⁴

Daycare Instability

Data suggest that 61 percent of US children under five are placed in some type of out-of-home childcare arrangement; nearly a quarter of preschoolers are cared for in organized facilities.³⁵ It's particularly relevant here that 39 percent of children under five, or over six million, experience irregular childcare arrangements (see the article in this issue by Ajay Chaudry and Heather Sandstrom).

In general, erratic childcare arrangements harm children's social-emotional development. Variability in childcare is linked to less-secure attachment behaviors with the mother, while staying with the same childcare provider is positively associated

with attachment security to the caregiver.³⁶ Instability in childcare arrangements is also associated with greater problematic behavior at age four and in first grade, and negatively associated with social adjustment in prekindergarten.³⁷ Independently of a host of statistical controls, the number of different daycare arrangements beginning at four months predicts noncompliant behaviors at 24 months (though not at 36 months).³⁸ In a national sample of Canadian infants and toddlers (aged three and under) cared for outside the home, those with one or more changes in daycare in the previous year were 33 percent more likely to be categorized as having a difficult temperament. However, motoric and social developmental risks were unrelated to daycare changes.³⁹ In another sample, the number of childcare settings experienced by children between eight and 36 months was negatively associated with social adjustment in prekindergarten.⁴⁰ Multiple childcare arrangements in the first year of life predicted acting out in third and fourth grade and peer nominations for aggressive behaviors.⁴¹ Though these studies weren't experimental, each was able to control for a range of factors that can influence the results, such as socioeconomic status.

Quasi-experimental studies, which compare groups of children, support the observational findings. Daycare stability between two and a half and four years of age was positively related to school readiness among low-income children, independently of a host of statistical controls.⁴² In one study, researchers observed distress and problem behaviors for three to four weeks before and after infants were moved from one daycare center classroom to a new one with a new caregiver.⁴³ The transition increased such behaviors, unrelated to other factors such as

pre-move outcomes, socioeconomic status, or gender. Another study, using a national data set, found that changes in the number of concurrent, nonparental caregivers predicted both increased problem behaviors and fewer prosocial actions.⁴⁴ In a different form of daycare instability, fluctuations in the peer groups and childcare providers of six- to 30-month-olds were associated with teacher ratings of stress and apprehension, though this relation had dissipated 18 months later.⁴⁵

As Chaudry and Sandstrom note elsewhere in this issue, multiple childcare arrangements are common, particularly among disadvantaged families, and many childcare providers themselves are working poor who are experiencing great financial pressure. Daycare providers' capacity to give children optimal care is often compromised by stress and anxiety related to their own financial instability.

Noise, Crowding, and Chaos

In addition to instability in social contexts, unpredictable environmental factors such as noise, crowding, and chaos are also associated with adverse child development.

Sleep disturbance from chronic noise exposure is well documented, with both behavioral and psychophysiological effects.

Noise

Background noise is everywhere, and noise—defined as unwanted or unattended sound, often at loud volumes—is common

in young children's environments.⁴⁶ Noise can have many effects, such as impairing learning and perception as well as health.⁴⁷ Both cross-sectional and longitudinal data indicate that noise exposure can have negative consequences for children's cognitive development as early as six months through 42 months of age; some evidence suggests that the correlation is stronger in boys and in infants and toddlers with difficult temperaments.⁴⁸ In a study of children with a mean age of 28.2 months attending home daycare settings, noise levels were negatively associated with wellbeing—as assessed by experimenter ratings of children's flexibility, confidence, vitality, and pleasure—independent of setting quality, teacher competence, or multiple sociodemographic factors.⁴⁹ In a second study, this one of children in center daycare with a mean age of 34.5 months, using similar statistical controls, noise was again significantly related to ratings of wellbeing.⁵⁰

Sleep disturbance from chronic noise exposure is well documented, with both behavioral and psychophysiological effects.⁵¹ Community noise effects on sleep resemble those produced in laboratory studies. In a series of studies in Japan, researchers found that the majority of babies living in an area where noise levels were above a certain threshold had abnormal brain activity, suggesting disturbed sleep.⁵² Similarly, in most epidemiological studies, low birth weight is associated with mothers' exposure to occupational and environmental noise, though the quality of research is poor.⁵³ Experimental work with animals, however, finds adverse noise impacts on birth outcomes along with evidence of stress-related neuroendocrine disruptions caused by noise exposure.⁵⁴

One experimental study examined the role of noise when children from 12 to 36 months old played with toys. Each child was observed with the toys for 30 minutes with a television on (at typical listening volume) and off.⁵⁵ The investigators found significant television-related reduction in both length of play episodes and focused attention.

Another aspect of noise exposure that's relevant to early child development is how caregivers adapt to noisy environments. Not surprisingly, teachers and parents in noisier settings are more annoyed, more irritated, and less patient; they report higher levels of fatigue, and teachers report less job satisfaction.⁵⁶ Two studies found that parents in noisier home environments were less responsive to one-year-olds; in a different sample of one-year-olds, boys (but not girls) exposed to noise showed less mastery-oriented behavior in a standard play protocol.⁵⁷ In an experiment where background noise was manipulated by having a television on or off, parents interacted less with their children (both verbally and nonverbally) and were less responsive to them when the television was on.⁵⁸

Given that language acquisition depends on speech perception, young children who spend a lot of time in noisy settings may be at risk for deficits in reading skills. In comparing two cohorts of children in a daycare center (median age 55 months) before and after extensive sound attenuation in the facility, researchers found that in the second year, after the sound attenuation work, children scored higher on phoneme recognition, an underlying cognitive skill for reading acquisition, and on teacher-rated language skills.⁵⁹ Similar improvements in reading acquisition have been documented in primary school children on the noisy side

of a school adjacent to a train track following extensive sound attenuation; reading scores remained the same for pupils on the quiet side of the building.⁶⁰ And in an experiment, novel word learning among 22- to 30-month-olds was impeded by exposure to background noise, although older toddlers (32 to 36 months) were relatively unaffected.⁶¹

Crowding

Crowding, typically measured by the number of people per room, can occur either in the home or in school. The evidence suggests that crowding has both direct and indirect effects, and is negatively associated with a range of social and cognitive factors. Like noise, crowding can diminish a parent's ability to provide sensitive care. It's essentially another source of stress, shown to lead to higher levels of the stress hormone cortisol. In one study, more-crowded daycare centers, less space per child, and an unexpectedly large number of caregivers were all associated with greater increases in cortisol among 18- to 40-month-olds.⁶² Like any source of stress, crowding can harm social functioning as well as cognitive development.

Crowding influences the social interactions of children and parents alike. Children in crowded nursery schools and those living in more-crowded homes exhibit more social withdrawal at school and are less likely to have formed a playmate bond there.⁶³ Both in laboratory studies and in manipulations of density in nursery schools, researchers found more social withdrawal in preschoolers who experienced crowding.⁶⁴ Among parents of toddlers, responsiveness is diminished in homes that are more crowded.⁶⁵ In turn, less-responsive parenting in crowded homes leads to less parent language diversity.⁶⁶ In two

large samples of three-year-olds in the United States and the United Kingdom, residential crowding was associated with less maternal responsiveness, which diminished children's basic cognitive skills.⁶⁷ Both of these field studies incorporated extensive statistical controls. These observational findings have been replicated in several laboratory studies and quasi-experimental field studies with older children.⁶⁸

In addition to social withdrawal and poor-quality interactions, crowding also seems to increase disruptive behaviors. In a quasi-experimental analysis of a national sample of children from three to 12 years old, increases in residential density were related to increases in acting out and other conduct problems.⁶⁹ In a cross-sectional analysis of a different sample (three to 17 years) old with greater variability in residential density, the behavioral problems and overall health effects were replicated.⁷⁰ Both analyses included extensive controls for sociodemographic factors. However, another study found that home and daycare crowding in and of itself didn't lead to behavior problems; the researchers saw higher levels of behavioral problems only when crowding was evident at both home and daycare.⁷¹

Several observational studies reveal negative correlations between residential crowding during infancy and cognitive development.⁷² A small number of studies with older children also reveal cognitive deficits caused by crowding. For instance, a time series study that experimentally altered room size among kindergarten children revealed that on-task behavior occurred for 88 percent of the time under low density periods and for 60 percent of the time under high density periods, in the same classrooms with the same students and teachers.⁷³

Research also suggests that crowding is associated with aggression, but findings are mixed. Unexpectedly, in one study boys seemed slightly less aggressive when crowded.⁷⁴ But in another they were more aggressive when crowded.⁷⁵ Girls didn't display higher levels of aggression as a function of crowding in either study. Crowding is often associated with resources or, in the context of childcare, play and educational materials. Crowding seems to be associated with the greatest aggression when density levels are very high and when children have less access to play and educational materials.⁷⁶

Chaos and Instability

As an aspect of the environment, chaos captures many factors—not just noise and density, but also cleanliness, clutter, and instability. Children's development of competency depends, in part, on having their basic physiological needs met (for example, sleep) and on having a predictable, reliable environment that fosters their understanding of the contingency between their own actions and environmental responses. Both of these are undoubtedly harder to come by in chaotic social and physical contexts. Indeed, for preschool children chaos can interfere with sleep, which in turn predicts outcomes such as helplessness.⁷⁷ Evidence also suggests that chaos affects the stress response system: among Head Start children, elevations in chaos from the beginning of the school year to the end have been found to be associated with higher levels of cortisol.⁷⁸ Long-term exposure to chaos is likely a source of chronic stress that disrupts the development of basic self-control in children.

Though we lack experimental studies with infants, several studies that followed children over time provide evidence of a detrimental relation between chaos and children's development. One study of a predominantly low-income sample measured chaos as a composite of residential density, noise exposure, cleanliness and clutter, and the household's level of preparation for the research team's home visit, recorded when children were two, six, 15, 24, and 36 months old.⁷⁹ This index negatively predicted language acquisition at age 36 months and at five years, after controlling for a large number of other factors. Other studies have found that household chaos in the first years of life leads to lower behavioral control in children measured at three to five years of age.⁸⁰ A dose-response relationship is apparent: one destabilizing event has no effect, but high levels of instability are associated with health problems and depression in caregivers and with attention/impulsivity problems in children.⁸¹ These findings dovetail with the research showing that regular routines are beneficial for children.

Instability is another composite index that typically includes changes in family composition, residential location, childcare arrangements, and parents' work schedules. The cumulative effect of these changes is likely more detrimental than any single factor alone. Increased instability is negatively associated with a wide range of indicators, including academic, emotional, and behavioral functioning, and the impact is greater among children from more disadvantaged backgrounds.⁸² Conversely, children who experienced decreased instability over a two-year period showed improvements in behavior.⁸³ Moreover, greater instability during childhood appears

to influence interpersonal functioning during adolescence and adulthood.⁸⁴

Policies and Interventions

Upstream policies and programs can play a pivotal role in the degree of chaos and instability in young children's lives. Unfortunately, interventions that specifically target predictability are rare—most programs are designed to promote healthy family functioning, or to improve living conditions for children broadly. Furthermore, the design and implementation of policies and programs may themselves influence the degree of chaos and instability in families' lives. Social safety net programs that are designed to help families from disadvantaged backgrounds generally focus on providing resources, but they rarely if ever consider how the programs' stipulations can inadvertently increase instability and chaos in children's lives. For example, to receive government benefits, families typically must be certified and recertified, with eligibility often tied to employment. These factors, along with administrative burdens, can lead to churn, resulting in unstable processes of enrolling and disenrolling, and unpredictable gaps in services. Administrative roadblocks to meeting and maintaining eligibility can shorten the length of time that families receive benefits, increase unpredictability, and heighten financial pressure. As another illustration, 58 percent of American women experience a change in health insurance coverage during their pregnancy, and 36 percent must contend with a change in coverage within six months after their child is born.⁸⁵ Moreover, as Christopher Wimer and Sharon Wolf document elsewhere in this issue, poverty is often accompanied by income instability, which has multiple adverse effects on young children. In table 1,

Table 1. How Programs and Policies Contribute to Family Instability

Programs/Policies	Contributions to Instability
Health insurance	Health insurance in the United States is often tied to a job, and it may be gained or lost for a variety of reasons, including employment, eligibility, or financial status. Insurance for prenatal and pediatric care is often sporadic; people enroll and disenroll as a result of fluctuating eligibility, as well as for procedural reasons common among disadvantaged families. Insurance instability reduces the use of preventative care for children as well as continuity of care.
Residential assistance	Programs such as Section 8 focus on providing housing for families via rental vouchers that families can use in any neighborhood. But if landlords can't be compelled to accept Section 8, finding stable housing with willing landlords can be a challenge and can lead to more moves.
Nutrition assistance	Nutrition assistance programs provide supplementary income to meet a family's food needs. The Supplemental Nutrition Assistant Program (SNAP), the largest program in the United States, serves about 45 million Americans. Unfortunately, it's often insufficient; families often run out of SNAP before receiving their next benefit. Moreover, preference for immediate usage can lead to elevated food insecurity at the end of the month, affecting children's development.
Work scheduling	Erratic work schedules affect about 10 percent of the workforce, mostly low-income families. Schedules that change with little notice can undermine economic security, upset family routines, wreak havoc on daycare provision, and generally make it hard to plan and schedule activities.

Source: Sean M. Orzol, Lauren Hula, and Mary Harrington, "Program Churning and Transfers between Medicaid and CHIP," *Academic Pediatrics* 15 (2015): S56–63, <https://doi.org/10.1016/j.acap.2015.02.006>; Thomas Buchmueller, Sean M. Orzol, and Lara Shore-Sheppard, "Stability of Children's Insurance Coverage and Implications for Access to Care: Evidence from the Survey of Income and Program Participation," *International Journal of Health Care Finance and Economics* 14 (2014): 109–26, <https://doi.org/10.1007/s10754-014-9141-1>; Ruth A. Lindberg et al., "Housing Interventions at the Neighborhood Level and Health: A Review of the Evidence," *Journal of Public Health Management and Practice* 16 (2010): S44–52, <https://doi.org/10.1097/PHH.0b013e3181dfbb72>; Susan M. Levin, Neal D. Barnard, and Rose E. Saltalamacchia, "A Proposal for Improvements in the Supplemental Nutrition Assistance Program," *American Journal of Preventive Medicine* 52 (2017): S186–92, <https://doi.org/10.1016/j.amepre.2016.07.016>; Chad Cotti, John Gordanier, and Orgul Ozturk, "When Does It Count? The Timing of Food Stamp Receipt and Educational Performance," *Economics of Education Review* 66 (2018): 40–50, <https://doi.org/10.1016/j.econedurev.2018.06.007>; Lonnie Golden, "Irregular Work Scheduling and Its Consequences," briefing paper, Economic Policy Institute, Washington, DC, April 9, 2015, <https://www.epi.org/publication/irregular-work-scheduling-and-its-consequences/>.

we provide examples of policies and programs that may inadvertently affect family stability.

Yet policies and interventions can improve families' stability if they're redesigned to consider predictability and stability more explicitly. For example, parenting-based interventions aim—through training, support, and education—to enhance or change parent behaviors through video or live modeling of skills, practicing such skills, and feedback.⁸⁶ Meta-analyses, where researchers combine

results from a host of different studies, suggest that parenting-based interventions are generally effective at improving both parenting behaviors and children's outcomes, including social-emotional development and attachment.⁸⁷ While parenting programs don't specifically address unpredictability, a core component of most of them is to foster warmth and contingent responses to children's signals (which is closely related to predictability). A good example is Playing and Learning Strategies (PALS), an infant intervention program that focuses on

improving mothers' ability to be warm and supportive, to limit negative affect, and (of particular relevance here) to respond to children contingently.⁸⁸ In a randomized controlled trial, the PALS intervention improved mothers' responsiveness compared to that of a control group; in turn, this improved responsiveness predicted greater growth in infants' emotional and cognitive competency.

In one intervention specific to family routines, parents of Early Head Start (EHS) children were randomly selected to receive information and support to encourage regular bedtimes; a control group of EHS families didn't receive this information. The intervention increased routine bedtimes among two-year-olds by about 10 percent, though it wasn't successful for three-year-olds.⁸⁹ A similar experimental intervention reduced the frequency and duration of nighttime awakening among infants and toddlers and, not surprisingly, elevated mothers' mood.⁹⁰

Several programs that focused on cultivating healthy marriages have demonstrated positive outcomes that may affect family stability. Bringing Baby Home, a psycho-educational program for couples transitioning to parenthood, aims to strengthen coping skills to prepare for the stress of a new baby. It offers support groups, education on marital satisfaction, and training for parent-child interactions, and it focuses on keeping fathers involved. Programs like this are particularly important because the transition to parenthood is a period of substantial stress associated with deterioration in relationships.⁹¹

Randomized evaluations of Bringing Baby Home have found that compared to parents in a control group, both husbands and wives

report higher rates of marital satisfaction and lower levels of depression and hostile affect.⁹² Similarly, the Becoming a Family Project intervention study found that men who participated in a couples group reported more psychological involvement than men who didn't. Moreover, in contrast to the drop in marital satisfaction typically seen after a child is born, marital satisfaction levels remained stable. Perhaps most important, by the time the children reached 18 months of age, 12.5 percent of control group couples had separated or divorced, while all couples in the intervention group remained intact.⁹³ Overall, 72 couples participated, with 24 in the intervention group and the others serving as controls.

Despite higher rates of family instability among low-income families, few couple and relationship education programs have been designed to serve these groups. But several studies show that these interventions can improve marital satisfaction and foster relationship skills that may mitigate risk for divorce or separation. Data from the Supporting Healthy Marriage Project—a randomized, controlled trial of relationship education of 1,034 low-income couples—found that the intervention was associated with higher levels of relationship satisfaction and improved communication 30 months after the intervention ended.⁹⁴ However, the effects were generally small. Interestingly, Hispanic couples (the largest ethnic minority group in the sample) had larger and more consistent positive impacts than did non-Hispanic couples.⁹⁵

Environmental design can also foster more predictability and routine in children's lives. Above we noted examples where

noise attenuation caused improvements in early reading skills. In the same way, architectural configuration of residential layouts can mitigate some of the negative impacts of crowding on psychological health caused by social withdrawal.⁹⁶

Conclusions

The evidence generally suggests that young children have more adjustment problems when they face unpredictable and unstable environments. At the same time, however, we must take into account the specific characteristics of the particular environmental instability or unpredictability, along with children's characteristics and family resources. It's also important to emphasize that the bulk of the evidence is correlational, although the quasi-experimental or experimental evidence that's available converges well with the observational results.

We've described specific dimensions of the social and physical environment and examined how the temporal predictability of these factors is associated with child outcomes. We've also delineated different types of instability in order to describe their nature and potential impacts more clearly. Still, these various sources of instability tend to cluster together. For example, family structural instability often accompanies higher levels of residential mobility, and instability in parents' work schedules undoubtedly creates challenges for childcare arrangements.⁹⁷ Instability also clusters with other factors: for example, families who often move are also more likely to be moving from one disadvantaged neighborhood to another. Moreover, environmental instability interacts with other early developmental risk factors,

accentuating their harmful impacts. For instance, high residential density amplifies the negative consequences of prematurity and low birth weight on both social-emotional and cognitive development among three-year-olds.⁹⁸

The types of chaos and instability as well as their effects are likely impacted by children's age. Unpredictability and instability in primary caregivers are most detrimental for infants and toddlers, who rely heavily on those caregivers for all their needs. On the other hand, primary caregivers who continue to provide sensitive and nurturing care can likely buffer the effects of other forms of instability, such as moving. Thus caregivers' responses to chaos and unpredictability may be a critical pathway for adverse impacts on children aged three and under. It's worth mentioning that a decades-long research program on chaotic environments among rodents and primates reveals adverse impacts on maternal behaviors among both types of animal—impacts that in turn influence their offspring's behavior and stress biomarkers.⁹⁹ Residential instability is linked to school instability and diminished peer relationships, which may affect school-aged children and young adolescents more than infants and toddlers. We need more research, however, to better understand how developmental periods interact with chaos and instability to influence children's development.

Finally, instability isn't necessarily bad. Divorce from an abusive spouse, for example, is better for children in the long run. Children in families that move to better neighborhoods early in their childhood are likely to have better outcomes. And some degree of adversity is

necessary to learn how to manage emotions and behaviors. But when the challenges are highly variable, children's ability to acquire self-regulatory skills is likely compromised. Thus understanding the nature of change—voluntary or involuntary, planned or unplanned—will be important for future research. The current evidence suggests that instability, chaos, and unpredictable circumstances are stressful for parents and

children early in life and produce a wide range of negative outcomes. Moreover, disadvantaged families who are also exposed to many other risks are precisely the families most likely to lack stable, predictable, and well-structured environmental conditions.¹⁰⁰ Policies and interventions that aim to help at-risk families need to account for the ways that chaos and instability influence early child development.

Endnotes

1. Bruce J. Ellis et al., "Fundamental Dimensions of Environmental Risk: The Impact of Harsh versus Unpredictable Environments on the Evolution and Development of Life History Strategies," *Human Nature* 20 (2009): 204–68, <https://doi.org/10.1007/s12110-009-9063-7>; Sheldon Cohen et al., *Behavior, Health and Environmental Stress* (New York: Plenum Press, 1986).
2. Emma K. Adam, "Beyond Quality: Parental and Residential Stability and Children's Adjustment," *Current Directions in Psychological Science* 13 (2004): 210–13, <https://doi.org/10.1111/j.0963-7214.2004.00310.x>; Gary W. Evans and Theodore D. Wachs, eds., *Chaos and Its Influence on Children's Development: An Ecological Perspective* (Washington, DC: American Psychological Association, 2010), <https://doi.org/10.1037/12057-000>.
3. Elysia Poggi Davis et al., "Exposure to Unpredictable Maternal Sensory Signals Influences Cognitive Development across Species," *Proceedings of the National Academy of Sciences* 114 (2017): 10390–5, <https://doi.org/10.1073/pnas.1703444114>.
4. Kenneth N. Levy et al., "Attachment Style," *Journal of Clinical Psychology* 67 (2011): 193–203, <https://doi.org/10.1002/jclp.20756>.
5. Beatrice Beebe et al., "The Origins of 12-Month Attachment: A Microanalysis of 4-Month Mother–Infant Interaction," *Attachment & Human Development* 12 (2010): 3–141, <https://doi.org/10.1080/14616730903338985>.
6. Judith A. Feeney, "Implications of Attachment Style for Patterns of Health and Illness," *Child: Care, Health and Development* 26 (2000): 277–88, <https://doi.org/10.1046/j.1365-2214.2000.00146.x>; Linda J. Luecken, "Childhood Attachment and Loss Experiences Affect Adult Cardiovascular and Cortisol Function," *Psychosomatic Medicine* 60 (1998): 765–72, <https://doi.org/10.1097/00006842-199811000-00021>; Gunilla Bohlin, Berit Hagekull, and Ann-Margret Rydell, "Attachment and Social Functioning: A Longitudinal Study from Infancy to Middle Childhood," *Social Development* 9 (2000): 24–39, <https://doi.org/10.1111/1467-9507.00109>.
7. Maureen M. Acker and Susan G. O'Leary, "Inconsistency of Mothers' Feedback and Toddlers' Misbehavior and Negative Affect," *Journal of Abnormal Child Psychology* 24 (1996): 703–14, <https://doi.org/10.1007/BF01664735>.
8. Douglas B. Sawin and Ross D. Parke, "Inconsistent Discipline of Aggression in Young Boys," *Journal of Experimental Child Psychology* 28 (1979): 525–38, [https://doi.org/10.1016/0022-0965\(79\)90079-1](https://doi.org/10.1016/0022-0965(79)90079-1).
9. Kathy Hirsh-Pasek et al., "The Contribution of Early Communication Quality to Low-Income Children's Language Success," *Psychological Science* 26 (July 2015): 1071–83, <https://doi.org/10.1177/0956797615581493>.
10. Celeste Kidd, Holly Palmeri, and Richard N. Aslin, "Rational Snacking: Young Children's Decision-Making on the Marshmallow Task Is Moderated by Beliefs about Environmental Reliability," *Cognition* 126 (2013): 109–14, <https://doi.org/10.1016/j.cognition.2012.08.004>.
11. Laura M. Glynn and Tallie Z. Baram, "The Influence of Unpredictable, Fragmented Parental Signals on the Developing Brain," *Frontiers in Neuroendocrinology* 53 (2019): article 100736, <https://doi.org/10.1016/j.yfrne.2019.01.002>.
12. Barbara H. Fiese, *Family Routines and Rituals* (New Haven, CT: Yale University Press, 2006).
13. Liat Tikotzky et al., "Sleep and Physical Growth in Infants during the First 6 Months," *Journal of Sleep Research* 19 (2010): 103–10, <https://doi.org/10.1111/j.1365-2869.2009.00772.x>; Nancy A. Hamilton et al., "Sleep and Psychological Well-Being," *Social Indicators Research* 82 (2007): 147–63, <https://doi.org/10.1007/s11205-006-9030-1>.

14. Theodore D. Wachs, "Specificity of Environmental Action as Manifest in Environmental Correlates of Infant's Mastery Motivation," *Developmental Psychology* 23 (1987): 782–90, <https://doi.org/10.1037/0012-1649.23.6.782>.
15. Lewis W. Sprunger, W. Thomas Boyce, and John A. Gaines, "Family-Infant Congruence: Routines and Rhythmicity in Family Adaptations to a Young Infant," *Child Development* 56 (1985): 564–72, <https://doi.org/10.2307/1129746>.
16. Angela D. Staples, John E. Bates, and Isaac T. Petersen, "Bedtime Routines in Early Childhood: Prevalence, Consistency, and Associations with Nighttime Sleep," *Monographs of the Society for Research in Child Development* 80, no. 1 (2015): 141–59, <https://doi.org/10.1111/mono.12149>.
17. Katherine E. Speirs, Janet M. Liechty, and Chi-Fang Wu, "Sleep, but Not Other Daily Routines, Mediates the Association between Maternal Employment and BMI for Preschool Children," *Sleep Medicine* 15 (2014): 1590–93, <https://doi.org/10.1016/j.sleep.2014.08.006>; Sarah E. Anderson et al., "Self-Regulation and Household Routines at Age Three and Obesity at Age Eleven: Longitudinal Analysis of the UK Millennium Cohort Study," *International Journal of Obesity* 41 (2017): 1459–66, <https://doi.org/10.1038/ijo.2017.94>.
18. Eileen FitzPatrick, Lynn S. Edmunds, and Barbara A. Dennison, "Positive Effects of Family Dinner Are Undone by Television Viewing," *Journal of the American Dietetic Association* 107 (2007): 666–71, <https://doi.org/10.1016/j.jada.2007.01.014>; Jaclyn A. Saltzman et al., "Associations between Father Availability, Mealtime Distractions and Routines, and Maternal Feeding Responsiveness: An Observational Study," *Journal of Family Psychology* 33 (June 2019): 465–75, <https://doi.org/10.1037/fam0000519>.
19. Lynne M. Casper and Suzanne M. Bianchi, *Continuity & Change in the American Family* (Thousand Oaks, CA: Sage, 2002).
20. Larry Bumpass and Hsien-Hen Lu, "Trends in Cohabitation and Implications for Children's Family Contexts in the United States," *Population Studies* 54 (2000): 29–41, <https://doi.org/10.1080/713779060>.
21. Sara McLanahan, Laura Tach, and Daniel Schneider, "The Causal Effects of Father Absence," *Annual Review of Sociology* 39 (July 2013): 399–427, <https://doi.org/10.1146/annurev-soc-071312-145704>.
22. Mitchell et al., "Family Structure Instability, Genetic Sensitivity, and Child Well-Being," *American Journal of Sociology* 120 (2015): 1195–1225, <https://doi.org/10.1086/680681>.
23. Yongmin Sun and Yuanzhang Li, "Alternative Households, Structural Changes, and Cognitive Development of Infants and Toddlers," *Journal of Family Issues* 35 (2014): 1440–72, <https://doi.org/10.1177/0192513X13495399>.
24. Shannon E. Cavanagh and Aletha C. Huston, "The Timing of Family Instability and Children's Social Development," *Journal of Marriage and Family* 70 (2008): 1258–70, <https://doi.org/10.1111/j.1741-3737.2008.00564.x>.
25. Shannon E. Cavanagh, "Family Structure History and Adolescent Adjustment," *Journal of Family Issues* 29 (2008): 944–80, <https://doi.org/10.1177/0192513X07311232>.
26. Kelly L. Donahue et al., "Early Exposure to Parents' Relationship Instability: Implications for Sexual Behavior and Depression in Adolescence," *Journal of Adolescent Health* 47 (2010): 547–54, <https://doi.org/10.1016/j.jadohealth.2010.04.004>.
27. Rebecca M. Ryan and Amy Claessens, "Associations between Family Structure Changes and Children's Behavior Problems: The Moderating Effects of Timing and Marital Birth," *Developmental Psychology* 49 (2013): 1219–31, <https://doi.org/10.1037/a0029397>.
28. Tim Jolleyman and Nicholas Spencer, "Residential Mobility in Childhood and Health Outcomes: A Systematic Review," *Journal of Epidemiology & Community Health* 62 (July 2008): 584–92, <https://doi.org/10.1136/jech.2007.060103>.

29. Matthew Desmond, Carl Gershenson, and Barbara Kiviat, "Forced Relocation and Residential Instability among Urban Renters," *Social Service Review* 89 (2015): 227–62, <https://doi.org/10.1086/681091>.
30. Adam, "Beyond Quality."
31. Julia C. Bond et al., "Residence Change during the First Trimester of Pregnancy and Adverse Birth Outcomes," *Journal of Epidemiology & Community Health* 73 (2019): 913–19, <https://doi.org/10.1136/jech-2018-211937>.
32. Tim T. Morris, Kate Northstone, and Laura D. Howe, "Examining the Association between Early Life Social Adversity and BMI Changes in Childhood: A Life Course Trajectory Analysis," *Pediatric Obesity* 11 (2016): 306–12, <https://doi.org/10.1111/ijpo.12063>.
33. Zolinda Stoneman et al., "Effects of Residential Instability on Head Start Children and Their Relationships with Older Siblings: Influences of Child Emotionality and Conflict between Family Caregivers," *Child Development* 70 (1999): 1246–62, <https://doi.org/10.1111/1467-8624.00090>; Lynn Magdol, "Is Moving Gendered? The Effects of Residential Mobility on the Psychological Well-Being of Men and Women," *Sex Roles* 47 (2002): 553–60, <https://doi.org/10.1023/A:1022025905755>.
34. Elizabeth M. Riina, Adam Lippert, and Jeanne Brooks-Gunn, "Residential Instability, Family Support, and Parent-Child Relationships among Ethnically Diverse Urban Families," *Journal of Marriage and Family* 78 (2016): 855–70, <https://doi.org/10.1111/jomf.12317>.
35. Lynda Laughlin, "Who's Minding the Kids? Child Care Arrangements: Spring 2011," *Household Economic Studies* (US Census Bureau, US Department of Commerce) (2013), <https://www.census.gov/prod/2013pubs/p70-135.pdf>.
36. Joan Suwalsky et al., "Continuity of Substitute Care in Relation to Infant-Mother Attachment," paper presented at the Annual Meeting of the American Psychological Association, Washington, DC, August 1986; Helen Raikes, "Relationship Duration in Infant Care: Time with a High-Ability Teacher and Infant-Teacher Attachment," *Early Childhood Research Quarterly* 8 (1993): 309–25, [https://doi.org/10.1016/S0885-2006\(05\)80070-5](https://doi.org/10.1016/S0885-2006(05)80070-5).
37. Carollee Howes and Claire E. Hamilton, "The Changing Experience of Child Care: Changes in Teachers and in Teacher-Child Relationships and Children's Social Competence with Peers," *Early Childhood Research Quarterly* 8 (1993): 15–32, [https://doi.org/10.1016/S0885-2006\(05\)80096-1](https://doi.org/10.1016/S0885-2006(05)80096-1); Verne R. Bacharach and Alfred A. Baumeister, "Child Care and Severe Externalizing Behavior in Kindergarten Children," *Journal of Applied Developmental Psychology* 23 (2003): 527–37, [https://doi.org/10.1016/S0193-3973\(02\)00140-5](https://doi.org/10.1016/S0193-3973(02)00140-5); Carollee Howes, "Relations between Early Child Care and Schooling," *Developmental Psychology* 24 (1988): 53–7, <https://doi.org/10.1037/0012-1649.24.1.53>; Mary E. Bratsch-Hines et al., "Child Care Instability from 6 to 36 Months and the Social Adjustment of Children in Prekindergarten," *Early Childhood Research Quarterly* 30 (2015), <https://doi.org/10.1016/j.ecresq.2014.09.002>.
38. NICHD Early Child Care Research Network, "Early Child Care and Self-Control, Compliance, and Problem Behavior at Twenty-Four and Thirty-Six Months," *Child Development* 69 (1998): 1145–70, <https://doi.org/10.2307/1132367>.
39. Dafna E. Kohen, Clyde Hertzman, and Michele Wiens, "Environmental Changes and Children's Competencies," working paper W-98-25E, Human Resources Development Canada, Ottawa, ON, 1998.
40. Bratsch-Hines et al., "Child Care Instability."
41. Lise M. Youngblade, "Peer and Teacher Ratings of Third- and Fourth-Grade Children's Social Behavior as a Function of Early Maternal Employment," *Journal of Child Psychology and Psychiatry* 44 (2003): 477–88, <https://doi.org/10.1111/1469-7610.00138>.
42. Susanna Loeb et al., "Child Care in Poor Communities: Early Learning Effects of Type, Quality, and Stability," *Child Development* 75 (2004): 47–65, <https://doi.org/10.1111/j.1467-8624.2004.00653.x>.

43. Debby Cryer et al., "Effects of Transitions to New Child Care Classes on Infant/Toddler Distress and Behavior," *Early Childhood Research Quarterly* 20 (2005): 37–56, <https://doi.org/10.1016/j.ecresq.2005.01.005>.
44. Taryn W. Morrissey, "Multiple Child-Care Arrangements and Young Children's Behavioral Outcomes," *Child Development* 80 (2009): 59–76, <https://doi.org/10.1111/j.1467-8624.2008.01246.x>.
45. J. Clasiën De Schipper et al., "The Relation of Flexible Child Care to Quality of Center Day Care and Children's Socio-Emotional Functioning: A Survey and Observational Study," *Infant Behavior and Development* 26 (2003): 300–25, [https://doi.org/10.1016/S0163-6383\(03\)00033-X](https://doi.org/10.1016/S0163-6383(03)00033-X).
46. Michel Picard, "Characteristics of the Noise, Reverberation Time and Speech-to-Noise Ratio Found in Day-Care Centers," *Canadian Acoustics* 32, no. 3 (2004): 30–1, <https://jcaa.caa-aca.ca/index.php/jcaa/article/view/1612>.
47. Lucy C. Erickson and Rochelle S. Newman, "Influences of Background Noise on Infants and Children," *Current Directions in Psychological Science* 26 (2017): 451–57, <https://doi.org/10.1177/0963721417709087>.
48. Theodore D. Wachs, Ina C. Uzgiris, and J. McVicker Hunt, "Cognitive Development in Infants of Different Age Levels and from Different Environmental Backgrounds: An Explanatory Investigation," *Merrill-Palmer Quarterly of Behavior and Development* 17 (1971): 283–317, <https://www.jstor.org/stable/23084532>.
49. Mariëlle Linting et al., "Threshold for Noise in Daycare: Noise Level and Noise Variability Are Associated with Child Wellbeing in Home-Based Childcare," *Early Childhood Research Quarterly* 28 (2013): 960–71, <https://doi.org/10.1016/j.ecresq.2013.03.005>.
50. Claudia D. Werner et al., "Noise in Center-Based Child Care: Associations with Quality of Care and Child Emotional Wellbeing," *Journal of Environmental Psychology* 42 (2015): 190–201, <https://doi.org/10.1016/j.jenvp.2015.05.003>.
51. Mia Zaharna and Christian Guilleminault, "Sleep, Noise and Health: Review," *Noise and Health* 12 (2010): 64–9, <https://doi.org/10.4103/1463-1741.63205>.
52. Yoshinori Ando and Hiroaki Hattori, "Effects of Noise on Sleep of Babies," *Journal of the Acoustical Society of America* 62 (1977): 199–204, <https://doi.org/10.1121/1.381482>.
53. Gordana Ristovska, Helga Elvira Laszlo, and Anna L. Hansell, "Reproductive Outcomes Associated with Noise Exposure—A Systematic Review of the Literature," *International Journal of Environmental Research and Public Health* 11 (2014): 7931–52, <https://doi.org/10.3390/ijerph110807931>; Mark J. Nieuwenhuijsen, Gordana Ristovska, and Payam Dadvand, "WHO Environmental Noise Guidelines for the European Region: A Systematic Review on Environmental Noise and Adverse Birth Outcomes," *International Journal of Environmental Research and Public Health* 14 (2017): 1252, <https://doi.org/10.3390/ijerph14101252>.
54. Ristovska, Laszlo, and Hansell, "Reproductive Outcomes."
55. Marie Evans Schmidt et al., "The Effects of Background Television on the Toy Play Behavior of Very Young Children," *Child Development* 79 (2008): 1137–51, <https://doi.org/10.1111/j.1467-8624.2008.01180.x>.
56. Gary W. Evans and Staffan Hygge, "Noise and Cognitive Performance in Children and Adults," in *Noise and Its Effects*, ed. Linda M. Luxon and Deepak Prasher (Chichester, UK: Wiley, 2007), 549–66.
57. Theodore D. Wachs and Ozlem Camli, "Do Ecological or Individual Characteristics Mediate the Influence of the Physical Environment upon Maternal Behavior," *Journal of Environmental Psychology* 11 (1991): 249–64, [https://doi.org/10.1016/S0272-4944\(05\)80186-0](https://doi.org/10.1016/S0272-4944(05)80186-0); Feyza Corapci and Theodore D. Wachs, "Does Parental Mood or Efficacy Mediate the Influence of Environmental Chaos upon Parenting

- Behavior?," *Merrill-Palmer Quarterly* 48 (2002): 182–201, <https://doi.org/10.1353/mpq.2002.0006>; Wachs, "Specificity of Environmental Action."
58. Heather L. Kirkorian et al., "The Impact of Background Television on Parent-Child Interaction," *Child Development* 80 (2009): 1350–59, <https://doi.org/10.1111/j.1467-8624.2009.01337.x>.
59. Lorraine E. Maxwell and Gary W. Evans, "The Effects of Noise on Pre-School Children's Pre-Reading Skills," *Journal of Environmental Psychology* 20 (2000): 91–7, <https://doi.org/10.1006/jevp.1999.0144>.
60. Arline L. Bronzaft, "The Effect of a Noise Abatement Program on Reading Ability," *Journal of Environmental Psychology* 1 (1981): 215–22, [https://doi.org/10.1016/S0272-4944\(81\)80040-0](https://doi.org/10.1016/S0272-4944(81)80040-0).
61. Brianna T. M. McMillan and Jenny R. Saffran, "Learning in Complex Environments: The Effects of Background Speech on Early Word Learning," *Child Development* 87 (2016): 1841–55, <https://doi.org/10.1111/cdev.12559>; Justine Dombroski and Rochelle S. Newman, "Toddlers' Ability to Map the Meaning of New Words in Multi-Talker Environments," *Journal of the Acoustical Society of America* 136 (2014): 2807–15, <https://doi.org/10.1121/1.4898051>.
62. Alain Legendre, "Environmental Features Influencing Toddlers' Bioemotional Reactions in Day Care Centers," *Environment and Behavior* 35 (2003): 523–49, <https://doi.org/10.1177/0013916503035004005>.
63. Christine Liddell and Pieter Kruger, "Activity and Social Behavior in a Crowded South African Township Nursery: A Follow-Up Study on the Effects of Crowding at Home," *Merrill-Palmer Quarterly* 35 (1989): 209–26, <https://www.jstor.org/stable/23086365>.
64. Chalsa M. Loo, "The Effects of Spatial Density on the Social Behavior of Children," *Journal of Applied Social Psychology* 2 (1972): 372–81, <https://doi.org/10.1111/j.1559-1816.1972.tb01288.x>; Corinne Hutt and M. Jane Vaizey, "Differential Effects of Group Density on Social Behaviour," *Nature* 209 (1966): 1371–2, <https://doi.org/10.1038/2091371a0>; J. Wesley Burgess and W. Kyle Fordyce, "Effects of Preschool Environments on Nonverbal Social Behavior: Toddlers' Interpersonal Distances to Teachers and Classmates Change with Environmental Density, Classroom Design, and Parent-Child Interactions," *Journal of Child Psychology and Psychiatry* 30 (March 1989): 261–76, <https://doi.org/10.1111/j.1469-7610.1989.tb00239.x>; Penny L. McGrew, "Social and Spatial Density Effects on Spacing Behaviour in Preschool Children," *Journal of Child Psychology and Psychiatry* 11 (1970): 197–205, <https://doi.org/10.1111/j.1469-7610.1970.tb01026.x>; Wolfgang F. E. Preiser, "Work in Progress: Behavior of Nursery School Children under Different Spatial Densities," *Man-Environment Systems* 2 (1972): 247–50.
65. Robert H. Bradley and Bettye M. Caldwell, "The HOME Inventory and Family Demographics," *Developmental Psychology* 20 (1984): 315–20, <https://doi.org/10.1037/0012-1649.20.2.315>; Corapci and Wachs, "Parental Mood or Efficacy"; Theodore D. Wachs, "The Nature of the Physical Microenvironment: An Expanded Classification System," *Merrill-Palmer Quarterly* 35 (1989): 399–419, <https://www.jstor.org/stable/23086393>; Wachs and Camli, "Ecological or Individual Characteristics."
66. Gary W. Evans, Lorraine E. Maxwell, and Betty Hart, "Parental Language and Verbal Responsiveness to Children in Crowded Homes," *Developmental Psychology* 35 (1999): 1020–23, <https://doi.org/10.1037/0012-1649.35.4.1020>.
67. Gary W. Evans, John Eckenrode, and Lyscha A. Marcynyszyn, "Chaos and the Macrosetting: The Role of Poverty and Socioeconomic Status," in *Chaos and Its Influence on Children's Development: An Ecological Perspective*, ed. Gary W. Evans and Theodore D. Wachs (Washington, DC: American Psychological Association, 2010), 225–38, <https://doi.org/10.1037/12057-014>.
68. Gary W. Evans, "Child Development and the Physical Environment," *Annual Review of Psychology* 57 (2006): 423–51, <https://doi.org/10.1146/annurev.psych.57.102904.190057>.
69. Claudia D. Solari and Robert D. Mare, "Housing Crowding Effects on Children's Wellbeing," *Social Science Research* 41 (2012): 464–76, <https://doi.org/10.1016/j.ssresearch.2011.09.012>.

70. Ibid.
71. Lorraine E. Maxwell, "Multiple Effects of Home and Day Care Crowding," *Environment and Behavior* 28 (1996): 494–511, <https://doi.org/10.1177/0013916596284004>.
72. Evans, Eckenrode, and Marcynyszyn, "Chaos and the Macrosetting."
73. Patricia J. Krantz and Todd R. Risley, "The Organization of Group Care Environments: Behavioral Ecology in the Classroom," paper presented at the annual meeting of the American Psychological Association, Honolulu, HI, 1972.
74. Loo, "Effects of Spatial Density."
75. Loo and Judi Smetana, "The Effects of Crowding on the Behavior and Perception of 10-Year-Old Boys," *Environmental Psychology and Nonverbal Behavior* 2 (1978): 226–49, <https://doi.org/10.1007/BF01173771>.
76. Rohe and Arthur H. Patterson, "The Effects of Varied Levels of Resources and Density on Behavior in a Day Care Center," in *Man-Environment Interactions: The State of the Art in Environmental Design Research—Proceedings of the Fifth Annual Environmental Design Research Association Conference*, ed. D. H. Carson (Stroudsburg, PA: Dowden, Hutchinson & Ross, 1974), 161–71.
77. Eleanor D. Brown and Christine M. Low, "Chaotic Living Conditions and Sleep Problems Associated with Children's Responses to Academic Challenge," *Journal of Family Psychology* 22 (2008): 920–23, <https://doi.org/10.1037/a0013652>.
78. Eleanor D. Brown et al., "Economic Instability and Household Chaos Relate to Cortisol for Children in Poverty," *Journal of Family Psychology* 33 (2019): 629–39, <https://doi.org/10.1037/fam0000545>.
79. Lynne Vernon-Feagans et al., "Chaos, Poverty, and Parenting: Predictors of Early Language Development," *Early Childhood Research Quarterly* 27 (2012): 339–51, <https://doi.org/10.1016/j.ecresq.2011.11.001>.
80. Lynne Vernon-Feagans, Michael Willoughby, and Patricia Garrett-Peters, "Predictors of Behavioral Regulation in Kindergarten: Household Chaos, Parenting, and Early Executive Functions," *Developmental Psychology* 52 (2016): 430–41, <https://doi.org/10.1037/dev0000087>.
81. Dana Charles McCoy and C. Cybele Raver, "Household Instability and Self-Regulation among Poor Children," *Journal of Children and Poverty* 20 (2014): 131–52, <https://doi.org/10.1080/10796126.2014.976185>.
82. Paula Fomby and Andrew J. Cherlin, "Family Instability and Child Well-Being," *American Sociological Review* 72 (2007): 181–204, <https://doi.org/10.1177/000312240707200203>; Evans and Wachs, *Chaos and Its Influence*.
83. Brian P. Ackerman, Eleanor Brown, and Carroll E. Izard, "Continuity and Change in Levels of Externalizing Behavior in School Children from Economically Disadvantaged Families," *Child Development* 74 (2003): 694–709, <https://doi.org/10.1111/1467-8624.00563>.
84. Ohad Szepesenwol, Osnat Zamir, and Jeffery A. Simpson, "The Effect of Early-Life Harshness and Unpredictability on Intimate Partner Violence in Adulthood: A Life History Perspective," *Journal of Social and Personal Relationships* 36 (2019): 1542–56, <https://doi.org/10.1177/0265407518806680>.
85. Jamie R. Daw et al., "Women in the United States Experience High Rates of Coverage 'Churn' in Months before and after Childbirth," *Health Affairs* 36 (2017): 598–606, <https://doi.org/10.1377/hlthaff.2016.1241>.
86. Anilena Mejia, Rachel Calam, and Matthew R. Sanders, "A Review of Parenting Programs in Developing Countries: Opportunities and Challenges for Preventing Emotional and Behavioral Difficulties in Children," *Clinical Child and Family Psychology Review* 15 (June 2012): 163–75, <https://doi.org/10.1007/s10567-012-0116-9>.

87. Jennifer Wyatt Kaminski et al., "A Meta-Analytic Review of Components Associated with Parent Training Program Effectiveness," *Journal of Abnormal Child Psychology* 36 (2008): 567–89, <https://doi.org/10.1007/s10802-007-9201-9>.
88. Susan H. Landry, Karen E. Smith, and Paul R. Swank, "Responsive Parenting: Establishing Early Foundations for Social, Communication, and Independent Problem-Solving Skills," *Developmental Psychology* 42 (2006): 627–42, <https://doi.org/10.1037/0012-1649.42.4.627>.
89. Cheri Vogel et al., "Impacts of Early Head Start Participation on Child and Parent Outcomes at Ages 2, 3, and 5," *Monographs of the Society for Research in Child Development* 78, no. 1 (2013): 36–63, <https://doi.org/10.1111/j.1540-5834.2012.00702.x>.
90. Jodi A. Mindell et al., "A Nightly Bedtime Routine: Impact on Sleep in Young Children and Maternal Mood," *Sleep* 32 (2009): 599–606, <https://doi.org/10.1093/sleep/32.5.599>.
91. Carolyn Pape Cowan and Philip A. Cowan, "Interventions to Ease the Transition to Parenthood: Why They Are Needed and What They Can Do," *Family Relations* 44 (1995): 412–23, <https://doi.org/10.2307/584997>; Brian D. Doss et al., "The Effect of the Transition to Parenthood on Relationship Quality: An 8-Year Prospective Study," *Journal of Personality and Social Psychology* 96 (2009): 601–19, <https://doi.org/10.1037/a0013969>.
92. M. Robin Dion, "Healthy Marriage Programs: Learning What Works," *Future of Children* 15, no. 2 (2005): 139–56, <https://www.jstor.org/stable/3556567>.
93. Cowan and Cowan, "Interventions to Ease the Transition."
94. Hannah C. Williamson et al., "Effects of Relationship Education on Couple Communication and Satisfaction: A Randomized Controlled Trial with Low-Income Couples," *Journal of Consulting and Clinical Psychology* 84 (2016): 156–66, <https://doi.org/10.1037/ccp0000056>.
95. JoAnn Hsueh et al., *The Supporting Healthy Marriage Evaluation: Early Impacts on Low-Income Families* (Washington, DC: Administration for Children and Families, Office of Planning, Research, and Evaluation, 2012).
96. Gary W. Evans, Stephen J. Lepore, and Alex Schroeder, "The Role of Interior Design Elements in Human Responses to Crowding," *Journal of Personality and Social Psychology* 70 (1996): 41–46, <https://doi.org/10.1037/0022-3514.70.1.41>.
97. Dani Carrillo et al., "Instability of Work and Care: How Work Schedules Shape Child-Care Arrangements for Parents Working in the Service Sector," *Social Service Review* 91 (2017): 422–55, <https://doi.org/10.1086/693750>.
98. Robert H. Bradley et al., "Early Indications of Resilience and Their Relation to Experiences in the Home Environments of Low Birthweight, Premature Children Living in Poverty," *Child Development* 65 (1994): 346–60, <https://doi.org/10.2307/1131388>.
99. Jeremy D. Coplan et al., "Maternal Hypothalamic-Pituitary-Adrenal Axis Response to Foraging Uncertainty: A Model of Individual vs. Social Allostasis and the 'Superorganism Hypothesis,'" *PLoS ONE* 12 (2017): e0184340, <https://doi.org/10.1371/journal.pone.0184340>.
100. Gary W. Evans, "The Environment of Childhood Poverty," *American Psychologist* 59 (2004): 77–92, <https://doi.org/10.1037/0003-066X.59.2.77>.

Supporting Development through Child Nutrition

Diane Whitmore Schanzenbach and Betsy Thorn

Summary

Nutrition is vitally important both during pregnancy and during a child's early years. Inadequate nutrition during this critical period can harm children's health and developmental outcomes throughout childhood and into adulthood. Thus, write Diane Whitmore Schanzenbach and Betsy Thorn, it's particularly important that young children have adequate nutrition and resources.

Yet many young children in the United States lack adequate nutrition. In this article, Schanzenbach and Thorn lay out the extent of the problem and review what the research tells us about inadequate nutrition's detrimental effects on young children's development. They report on the effectiveness of policies and programs that aim to improve nutrition among young children—especially the Supplemental Nutrition Assistance Program (SNAP) and the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)—as well as supplementation of nutrients (both mandatory and voluntary) by the manufacturers of food products, primarily grains. Finally, they suggest how policy makers and others could help more young children, especially the most vulnerable, get the nutrition they need.

www.futureofchildren.org

Diane Whitmore Schanzenbach is the Margaret Walker Alexander Professor of Human Development and Social Policy and director of the Institute for Policy Research at Northwestern University, and a research associate of the National Bureau of Economic Research. Betsy Thorn is associate director for food and nutrition programs at Insight Policy Research.

Too many young children in the United States have inadequate nutrition. In 2018, 13.5 percent of children aged zero to three lived in households experiencing food insecurity, meaning that members of their household worried about whether resources to buy food would run out, weren't able to afford balanced meals, skipped meals, or didn't eat enough.¹ Evidence shows that inadequate nutrition in early life, both prenatally and through early childhood, can permanently harm children's health and related outcomes.² In this article, we summarize the research on nutrition among young children and examine policies to improve it.

Some trends and policies affect US children across the income spectrum. Following a sustained public health effort, for example, an increasing share of babies are both being breastfed and being breastfed longer. In addition, manufacturers' food fortification has substantially reduced the share of children who don't get enough of a variety of nutrients, including iron, B vitamins, and iodine. Though many fortification practices were developed almost a century ago, it took a while for such practices to become commonplace: it was only as recently as 1998, for example, that manufacturers of enriched grains were required to add folic acid. Folic acid is particularly important for pregnant women and those who might become pregnant, and indeed, once folic acid fortification was required, the prevalence of neural tube defects at birth dramatically decreased. Risk factors for inadequate folic acid intake remain high among Hispanic women of childbearing age; however, if more corn masa flour and corn tortillas were to be fortified with folic acid, as the Food and Drug Administration

has allowed since 2016, this problem could be rectified.

Nearly all infants and toddlers consume added sugars from sources such as yogurt, fruit drinks, cakes and cookies, sweet snacks, and sugar-sweetened beverages. Although young children's consumption of added sugar has fallen modestly over the past decade and obesity rates for young children have declined, the potential for added sugar intake to be habit forming, along with the high share of young children who consume it, raises concerns.

Several important policies aim to help young children in low-income families. The Supplemental Nutrition Assistance Program (SNAP, formerly the food stamp program) and the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) are the federal food and nutrition programs that serve the most young children. They reach approximately one in three young children in the United States, including a large number living in families with income levels less than half of the poverty threshold, and both have been shown to improve children's health and developmental outcomes. We review ways to strengthen these programs, such as addressing the sharp drop-off in WIC participation as children age and increasing SNAP benefit levels for families with young children.

How Nutrition Affects Children's Health and Development

Many studies have documented the importance of early-life environments on later-life health and economic outcomes. This body of evidence was recently comprehensively reviewed by Douglas Almond, Janet Currie, and Valentina Duque.³ We summarize it here.

It has long been established that extreme deprivation during the prenatal period, such as can occur during a war, famine, or pandemic, has both immediate and long-term impacts on children.⁴ More recently, though, evidence has been building that more commonplace changes in resources—both deprivation and increases—have important and lasting impacts as well. These have been documented for both the prenatal period and early childhood.

The evidence is particularly strong for the prenatal period. Studies show that even relatively modest changes to the fetal environment can be linked to impacts on children's health and on later outcomes spanning education, economics, and personality.⁵ For example, a recent study comparing siblings in Arkansas showed that greater maternal weight gain during pregnancy predicts a greater likelihood of childhood obesity.⁶ Expectant mothers' fasting during the Muslim observation of Ramadan has been shown to reduce birth weight and to depress their children's later school performance.⁷ High levels of maternal stress can also reduce birth weight, as one recent study showed for pregnant women whose were in the predicted path of a hurricane but did not end up being hit by it.⁸ Relatively mild infectious diseases such as seasonal influenza also have been shown to increase the incidence of both preterm delivery and low birth weight.⁹ These impacts can be long lasting. For example, a recent study that compared siblings in Denmark who were and weren't exposed in utero found that prenatal exposure to seasonal influenza leads to reduced earnings in adulthood.¹⁰

Policy changes that improve maternal health and the environment, on the other hand, can

have positive effects. One recent study found that children born to women in states that raised the sales tax on cigarettes during their pregnancies had better health, measured as days absent from school and whether they visited the doctor more than once per year, than children born to women in states that did not.¹¹ Similarly, birth weight among children born to young mothers is better in states with a higher minimum legal drinking age.¹² Environmental improvements matter as well. Another recent study comparing geographic areas with baseline rates of air pollution that were either just above or just below the threshold for remediation under the Clean Air Act of 1970, and children born in these areas before and after large changes in air pollution, found a positive correlation between improved air quality in a child's birth year and their earnings and labor force participation as adults.¹³

Other policies that give low-income pregnant women access to more resources also improve birth weight outcomes, such as the earned income tax credit (EITC), which is a cash payment made to low-wage workers. A recent study found a higher than average birth weight among infants of women who received EITC payments and a lower incidence of low birth weight.¹⁴ Expectant mothers receive similar benefits from SNAP and WIC.

Timely policy interventions can also offset health damage that children have already experienced. For example, it is well known that lead exposure in early life has detrimental cognitive impacts, even among children exposed to lead levels that have been considered low historically.¹⁵ A recent study found that if children who have been exposed to lead are able to promptly receive lead remediation, the harm can be reversed.¹⁶

Overall, research has established a clear link between early-life circumstances, including modest and commonplace harms, and both short- and long-term effects. On a brighter note, however, there is also evidence that policies designed to provide resources to low-income families or improve the health of pregnant women can have a positive effect on children's health and their economic outcomes as adults. Many of these are policies that promote better nutrition. Together, the evidence suggests that we need to carefully craft policies that champion health and reduce economic hardship for pregnant women and young children.

The voluntary addition of iodine, vitamin D, and B vitamins to widely used products from the 1920s through the 1940s nearly eradicated ailments such as goiter, rickets, beriberi, and pellagra, and folic acid fortification in grains and cereals has dramatically reduced neural tube defects in infants.

Policies Promoting Nutrition

The Dietary Guidelines for Americans (DGA) is a leading source of nutrition advice. Typically updated every five years, the DGA reflects the best scientific evidence on nutrition and is designed to help Americans make healthy consumption

choices.¹⁷ Historically, the DGA hasn't included recommendations for infants (birth to 11 months old) and toddlers (12 to 23 months old) because of their unique nutritional needs, eating patterns, and developmental stages, and so federal nutrition assistance programs have had to rely on recommendations from the American Academy of Pediatrics. But starting with the 2020–25 edition, the DGA will be expanded and begin providing comprehensive guidance for infants and toddlers that covers topics such as the role of beverages (including fruit juices and sugar-sweetened beverages), the development of salt versus sweet taste preferences, and the impact of food marketing on this age group.¹⁸

Supplementation

Food fortified with vitamins and minerals is an important source of nutrients among US children. Though the US Food and Drug Administration doesn't require fortification of any product, it maintains labeling standards under which foods can be labeled "enriched," and many food manufacturers voluntarily fortify their foods.¹⁹ Consumption of fortified foods substantially reduces the share of children who don't get enough of a variety of nutrients.²⁰

The voluntary addition of iodine, vitamin D, and B vitamins to widely used products from the 1920s through the 1940s nearly eradicated ailments such as goiter, rickets, beriberi, and pellagra, and folic acid fortification in grains and cereals has dramatically reduced neural tube defects in infants. But many children still don't get enough vitamins and minerals. In this section, we briefly review the history of fortification and summarize the current state of vitamin and mineral intake.

Iodine. The discovery of links between deficiencies in vitamins and nutrients and diseases sparked a movement in the mid-1910s to supplement foods.²¹ In 1924, iodine—a micronutrient needed for healthy thyroid functioning and fetal brain development—was added to table salt. Lack of sufficient iodine leads to goiter, an enlargement of the thyroid gland that can cause coughing and breathing difficulties. Iodine accumulates naturally on the coasts, and people in coastal areas consumed it through fish and dairy products, but it was scarce in diets in other areas of the country where the water and soil contained little iodine. Before the 1920s, between 26 and 70 percent of children had goiter in areas from the Great Lakes to the Appalachians and the Northwest.²² Medical studies published as early as 1917 documented substantially reduced incidence of goiter among children who received iodine supplements. A series of reports, as well as advocacy work by health professionals, led to voluntary iodization of salt by producers, beginning in 1924.²³ Contemporaneous studies documented sharp declines in goiter among those who consumed iodized salt.²⁴ A recent study using geographical variation in baseline iodine consumption levels along with the introduction of iodized salt to pregnant women's diets finds that children exposed to higher levels of iodine in utero showed long-term benefits, including greater participation in the labor force and higher income.²⁵

Today, the majority of US households use only iodized salt.²⁶ Iodine fortification of salt remains voluntary, but manufacturers are required to include a label on the product that says whether the salt does or doesn't supply "iodide, a necessary nutrient," and it is not legal to charge more for iodized table salts.²⁷ While today the US population

at large—if not the world population—gets enough iodine, subsets of the population, including pregnant women, may be at risk for mild to moderate iodine deficiency.²⁸ Guidelines developed by medical experts suggest that iodine be included in all prenatal vitamins, but a recent survey of 223 prenatal multivitamins reported that only half of the brands listed any iodine.²⁹

Vitamin D. In 1900, an estimated 80 percent of children in Boston had rickets, a disease characterized by slow growth and skeletal deformities such as bowed or knocked knees.³⁰ Scientists discovered that rickets could be prevented by exposure to sunlight (a major source of vitamin D) or ultraviolet radiation, or by consuming cod liver oil or foods supplemented with vitamin D. By the 1930s, milk was being widely fortified with vitamin D through irradiation and by the 1940s through the addition of vitamin D concentrate.³¹ Within a few years, rickets was eradicated in the United States.³² As with iodized salt, demand for the fortification of milk was largely driven by medical professionals educating their patients and the public about the importance of vitamin D.³³

There is no federal mandate for vitamin D fortification of milk (though many states do have such a mandate), but in the United States today milk is almost always fortified with it.³⁴ Although rickets is still uncommon, many children don't get enough vitamin D: 61 percent of US children and adolescents have insufficient levels, and 9 percent have deficient levels. Children who spend more than four hours a day in front of a screen and who rarely drink milk are at higher risk for insufficient vitamin D intake.³⁵ Though vitamin D is most commonly thought of as a nutrient that strengthens bones, a recent study showed that increased maternal

exposure to sunlight during pregnancy reduces the fetus's likelihood of developing asthma during childhood.³⁶

B vitamins. Supplementation of bread and flour with B vitamins represents another success story. Illnesses caused by deficiencies of B vitamins were also common in the early 1900s. In particular, beriberi, which harms the cardiovascular system and can cause an enlarged heart in babies, can be prevented by consuming thiamine (also known as vitamin B1).³⁷ Pellagra, a potentially fatal illness characterized by skin and mouth sores and diarrhea, was among the 10 most common causes of nonaccidental deaths in many southern states in the late 1920s; it can be prevented with adequate niacin (also known as vitamin B3) intake.³⁸

In the 1930s, health professionals advocated for requiring manufacturers to add thiamine to flour, based on findings that a substantial population, especially in the South, did not get enough of the vitamin. US bakers and flour producers began to voluntarily enrich their products in the late 1930s. In 1940, the Committee on Food and Nutrition recommended that flour be enriched with thiamin, niacin, riboflavin, and iron.³⁹ By the early 1940s, though, only 40 percent of the nation's flour was enriched, due in part to differences in the cost of enrichment across large and small mills. Thanks to economies of scale, large mills could fortify their flour at a low per-bag cost. Costs were higher for smaller mills, so in the face of weak consumer demand for enriched flour, they delayed enriching their products so that they could remain competitive with larger mills. By 1950, in response to advocacy by health professionals, most states had adopted laws mandating enrichment of flour and bread.

Studies show that deaths from pellagra dropped quickly after states mandated bread enrichment, and such deaths were eradicated nationwide by 1960.⁴⁰ Today, most flour sold is enriched with B vitamins and iron, though properly labeled unenriched flour can still be sold.

More recently, in 1992, the US Public Health Service recommended that women capable of becoming pregnant consume 400 micrograms of folic acid (vitamin B9) daily to prevent neural tube defects such as anencephaly and spina bifida in their babies. Starting in 1998, the federal government required that enriched grains include folic acid. Since then, the number of neural tube defects at birth has declined by approximately 30 percent to 1,300 per year, and the prevalence of folate deficiency in laboratory serum tests has declined from 30 percent to less than 1 percent.⁴¹ Despite these improvements, however, more than 20 percent of women of childbearing age don't have folate concentrations at levels associated with low risk of neural tube defects. Risk factors for and prevalence of neural tube defects among Hispanics are higher than among other groups. One way to address this problem would be to fortify corn masa flour with folic acid, which could prevent an additional 40 cases of neural tube defects each year.⁴²

Nutrient Deficiencies Today

Scientific guidance indicates that discretionary fortification of foods is justified if a substantial share of the population would otherwise not receive an adequate amount of a vitamin or mineral.⁴³ Current fortification levels are clearly improving nutrient intake, and thanks to the fortification of commonly consumed foods many more children consume the estimated average requirement

(EAR) of essential vitamins and minerals. A study of data collected on children aged two through eight between 2003 and 2006 shows that 56 percent didn't reach the EAR for folate through the intrinsic nutrients in the foods they consumed, while 11, 9, and 3 percent didn't meet the EAR for iron, thiamin, and niacin, respectively. Thanks to supplementation, however, the share that failed to consume the EAR was 0.7 percent or lower for each of these nutrients.⁴⁴ The primary foods contributing to these increases included fortified cereals, yeast breads, pasta, and pizza. Some nutrients also have an established upper tolerable level (UL), so it is possible to get too much of them. Supplementation raises approximately 10 percent of children above the UL for folate and niacin (although it's worth noting that there's some scientific controversy over whether the UL is set correctly for children, since it is calculated as a weight-adjusted extrapolation from adults).

A substantial share of children fail to meet the EAR for vitamin D. Without supplementation, 100 percent of children would fall short, but the share drops to 81 percent after supplementation and 63 percent when vitamins are included. Both milk and cereals provide substantial vitamin D in children's diets. Even some foods that add sugar to children's diets have nutritional value. While fruit drinks are a major source of added sugars in children's diets, they are also the major source of vitamin C.⁴⁵

Added Sugars

A particular nutritional concern for infants and toddlers is the extent to which they consume added sugars, which may lead to obesity, dental caries, and preferences for further consumption of sweets.⁴⁶ For

example, a recent study found that overall, 84 percent of infants and toddlers consumed added sugars, and fully 98 percent of toddlers did so.⁴⁷ Added sugars made up about 7 percent of daily calorie intake among toddlers, but fewer than 2 percent of daily calories among infants six to 11 months old. The top sources of added sugars include yogurt, fruit drinks, sweet bakery products such as cakes and cookies, and sweet snacks. Sugar-sweetened beverages (SSBs)—including sodas as well as fruit drinks that aren't 100 percent juice—are also a top-10 source, making up 7.5 percent of toddlers' daily intake of added sugar. In a welcome piece of news, consumption of added sugars among infants and toddlers has decreased over the past decade.⁴⁸

One reason that added sugar consumption among infants and toddlers is concerning is that it may contribute to habit formation, taste preferences, and obesity. In this respect, research has focused particularly on consumption of SSBs. For example, one study that followed children over time found that infants who drank SSBs were substantially more likely to consume SSBs at least once per day at age six.⁴⁹ Cross-sectional studies tend to find that children who consume SSBs are more likely to be overweight, although this correlation isn't uniform across studies, especially among young children. Studies over time tend to find that increased consumption of SSBs at age two or three is associated with an increased likelihood of obesity one to three years later, especially among children who were already overweight when the study began.⁵⁰ Among younger children, non-Hispanic black children are most likely to consume SSBs daily, followed by Hispanics, whites, and Asians, and children in low-income families are substantially more likely

to consume SSBs daily than are children in higher-income families.⁵¹

Raising the price of SSBs by taxing them, with the aim of reducing sales and consumption, is one idea that has received considerable attention as way to discourage overconsumption.⁵² Recent studies have documented that taxes can reduce SSB consumption, although such taxes fall disproportionately on low-income families and aren't designed to reduce children's intakes specifically.⁵³ A more targeted approach was the recent reform in WIC, which reduced the amount of vouchers for juice provided to participants; this change has been associated with reductions in juice consumption.⁵⁴ Others have focused on the potential role of food marketing, finding among older children that even advertising "healthy" fast food options serves to increase children's preferences for fast food but not their likelihood of making healthy food choices among the available options.⁵⁵

Improved guidance from the new DGA on consumption of added sugars and SSBs will help both to educate parents and to highlight areas where further research is needed. Any policies that aim to alter sugar consumption will have to carefully consider a multitude of factors, including supply and demand, access, and prices.

Breastfeeding

There is widespread consensus that breastfeeding is the best source of nutrition for most infants. The American Academy of Pediatrics recommends exclusive breastfeeding for the first six months of life, followed by at least an additional six months of breastfeeding combined with complementary foods.⁵⁶ Similarly, the federal government's Healthy People 2020 initiative

included goals for increased breastfeeding initiation, breastfeeding duration, and exclusive breastfeeding.⁵⁷

However, although breastfeeding has been found to be correlated with a range of desirable outcomes, from fewer ear infections during infancy to a healthy childhood body mass index (BMI) to higher IQ later in life, relatively few studies are able to identify a causal relationship between breastfeeding and those outcomes. Since breastfeeding rates are higher among more affluent families, some of the positive outcomes associated with breastfeeding may be due to other factors. Studies comparing siblings who differ in breastfeeding status tend to find smaller or no impacts on longer-term outcomes.⁵⁸ A landmark study conducted in the 1990s in Belarus randomly assigned pregnant women who intended to breastfeed their infants into groups that received different kinds and amounts of breastfeeding support. The two groups varied substantially in breastfeeding duration and in exclusive breastfeeding. Infants in the group who received breastfeeding support were less likely to experience a gastrointestinal tract infection or a rash such as eczema, but they showed no statistically significant differences in the rates of other problems, such as upper respiratory infections and ear infections.⁵⁹ Follow-up studies on the same group of children found that breastfeeding wasn't related to childhood BMI, blood pressure, or dental health.⁶⁰ These findings suggest that breastfeeding may have less extensive effects on child outcomes than previously believed.

Many of the goals for breastfeeding set out in Healthy People 2020 have been met. The percentage of babies who are breastfed

even if only for a short time increased from 73 percent in 2004 to 84 percent in 2016.⁶¹ The share of babies who are exclusively breastfed through three and six months has generally increased each year. Over half of children were breastfeeding at six months, and over one-third were breastfeeding at 12 months. Today there are also more external supports for breastfeeding. An increasing number of babies are born at hospitals (over one in four for babies born in 2015) that provide recommended care in support of breastfeeding initiation, and nearly half of US employers offer worksite lactation support programs. However, important disparities in breastfeeding remain; in particular, black infants are 16.5 percentage points less likely than non-Hispanic white infants to have ever been breastfed.⁶²

Nutrition Assistance Programs

Through WIC and SNAP, the federal government provides substantial nutritional support to pregnant women and families with young children. Both programs are administered by the US Department of Agriculture's Food and Nutrition Service. Several smaller programs also help young children nutritionally, including the Child and Adult Care Food Program, which makes meals and snacks available to children in day care; the Summer Food Service Program, which provides summer meals through community organizations and schools, some of which may go to young children; and the Special Milk Program, which supplies milk to children in childcare institutions. We couldn't find estimates of how many young children are served by these smaller programs, but their combined budgets add up to less than 4 percent of the total spending on the agriculture department's food and nutrition programs.

Overview of WIC

WIC offers its participants supplemental foods, nutrition education (including breastfeeding promotion and support), and referrals to other services. Only infants in their first year of life, children younger than five, and pregnant or postpartum women (up to 12 months postpartum for women who are breastfeeding, or six months for those who aren't) are eligible. Further, the family's income must be at or below 185 percent of the federal poverty level, and applicants must be at nutritional risk—that is, they must have medical conditions or dietary deficiencies that could be improved through participation in WIC. Total 2017 spending on WIC was \$5.6 billion, which included \$3.6 billion for food.⁶³

A set of supplemental foods, called a food package, is prescribed to participants based on their participant category, and they can obtain these foods at authorized retailers by using electronic benefit transfer cards, paper vouchers, or checks. Benefits and their length vary by participant category, as table 1 shows. The foods included in the monthly packages are intended to provide nutrients generally lacking in the diets of low-income women, infants, and children. For example, regulations require that reduced-fat milk purchased with WIC benefits contain specified minimum quantities of vitamins A and D and that breakfast cereals contain at least a minimum quantity of iron. Participants with qualifying conditions may receive special formulas or foods in addition to the standard foods. Other than for fruits and vegetables, WIC benefits provide a specified quantity of goods regardless of price charged by the authorized grocery outlet. As of 2014, average monthly per-participant food package costs to state agencies was \$42.45.⁶⁴

Table 1. WIC Program Characteristics, by Group

	Infants (up to 12) months)	Children (one to four years old)	Pregnant women	Postpartum women, breastfeeding	Postpartum women, not breastfeeding
Certification length	Through first birthday	12 months (six in AL, AR, KY LA, NE, NJ, OH, WV)	Duration of pregnancy plus six weeks	One year or until breastfeeding stops	Six months
Value of monthly food package	\$0–\$171, depending on breastfeeding status and age	\$43	\$50	\$50–\$66, depending on intensity of breastfeeding	\$39
Foods included in standard package	Formula Infant food (cereal, fruits and vegetables, and meat	Milk, eggs, breakfast cereal, whole-grain bread, legumes/peanut butter, fruit or vegetable juice, cash-value benefit for fruits and vegetables. Allowable substitutions for milk are cheese, soy-based beverages, tofu, and yogurt			

Source: Data from Special Supplemental Nutrition Program for Women, Infants and Children. 7 C.F.R. § 246 (1985). The market value of the WIC food package is calculated from the 2015 IRI Consumer Network Panel data.

WIC’s benefits, unlike SNAP’s, aren’t phased out as income rises, so the poorest families receive the same benefits as the least-poor families who participate. Under federal rules, immigrants are eligible for WIC, although states have the right to limit that eligibility (currently none does). WIC participants also receive nutrition education as well as referrals to other organizations that provide childcare services, health and dental care, and housing assistance, though little is known about the efficacy of these aspects of the program.

More than half (53.3 percent) of WIC participants are children, and 23.3 percent are infants. The remainder are women who are either pregnant (9.1 percent), breastfeeding (7.8 percent), or postpartum (6.5 percent). Infants and children who participate in WIC are more likely to belong to racial or ethnic minorities than infants and children in the United States as a whole. Participation declines sharply as children grow older.⁶⁵

Overview of SNAP

SNAP provides electronic voucher payments that can be used at most grocery stores to purchase food that is intended to be taken home and prepared. SNAP is a universal program not specifically targeted at children, but its reach among young children is almost as large as WIC’s. In 2018, 16.6 percent of SNAP households included a child between zero and three, and 10 percent of all people receiving SNAP benefits were children in that age range. Of the \$60.6 billion spent on SNAP benefits in 2018, \$17.9 billion (29.5 percent of the total) went to families with children three and under. Because SNAP data don’t tell us whether a participating woman is pregnant, we can’t estimate SNAP’s reach among this group.

SNAP is designed to supplement a family’s other resources (such as earnings or disability benefits payments) for food purchases, and most participants combine SNAP with other cash resources to meet their food needs.⁶⁶

Table 2. Characteristics of Households on SNAP with Children, by Age of Children

	0–3	Any<18
Share of households on SNAP overall	16.6%	41.3%
Average monthly benefit	\$425	\$384
In deep poverty (<50% FPL)	49.0%	45.3%
No cash income	17.2%	14.9%
With any earnings	57.6%	54.0%
Single parent	57.4%	57.4%
With at least one noncitizen	19.8%	18.9%
Number in SNAP unit	3.54	3.24
Total people in household	3.89	3.58

Source: Authors' calculations from 2018 USDA FNS Supplemental Nutrition Assistance Program (SNAP) Quality Control Data, available at <https://www.fns.usda.gov/resource/snap-quality-control-data>.

Eligibility depends on a family's income and asset levels, and benefits are calculated as the difference between the minimum monthly amount necessary to feed a family of a given size and the resources that the family has available to purchase food. The family's resource availability is calculated according to a formula that takes into account cash income from all sources, minus certain deductions such as childcare expenses, a portion of housing expenses, and a portion of earnings. SNAP benefits drop as income rises.

Legal immigrants were barred from the program as part of the 1996 welfare reform legislation, but the 2002 Farm Bill restored eligibility for all legal immigrants who are children or disabled, as well as for some categories of adult immigrants, such as refugees or those who have been in the country for at least five years.

SNAP households with young children have lower incomes and are generally more disadvantaged than participants with older children. Table 2 records the presence of children in various age ranges in households, documenting one aspect of SNAP recipient demographics. Information for families with children in multiple age ranges appears in

more than one column. In 2018, average benefits for households with young children were \$425 per month, or about \$14 per day. This is about 10 percent higher than average benefits for all SNAP households with children, reflecting the fact that SNAP families with young children have both larger households and lower incomes than SNAP families with older children. A majority of these households receive earnings in the same month they receive SNAP, but 17 percent of SNAP households with young children report no cash income from any source. More than half live in households headed by a single parent, and nearly 20 percent of SNAP households with young children include at least one noncitizen.

Table 3 breaks down the caseload with young children by their income-to-poverty levels, revealing substantial variation in the population and large numbers of extremely disadvantaged children. Nearly half of SNAP households with young children live in deep poverty. By design, these families receive higher SNAP benefits, averaging \$531 per month—an amount that comprises three-quarters of their total cash resources. Twenty-six percent of those in deep poverty also earn money in the month they receive

Table 3. Characteristics of Households on SNAP with Children from Birth to Three, by Household Income Relative to the Federal Poverty Threshold

	Less than or equal to 50% FPL	Greater than 50% to 100% FPL	Greater than 100% FPL
Distribution of SNAP households w/young children	47.3%	36.3%	16.1%
Average monthly benefit	\$531	\$390	\$193
Share of total resources made up by SNAP	75%	16%	6%
With any earnings	26%	84%	95%
With no cash income	35%	0%	0%
Single parent	69%	44%	50%
Total in household	3.76	4.16	3.78
Share w/children ages 0-3 among total SNAP households at this income level	21.4%	12.9%	15.6%

Source: Authors’ calculations from 2018 USDA FNS Supplemental Nutrition Assistance Program (SNAP) Quality Control Data, available at <https://www.fns.usda.gov/resource/snap-quality-control-data>.

SNAP benefits, while 35 percent have no cash income from any source in the month. More than one in five SNAP households in deep poverty have a child three or younger.

Another 36 percent of SNAP households with young children have income levels between 51 and 100 percent of the poverty threshold; they receive an average of \$390 per month in SNAP benefits, and 84 percent of these households have earnings. The remaining 16.4 percent of households have incomes above the poverty threshold. Nearly all of these families have earnings, and their average monthly benefits are less than \$220.

Impacts of Federal Nutrition Programs

Research on SNAP and WIC shows how important these programs are for young children and their families, both in the short and the long run. A primary challenge for researchers is to disentangle the effects of these programs from the needs they were designed to address. Because the programs are designed to serve people who have low

incomes, are experiencing food insecurity, or have other characteristics reflecting need, studies have to be carefully designed to separate the impact of the programs from the underlying reasons that people are eligible for or opt to participate in them. Drawing from other recent reviews, we briefly summarize the research, limiting our focus to studies that employ a research design that can isolate the programs’ causal impacts.⁶⁷

In order to assess whether SNAP improves nutritional intake and reduce food insecurity among children, we must draw on estimates for the program overall because there are no separate studies of impacts among families with young children. Studies have shown that SNAP benefits increase access to food, measured by higher food spending and more nutrient availability. Results on the relationship between SNAP and food insecurity are mixed—some studies have found that food insecurity actually rises under SNAP, while others have found that, as expected, it falls—due in large part to the challenges in establishing

the program's causal impact.⁶⁸ The best studies are those that use variation in policies, such as differences in immigrants' eligibility for SNAP or in expected benefit levels compared to populations with fewer eligibility requirements or access to more benefits; these studies have found that SNAP indeed reduces food insecurity.⁶⁹ Another line of research uses so-called partial identification approaches that transparently allow for different assumptions about who decides to participate in each program; using this approach, both SNAP and WIC have been shown to reduce food insecurity.⁷⁰

Most studies of WIC and nutritional intake have focused on changes in participants' diets associated with the change in food packages implemented in 2009. One study that compared child WIC participants to income-eligible nonparticipants found correlations between participation and intake along a variety of measures (for example, WIC children consume more potassium and fewer empty calories and are more likely to consume the foods in the WIC food package). But these studies don't address how families who decide to participate in WIC may differ from those who don't, so they can't disentangle correlation from causality.⁷¹ The 2009 revisions to the food packages were also intended to promote breastfeeding. Studies of WIC participants have found increases in breastfeeding, but breastfeeding rates have also increased in the general population.⁷²

Another question is how the programs affect children's health and wellbeing. Studies show that expectant mothers' access to SNAP and WIC leads to improved birth weight.⁷³ This is important because improvements in birth weight result in improved learning outcomes in children and even to improvements

across a wide range of outcomes measured in adulthood, including wages, disability, health conditions, and human capital accumulation.⁷⁴ In particular, several studies that use credible research designs—for example, that compare similar families who do and don't receive WIC because of variation in access—find that participation in WIC improves birth weight and/or reduces the incidence of low birth weight.⁷⁵ Some important recent studies also find that loss of ready access to WIC due to closures of local clinics or stores that took part in the program reduces expectant mothers' participation and in turn has a harmful impact on birth outcomes.⁷⁶ For SNAP, studies that use policy variation in program access—due to cross-county variation in the original introduction of the program or to changes in immigrants' eligibility status in the wake of welfare reform—also find that in utero exposure to SNAP improves health at birth.⁷⁷

More recently, direct evidence has emerged that access to SNAP and WIC in early life improves later-life outcomes. A recent study used the fact that originally the program was introduced on a county-by-county basis over a span of more than a decade to compare outcomes of children who lived in different counties in the same states and therefore had different access to SNAP from conception through age five.⁷⁸ Children who received SNAP longer had better health in adulthood, measured by large and statistically significant reductions in an index of characteristics associated with metabolic syndrome, including obesity, high blood pressure, heart disease, and diabetes. The study also found that for women, but not men, access to SNAP in early childhood improved later economic self-sufficiency, a measure that includes earnings and family income, and had a positive effect on indicator

variables including whether the individual graduated from high school, is currently employed, is currently not living in poverty, and is not participating in Temporary Aid for Needy Families or SNAP. For both health and economic outcomes, the effects were largest among children who had access at the youngest ages and who spent their childhoods in the most disadvantaged counties. Another recent study estimates what happened when immigrants lost and eventually regained eligibility for SNAP in the years after the 1996 welfare reform law.⁷⁹ Among children of immigrants, access to SNAP between conception and age five led to improvements in health between ages six and 16 (as reported by parents), with suggestive evidence that children missed fewer school days and visited the doctor and were hospitalized less often. Similarly, a recent study comparing siblings found that prenatal WIC participation led to fewer diagnoses for ADHD and other childhood mental health conditions and reduced grade repetition.⁸⁰

There are many important questions we don’t have adequate research to answer, and more research would vastly improve

our understanding of the impacts of SNAP and WIC and how to improve the designs of these programs. It would be particularly important to better understand the causes and consequences of the dramatic decline in WIC participation as children age. In addition, although it may be likely that WIC and SNAP have similar impacts on children’s short- and long-term outcomes, it would nonetheless be useful to have more direct evidence on WIC’s impacts. Certainly, we need much more research into how nutrition education, including breastfeeding promotion and support, and other aspects of WIC can best promote healthy diets and development.

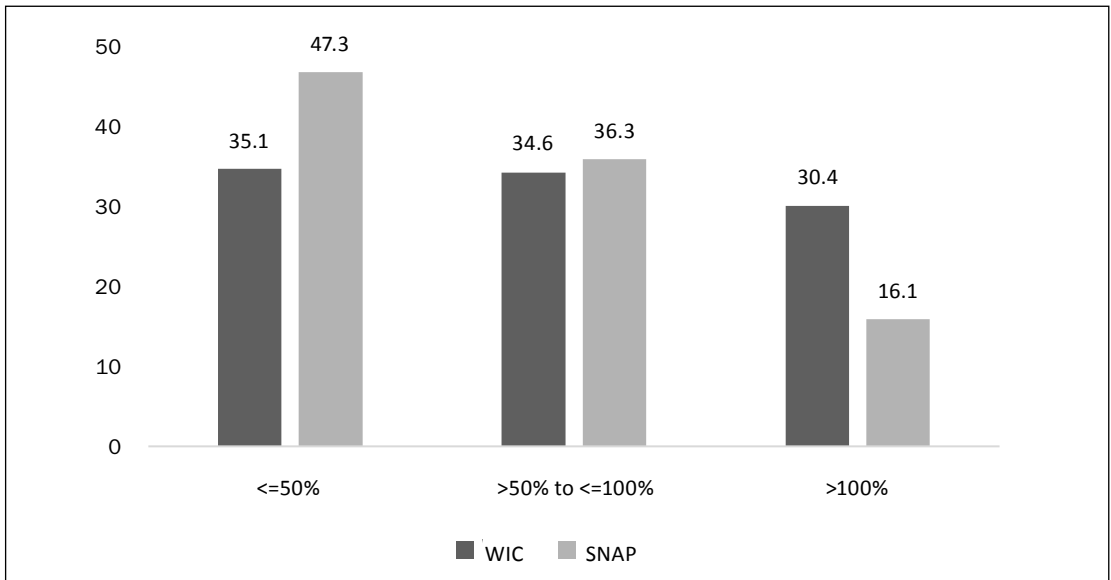
The Reach of WIC and SNAP, and Policy Challenges

SNAP and WIC are extremely important in boosting food access among US children, and each program reaches a substantial share of US children. As table 4 shows, according to calculations from the Current Population Survey (CPS), 24.7 percent of all children from birth to three participate in WIC, and 21.8 percent participate in SNAP. About half of these children (12.8 percent) participate in both programs simultaneously.

Table 4. Participation in WIC and SNAP, by Child’s Age

	Age 0	Age 1	Age 2	Age 3	Age 0–3 Pooled
<i>Panel A: Survey estimates from CPS (2015–19)</i>					
WIC	30.9%	27.8%	20.9%	19.2%	24.7%
SNAP	21.2%	21.9%	21.6%	22.4%	21.8%
Both	15.4%	14.4%	11.3%	10.4%	12.8%
<i>Panel B: Estimates from administrative records (2015–16)</i>					
WIC	47.6%	35.1%	27.0%	24.0%	33.4%
SNAP	28.6%	31.4%	30.1%	30.0%	30.0%
Ratio WIC:SNAP	1.67	1.12	0.90	0.80	1.11

Source: Authors’ calculations from US Census Bureau Annual Social and Economic Supplement of the Current Population Survey, USDA FNS “WIC 2016 Eligibility and Coverage Rates,” USDA FNS SNAP Quality Control data 2015–1026, US Census Bureau American Factfinder.

Figure 1. Distribution of WIC and SNAP Caseloads for Children Three and Under, by Income-to-Poverty Level Ratios

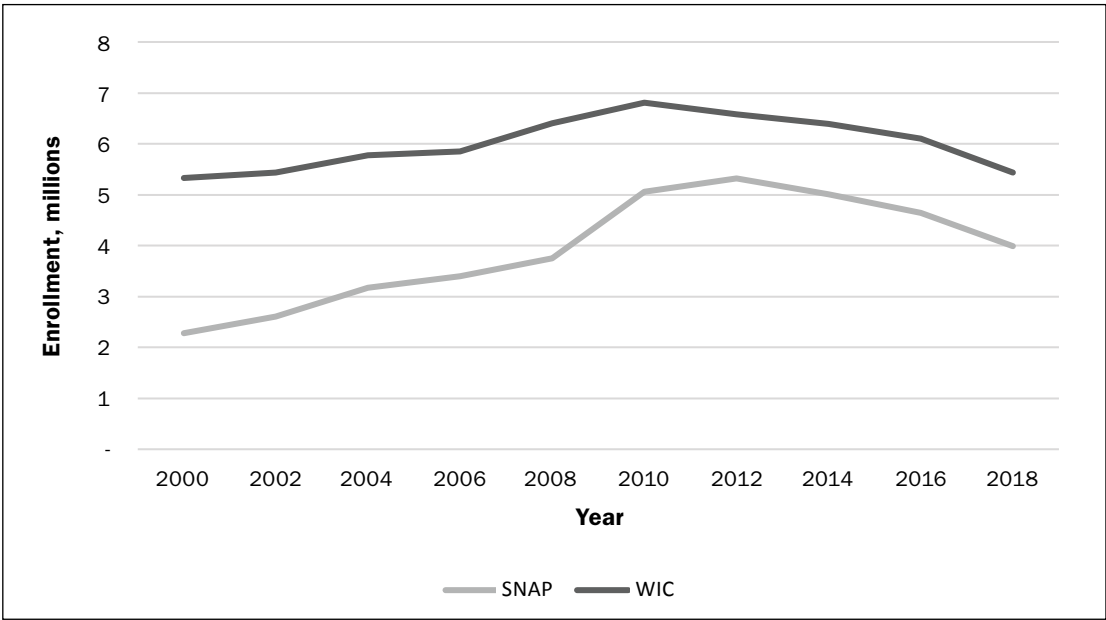
Sources: Authors' calculations from USDA FNS "WIC 2016 Eligibility and Coverage Rates," USDA FNS SNAP Quality Control data 2015–2016.

A known problem with the CPS is that respondents underreport their participation in programs like SNAP and WIC, so actual participation rates are likely higher. We can calculate a more accurate measure by using administrative records for SNAP and WIC participation and calculating the ratio of those to population counts. As panel B shows, this method increases the estimated participation of children three and under to 30 percent for SNAP and 33 percent for WIC. Participation in WIC declines sharply with age—only half as many three-year-old children participate as do infants. By contrast, SNAP participation among three-year-olds is 5 percent greater than among infants. The bottom row shows the ratio in program participation by children's age. WIC serves 67 percent more infants than SNAP does, but by ages two and three, SNAP serves more children than WIC, which raises the question of the causes and consequences of the drop-off in participation in WIC.

Most WIC and SNAP participants have incomes below the poverty line, but WIC participants are somewhat less disadvantaged than SNAP's because WIC's income eligibility threshold is higher (see figure 1). Nearly half of SNAP households with children three and under have incomes less than 50 percent of the federal poverty level—equal to an annual income level of less than \$8,455 for a family of two in 2019. Among WIC participants, the share living in deep poverty is 36.5 percent. Both programs have a substantial minority with income above the poverty line—27 percent of WIC households and 16 percent of SNAP households.

In 2016, 4.9 million infants and children and 3.9 million women were enrolled in WIC, and 4.6 million children from birth to age three were enrolled in SNAP.⁵¹ Participation in each program by children three and under increased substantially in the 2000s: WIC enrollment increased 29 percent,

Figure 2. Enrollment of Children Three and Under in WIC and SNAP, by Year



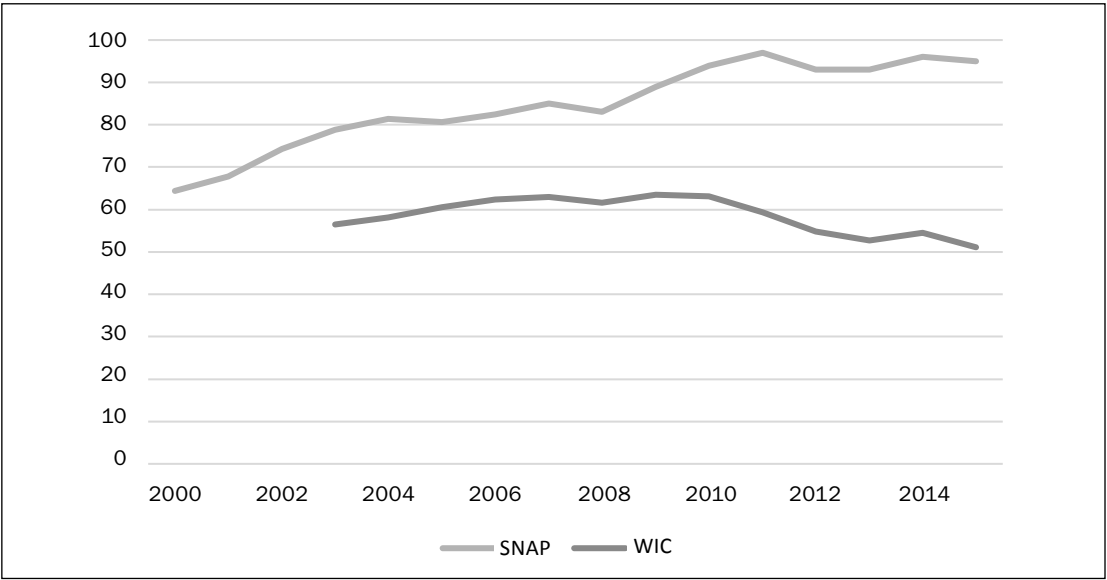
Sources: SNAP data from authors’ calculations from USDA FNS SNAP Quality Control data 2000-2018. WIC data from Nicole Kline et al., *WIC Participant and Program Characteristics 2018*, US Department of Agriculture, Food and Nutrition Service, 2020.

and SNAP enrollment more than doubled. WIC and SNAP enrollments peaked in 2010 and 2011, respectively, at the height of the recession. Before COVID-19, both had decreased to levels similar to those of the mid-2000s (see figure 2). A portion of benefits go unused. Only 87 percent of those enrolled in WIC claimed their benefits in a given month in 2016, and most households didn’t redeem those benefits for the full food package prescribed to them; 97 percent of SNAP benefits are spent within the month.⁸²

Variation in the number of participants is driven both by the number of people who have incomes low enough to qualify for the programs and the participation rate among those who are eligible. The participation rate can be increased by factors such as outreach and policies designed to reduce the burden associated with applying for and

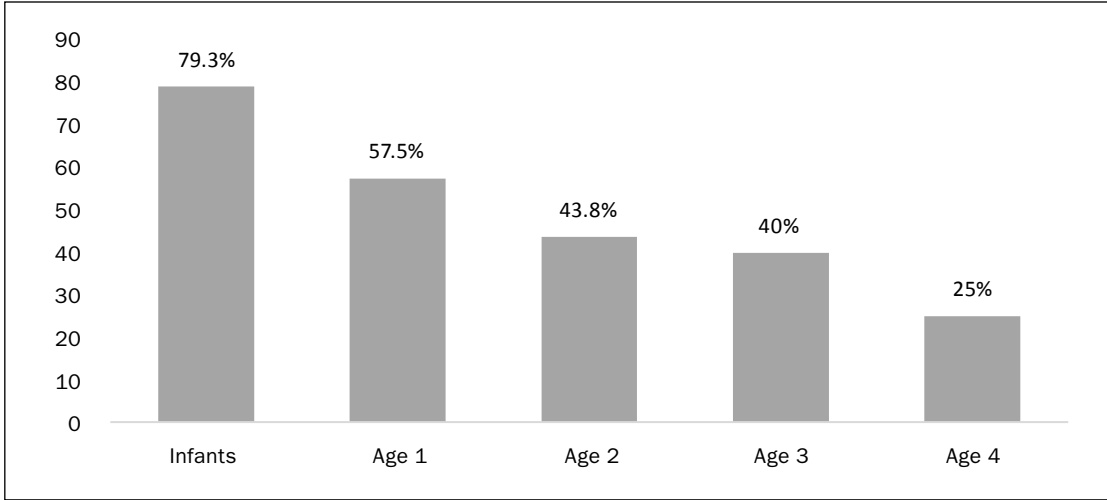
participating in the program. Figure 3 shows time trends in program participation rates among those eligible for WIC and SNAP. Participation in SNAP among the eligible population has been increasing in recent years, from 68 percent in 2002 to 95 percent in 2017 (due to data limitations, SNAP participation is calculated for all households with children, not just households with young children). Participation in WIC, by contrast, has dropped off over the last eight years, falling from a peak of 63.5 percent in 2011 to a low of 51 percent in 2017. As figure 4 shows, participation rates in WIC among the eligible population decline sharply by children’s age, ranging from 86 percent of infants to 40 percent of three-year-olds and 25 percent of four-year-olds.⁸³ Rates of participation in WIC also vary by race and ethnicity, from a low of 42.6 percent of eligible non-Hispanic whites to a high of 66.7 percent of eligible Hispanics.⁸⁴

Figure 3. Participation Rate in WIC and SNAP among Those Eligible



Sources: Data from the following reports. For SNAP: Joshua Leftin, *Trends in Supplemental Nutrition Assistance Program Participation Rates: 2001 to 2008*, Mathematica Policy Research, 2010; Alma Vigil, *Trends in Supplemental Nutrition Assistance Program participation Rates: Fiscal Year 2010 to Fiscal Year 2017*, Mathematica Policy Research, 2019. For WIC: Kelsey Gray et al., *National- and State-Level Estimates of Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) Eligibility and Program Reach in 2017*, US Department of Agriculture, Food and Nutrition Service, 2019.

Figure 4. Participation in WIC among Eligible Children, by Age (2017)



Sources: Data from Kelsey Gray et al., *National- and State-Level Estimates of Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) Eligibility and Program Reach in 2017*, US Department of Agriculture, Food and Nutrition Service, 2019.

Given the documented importance of having adequate food and the high levels of food insecurity among young children, an important question is how to improve

WIC’s and SNAP’s impacts on vulnerable children. One straightforward way would be to increase maximum SNAP benefits for families with young children. This

would yield a double dividend by reducing poverty for families with young children and improving those children's life trajectories.⁸⁵

For WIC, a primary concern is how to stem the decline in participation as children age. One hypothesis for the decline is that the costs of signing up for benefits, in terms of time and hassle, may discourage some families from remaining in the program. For example, in a sample of 10 states, 40 percent of families with multiple participating children must separately recertify each child, sometimes in different months. An estimated 28 percent of low-income families with young children have more than one child four and under, and the added transaction costs of multiple certification dates could be a meaningful barrier to them. Moreover, the WIC certification process is intensive: it requires height and weight measurements, a blood test, and a nutrition risk assessment for each participant. Another hypothesis is that families don't value the benefits sufficiently. The monthly value of the child's food package is \$43, but since recipients are restricted in the foods they can buy with the benefits, many families likely value the benefits at substantially lower than their face value. Many recipients report that it's hard and stigmatizing to use WIC benefits in grocery stores, which also diminishes their value.⁸⁶ Of course, the combination of these factors—the costs of signing up and the nature of the benefits package—likely has more of an impact than either one alone as families decide whether to continue to participate in WIC. It's worth noting that the decline in participation as children age is nearly uniform across income levels, even though the relative value of the food package is likely higher among the poorest families. This suggests that hassle factors, either at the point of signing up or at the point of use,

may be an important reason for the decline in participation.⁸⁷

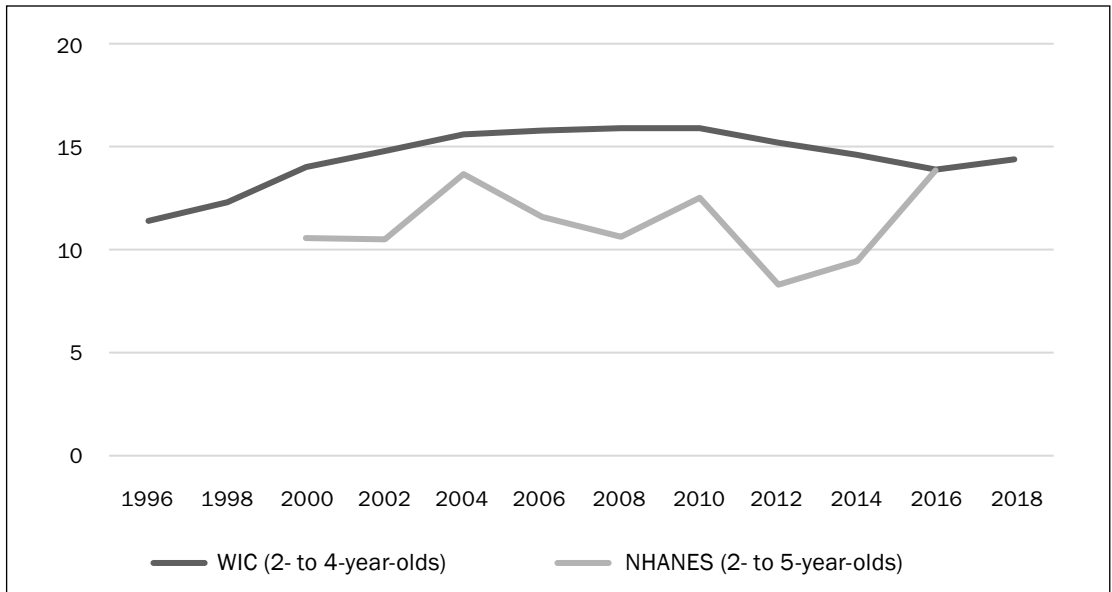
Another factor could be the nature of the current political and policy environment for immigrants. In particular, news reports have documented recent declines in participation in SNAP and WIC among households containing noncitizens, potentially due to the chilling effects of proposed changes to immigration policy.⁸⁸ Barriers to access to WIC, SNAP, or other programs that invest in early health are likely to harm health in the short run and both health and human capital in the longer run, and more vulnerable populations may be more at risk.⁸⁹

Obesity among Young Children

While much of our discussion to this point has been focused on a deficiency of food and nutrients, obesity is also a pressing public health concern. Children (and adults) can experience both simultaneously. For example, a recent study found that 10 percent of children in poverty are both obese and food insecure.⁹⁰

The overall prevalence of childhood obesity has more than tripled since the late 1970s; by 2016, 18.5 percent of US children were obese. According to Centers for Disease Control and Prevention statistics calculated from the National Health and Nutrition Examination Survey (NHANES), obesity among young children (defined as two- to five-year-olds) has increased more slowly than it has among older children. In 2016, 13.9 percent of two- to five-year-old children were obese, compared with 18.4 percent of six- to 11-year-olds and 20.6 percent of 12- to 19-year-olds.⁹¹ Some evidence suggests that obesity rates among the youngest children are declining, in contrast to older children, whose obesity rates have continued to rise in

Figure 5. Obesity among WIC Participants (Ages 2–4) and Nationally Representative Sample (Ages 2–5)



Sources: Nationally representative sample drawn from the National Health and Nutrition Examination Survey (NHANES). Source for NHANES data: Patricia M. Anderson et al., "Understanding Recent Trends in Childhood Obesity in the United States," *Economics & Human Biology* 34 (2019): 16-25, <https://doi.org/10.1016/j.ehb.2019.02.002>.

the past decade.⁹² Although the NHANES data are nationally representative, they are calculated from a relatively small sample, which means that it's hard to know whether changes in obesity from year to year are statistically meaningful.

We have more detailed information on obesity among WIC participants, because the height and weight of children must be reported as part of the application and recertification process. This yields a large dataset, with approximately six million observations in each biennial wave of WIC program data. These data allow researchers to examine obesity among racial and ethnic groups, such as Native Americans and Pacific Islanders, that cannot be reliably measured in smaller nationally representative datasets. A limitation, however, is that information is available only for WIC participants, and participation rates vary by children's age, by

their race/ethnicity, and over time. Despite these limitations, this is the best source of data on obesity among young children.

As figure 5 shows, among the WIC sample, measured obesity among two- to four-year-old children increased substantially between 1996 and 2000. Between 2000 and 2010, the rate edged up slightly, but then we see a statistically significant decline for the period from 2014 to 2018 (compared to 2010). The decline has been significant for all children, but sharper among boys.⁹³ Figure 5 also includes obesity rates for a nationally representative but small sample of two- to five-year-old children from NHANES data. These data show lower estimated obesity rates, which is to be expected since WIC participants come from lower-income families among whom obesity rates are higher.⁹⁴ In addition, the nationally representative data show a large spike in

2016, while the WIC data continue to show a decline. Though the NHANES spike may be concerning, we need more data; due to its small sample size and considerable sampling variability, the change from 2016 to 2018 is not statistically significant. Blacks, whites and Asians have had similar rates of obesity since 2004, and for all three groups those rates were somewhat lower in 2016 than in 2004. Hispanics have also seen a decline in obesity rates between 2010 and 2016, though the level of obesity among Hispanics is substantially higher than among blacks and whites in the WIC data.

We can't be certain whether the drop in obesity in the WIC data stems from sample changes or from a true underlying improvement because at the same that obesity among WIC participants has fallen, the rate of participation in WIC has also declined. However, a recent study compared state-level changes in participation rates to state-level changes in obesity among WIC participants and found that changing caseload participation wasn't closely correlated with the observed drop in obesity rates. This suggests that the decline we see likely reflects a true shift in obesity's prevalence, at least among the low-income population.⁹⁵

In 2009, the WIC food package was revised, reducing the amounts of some items—notably fruit juices and also milk and cheese—and introducing fruits and vegetables, whole-grain foods, and low-fat milk. The revised food packages were also intended to promote breastfeeding by providing more supplemental foods to breastfeeding mothers. Comparing purchases before and after the food package revisions, recent studies have found that after the revisions, WIC households purchased more whole grains and that WIC participant

children had a higher Healthy Eating Index-2010 score and consumed fruits and vegetables more frequently.⁹⁶ Notably, WIC households also purchased less fruit juice. Before the change, WIC vouchers accounted for two-thirds of the total juice purchases in these households. Afterwards, juice purchases declined but by less than the decline in WIC vouchers, implying that families increased their purchases of juice (and other sweetened fruit drinks) using other resources.⁹⁷ Though the timing of the food package change lines up with the decrease in obesity in this population, we can't yet determine whether the relationship is causal due to challenges in isolating the effects of WIC participation from other factors.

Conclusions

Research has clearly documented the vital importance of nutrition in early life. Resources available to children during this critical period influence health and developmental outcomes throughout later childhood and into adulthood. As a result, it's particularly important that young children have adequate nutrition and resources, and, to the extent possible, be insulated from negative shocks such as economic recessions that could cause permanent harm to their health and other measures of wellbeing.

Dietary fortification of certain foods helps improve nutrient intake among young children overall and reduces the number of children who don't get enough of a number of vitamins and minerals needed for healthy development. The addition of folic acid to enriched grains beginning in 1998 means that more women of childbearing age are getting an adequate amount of this vitamin, which in turn has dramatically reduced neural tube

defects among newborns. Still, a sizeable share of Hispanic women don't get enough folic acid in their diets, and adding folic acid to more corn masa flour products would help address this shortfall and further reduce neural tube defects among Hispanics.

Given the importance of adequate nutrition in early life for later outcomes, it's particularly important to ensure that children from low-income families have access to the foods they need to grow and thrive. SNAP and WIC provide essential additional resources that allow families to purchase food for almost a third of young children. Research demonstrates that each of these programs has important positive impacts on children's nutrition, health, and wellbeing.

Many issues require urgent attention from researchers and policy makers. One set of issues surrounds participation in and adequacy of food support programs. We know little about what an optimal level of food support would be, but the fact that studies show sizeable returns to such support suggests that benefit levels are too low. In addition, participation in WIC dramatically declines as children age, but we don't know

much about the causes and consequences of this decline and what types of reforms would improve participation and children's outcomes. Given high rates of food insecurity and the documented importance of early life nutrition, we should explore reforms to enhance SNAP's and WIC's impact on young children. Furthermore, fully two-thirds of food insecure families (overall, not limited to those with children aged zero to three) have annual incomes greater than the federal poverty threshold. These families are generally ineligible for SNAP and WIC. Because it's important to shield young children from nutrition deprivation, it's worth investigating whether we're adequately protecting young children in families with incomes above the poverty line.

The scientific evidence is strong enough to conclude that resources available from conception through age three are an important investment in the future health and wellbeing of America's children. We need to protect all children, especially the most vulnerable, from food insecurity, inadequate nutritional intake, and negative shocks such as recessions.

Endnotes

1. Alisha Coleman-Jensen et al., *Household Food Security in the United States in 2018* (Washington, DC: US Department of Agriculture, Economic Research Service, 2019), <https://www.ers.usda.gov/publications/pub-details/?pubid=94848>.
2. Douglas Almond, Janet Currie, and Valentina Duque, “Childhood Circumstances and Adult Outcomes: Act II,” *Journal of Economic Literature* 56 (2018): 1360–1446, <https://doi.org/10.1257/jel.20171164>; Hilary W. Hoynes and Diane Whitmore Schanzenbach, *Safety Net Investments in Children* (Washington, DC: Brookings Papers on Economic Activity, 2018).
3. Almond, Currie, and Duque, “Childhood Circumstances.”
4. Douglas Almond and Janet Currie, “Killing Me Softly: The Fetal Origins Hypothesis,” *Journal of Economic Perspectives* 25, no. 3 (2011): 153–72, <https://doi.org/10.1257/jep.25.3.153>.
5. Almond, Currie, and Duque, “Childhood Circumstances.”
6. David S. Ludwig, Heather L. Rouse, and Janet Currie, “Pregnancy Weight Gain and Childhood Body Weight: A Within-Family Comparison,” *PLoS Medicine* 10 (2013): e1001521, <https://doi.org/10.1371/journal.pmed.1001521>.
7. Douglas Almond and Bhashkar Mazumder, “Health Capital and the Prenatal Environment: The Effect of Ramadan Observance during Pregnancy,” *American Economic Journal: Applied Economics* 3, no. 4 (2011): 56–85, <https://doi.org/10.1257/app.3.4.56>; Douglas Almond, Bhashkar Mazumder, and Reyn Van Ewijk, “In Utero Ramadan Exposure and Children’s Academic Performance,” *Economic Journal* 125 (2015): 1501–33, <https://doi.org/10.1111/ecoj.12168>.
8. Janet Currie and Maya Rossin-Slater, “Weathering the Storm: Hurricanes and Birth Outcomes,” *Journal of Health Economics* 32 (2013): 487–503, <https://doi.org/10.1016/j.jhealeco.2013.01.004>.
9. Janet Currie and Hannes Schwandt, “Within-Mother Analysis of Seasonal Patterns in Health at Birth,” *Proceedings of the National Academy of Sciences* 110 (2013): 12265–70, <https://doi.org/10.1073/pnas.1307582110>.
10. Hannes Schwandt, “The Lasting Legacy of Seasonal Influenza: In-Utero Exposure and Labor Market Outcomes,” discussion paper, IZA Institute of Labor Economics, Bonn, Germany, February 2017, <http://ftp.iza.org/dp10589.pdf>.
11. David Simon, “Does Early Life Exposure to Cigarette Smoke Permanently Harm Childhood Welfare? Evidence from Cigarette Tax Hikes,” *American Economic Journal: Applied Economics* 8, no. 4 (2016): 128–59, <https://doi.org/10.1257/app.20150476>.
12. Alan Barreca and Marianne Page, “A Pint for a Pound? Minimum Drinking Age Laws and Birth Outcomes,” *Health Economics* 24 (2015): 400–18, <https://doi.org/10.1002/hec.3026>.
13. Adam Isen, Maya Rossin-Slater, and W. Reed Walker, “Every Breath You Take—Every Dollar You’ll Make: The Long-Term Consequences of the Clean Air Act of 1970,” *Journal of Political Economy* 125 (2017): 848–902, <https://doi.org/10.1086/691465>.
14. Hilary Hoynes, Douglas Miller, and David Simon. “Income, the Earned Income Tax Credit, and Infant Health,” *American Economic Journal: Economic Policy* 7, no. 1 (2015): 172–211, <https://doi.org/10.1257/pol.20120179>.
15. American Academy of Pediatrics Committee on Environmental Health, “Lead Exposure in Children: Prevention, Detection, And Management,” *Pediatrics* 116 (2005): 1036–46, <https://doi.org/10.1542/peds.2005-1947>; Anna Aizer et al., “Do Low Levels of Blood Lead Reduce Children’s Future Test Scores?” *American Economic Journal: Applied Economics* 10, no. 1 (2018): 307–41, <https://doi.org/10.1257/app.20160404>.

16. Stephen B. Billings and Kevin T. Schnepel, "Life after Lead: Effects of Early Interventions for Children Exposed to Lead," *American Economic Journal: Applied Economics* 10, no. 3 (2018): 315–44, <https://doi.org/10.1257/app.20160056>.
17. "Questions and Answers," Office of Disease Prevention and Health Promotion, last updated January 15, 2020, <https://health.gov/our-work/food-nutrition/2015-2020-dietary-guidelines/questions-answers#guidelines-q5>.
18. Colette I. Rihane, "Developing National Dietary Guidance for the Birth to 24 Months Age Group," blog post, US Department of Agriculture, February 21, 2017, <https://www.usda.gov/media/blog/2014/05/06/developing-national-dietary-guidance-birth-24-months-age-group>; Daniel J. Raitenet et al., "Executive Summary: Evaluating the Evidence Base to Support the Inclusion of Infants and Children from Birth to 24 Mo of Age in the Dietary Guidelines for Americans—"The B-24 Project,"" *American Journal of Clinical Nutrition* 99 (2014): 663S–91S, <https://doi.org/10.3945/ajcn.113.072140>.
19. Louise A. Berner et al., "Fortified Foods Are Major Contributors to Nutrient Intakes in Diets of US Children and Adolescents," *Journal of the Academy of Nutrition and Dietetics* 114 (2014): 1009–22, <https://doi.org/10.1016/j.jand.2013.10.012>; Institute of Medicine, *Dietary Reference Intakes: Guiding Principles for Nutrition Labeling and Fortification* (Washington, DC: National Academies Press 2003), <https://doi.org/10.17226/10872>.
21. Institute of Medicine, *Dietary Reference Intakes*.
22. Angela M. Leung, Lewis E. Braverman, and Elizabeth N. Pearce, "History of US Iodine Fortification and Supplementation," *Nutrients* 4 (2012): 1740–46, <https://doi.org/10.3390/nu4111740>.
23. Howard Markel, "When It Rains It Pours': Endemic Goiter, Iodized Salt, and David Murray Cowie, MD," *American Journal of Public Health* 77, no. 2 (1987): 219–29, <https://doi.org/10.2105/AJPH.77.2.219>.
24. Ibid.
25. Achyuta Adhvaryu et al., "When It Rains It Pours: The Long-Run Economic Impacts of Salt Iodization in the United States," *Review of Economics and Statistics* 102 (2020): 395–407, https://doi.org/10.1162/rest_a_00822.
26. Leung, Braverman, and Pearce, "History of US Iodine."
27. David Bishai and Ritu Nalubola, "The History of Food Fortification in the United States: Its Relevance for Current Fortification Efforts in Developing Countries," *Economic Development and Cultural Change* 51 (2002): 37–53, <https://doi.org/10.1086/345361>.
28. Kathleen L. Caldwell et al., "Iodine Status of the US Population, National Health and Nutrition Examination Survey, 2005–2006 and 2007–2008," *Thyroid* 21 (2011): 419–27, <https://doi.org/10.1089/thy.2010.0077>.
29. Leung, Braverman, and Pearce, "History of US Iodine."
30. Michael F. Holick, "Sunlight and Vitamin D for Bone Health and Prevention of Autoimmune Diseases, Cancers, and Cardiovascular Disease," *American Journal of Clinical Nutrition* 80 (2004): 1678S–88S, <https://doi.org/10.1093/ajcn/80.6.1678S>.
31. Institute of Medicine, *Dietary Reference Intakes*.
32. Michael F. Holick, "The Vitamin D Deficiency Pandemic: A Forgotten Hormone Important for Health," *Public Health Reviews* 32 (2010): 267–83, <https://doi.org/10.1007/BF03391602>.
33. Bishai, and Nalubola, "History of Food Fortification."
34. Suvi T. Itkonen, Maijaliisa Erkkola, and Christel J. E. Lamberg-Allardt, "Vitamin D Fortification of Fluid Milk Products and Their Contribution to Vitamin D Intake and Vitamin D Status in Observational Studies—A Review," *Nutrients* 10 (2018): 1054, <https://doi.org/10.3390/nu10081054>.

35. Juhi Kumar et al., “Prevalence and Associations of 25-Hydroxyvitamin D Deficiency in US Children: NHANES 2001–2004,” *Pediatrics* 124 (2009): e362–70, <https://doi.org/10.1542/peds.2009-0051>.
36. Nils Wernerfelt, David JG Slusky, and Richard Zeckhauser, “Second Trimester Sunlight and Asthma: Evidence from Two Independent Studies,” *American Journal of Health Economics* 3, (2017): 227–53, https://doi.org/10.1162/AJHE_a_00073.
37. Bishai and Nalubola, “History of Food Fortification.”
38. Youngmee K. Park et al., “Effectiveness of Food Fortification in the United States: The Case of Pellagra,” *American Journal of Public Health* 90 (2000): 727–38, <https://doi.org/10.2105/ajph.90.5.727>.
39. Institute of Medicine, *Dietary Reference Intakes*.
41. Jennifer Williams et al., “Updated Estimates of Neural Tube Defects Prevented by Mandatory Folic Acid Fortification—United States, 1995–2011,” *Morbidity and Mortality Weekly Report* 64, no. 1 (2015): 1–5.
42. Ibid.
43. Institute of Medicine, *Dietary Reference Intakes*.
44. Berner et al., “Fortified Foods Are Major Contributors.”
45. Jill Reedy and Susan M. Krebs-Smith, “Dietary Sources of Energy, Solid Fats, and Added Sugars among Children and Adolescents in the United States,” *Journal of the American Dietetic Association* 110 (2010): 1477–84, <https://doi.org/10.1016/j.jada.2010.07.010>.
46. ebecca J. Scharf and Mark D. DeBoer, “Sugar-Sweetened Beverages and Children’s Health,” *Annual Review of Public Health* 37 (2016): 273–93, <https://doi.org/10.1146/annurev-publhealth-032315-021528>.
47. Kirsten A. Herrick et al., “Added Sugars Intake among US Infants and Toddlers,” *Journal of the Academy of Nutrition and Dietetics* 120 (2020): 23–32, <https://doi.org/10.1016/j.jand.2019.09.007>.
48. Ibid.
49. Sohyun Park et al., “The Association of Sugar-Sweetened Beverage Intake during Infancy with Sugar-Sweetened Beverage Intake at 6 Years of Age,” *Pediatrics* 134 (2014): S56–S62, <https://doi.org/10.1542/peds.2014-0646j>.
50. Mark D. DeBoer, Rebecca J. Scharf, and Ryan T. Demmer, “Sugar-Sweetened Beverages and Weight Gain in 2- to 5-Year-Old Children,” *Pediatrics* 132 (2013): 413–20, <https://doi.org/10.1542/peds.2013-0570>; Jean A. Welsh et al., “Overweight among Low-Income Preschool Children Associated with the Consumption of Sweet Drinks: Missouri, 1999–2002,” *Pediatrics* 115 (2005): e223–e9, <https://doi.org/10.1542/peds.2004-1148>.
51. Scharf and DeBoer, “Sugar-Sweetened Beverages.”
52. Hunt Allcott, Benjamin B. Lockwood, and Dmitry Taubinsky, “Should We Tax Sugar-Sweetened Beverages? An Overview of Theory and Evidence,” *Journal of Economic Perspectives* 33, no. 3 (2019): 202–27, <https://doi.org/10.1257/jep.33.3.202>; John Cawley et al., “The Economics of Taxes on Sugar-Sweetened Beverages: A Review of the Effects on Prices, Sales, Cross-Border Shopping, and Consumption,” *Annual Review of Nutrition* 39 (2019): 317–38, <https://doi.org/10.1146/annurev-nutr-082018-124603>.
53. Matthew M. Lee et al., “Sugar-Sweetened Beverage Consumption 3 Years after the Berkeley, California, Sugar-Sweetened Beverage Tax,” *American Journal of Public Health* 109 (2019): 637–39, <https://doi.org/10.2105/AJPH.2019.304971>; Leslie McGranahan and Diane Whitmore Schanzenbach, “Who Would Be Affected by Soda Taxes?,” *Chicago Fed Letter* 284, March 2011, 1–4.
54. Tatiana Andreyeva et al., “Effects of Reduced Juice Allowances in Food Packages for the Women, Infants, and Children Program,” *Pediatrics* 131 (2013): 919–27, <https://doi.org/10.1542/peds.2012-3471>.

55. Emma J. Boyland, Melissa Kavanagh-Safran, and Jason C. G. Halford, "Exposure to 'Healthy' Fast Food Meal Bundles in Television Advertisements Promotes Liking for Fast Food but not Healthier Choices in Children," *British Journal of Nutrition* 113 (2015): 1012–18, <https://doi.org/10.1017/S0007114515000082>.
56. "Infant Food and Feeding," American Academy of Pediatrics, accessed March 26, 2020, <https://www.aap.org/en-us/advocacy-and-policy/aap-health-initiatives/HALF-Implementation-Guide/Age-Specific-Content/Pages/Infant-Food-and-Feeding.aspx>.
57. "Maternal, Infant, and Child Health," US Office of Disease Prevention and Health Promotion, Healthy People 2020, last updated March 13, 2020, <https://www.healthypeople.gov/2020/topics-objectives/topic/maternal-infant-and-child-health/objectives>.
58. Cynthia G. Colen and David M. Ramey, "Is Breast Truly Best? Estimating the Effects of Breastfeeding on Long-Term Child Health and Wellbeing in the United States Using Sibling Comparisons," *Social Science & Medicine* 109 (2014): 55–65; Eirik Evenhouse and Siobhan Reilly, "Improved Estimates of the Benefits of Breastfeeding Using Sibling Comparisons to Reduce Selection Bias," *Health Services Research* 40 (2005): 1781–1802.
59. Michael S. Kramer et al., "Promotion of Breastfeeding Intervention Trial (PROBIT): A Randomized Trial in the Republic of Belarus," *JAMA* 285 (2001): 413–20.
60. Patricia J. Martens, "What do Kramer's Baby-Friendly Hospital Initiative PROBIT Studies Tell Us? A Review of a Decade of Research," *Journal of Human Lactation* 28 (2012): 335–42.
61. *Breastfeeding Report Card United States 2018*, US Centers for Disease Control and Prevention, <https://www.cdc.gov/breastfeeding/pdf/2018breastfeedingreportcard.pdf>.
62. Jennifer L. Beauregard et al., "Racial Disparities in Breastfeeding Initiation and Duration Among U.S. Infants Born in 2015," *Morbidity and Mortality Weekly Report* 68 (2019): 745–48. <https://doi.org/10.15585/mmwr.mm6834a3>.
63. "WIC Program: Nutrition Service and Administrative Costs," US Department of Agriculture- Food and Nutrition Service, February 14, 2020, <https://fns-prod.azureedge.net/sites/default/files/resource-files/23WICAdm%24-2.pdf>; WIC Program: Food Cost," US Department of Agriculture, Food and Nutrition Service, February 14, 2020, <https://fns-prod.azureedge.net/sites/default/files/resource-files/24wicfood%24-2.pdf>.
64. Betsy Thorn et al., *WIC Participant and Program Characteristics 2016* (Alexandria, VA: US Department of Agriculture, Food and Nutrition Service, 2018), <https://fns-prod.azureedge.net/sites/default/files/ops/WICPC2016.pdf>.
65. Nicole Kline et al., "WIC Participant and Program Characteristics 2018," unpublished manuscript, US Department of Agriculture, Food and Nutrition Service, 2020.
66. Hilary W. Hoynes, Leslie McGranahan, and Diane W. Schanzenbach. "SNAP and Food Consumption," in *SNAP Matters: How Food Stamps Affect Health and Well Being*, ed. Judith Bartfeld et al. (Palo Alto, CA: Stanford University Press, 2015), 107–33.
67. Hilary Hoynes and Diane Whitmore Schanzenbach, "US Food and Nutrition Programs," in *Economics of Means-Tested Transfer Programs in the United States*, vol. 1, ed. Robert A. Moffitt (Chicago: University of Chicago Press, 2015), 219–301; Hoynes and Schanzenbach, "Safety Net Investments."
68. Christian Gregory, Matthew P. Rabbitt, and David C. Ribar, "The Supplemental Nutrition Assistance Program and Food Insecurity," in *SNAP Matters*, 74–106.
69. George J. Borjas, "Food Insecurity and Public Assistance," *Journal of Public Economics* 88 (2004): 1421–43, [https://doi.org/10.1016/S0047-2727\(02\)00188-3](https://doi.org/10.1016/S0047-2727(02)00188-3); Lucie Schmidt, Lara Shore-Sheppard, and Tara Watson, "The Effect of Safety-Net Programs on Food Insecurity," *Journal of Human Resources* 51 (2016): 589–614, <https://doi.org/10.3368/jhr.51.3.1013-5987R1>.

70. Craig Gundersen, Brent Kreider, and John V. Pepper, “Partial Identification Methods for Evaluating Food Assistance Programs: A Case Study of the Causal Impact of SNAP on Food Insecurity,” *American Journal of Agricultural Economics* 99 (2017): 875–93, <https://doi.org/10.1093/ajae/aax026>; Brent Kreider, John V. Pepper, and Manan Roy, “Identifying the Effects of WIC on Food Insecurity among Infants and Children,” *Southern Economic Journal* 82 (2016): 1106–22, <https://doi.org/10.1002/soej.12078>.
71. Elizabeth Condon et al., *Diet Quality of American Young Children by WIC Participation Status: Data from the National Health and Nutrition Examination Survey, 2005–2008—Summary*, US Department of Agriculture, Food and Nutrition Service, March 2015, <https://fnis-prod.azureedge.net/sites/default/files/ops/NHANES-WIC05-08-Summary.pdf>.
72. Mary Ann Chiasson et al., “Changing WIC Changes What Children Eat,” *Obesity* 21 (2013): 1423–29; Shannon E. Whaley et al., “Impact of Policy Changes on Infant Feeding Decisions among Low-Income Women Participating in the Special Supplemental Nutrition Program for Women, Infants, and Children,” *American Journal of Public Health* 102 (2012): 2269–73.
73. Silvie Colman et al., *Effects of the Special Supplemental Nutrition Program for Women, Infants and Children (WIC): A Review of Recent Research* (Alexandria, VA: US Department of Agriculture, Food and Nutrition Service, Office of Research and Analysis, January 2012); Hoynes and Schanzenbach, “US Food and Nutrition Programs.”
74. David Figlio et al., “The Effects of Poor Neonatal Health on Children’s Cognitive Development,” *American Economic Review* 104 (2014): 3921–55, <https://doi.org/10.1257/aer.104.12.3921>; Almond, Currie, and Duque, “Childhood Circumstances.”
75. Marianne P. Bitler and Janet Currie, “Does WIC Work? The Effects of WIC on Pregnancy and Birth Outcomes,” *Journal of Policy Analysis and Management* 24 (2005): 73–91, <https://doi.org/10.1002/pam.20070>; David Figlio, Sarah Hamersma, and Jeffrey Roth, “Does Prenatal WIC Participation Improve Birth Outcomes? New Evidence from Florida,” *Journal of Public Economics* 93 (2009): 235–45, <https://doi.org/10.1016/j.jpubeco.2008.08.003>; Hilary Hoynes, Marianne Page, and Ann Huff Stevens, “Can Targeted Transfers Improve Birth Outcomes? Evidence from the Introduction of the WIC Program,” *Journal of Public Economics* 95 (2011): 813–27, <https://doi.org/10.1016/j.jpubeco.2010.12.006>; Maya Rossin-Slater, “WIC in Your Neighborhood: New Evidence on the Impacts of Geographic Access to Clinics,” *Journal of Public Economics* 102 (2013): 51–69, <https://doi.org/10.1016/j.jpubeco.2013.03.009>; Janet Currie and Ishita Rajani, “Within-Mother Estimates of the Effects of WIC on Birth Outcomes in New York City,” *Economic Inquiry* 53 (2015): 1691–1701, <https://doi.org/10.1111/ecin.12219>.
76. Rossin-Slater, “WIC in Your Neighborhood”; Katherine Meckel, “Is the Cure Worse Than the Disease? Unintended Effects of Payment Reform in a Quantity-Based Transfer Program,” *American Economic Review* 110 (2020): 1821–65, <https://doi.org/10.1257/aer.20160164>.
77. Douglas Almond, Hilary W. Hoynes, and Diane Whitmore Schanzenbach, “Inside the War on Poverty: The Impact of Food Stamps on Birth Outcomes,” *Review of Economics and Statistics* 93 (2011): 387–403, https://doi.org/10.1162/REST_a_00089; Chloe N. East, “The Effect of Food Stamps on Children’s Health: Evidence from Immigrants’ Changing Eligibility,” *Journal of Human Resources* 55 (2020): 387–427, <https://doi.org/10.3368/jhr.55.3.0916-8197r2>.
78. Hilary Hoynes, Diane Whitmore Schanzenbach, and Douglas Almond, “Long-Run Impacts of Childhood Access to the Safety Net,” *American Economic Review* 106 (2016): 903–34, <https://doi.org/10.1257/aer.2016.106.4.903>.
79. East, “Effect of Food Stamps.”
80. Anna Chorniy, Janet Currie, and Lyudmyla Sonchak, “Does Prenatal WIC Participation Improve Child Outcomes?,” *American Journal of Health Economics* 6 (2019), <https://doi.org/10.1086/707832>.
81. Thorn et al., *Participant and Program Characteristics*.

82. Ibid.; “Policy Basics: The Supplemental Nutrition Assistance Program (SNAP),” Center on Budget and Policy Priorities, updated June 25, 2019, <https://www.cbpp.org/research/food-assistance/policy-basics-the-supplemental-nutrition-assistance-program-snap>.
83. Carole Trippe et al., *National and State-Level Estimates of WIC Eligibility and WIC Program Reach in 2016* (Alexandria, VA: US Department of Agriculture, Food and Nutrition Service, 2019).
84. Trippe et al., *National and State-Level Estimates*.
85. 86 Hilary Hoynes and Diane Whitmore Schanzenbach, “Policies to Strengthen Our Nation’s Supplemental Nutrition Assistance Program,” Washington Center for Equitable Growth, February 18, 2020, <https://equitablegrowth.org/policies-to-strengthen-our-nations-supplemental-nutrition-assistance-program>.
86. New York State WIC Program, *NY WIC Retention Promotion Study: Keep, Reconnect, Thrive* (Albany, NY: New York State Department of Health, 2016), https://wicworks.fns.usda.gov/wicworks/Sharing_Center/spg/NY2010summary.pdf; Denise Huynh, *Women, Infants, and Children (WIC): Awareness, Experience, and Access* (St. Paul, MN: Wilder Research, 2013), https://www.wilder.org/sites/default/files/imports/MDH_WIC_Study_Summ_5-13.pdf; Karissa Horton, Amanda Hovis, and Jennifer Loyo, “Arizona Department of Health Services—WIC Attitudes, Barriers, and Beliefs Study: Final report,” Limetree Research, October 28, 2013, <https://azdhs.gov/documents/prevention/azwic/arizona-wic-program-attitudes-barriers-and-beliefs-study-limetree-2013.pdf>.
87. Shannon E. Whaley et al., “Predictors of WIC Participation through 2 Years of Age,” *Journal of Nutrition Education and Behavior* 52 (2020): P672–P79, <https://doi.org/10.1016/j.jneb.2019.12.015>.
88. Helena Bottemiller Evich, “Immigrants, Fearing Trump Crackdown, Drop Out of Nutrition Programs,” *Politico*, September 3, 2018, <https://www.politico.com/story/2018/09/03/immigrants-nutrition-food-trump-crackdown-806292>.
89. Wendy Parmet, “The Health Impact of the Proposed Public Charge Rules,” blog post, *Health Affairs*, September 27, 2018, <https://www.healthaffairs.org/doi/10.1377/hblog20180927.100295/full/>.
90. Melissa Kearney et al., “A Dozen Facts about America’s Struggling Lower-Middle Class,” Brookings Institution, Washington, DC, 2013, https://www.hamiltonproject.org/papers/a_dozen_facts_about_americas_struggling_lower-middle_class.
91. “Childhood Obesity Facts,” Centers for Disease Control and Prevention, last reviewed June 24, 2019, <https://www.cdc.gov/obesity/data/childhood.html>.
92. Patricia M. Anderson, Kristin F. Butcher, and Diane Whitmore Schanzenbach, “Understanding Recent Trends in Childhood Obesity in the United States,” *Economics & Human Biology* 34 (2019): 16–25, <https://doi.org/10.1016/j.ehb.2019.02.002>.
93. Liping Pan et al., “Changes in Obesity among US Children aged 2 through 4 Years Enrolled in WIC during 2010–2016,” *JAMA* 321 (2019): 2364–66, <https://doi.org/10.1001/jama.2019.5051>.
94. Anderson, Butcher, and Schanzenbach, “Understanding Recent Trends.”
95. Ibid.
96. Chiasson et al., “Changing WIC”; Miyoung Oh, Helen H. Jensen, and Ilya Rahkovsky, “Did Revisions to the WIC Program Affect Household Expenditures on Whole Grains?” *Applied Economic Perspectives and Policy* (2016): 578–98, <https://doi.org/10.1093/aepp/ppw020>; June M. Tester, Cindy W. Leung, and Patricia B. Crawford, “Revised WIC Food Package and Children’s Diet Quality,” *Pediatrics* 137 (2016): e20153557, <https://doi.org/10.1542/peds.2015-3557>.
97. Andreyeva et al., “Reduced Juice Allowances.”

Evolving Roles for Health Care in Supporting Healthy Child Development

Adam Schickedanz and Neal Halfon

Summary

Health care reaches more children under age three in the United States than any other family-facing system and represents the most common entry point for developmental assessment of and services for children. In this article, Adam Schickedanz and Neal Halfon examine how well the child health care system promotes healthy child development early in life. They also review children's access to health care through insurance coverage, the health care system's evolution in response to scientific and technical advances, and the shifting epidemiology of health and developmental risk.

The authors find that the health care system is significantly underperforming because it is constrained by antiquated conventions, insufficient resources, and outmoded incentive structures inherent in the traditional medical model that still dominates pediatric care. These structural barriers, organization challenges, and financial constraints limit the system's ability to adequately recognize, respond to, and, most importantly, prevent adverse developmental outcomes at the population level.

To achieve population-level progress in healthy child development, Schickedanz and Halfon argue that pediatric care will need to transform itself and go beyond simply instituting incremental clinical process improvement. This will require taking advantage of opportunities to deliver coordinated services that bridge sectors and focusing not only on reducing developmental risk and responding to established developmental disability but also on optimizing healthy child development before developmental vulnerabilities arise.

New imperatives for improved population health, along with the growing recognition among policy makers and practitioners of the social and developmental determinants of health, have driven recent innovations in care models, service coordination, and coverage designs. Yet the available resources and infrastructure are static or shrinking, crowded out by rising overall health care costs and other policy priorities. The authors conclude that child health systems are at a crossroads of conflicting priorities and incentives, and they explore how the health system might successfully respond to this impasse.

www.futureofchildren.org

Adam Schickedanz is an assistant professor in residence in the Department of Pediatrics at the David Geffen School of Medicine at the University of California, Los Angeles. Neal Halfon is the founding director of the Center for Healthier Children, Families and Communities; a professor of pediatrics in the David Geffen School of Medicine; a professor of health policy and management in the Fielding School of Public Health; and a professor of public policy in the Luskin School of Public Affairs, all at the University of California, Los Angeles.

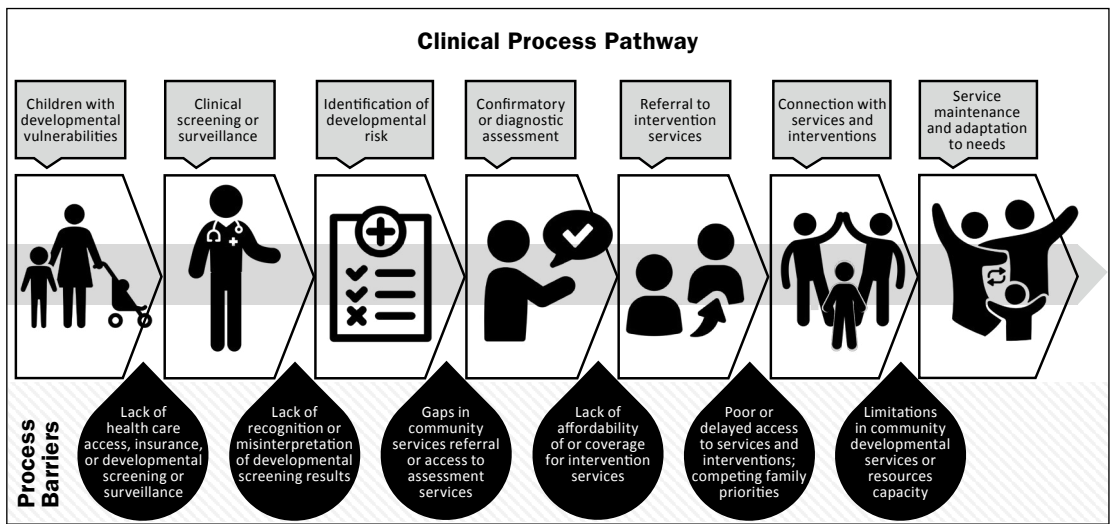
Child health care professionals reach more American families with children under age three than any other family-facing system or service. Current national recommendations call for no fewer than 12 health care visits by a child's third birthday. These recommended clinical visits for children and their parents can provide access to developmental surveillance, screening for developmental delay, and referrals to developmental services.

Pediatric clinicians support healthy child development in various ways. Developmental risk assessment, surveillance, and screening are recommended components of routine preventive health care for all children. Even though the American Academy of Pediatrics (AAP) Bright Futures prevention and health promotion guidelines were adopted by the Centers for Medicare and Medicaid Services as part of the Affordable Care Act (ACA) in 2010, developmental monitoring rates still vary widely across states, and the national rate of clinical developmental monitoring has been fairly static for the past decade.¹ Figure 1 depicts the current, conventional pathway that health care providers follow in attending to children at risk for developmental delays. This figure also shows key barriers to each stage of the pathway that impede the health system's ability to promote healthy child development.

Models of child health care have evolved substantially over the past century and continue to evolve today. Until the middle of the 20th century, infectious diseases ravaged children's health and led to high morbidity and mortality. Pediatric health care had focused primarily on acute illnesses and their medical aftermath, which often had multiple developmental consequences.

But widespread access to antibiotics, effective vaccines, and the postwar baby boom fundamentally reshaped pediatric health care. The profession adapted to new roles focused on monitoring the health of predominantly well infants and children (that is, those without serious acute or chronic diseases) and helping to define parameters of healthy child development.

Though the establishment and widespread monitoring of developmental and behavioral norms through health care was seen by some as an overmedicalization of issues in children's lives previously left to the purview of parents and families, there was widespread demand for these services from the nation's parents. Standards for pediatric care that came with the passage of Medicaid in the mid-1960s further codified its diagnosis-based reimbursement structure, increased access for low-income children, and put new pressure on private health plans to standardize coverage as well. Pediatrics continued to expand the scope of diagnosis and treatment for a growing number of previously overlooked childhood conditions, and with this growth came more pediatric health professions and subspecialties that had to be integrated with the child health care system. The term *patient-centered medical home* was coined by pediatricians in 1978 to describe standards for improving the continuity of primary care and coordinating an expanded array of medical services within the health care system to deliver quality care.² The medical home model has continued to be disseminated and refined across all of health care since then, accelerated by the widespread adoption of managed care in the 1980s and 1990s. The ACA introduced new incentives for child health care to deliver better quality and shift to value-based reimbursement, opening the

Figure 1. Pathway of Developmental Risk Identification and Intervention in the Conventional Child Health Care Model

door to a greater focus on preventing disease in its social context and coordinating with services outside the health care system to promote population health.

Pediatric health care has improved in response to technical advances, changing epidemiology, and evolving demands for care, but the basic organization and structure of primary health care in pediatric offices and clinics has remained largely unchanged since the 1960s (if not before). Preventive and well-child health care services in the United States are provided in ways that are quite distinct from those of other advanced nations. In many other countries, including England, Australia, and most European nations, pediatricians predominantly care for sick children. Well-child and preventive care is largely managed by specially designated maternal and child health nurses, general practitioners, or well-child clinics. In the United States, where pediatricians generally provide these services for young children, the schedule of visits was initially built around immunization schedules and the routine monitoring of growth and developmental

milestones. Though there have been modifications over the past 50 years, this visit schedule and content remains largely the same today.

The approach to promoting healthy child development in primary care settings has nonetheless evolved in response to practice, norms, and needs; table 1 summarizes the changes that have occurred. Among the distinctive skills that pediatric practitioners possess, in addition to expertise in the diseases unique to childhood, is expertise in measuring and monitoring growth, child development, and nutrition. Several factors contributed to the growing role of pediatricians in identifying and managing child development. One was the advent of neonatal intensive care, which improved the odds of survival of many infants that were born prematurely. The host of developmental disabilities associated with what was initially a set of neonatal care interventions with limited clinical efficacy meant that pediatricians had to be trained not only to care for premature newborns with multiple medical problems but to manage the developmental delays

Table 1. Stages of Evolution of Health Care Delivery System Models to Support Healthy Child Development

	1. Conventional Medical Care System	2. Expanded Medical Home and Coordinated Health Care System	3. Community Integrated Health System
Goals of the System	Decrease Mortality and morbidity	Decrease morbidity and disability	Prevent developmental vulnerabilities; increase developmental capabilities; improve population developmental outcomes
Developmental Focus	Identify and treat developmental disability	Prevent developmental risks	Optimize developmental potential
Health Care Model	Acute and rescue health care; identification of disease; management of disability	Chronic disease prevention and management	Creation of integrated systems and sectors to promote healthy development
Scientific Model	Biomedical model disability	Biopsychosocial model	Biopsychosocial and life course health development models
Organizational Models	Offices, clinics, and hospitals without horizontal or vertical integration	Capitated accountable health care organizations	Accountable communities for healthy development
Payment Models	Fee for service; volume-driven	Capitated payments	Bundled services, value-based payment incentives for high quality, upstream care, and service care, and service coordination; value-driven
Developmental Services	Developmental screening for disabilities	Developmental surveillance; coordinated intervention from by community organizations	Provision of and linkage to services (parenting supports, early literacy materials, etc.) that promote healthy development
Innovations in Developmental Interventions	Nurse home visitation for high-risk infants	Integration of developmental services into health care; centralized access to resources and service coordination	Community-wide healthy development promotion networks; community service hubs

that followed. Other technical advances also meant that children with chromosomal abnormalities and other genetic conditions were also surviving, and their developmental needs likewise required attention.

As pediatrics ascended as its own specialty, the prevailing construct of child development was informed by biological maturation, consistent with developmental biology that undergirded the dominant biomedical

model and the explanatory model of growth that animated pediatric assessments. This thinking was highly influential in the creation of the Denver Developmental Screening Test (DDST), which was introduced into pediatric training and practice in the early 1970s. The DDST became a widely used tool, shaping the developmental understanding of many young pediatric trainees who were taught to see development through a maturational framework. Not until the introduction of a biopsychosocial alternative to the biomedical model was the role of adverse environments recognized, at which point approaches to child development largely driven by biological and neurological determinism began to be questioned.

In the early 1970s, leading pediatricians championed a set of transformative ideas that would change how pediatricians saw their roles. The promulgation of these ideas also encouraged the AAP to embrace the profession's role in addressing "new morbidities" of child health: learning, behavioral, and developmental disorders that were caused by social, family, and environmental conditions. As a result, pediatric practice shifted toward screening for developmental concerns in the context of a more holistic approach to young children's needs. This was codified in the early 1990s in *Bright Futures*, which established a new way to integrate child health, development, and family supports into each pediatric visit.

Children's health care has increasingly been held accountable for adherence to health care quality guidelines, including clinical guidelines for developmental screening and surveillance. But owing to how American health care is financed, it hasn't been possible to align clinical processes and pathways to ensure that most children

receive recommended care and have access to community-based early interventions or to guarantee that children with developmental risks are appropriately connected to services.

In a post-ACA system, the next stage of the child health care system's evolution and transformation should focus on preventing the upstream causes of children's developmental vulnerabilities, integrating community-based services, creating incentive structures that support these functions for improving developmental capabilities, and optimizing healthy development and developmental capabilities.³ Right now, however, the health care system is still constrained by funding streams that distribute more resources to medically complex patients at the end of their lives, by short-term insurance coverage time horizons that limit opportunities to focus on long-term investments in healthy development and recoup on those investments, and by siloed services and barriers to collaboration between health care and other child-facing systems concerned with promoting healthy lifelong development. All of these constraints are layered onto volume-driven clinical care delivery and reimbursement models that leave insufficient time and resources for doctors to identify those at risk for developmental disability, that fail to provide incentives for preventing developmental disability in the absence of a medical condition to diagnose and treat, and that fail to capitalize on opportunities to optimize healthy child development for the many children who may be medically well but are at risk for developmental delays and deficits due to early childhood adversity and socioemotional risks in their homes.

It's no wonder that the US child health care system has a long way to go to substantially

improve its care practices, processes, and coordination to support healthy child development. The best available data from the National Survey of Children's Health suggest only one-third of children from nine to 35 months old receive the recommended developmental screening.⁴ Among children with identified developmental risks, referral from a health care setting to appropriate early intervention services is inconsistent, as is successful connection.⁵ And even when referral and connection are successful, early intervention agencies and health care providers rarely share information about children's progress. As a result, the effectiveness of both sectors in promoting healthy child development is limited.

These operational and structural shortcomings are largely a legacy of health care's historical conceptions of developmental disability, which focused on medical, disease-related causes of physical and cognitive impairments. Such a view grew out of clinicians' focus on prematurity, low birth weight, or other perinatal complications that affected only a small percentage of children with significant medical issues. Yet it has become increasingly clear that adversity due to social, economic, and environmental conditions is a major source of developmental risk common for children at the population level. For the large and growing number of young children whose developmental vulnerabilities are a consequence of their social conditions, clinical monitoring and response lack sufficient resources to address the scope of their needs. Through advances in our understanding of how childhood economic and interpersonal adversity threatens health outcomes and achievement over the life course, we know that early adversity increases and compounds developmental vulnerability as well.

The gap between the child health care system's potential to improve population-level developmental outcomes and its current performance is alarmingly wide. The disconnects are occurring at the clinical practice level, the community level, and the policy level. There's a mismatch at the clinical practice level between population-level needs, processes, and financing of care. In the community, the health care system faces barriers in integrating its services with other resources and services to achieve optimal developmental outcomes for populations of children. And, finally, policy dictates the flow of funding and resources to the child health system embedded in its community of aligned partner organizations in other sectors. Opportunities exist at each of these levels to transform the way we provide care and ensure that child health care lives up to its potential to promote healthy child development.

Health Care Access and Insurance Coverage

In the US system, pediatricians and other child health care professionals are parents' primary source of information about healthy child development in the preschool years, making medical insurance and access to the health care system critical for families.⁶ After decades of gains in insurance coverage rates nationally, leading to a peak child insurance rate of 95.3 percent in 2016, insurance rates for children have shown an alarming decline in the past four years. Since 2016, more than 400,000 children have become uninsured, raising the total to over four million.⁷ This decline in health insurance rates was driven by loss of coverage among children under age six, white and Hispanic children, those in the low to moderate income range, and those with Medicaid and CHIP coverage.⁸

States that failed to expand Medicaid saw threefold increases in their uninsured rates compared to those in expansion states. Young children and those on public health insurance are at particularly high risk for developmental delay and are also likely to find it difficult to access early intervention services. Given that health care access is the primary point of entry for identifying developmental disability and linking to early intervention services for children in the age and demographic groups where insurance coverage rates are eroding, adverse impacts on developmental outcomes for these children are of great concern (see figure 1).

Insurance coverage for child developmental services in health care became standard two years after the establishment of Medicaid in 1965 when Congress added the Early and Periodic Screening, Diagnostic, and Treatment (EPSDT) benefit. This assured that children from lower-income families would receive appropriate preventive services, with the goal of reducing the burden of disabling chronic health conditions in adulthood. Under the EPSDT benefit, state Medicaid agencies are required to cover childhood preventive screenings, resultant referrals, and medically necessary services for conditions revealed by screenings during clinical encounters. The timing of EPSDT-mandated, Medicaid-reimbursed preventive encounters and preventive screenings is now based largely on the Bright Futures guidelines and periodicity schedule, which includes developmental screenings with validated tools. Reimbursement for developmental screening through Medicaid may be bundled with age-specific well-child visits or may be a separate payment depending on the state, and neither bundled nor separate payments appear to yield superior rates of childhood developmental screening.⁹ Medicaid fee-for-service rates for

developmental screening vary by an order of magnitude across states (\$4.95 in Michigan to \$61.51 in Iowa), while managed care plans now covering most children under Medicaid have wide latitude to set their own reimbursement rates that may not adhere to the state fee-for-service rates.¹⁰ In addition to adopting these conventional approaches to reimbursement for clinical developmental screening, state Medicaid agencies have implemented a variety of statewide performance improvement projects, incentives for collaboration across state agencies, public-private partnerships, and training initiatives for health professionals to increase developmental screening and early intervention rates.¹¹ For children covered by private insurance, developmental screening under age three became an essential covered health benefit with passage of the ACA. This patchwork of funding approaches contributes to the great variation in developmental screening rates across states.

Beyond requiring coverage for developmental screening, EPSDT mandates coverage for an array of medical services necessary to address identified developmental disability. For children with isolated developmental delays or disabilities without other medical conditions, Medicaid's benefits for children under age three also include physical, occupational, and speech therapy, as well as services such as hearing and vision assessment, behavioral health care, and case management. Children other than those in low-income families are also eligible for Medicaid (though with marked or severe limitations) if they have special health care needs, defined as those who "have or are at increased risk for chronic physical, developmental, behavioral, or emotional conditions and also require health and related services of a type or amount beyond that

required by children generally.”¹² This allows Medicaid to fill gaps in private insurance service coverage for many children with such needs and makes coverage of services for developmental disabilities more affordable for families. Though developmental and medical services are covered benefits under Medicaid for the most medically complicated children with special health care needs, the health care system is not as responsive to families whose children have isolated developmental delays or disabilities in the absence of other medical conditions, nor to the large proportion of children at risk for developmental delay because of psychosocial adversity. These gaps become especially important when we consider the evolving epidemiology of developmental risk.

Epidemiology and Recognition of Developmental Risk

Physical, cognitive, and language impairments and disabilities have steadily become more prevalent over the past few decades. Currently, according to national estimates, just under 18 percent of all children have diagnosed developmental-behavioral disabilities.¹³ Rates of diagnosed developmental disability, excluding behavioral disabilities, have increased even more markedly, from an estimated 4 percent of children in 1994 to nearly 7 percent in 2016.¹⁴ Speech, cognitive, and other developmental disabilities have grown faster than nearly all other conditions, with the most recent estimates showing growth of 40 to 60 percent for each between 2001 and 2011.¹⁵ For children under age three, these speech, cognitive, and motor issues represent the most common types of delays.¹⁶ Though emotional and behavioral disorders like attention deficit disorder and autism can be identified through clinical screening

before age three, they are more commonly diagnosed in later preschool and the early school-age years. Early manifestations of behavioral disorders in the first three years of life are also increasingly seen as antecedents of later emotional, behavioral, and psychiatric problems, but without better screening they aren’t commonly recognized, diagnosed, or treated.¹⁷

A number of factors lie behind changes in the epidemiology of childhood developmental risk. For one, advances in medical care in the prenatal and neonatal periods have led to better diagnosis and treatment and reduced mortality for children who are born with or develop serious illness, children born extremely prematurely, and children with perinatal complications, who now survive with higher rates of developmental disability. Though medical advances are often mentioned as a key factor, most of the growth in childhood developmental risk appears to be caused by other things. First, rates and sensitivity of developmental and behavioral screening, assessment, and diagnoses have increased moderately, meaning that more children are identified who would likely not have been diagnosed before.¹⁸ Second, the extent of socioemotional developmental problems is just beginning to be understood. Until recently, socioemotional vulnerabilities were often overlooked or downplayed as minor complications of more consequential language and cognitive delays, and they are still underappreciated by child health care professionals, who aren’t trained to recognize them, assess their origins, or intervene. Because such vulnerabilities often require complex family interventions and must be delivered by service providers who are few and far between, there is also a disincentive to identify these problems, which require extensive case management and coordination

to address. Third, psychosocial and socioeconomic developmental risk factors have increasingly been recognized, leading to heightened awareness of how the nested interplay of neighborhood, household, family dynamics, parenting practices, and early relational and interpersonal supports and attachment affects brain development, cognitive functioning, and developmental outcomes.¹⁹

Advances in understanding the developmental consequences of various forms of childhood adversity—including social determinants such as poverty, low education, and racial and ethnic discrimination—have brought more vulnerable children to the attention of the health care system than ever before. In particular, because of the growing evidence that early psychosocial adversity becomes biologically ingrained in physiology and health behavior, the health care system increasingly recognizes severe stress and emotional trauma due to childhood abuse, neglect, household violence, mental illness, or substance abuse, together termed adverse childhood experiences (ACEs), as threats to children's developmental outcomes and also their mental and physical health.²⁰ Parents' own ACEs may influence child developmental risk intergenerationally.²¹ The growing recognition that common social risk factors for adverse developmental outcomes must be addressed through the health care system is now leading to a mismatch between the health care system's aspirational goals and its actual capacity to mitigate these widespread, traditionally nonmedical developmental hazards.

The challenge we face is how to create a more comprehensive approach to assessing and intervening in developmental

vulnerability caused by complex social and relational risks embedded in family socioeconomic conditions, resources, and behavioral adaptations and community ecosystems. To better meet the needs of children who are developmentally at risk, a host of policy and health care practice changes are needed, particularly for children in disproportionately vulnerable sociodemographic populations.

Developmental Screening and Services Standard of Care

Health care professional societies, clinical practice guidelines, and national targets for health and health care improvement recommend developmental surveillance, screening, and referral to appropriate services as standard of care in the early childhood years.²² The AAP recommends screening all children regardless of risk for developmental delay at nine, 18, and 24 or 30 months of age using standardized, age-specific screening tools completed by their caregivers. Screening tools have advanced considerably since those that focused squarely on motor, language, and cognition; new tools assess a broader swath of emotional, behavioral, and social developmental vulnerabilities. The AAP also recommends that health care providers surveil and monitor development at all child preventive health care visits before age five by asking parents about their concerns, observing children, and assessing risk. Other AAP recommendations include 1) referring patients to appropriate developmental and medical assessments and services, 2) coordinating care for patients to help them connect to such assessments and services, and 3) developing and maintaining working relationships with state and local programs and resources that serve children with

developmental-behavioral concerns.²³ The Centers for Disease Control and Prevention has endorsed these recommendations, and they form the basis for the widely used Bright Futures clinical practice guidelines. Other health care quality targets and improvement initiatives nationally, including Healthy People 2020 and the Core Set of Child Health Quality Measures for Medicaid and CHIP, have likewise been guided by these recommendations. A measure for standardized developmental screening for children under age three was endorsed by the National Quality Forum and subsequently recommended by the Core Quality Measures Collaborative for all public and private insurance payers. Currently, states voluntarily report the measure, but in 2024 the Centers for Medicaid and Medicare Services will begin requiring them to do so.

While the AAP recommendations have been widely adopted and cited to support developmental screening and surveillance as a standard of care, the US Preventive Services Task Force found insufficient published evidence that the benefits of universal clinical developmental screening outweigh its potential risks in situations where neither caregivers nor clinicians are concerned about delays or disabilities. This determination reflects a lack of studies on the potential for universal clinical developmental screening to mediate risk and produce long-term benefits. The American Academy of Family Physicians cited this lack when it recommended against universal screening for developmental delay by family physicians, who conduct roughly 20 percent of childhood preventive visits.

Increases in the proportion of children who receive clinical developmental screening have been bolstered by initiatives such as the

Commonwealth Fund's Assuring Better Child Development (ABCD) program and the Administration for Children and Families' "Birth to Five, Watch Me Thrive" and the Center for Disease Control and Prevention's "Learn the Signs. Act Early" campaigns.²⁴ At the same time, the rate at which pediatricians employ standardized developmental screening tools in their practices has risen; it was estimated at just under 50 percent in one national study published in 2011.²⁵ Yet outside of pediatrics, standardized screening tools are used much less, and the national rate of clinical developmental screening among young children appears to have plateaued at around 30 percent over the past half decade.²⁶ The major barriers appear to be time constraints in the clinical encounter itself and the fact that physicians seem to prefer to rely on clinical observation and surveillance rather than screening.²⁷

Compared to pediatrician surveillance alone, standardized, validated screening tools have been shown to increase referral for further developmental evaluation.²⁸ Nevertheless, nearly half of children who screen positive for developmental delay are either never referred for further assessment or face other barriers to reaching early intervention services. The reasons for this disconnect appear to be different from the barriers to screening. They include inefficient clinical practice referral processes, clinicians' perceptions that a family doesn't want a referral, and notions that families lack the health literacy to correctly interpret positive screening results and therefore wouldn't follow through on a referral.²⁹ This may not be surprising, given that health care visits are time limited and clinicians and parents alike are often focused on other priorities. Also, in the absence of a concurrent medical diagnosis, no financial incentive exists for

most clinicians to respond to an identified developmental delay.

Workforce, Training, and Clinical Process Improvement

Even within the confines of the more traditional medical model and conventional visit structure, clinicians can become better at recognizing and responding to developmental risks and outright disabilities (see figure 1). Education and training for providers in health professions that play integral roles in children's health care can improve their ability to recognize developmental problems. Currently, over 80 percent of preventive health care visits for children under age two take place in general pediatricians' offices, which thus represent the largest opportunity to increase developmental screening and referral rates. Since 1997, when the Accreditation Council for Graduate Medical Education (ACGME) began requiring that pediatric residents receive training in developmental and behavioral pediatrics, pediatricians and other members of child health care teams have been routinely trained to identify children with or at risk for developmental delay and those in need of therapeutic intervention. But there are still many practicing pediatricians who were trained before then. And this training is not required for family physicians. Evidence from the single national cross-sectional study available on the topic clearly supports the conclusion that the 1997 change in ACGME requirements led to higher rates of clinical recognition and management of pediatric developmental and behavioral issues among practicing pediatricians.³⁰ However, according to one medium-sized study, only two-thirds of pediatricians certified after the 1997 change reported that their developmental and

behavioral pediatrics training was adequate, and the result was that they appropriately identified and managed developmental issues less than 30 percent of the time.³¹ Moreover, few pediatricians are aware of the agencies and services available in their communities to address developmental risks and disabilities. Pediatricians also tend to have little practical experience in coordinating care with early assessment and intervention services.

Beyond general pediatricians, the workforce in the field of developmental and behavioral pediatrics is especially critical for definitively assessing and managing developmental issues in children, especially in cases of greater developmental and clinical complexity and risk that require specialized expertise to manage. This critical workforce mostly consists of subspecialist developmental-behavioral pediatricians who require years of additional training beyond that of general pediatricians. A recent survey of developmental-behavioral pediatrics clinicians found that their capacity is being severely squeezed under the pressure of higher rates of developmental issues at the population level and the greater developmental and medical complexity of the patients they see. Perhaps most alarmingly, one-third of these clinicians anticipate retiring in the next three to five years.³² Thus it will be critically important not only to invest in strengthening the existing workforce but also to expand and restructure it to include a wider array of professionals, such as developmental specialists, care coordinators, parent coaches, and partners in key community organizations.

Process improvements in the current preventive child health care delivery model would also likely help increase identification of developmental risk and early

intervention. A handful of rigorous studies that focused on interventions to standardize or automate developmental screening in clinical settings found improvements in screening rates, rates of identification of children as developmentally delayed, rates of referral to early intervention services, and rates of children ultimately being ruled eligible for early intervention services and receiving those services more quickly.³³ In a cluster randomized trial of a computerized decision support system to determine and assign children to standardized screening for developmental delays, screening at recommended ages increased more than threefold and developmental surveillance at other visits rose by 75 percent.³⁴

Unsurprisingly, experimental evidence supports the notion that rigorous and uniform implementation of a standardized tool will result in measurable improvement in screening and referral rates and efficiency. This is consistent with abundant evidence suggesting that the leading threat to the quality of medical care for children, unlike for adults, is underutilization of recommended preventive services and screening. The key factors behind this problem are resource and time limitations during the medical visit.

Underutilization impairs the effectiveness of early intervention services, too. Population-level estimates indicate that roughly 10 percent of eligible children under age three actually receive early intervention services.³⁵ These early intervention services are mandated by part C of the federal Individuals with Disabilities Education Improvement Act (IDEA), which covers services from birth through age three for children with developmental delays who meet state-defined eligibility criteria or who have conditions

that automatically qualify because of high risk for future developmental, emotional, or behavioral impairments. Services potentially offered under the umbrella of early intervention include community-based and publicly funded programs such as developmental therapies (for example, speech, physical/gross motor, or occupational/fine motor therapies), audiology and hearing services, socioemotional and behavioral therapies, nutritional services, specialized medical or nursing services, preschools designed to deliver therapies, home-based therapies, and many others, all tailored to needs identified in initial and ongoing developmental assessments. Both the criteria for receiving services and the services offered vary considerably from state to state, limiting evidence on early intervention effectiveness nationally. Lack of health insurance and structural racism have been shown to predict poor access to early intervention services for African American children.³⁶ Indeed, at the population level, the largest barrier to children receiving early intervention services is either that they're not referred or that even if they are, they aren't able to use those services. Though empirical evidence largely suggests that early intervention services are effective for older children, evidence is limited and at best mixed for children under age three. This may be because the issues picked up in infancy and toddlerhood are a combination of severe disease-related delays, mild speech delays related to the language environment, and everything in between, making it hard to standardize service assessment. Indeed, reviews of evidence on early intervention under age three find that multifaceted early intervention services have the greatest impact. But, paradoxically, that multifaceted nature makes it hard to determine which specific components of those services are most effective.³⁷

How could clinical systems and structures increase rates of preventive developmental screening and referral? One possibility would be for the health care system to realign clinical resources, processes, and structures to provide services that promote and maintain healthy development early in life rather than waiting for healthy development to erode in a way that might have been fully predictable and preventable earlier on. The health care system could also invest in upstream services that would safeguard healthy development by minimizing predictable and known risks.

Vulnerabilities such as exposure to maternal depression, lack of stable caregiver relationships, and various other forms of economic and interpersonal early childhood adversity are now known to drive a large proportion of adverse developmental outcomes early in life; they are also linked to conventional medical disease outcomes in adulthood.³⁸ Well-documented developmental vulnerabilities, including poverty, early childhood emotional trauma, and various other forms of childhood adversity, are also beginning to be recognized and measured by health systems interested in addressing such experiences and the social determinants of health.³⁹ These social determinants are already understood by many health professionals to account for most of the variation in population health outcomes related to the most common causes of illness and death in the United States and other developed nations.⁴⁰ Screening for these social risk factors is becoming more routine and could be a way for the health care system to intercede in the upstream determinants of developmental risk as well. Pediatric practices have substantially increased their social risk screening owing to recognition that poverty-related social

needs predict a host of health outcomes, including risk of developmental delay.⁴¹ This approach is beginning to gain traction for clinical screening and identification of and interventions for ACEs and early childhood trauma, which also have clear associations with children's socioemotional, language, and cognitive developmental outcomes within and across generations.⁴² This growing focus on social and economic root causes of most developmental vulnerability, along with new care models designed to address those root causes and respond to socioemotional needs, offers an opportunity for the health care system to proactively promote healthy development rather than reactively treating developmental problems as they arise.

Promising Health Care Models to Improve Child Development

The shortfalls of current models of health care designed to promote healthy child development have not been studied rigorously, but barriers at each step of the screening-referral-intervention process can limit their success. Also, these models haven't been able to coordinate with nonmedical systems that are involved in addressing developmental delays. Successful models will need to improve performance within the health care system regarding its scope of services and, at the same time, coordinate with and facilitate the success of other service systems for evaluating and treating developmental issues.

To see how the child health care system could better promote healthy child development it is helpful to understand broadly how it's currently evolving and how its developmental services are conceived, organized, and funded. Table 1 describes a stepwise evolution of the health care system from

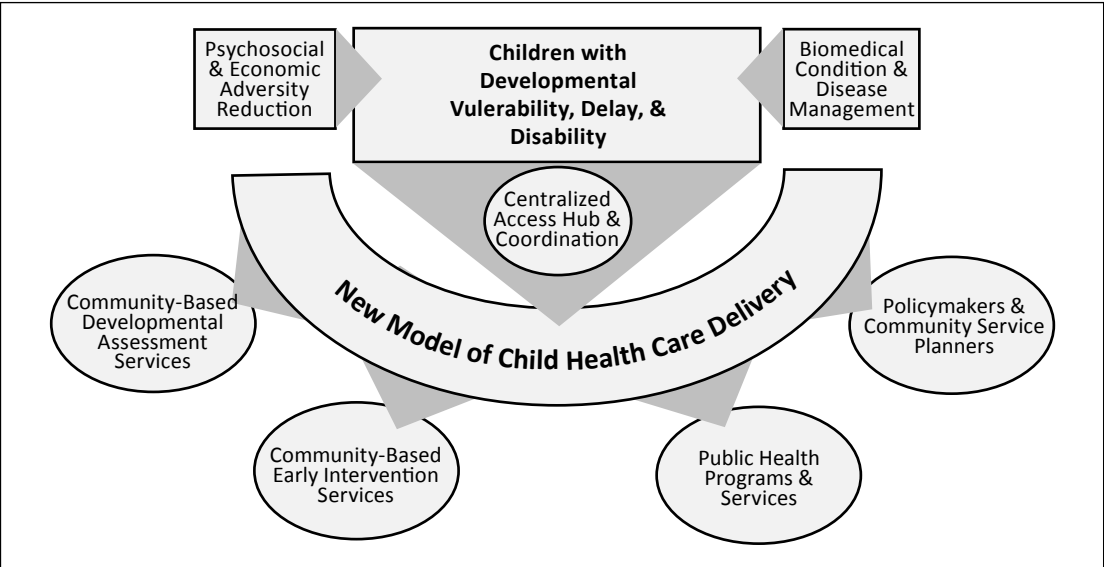
acute care whose goal is to minimize the number of deaths and mitigate illness to care focused on managing chronic conditions to a new delivery model focused on optimizing health by ameliorating adversity and emphasizing upstream prevention. The table outlines how the system for healthy child development evolves through these stepwise shifts. The rest of this section mirrors the progression in the table.

The primary approaches that have been used to improve developmental monitoring and response in the conventional child health care delivery model (stage 1 in the table) have been focused on making incremental changes in the clinical process. Despite the fact that clinical guidelines recommend standardized developmental screening and intervention, that pediatricians have been trained in developmental assessment, that developmental screening is being reimbursed through public payers in every state, and that the federal government has set national surveillance and screening

rate targets, the health care system has made little progress in ensuring that children are monitored for developmental issues and referred to early intervention services. Most of the progress that has been made has been in just the very first step (increasing screening rates) of a multistep process designed to connect children with heightened developmental risks to appropriate developmental services. It appears that we need new approaches, along with new models of child health care delivery and integration with the ecosystem of developmental services, depicted visually in figure 2.

Child health care systems may be more ready for these new approaches than ever before. Providers are increasingly aware of children’s developmental and behavioral needs in family and community context, especially the ways that individual-, household-, and neighborhood-level adversity are linked to childhood developmental hazards.⁴³ The ACA ushered

Figure 2. Evolution of Child Health Care Delivery to Prevent Developmental Vulnerability and Integrate with Community Developmental Services



in a shift in reimbursement emphasis from volume to value that has paved the way for new models of care that emphasize preventing disease and disability rather than awaiting their onset before responding, as in the fee-for-service framework. Yet limited payment reform alone hasn't brought about clinical practice improvements in areas like developmental screening and response. The solution doesn't appear to be attempting further changes in the clinical process in the hope that it can squeeze more productivity out of clinicians who are already short of time and resources and find it hard to coordinate with other services. Instead, a better option would be to restructure the child health care delivery model and to make developmental assessment and early intervention services available across key sectors in the community.

Innovative health care delivery models based on this kind of restructuring have thus far been successful in promoting healthy development while identifying and connecting more children to early intervention. Adding more resources for coordinating care with the existing clinical delivery model is a starting point. A study that examined what happened when electronic centralized referral tracking, clinical patient navigators, and a postreferral tracking system were added to one practice showed that such resources can substantially increase the rate at which children with identified developmental issues are connected to early intervention.⁴⁴ Embedding developmental specialists and enhanced developmental services into the child health care system has also been shown to help providers prevent developmental risk and delay and not just respond more effectively to delays once they appear. The HealthySteps model,

which tested this approach, led to sustained improvements in children's communication and language skills, fewer parental concerns about their children's behavior, and less use of severe discipline and other parenting practices known to be linked to adverse developmental outcomes.⁴⁵ Not only do HealthySteps and other programs like it support development by improving parenting, they also improve parents' sense of wellbeing and competence and increase their satisfaction with health care as well as advance preventive well-child care and anticipatory guidance in other areas beyond development.⁴⁶ Clinicians participating in HealthySteps also report improvements in the quality of care delivered, especially in low-income communities.⁴⁷ Such improvements were also seen in a similar enhanced pediatric care model that integrated lay parent coaches, as opposed to developmental specialists, demonstrating that some of the benefits can be achieved at a lower cost than in HealthySteps.⁴⁸ The spread and scaling of enhanced child health care models have been stymied by a lack of standardization, a range of different conceptual and implementation approaches, incomplete parental uptake, and the need for follow-up to measure impact. Yet such models demonstrate short- and medium-term impacts on identification and referral for developmental risk, promote parenting and clinical practices that should prevent developmental risk, and provide more evidence of their effectiveness than is required for most medical advances to be adopted and reimbursed.⁴⁹

It's feasible to enable the health care system to respond to growing family needs for interventions that promote healthy child development. And it makes sense to do so, considering that multiple randomized

studies of nurse home visitation programs have demonstrated positive impacts on children's developmental outcomes, including improvements in communication and language, motor, and cognitive developmental risk over the period of the visitation program. Several studies have shown that children continued to see improvements in their cognition, language, and achievement years after the intervention ended.⁵⁰ One study of a statewide home visitation program in Oregon found improvements in rates of parents reading to their children and developmental screening and even in rates of developmental delay.⁵¹ Providing additional developmental supports and services for coordination with the medical home through the vehicle of home visitation may be particularly effective as a tool for optimizing healthy child development, especially when home visitation nurses have enough resources, their visits are sufficiently frequent, and they're able to reach at-risk families.⁵²

One promising strategy for improving healthy development in which the health care system figures as a key partner is to increase resources and opportunities for service coordination. The national Help Me Grow initiative is a good example of such a community-oriented approach. Help Me Grow creates a single, centralized access point for assessing and responding to developmental delay; it also reaches out directly to families and encourages health care providers to offer developmental screening and referral. By 2018 it had grown to 92 sites in 28 states.⁵³ Elements of this community-oriented model have demonstrated impact in experimental studies, though no experimental studies of the model as a whole have been published (only nonexperimental studies have been

carried out to date).⁵⁴ In a trial in which a trained staff coordinated with pediatric clinics from a centralized hub designed to link developmental services, rates of developmental screening, referral, and receipt of services markedly improved.⁵⁵ Community-integrated approaches like this have been recommended for decades. Given growing need for developmental supports and services, as well as the appetite for such programs among health professionals, it's likely an excellent time to begin developing such community-integrated models.

Evolving Practices and Horizons in Care

Despite the current large mismatch between developmental needs and the health care system's ability to identify developmental risk or delay, provide supports, and connect vulnerable children with services, the system is evolving, albeit incrementally, to meet the health and developmental needs of the nation's children through innovations in care models, service coordination, and coverage designs (see table 1). For instance, a group of care models for children has been developed to clinically screen for poverty-related material hardships and adversity (for example, food insecurity, housing insecurity, transportation problems, etc.) and to link children and parents to community resources when such risks are identified.⁵⁶ Though a handful of experimental and quasi-experimental studies of such models have shown higher rates of social resource connections and improvements in quality of life, none have yet examined child development. Similarly, screening for ACEs in the clinical setting is gaining traction in pediatrics and has been made reimbursable

in California for children on Medicaid. Though it's far from clear whether rigorous studies of ACEs screening and subsequent intervention via the child health care system will affect developmental outcomes, few factors influence children's development more than early exposure to trauma. If the health care system can effectively identify and respond to ACEs without further stigmatizing or marginalizing the families that experience them, this approach could help prevent developmental risk.

To meaningfully improve the health system's performance in identifying, responding to, and preventing developmental risk, transformative change may be required. Various transformative models have been proposed, all of which show promise for helping health care systems build meaningful partnerships with key community services and agencies, coordinate services to achieve efficiency and scale, and reach families that would otherwise be left behind. This is especially urgent at a time when the resources and infrastructure available to address children's health development are static or shrinking, crowded out by rising overall health care costs and other policy priorities. New models of payment are needed to match these new models of care delivery and coordination.⁵⁷ We also need more research that evaluates the effectiveness of such payment reforms. A handful of alternative payment programs under state Medicaid agencies offer possible roadmaps for funding both direct provision of an expanded set of services and capacity-building programs for integrating community services and health care. These might be adapted to the child health care system.⁵⁸

We'll need rigorous evidence to guide the evolution of innovative, integrated health care models. Measures of success will need to reflect the full scope of health care, education, early intervention, and community resources required to support healthy child development. These measures must capture rates of screening at the population level and rates of referral or receipt of early intervention services and must ultimately track the extent to which early interventions lead to decreasing rates of developmental delay.

Conclusions

The child health care system is at a crossroads of competing and conflicting priorities and incentives supporting patchwork approaches carried over from outmoded, overly medicalized conceptions of how to address and promote healthy child development. Substantive systemwide improvement is currently elusive, and no clear reduction in developmental risk or increase in developmental capabilities has been achieved at the population level. Instead, the child health care system continues to apply its existing tools to the shifting epidemiology and swell of newly recognized developmental vulnerabilities, deploying a push broom against a flood.

As US inequality continues to grow, the number of children with developmental needs is likely to increase as well. We need transformational changes in health care delivery if we are to recognize and prevent a broader set of developmental vulnerabilities, foster clinical-community service coordination and facilitation of access to developmental services expertise, and develop payment models that encourage upstream intervention to mitigate a range

of psychosocial and medical developmental vulnerabilities and lead to improvements in population-level developmental capabilities. A growing number of pediatric clinicians and child health delivery systems recognize the need for such transformations and are more

ready to implement new models of upstream care than at any time in recent memory. Through this evolution, the child health care system can realize its potential to serve as a catalyst of healthier development among America's children.

Endnotes

1. Ashley H. Hirai et al., “Prevalence and Variation of Developmental Screening and Surveillance in Early Childhood,” *JAMA Pediatrics* 172 (2018): 857–66, <https://doi.org/10.1001/jamapediatrics.2018.1524>; Linda Radecki et al., “Trends in the Use of Standardized Tools for Developmental Screening in Early Childhood: 2002–2009,” *Pediatrics* 128 (2011): 14–19, <https://doi.org/10.1542/peds.2010-2180>.
2. Calvin Sia et al., “History of the Medical Home Concept,” *Pediatrics* 113 (2004): S1473–S78.
3. Neal Halfon et al., “Applying a 3.0 Transformation Framework to Guide Large-Scale Health System Reform,” *Health Affairs* 33 (2014): 2003–11, <https://doi.org/10.1377/hlthaff.2014.0485>.
4. Hirai et al., Prevalence and Variation.”
5. Christina Bethell et al., “Rates of Parent-Centered Developmental Screening: Disparities and Links to Services Access,” *Pediatrics* 128 (2011): 146–55, <https://doi.org/10.1542/peds.2010-0424>.
6. Schuster et al., “Anticipatory Guidance: What Information Do Parents Receive? What Information Do They Want?,” *Archive of Pediatrics & Adolescent Medicine* 154 (2000): 1191–8, <https://doi.org/10.1001/archpedi.154.12.1191>; Linda Radecki et al., “What Do Families Want from Well-Child Care? Including Parents in the Rethinking Discussion,” *Pediatrics* 124 (2009): 858–65, <https://doi.org/10.1542/peds.2008-2352>.
7. Joan Alker and Lauren Roygardner, *The Number of Uninsured Children is on the Rise*, (Washington, DC: Georgetown University Center for Children and Families, 2019), <https://ccf.georgetown.edu/2019/10/29/the-number-of-uninsured-children-in-on-the-rise-acs>.
8. Edward R. Berchick and Laryssa Mykyta , “Children’s Public Health Insurance Coverage Lower Than in 2017,” US Census Bureau, September 10, 2019, <https://www.census.gov/library/stories/2019/09/uninsured-rate-for-children-in-2018.html>.
9. Shirley Berger, “Rates of Developmental and Behavioral Screening of Young Children,” PhD dissertation (CUNY Graduate School of Public Health, 2018), <https://pdfs.semanticscholar.org/0b07/ae1117cd14cc62034ac984d79b4f9087599e.pdf>.
10. Najeia Mention and Felicia Heider, *The Nuts and Bolts of Medicaid Reimbursement for Developmental Screening: Insights from Georgia, Minnesota, and North Carolina* (Portland, ME: National Academy for State Health Policy, 2016), <https://nashp.org/wp-content/uploads/2016/09/Screening-Brief.pdf>.
11. Felicia Heider, *State Medicaid and Early Intervention Partnerships to Promote Healthy Child Development* (Portland, ME: National Academy for State Health Policy, 2016), <https://www.nashp.org/wp-content/uploads/2016/05/Healthy-Child-Brief.pdf>.
12. “Children with Special Health Care Needs,” US Department of Health and Human Services, Health Resources and Services Administration, last reviewed October 2020, <https://mchb.hrsa.gov/maternal-child-health-topics/children-and-youth-special-health-needs>.
13. Benjamin Zablotsky et al., “Prevalence and Trends of Developmental Disabilities among Children in the United States: 2009–2017,” *Pediatrics* 144 (2019): e20190811, <https://doi.org/10.1542/peds.2019-0811>.
14. Coleen A. Boyle, Pierre Decoufflé, and Marshalyne Yeargin-Allsopp, “Prevalence and Health Impact of Developmental Disabilities in US Children,” *Pediatrics* 93 (1994): 399–403; Benjamin Zablotsky, Lindsey I. Black, and Stephen J. Blumberg, “Estimated Prevalence of Children with Diagnosed Developmental Disabilities in the United States, 2014–2016,” data brief no. 291, National Center for Health Statistics, November 2017, <https://www.cdc.gov/nchs/data/databriefs/db291.pdf>.
15. Amy J. Houtrow et al., “Changing Trends of Childhood Disability, 2001–2011,” *Pediatrics* 134 (2014): 530–38, <https://doi.org/10.1542/peds.2014-0594>.

16. Beth M. McManus, Cordelia C. Robinson, and Steven A. Rosenberg, "Identifying Infants and Toddlers at High Risk for Persistent Delays," *Maternal and Child Health Journal* 20 (2016): 639–45, <https://doi.org/10.1007/s10995-015-1863-2>.
17. Daniel M. Bagnier et al., "Assessment of Behavioral and Emotional Problems in Infancy: A Systematic Review," *Clinical Child and Family Psychology Review* 15 (2012): 113–28.
18. Zablotsky et al., "Prevalence and Trends"; Susan Woolfenden et al., "A Systematic Review of the Prevalence of Parental Concerns Measured by the Parents' Evaluation of Developmental Status (PEDS) Indicating Developmental Risk," *BMC Pediatrics* 14 (2014): 231, <https://doi.org/10.1186/1471-2431-14-231>.
19. Frances Page Glascoe and Shirley Leew, "Parenting Behaviors, Perceptions, and Psychosocial Risk: Impacts on Young Children's Development," *Pediatrics* 125 (2010): 313–19, <https://doi.org/10.1542/peds.2008-3129>.
20. Robert F. Anda et al., "The Enduring Effects of Abuse and Related Adverse Experiences in Childhood," *European Archives of Psychiatry and Clinical Neuroscience* 256 (2006): 174–86, <https://doi.org/10.1007/s00406-005-0624-4>; Bonnie D. Kerker et al., "Adverse Childhood Experiences and Mental Health, Chronic Medical Conditions, and Development in Young Children," *Academic Pediatrics* 15 (2015): 510–17, <https://doi.org/10.1016/j.acap.2015.05.005>.
21. Jing Sun et al., "Mothers' Adverse Childhood Experiences and Their Young Children's Development," *American Journal of Preventive Medicine* 53 (2017): 882–91, <https://doi.org/10.1016/j.amepre.2017.07.015>.
22. Evelyn Berger-Jenkins et al., "Screening for Both Child Behavior and Social Determinants of Health in Pediatric Primary Care," *Journal of Developmental & Behavioral Pediatrics* 40 (2019): 470–71, <https://doi.org/10.1097/DBP.0000000000000676>.
23. Council on Children with Disabilities, Section on Developmental Behavioral Pediatrics, Bright Futures Steering Committee, and Medical Home Initiatives for Children with Special Needs Project Advisory Committee, "Identifying Infants and Young Children with Developmental Disorders in the Medical Home: An Algorithm for Developmental Surveillance and Screening," *Pediatrics* 118 (2006): 405–20, <https://doi.org/10.1542/peds.2006-1231>.
24. Cynthia A. Connelly, *A History of the Commonwealth Fund's Child Development and Preventive Care Program* (New York: Commonwealth Fund, 2013).
25. Radecki et al., "Trends"; Jennifer M. Gills, "Screening Practices of Family Physicians and Pediatricians in 2 Southern States," *Infants & Young Children* 22 (2009): 321–31, <https://doi.org/10.1097/IYC.0b013e3181bc4e21>.
26. Wirongrong Arunyanart et al., "Developmental and Autism Screening: A Survey across Six States," *Infants & Young Children* 25 (2012): 175–87, <https://doi.org/10.1097/IYC.0b013e31825a5a42>; "Indicator 4.16: During the Past 12 Months, Was [Child's Name] Screened for Being at Risk for Developmental, Behavioral and Social Delays Using a Parent-Reported Standardized Screening Tool during a Health Care Visit?," Data Resource Center for Child and Adolescent Health, <http://www.childhealthdata.org/browse/survey/results?q=2498&r=1>.
27. Deanna L. Morelli et al., "Challenges to Implementation of Developmental Screening in Urban Primary Care: A Mixed Methods Study," *BMC Pediatrics* (2014): 16, <https://doi.org/10.1186/1471-2431-14-16>; Tracy M. King et al., "Implementing Developmental Screening and Referrals: Lessons Learned from a National Project," *Pediatrics* 125 (2010): 350–60, <https://doi.org/10.1542/peds.2009-0388>.
28. Hollie Hix-Small et al., "Impact of Implementing Developmental Screening at 12 and 24 Months in a Pediatric Practice," *Pediatrics* 120 (2007): 381–89, <https://doi.org/10.1542/peds.2006-3583>; Alison Schonwald et al., "Routine Developmental Screening Implemented in Urban Primary Care Settings: More Evidence of Feasibility and Effectiveness," *Pediatrics* 123 (2009): 660–8, <https://doi.org/10.1542/peds.2007-2798>.

29. Manuel E. Jimenez et al., "Factors Associated with Early Intervention Referral and Evaluation: A Mixed Methods Analysis," *Academic Pediatrics* 14 (2014): 315–23, <https://doi.org/10.1016/j.acap.2014.01.007>.
30. Ruth E. K. Stein et al., "Does Length of Developmental Behavioral Pediatrics Training Matter?," *Academic Pediatrics* 17 (2017): 61–67, <https://doi.org/10.1016/j.acap.2016.07.007>.
31. Lani Lieberman and Robert I. Hilliard, "How Well Do Paediatric Residency Programmes Prepare Residents for Clinical Practice and Their Future Careers?," *Medical Education* 40 (2006): 539–46, <https://doi.org/10.1111/j.1365-2929.2006.02479.x>.
32. Carolyn Bridgemohan et al., "A Workforce Survey on Developmental-Behavioral Pediatrics," *Pediatrics* 141 (2018): e20172164, <https://doi.org/10.1542/peds.2017-2164>.
33. James P. Guevara et al., "Effectiveness of Developmental Screening in an Urban Setting," *Pediatrics* (2013): 30–37, <https://doi.org/10.1542/peds.2012-0765>; R. E. Thomas et al., "Rates of Detection of Developmental Problems at the 18-Month Well-Baby Visit by Family Physicians' Using Four Evidence-Based Screening Tools Compared to Usual Care: A Randomized Controlled Trial," *Child: Care, Health, and Development* (2016): 382–93, <https://doi.org/10.1111/cch.12333>.
34. Aaron E. Carroll et al., "Use of a Computerized Decision Aid for Developmental Surveillance and Screening: A Randomized Clinical Trial," *JAMA Pediatrics* 168 (2014): 815–21, <https://doi.org/10.1001/jamapediatrics.2014.464>.
35. Steven A. Rosenberg, Duan Zhang, and Cordelia C. Robinson, "Prevalence of Developmental Delays and Participation in Early Intervention Services for Young Children," *Pediatrics* 121 (2008): e1503–e9, <https://doi.org/10.1542/peds.2007-1680>.
36. Ibid.
37. Mijna Hadders-Algra et al., "Effect of Early Intervention in Infants at Very High Risk of Cerebral Palsy: A Systematic Review," *Developmental Medicine & Child Neurology* 59 (2017): 246–58, <https://doi.org/10.1111/dmcn.13331>; Suzanne Fillis, Laura Dunne, and Barbara McConnell, "Empirical Studies on Early Intervention Services for Toddlers Aged 24–36 Months: A Systematic Review," *International Journal of Educational Research* 89 (2018): 119–38, <https://doi.org/10.1016/j.ijer.2017.10.008>.
38. Adam Schickedanz, Benard P. Dreyer, and Neal Halfon, "Childhood Poverty: Understanding and Preventing the Adverse Impacts of a Most-Prevalent Risk to Pediatric Health and Well-Being," *Pediatric Clinics* 62 (2015): 1111–35, <https://doi.org/10.1016/j.pcl.2015.05.008>.
39. Michael Marmot, "Social Determinants of Health Inequalities," *Lancet* 365 (2005): 1099–1104, [https://doi.org/10.1016/S0140-6736\(05\)71146-6](https://doi.org/10.1016/S0140-6736(05)71146-6).
40. Andrew F. Beck et al., "Perspectives from the Society for Pediatric Research: Interventions Targeting Social Needs in Pediatric Clinical Care," *Pediatric Research* 84 (2018): 10–21, <https://doi.org/10.1038/s41390-018-0012-1>.
41. Arvin Garg et al., "Screening and Referral for Low-Income Families' Social Determinants of Health by US Pediatricians," *Academic Pediatrics* 19 (2019): 875–83, <https://doi.org/10.1016/j.acap.2019.05.125>.
42. Kerker et al., "Adverse Childhood Experiences"; Sun et al., "Mothers' Adverse Childhood Experiences."
43. Garg, "Screening and Referral"; Bonnie D. Kerker, "Do Pediatricians Ask about Adverse Childhood Experiences in Pediatric Primary Care?," *Academic Pediatrics* 16 (2016): P154–P60, <https://doi.org/10.1016/j.acap.2015.08.002>.
44. Kathleen Conroy et al., "Ensuring Timely Connection to Early Intervention for Young Children with Developmental Delays," *Pediatrics* 142 (2018): e20174017, <https://doi.org/10.1542/peds.2017-4017>.

45. Cynthia S. Minkovitz et al., “Healthy Steps for Young Children: Sustained Results at 5.5 Years,” *Pediatrics* 120 (2007): e658–e68, <https://doi.org/10.1542/peds.2006-1205>; Alan L. Mendelsohn et al., “Primary Care Strategies for Promoting Parent-Child Interactions and School Readiness in At-Risk Families: The Bellevue Project for Early Language, Literacy, and Education Success,” *Archives of Pediatrics & Adolescent Medicine* 165 (2011): 33–41, <https://doi.org/10.1001/archpediatrics.2010.254>.
46. Karen Bearss et al., “Effect of Parent Training vs. Parent Education on Behavioral Problems in Children with Autism Spectrum Disorder: A Randomized Clinical Trial,” *JAMA* 313 (2015): 1524–33, <https://doi.org/10.1001/jama.2015.3150>; Susan M. Chang et al., “Integrating a Parenting Intervention with Routine Primary Health Care: A Cluster Randomized Trial,” *Pediatrics* 136 (2015): 272–80, <https://doi.org/10.1542/peds.2015-0119>; Laurie Miller Brotman et al., “Effects of ParentCorps in Prekindergarten on Child Mental Health and Academic Performance: Follow-Up of a Randomized Clinical Trial through 8 Years of Age,” *JAMA Pediatrics* 170 (2016): 1149–55, <https://doi.org/10.1001/jamapediatrics.2016.1891>.
47. Caroline Piotrowski, Gregory A. Talavera, and Joni A. Mayer, “Healthy Steps: A Systematic Review of a Preventive Practice-Based Model of Pediatric Care,” *Journal of Developmental & Behavioral Pediatrics* 30 (2009): 91–103, <https://doi.org/10.1097/DBP.0b013e3181976a95>.
48. Tumaini R. Coker et al., “A Parent Coach Model for Well-Child Care among Low-Income Children: A Randomized Controlled Trial,” *Pediatrics* 137 (2016): e20153013, <https://doi.org/10.1542/peds.2015-3013>.
49. Courtney M. Brown, Whitney J. Raglin Bignall, and Robert T. Ammerman, “Preventive Behavioral Health Programs in Primary Care: A Systematic Review,” *Pediatrics* 141 (2018): e20170611, <https://doi.org/10.1542/peds.2017-0611>.
50. David L. Olds et al., “Effects of Home Visits by Paraprofessionals and by Nurses on Children,” *JAMA Pediatrics* 114 (2014): 1560–68.
51. Beth L. Green et al., “Results from a Randomized Trial of the Healthy Families Oregon Accredited Statewide Program,” *Children and Youth Services Review* 44 (2014): 288–98, <https://doi.org/10.1016/j.childyouth.2014.06.006>.
52. Heather A. Paradis et al., “Building Healthy Children: Evidence-Based Home Visitation Integrated with Pediatric Medical Homes,” *Pediatrics* 132 (2013): S174–S79, <https://doi.org/10.1542/peds.2013-1021R>.
53. Erin Cornell et al., *Help Me Grow Building Impact Report 2018* (Hartford, CT: Help Me Grow National Center, 2019).
54. Marcia Hughes et al., “Connecting Vulnerable Children and Families to Community-Based Programs Strengthens Parents’ Perceptions of Protective Factors,” *Infants & Young Children* 29 (2016): 116–29, <https://doi.org/10.1097/IYC.0000000000000059>; Karen D. Hill and Brian J. Hill, “Help Me Grow Utah and the Impact on Family Protective Factors Development,” *Journal of Children’s Services* 13 (2018): 33–43, <https://doi.org/10.1108/JCS-05-2017-0016>.
55. Bergen B. Nelson et al., “Telephone-Based Developmental Screening and Care Coordination through 2-1-1: A Randomized Trial,” *Pediatrics* 143 (2019): e20181064, <https://doi.org/10.1542/peds.2018-1064>.
56. Beck et al., “Perspectives.”
57. Nathaniel Z. Counts et al., “Redesigning Provider Payments to Reduce Long-Term Costs by Promoting Healthy Development,” discussion paper, National Academy of Medicine, April 20, 2018, <https://nam.edu/redesigning-provider-payments-to-reduce-long-term-costs-by-promoting-healthy-development>.
58. Hugh Alderwick, Carlyn M. Hood-Ronick, and Laura M. Gottlieb, “Medicaid Investments to Address Social Needs in Oregon and California,” *Health Affairs* 38 (2019): 774–81, <https://doi.org/10.1377/hlthaff.2018.05171>.

Child Care and Early Education for Infants and Toddlers

Ajay Chaudry and Heather Sandstrom

Summary

In this article, Ajay Chaudry and Heather Sandstrom review research on child care and early education for children under age three. They describe the array of early care and education arrangements families use for infants and toddlers; how these patterns have changed in recent decades; and differences by family socioeconomic status, race, and ethnicity.

Chaudry and Sandstrom note that families face many challenges both in getting access to child care and in finding care of more than mediocre quality. These challenges include limited supply and limited affordability relative to the needs of working parents and those pursuing education. Other challenges are based on families' and children's circumstances; for example, parents may work nontraditional or variable hours, or children may have special developmental needs.

Although experts agree that the quality of children's care is important for their learning and development, the authors write, there is no consensus on how to best measure quality and what factors are most important. They review what we know about the quality of infant and toddler child care in the United States, why child care quality matters for children's learning and development, and how the federal government as well as the states are trying to improve child care quality.

Chaudry and Sandstrom also examine the major public programs that support early care and education, primarily for children in low-income families—child care subsidies, tax credits, and the Early Head Start program. Overall, they note, the United States' public investment in quality child care and early education is relatively minimal, though bold proposals to bolster that investment are now on the table.

www.futureofchildren.org

Ajay Chaudry is a research scholar at New York University's Institute for Human Development and Social Change and Robert F. Wagner Graduate School of Public Services. Heather Sandstrom is a principal research associate in the Center on Labor, Human Services, and Population at the Urban Institute.

Research in child development and neuroscience shows clearly that children's very early development and learning occur in the context of relationships and experiences.¹ During the earliest years of life, an infant's brain is forming at a rapid pace and is at its most flexible and adaptable.² Because babies are highly sensitive to environmental influences and their caregiving relationships in these years, this is the most promising time for human development. Through daily interactions with parents, other caregivers, and the environment, children acquire early social, emotional, and cognitive skills that form the foundation for later development.

Despite the importance of the first three years of a child's life, they are the most underresourced time in the human life span. Child care and early education settings are central to child development, and most US children receive care from people other than their parents starting very early in life; during their first three years they might spend thousands of hours in multiple care settings. Yet most of the responsibility for finding and funding early learning opportunities is left up to families. Public investment in child care and early education programs is minimal compared to spending on older children's education. Thus the quality of care children experience depends largely on what their families can afford and what is available in their communities.

Because many families can't afford higher-quality care for their infants and toddlers, the supply of good child care is generally low, and especially so for children in lower- and middle-income families.³ These yawning gaps in access and quality in early care and education mean that many children miss out

on enriching early childhood experiences that could help them develop skills and set the foundation for further learning and later success in school and life.

Child Care Statistics for Infants and Toddlers

Mothers' participation in the workforce has expanded dramatically since the 1960s, nearly tripling from 24 percent in 1965 to 69 percent in 2018.⁴ As a result, over the last two generations nonparental care has become a common necessity for many families of young children. According to cross-sectional data from repeated national surveys, by 1997 6.9 million infants and toddlers, or 60 percent of all children, were regularly receiving nonparental care, and these numbers were unchanged in 2011.⁵ Young children with working mothers averaged 36 hours in child care and early education per week, and 27 percent had multiple care providers each week.⁶

Data from a few national cross-sectional sources together provide a fuller picture of the characteristics and use of child care and early education than do descriptive data from any one source alone. The Survey of Income and Program Participation, the National Household Education Survey, and the 2012 National Survey of Early Care and Education (NSECE) each collected data from households with young children. These sources vary in how extensively they survey households, in how they define and categorize types of child care and early education, in how they word questions, in how many years they cover, and in how frequently they are repeated. Yet for common areas of questioning, such as the number of children regularly in nonparental care, weekly hours in care,

and use of multiple care arrangements, the results are roughly similar across surveys.⁷

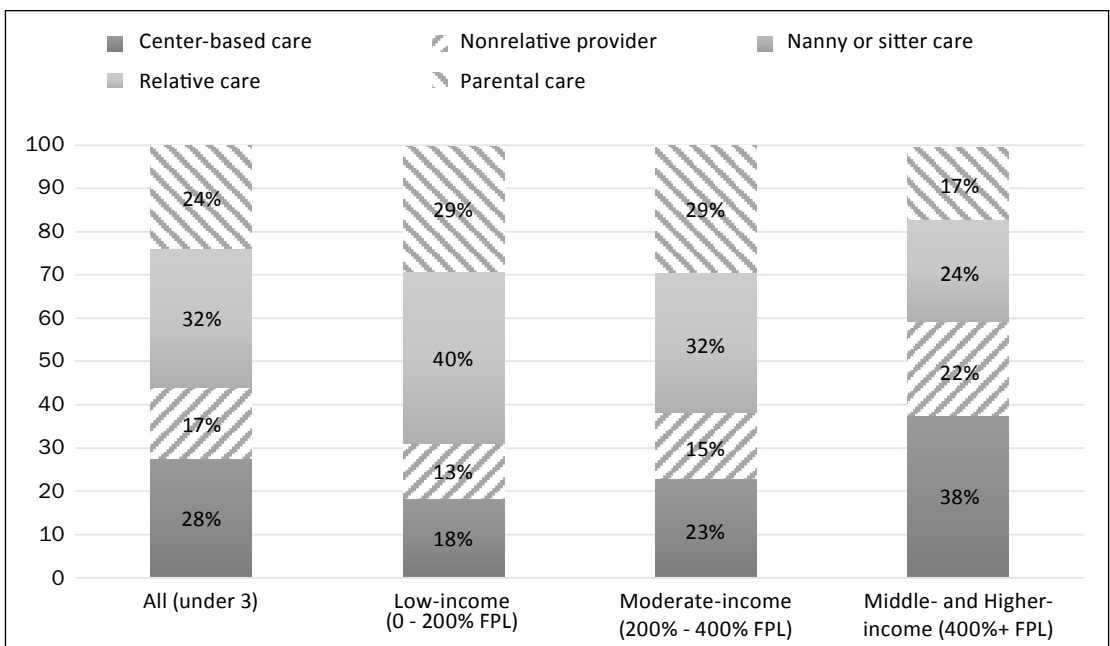
Many families use home-based child care arrangements for their infants and toddlers (see figure 1). In 2011, nearly one-third of young children were primarily cared for by relatives, most often a grandmother. Seventeen percent were cared for by nonrelatives in a home: either by family child care providers (who are often licensed to care for multiple unrelated children in the provider's home), nannies, or unlicensed care providers such as friends and neighbors who care for one or two children (the threshold for licensing requirements is typically higher).⁸ Nearly one-fourth of infants and toddlers with employed mothers are primarily cared for by parents, who often work different shifts so that one parent can care for the children while the other parent works. This

arrangement is most common when mothers or fathers work part time.⁹

In recent years, more families, especially those with working mothers, have turned to center-based care for their infants and toddlers. Between 1995 and 2016, the rate of center-based care use for all children under three nearly doubled, from 11 percent to 20 percent.¹⁰ Among families with employed mothers, 28 percent used center care for children under three in 2011—an increase from 20 percent in 1997 and just 7 percent in 1977.¹¹

The types of child care that families use varies with children's age, family income, and race and ethnicity. Most families begin using nonparental care when their child is an infant, and 16 percent of such families with employed mothers use center care. The proportion in center care increases to 30 percent at ages one and two.¹²

Figure 1. Distribution of Types of Primary Child Care Used for Children under Three with Employed Mothers, by Income Level, 2011



Sources: Authors' analysis of SIPP Panel Data for Primary Care Arrangements in 2011.

As figure 1 shows, young children with employed mothers in low-income families (that is families with incomes below 200 percent of the federal poverty level [FPL] threshold, or below \$51,500 for a family of four in 2019) are half as likely to be in center-based care as those in families with incomes of 400 percent or more of the FPL (\$103,000 for a family of four in 2019). At all levels of family income, infants and toddlers are cared for by relatives; 25 to 40 percent of families use this type of care, but lower-income families are more likely to do so.

Non-Hispanic white and black families use nonparental care for infants and toddlers at a higher rate than do Hispanic families (50 percent versus 40 percent, respectively). This is consistent with the fact that Hispanic mothers are less likely to be employed. However, among families using child care, low-income families of different races and ethnicities select similar types of care, and there are similar proportions of children from non-Hispanic white and black families in center- and home-based care.¹³

Cost Constraints

Parents' child care choices are often constrained by cost and supply limitations, work schedules, and family circumstances.¹⁴ Child care and early education are expensive, driven by the labor cost of caregivers and the greater care and attention that very young children require, which is reflected in the ratio of caregivers to children. In 2016, families spent an average of \$309 per week on full-time center-based care for children three and under.¹⁵ Costs vary considerably across states; full-time center care for infants ranges from

\$5,300 annually in Mississippi to more than \$20,400 in Massachusetts, while full-time family child care for infants ranges from \$3,700 annually in Mississippi to \$17,600 in the District of Columbia.¹⁶

Partly because of high costs, most families place their young children in unregulated home-based care with relatives and nonrelatives, many of whom provide no-cost care or at least lower-cost care that more families can afford. The 2012 NSECE shows that families made payments for 87 percent of center-based care and 41 percent of home-based care arrangements. Generally, individual home-based caregivers with no prior relationship to the family were paid for their services, averaging \$156 per week. Among home-based caregivers who did have a prior relationship with the family, most of whom were relatives, just 20 percent received payments; those payments averaged \$77 per week.¹⁷

Low-income families were much more likely to rely on lower-cost or no-cost care arrangements. Sixty-three percent of those with incomes below 200 percent of the FPL had childcare they didn't pay for, compared to 32 percent of those with incomes higher than that. And when they were paying for care, low-income families paid less.¹⁸ However, the payments made by lower-income families represented a much larger proportion of their family income. Among families with incomes below 200 percent of the FPL, those making payments spent 35 percent of their income on child care; those with incomes between 200 percent of the FPL and 400 percent of the FPL spent 14 percent of their income on child care; and those with incomes above 400 percent of the FPL spent 8 percent of their income on child care.¹⁹

Supply Constraints

Due to the high costs of infant and toddler care relative to most families' incomes, the effective demand and resultant supply of infant and toddler child care, particularly for center care, is very limited across the country. An analysis of 2018 licensed capacity across nine states found that overall 18 percent of children younger than three could be accommodated, with the lowest capacity being 12 percent in Indiana and the highest being 31 percent in Vermont.²⁰ Supply varies within states and municipalities as well—in areas that have more higher-income families, more center-based care is available and more families use such care. In 2012, in communities with relatively low concentrations of poverty (less than 13.9 percent of individuals living in poverty), 20 percent of children under age three attended centers, compared with 12 percent in communities with higher rates of poverty. In rural communities, just 10 percent of children under age three were attending centers in 2012.²¹

Other factors that restrict care options are parents' work circumstances, family and household composition, and children's particular developmental needs. Many parents work nonstandard and variable hours that include evenings, nights, or weekends, when child care options are more limited. These families disproportionately have low incomes. A recent analysis indicates that 58 percent of low-income families with young children work at least some hours outside of 8 a.m. to 6 p.m. on weekdays, which is the range of hours during which most child care centers operate. About 15 percent work the majority of their hours outside this traditional window.²² Parents who mostly work nontraditional hours are much less likely to

be able to use center care and more likely to rely on home-based care. Only 8 percent of centers in the NSECE supply study offered any care hours outside the traditional time window, while two-thirds of the "unlisted" caregivers (which refers primarily to informal care from relatives and nonrelatives) provided care that met the needs of families with nontraditional work hours.²³

In two-parent families in which both parents work, the parents are more likely to care for their children themselves. This suggests that some parents arrange their work schedules to avoid needing nonparental care, particularly when their children are very young. Arranging work schedules in this way tends to be more common when one parent is working part time. Working single parents seldom rely on nonresident parents for care and are more likely to rely on relatives.²⁴

The large share of children in informal, unlicensed care reflects a combination of individual family preferences and the employment and child care constraints that parents face. We know from household surveys over time that some share of families want their relatives, particularly grandmothers, to serve as their child's primary caregiver when they are working. Yet the fact that higher-income families don't use informal relative and nonrelative home-based care as much suggests that they can afford other options such as center-based care. For most lower-income families, supply and cost constraints limit access to and quality of child care and early education.

Ample economic research also demonstrates the inverse relationship between the price of child care and the level of parental employment.²⁵ Limited access to child care contributes to lower employment levels among parents, fewer hours worked, and

reduced family income and resources. This translates to less overall labor force participation and lost economic activity. Though the rate of women's participation in the labor force rose significantly and continuously between 1970 and 2000, it has now plateaued and fallen well behind those of other countries with advanced economies, both because US families pay more for child care and because fewer public resources are devoted to it.²⁶

Public Support for Infant and Toddler Child Care

Families privately finance the bulk of their children's care and early education, especially in the first three years. As a result, the total devoted to young children's development in early learning settings is limited by what families can afford, which varies tremendously. In the aggregate, this constricts overall child care supply, and it means that not enough is invested in children's development. Most of what does get invested in early learning and care supports the development of children from families with the greatest means, exacerbating inequalities across generations.²⁷

Relative to the overall need, governments invest very little in child care and early education for children younger than age three. We have a hodgepodge of fairly modest programs that reach a small share of children, are insufficient to support quality care, and are challenging for families to access and navigate.

The two primary ways that governments offer financial assistance for children's care and early education are child care subsidies and income tax credits. The federal Child Care and Development Block

Grant (CCDBG) provides the lion's share of funding for child care subsidies, with states providing additional funding to meet matching requirements. The states administer the child care subsidy programs, which are means tested and targeted to low-income families with employed parents; they aim to reduce child care costs for children up to age 13. Families receiving or transitioning off the states' Temporary Assistance to Needy Families (TANF) programs, which provide cash assistance to poor families, are also eligible. Parents in school and training programs may be eligible depending on their state and the program type, though most subsidy recipients work; in 2016, only 4 percent of those who received non-TANF subsidies were getting the assistance for education or training only.²⁸

In 2017, total public spending on child care assistance for children under age 13 was \$11.4 billion, including federal CCDBG allocations, state matching funds, and TANF block grant funding used for child care assistance.²⁹ Roughly one-third of this total went toward subsidies for children under age three. This is the largest source of public investment in infant and toddler child care and early education, and yet just 15 percent of the 13.6 million children eligible under federal guidelines received child care subsidies in an average month in 2015.³⁰

The federal child and dependent care tax credit is a second source of financial assistance. The tax credit is small—the maximum benefit is \$600 per year for most people who are eligible—and many low-income families can't benefit from it because they don't have significant tax liability and the credit isn't refundable. In

Table 1. Early Care and Education (ECE) Enrollment and Public Spending, Children Under Three, Selected Countries

Country	Enrollment in Licensed, Formal Child Care	Public ECE Spending per Child	Public ECE Spending as Percent of GDP
France	56%	\$7,200	0.60
Germany	37%	\$3,600	0.20
Japan	30%	\$5,700	0.30
Korea	56%	\$6,500	0.50
United Kingdom	38%	\$900	0.10
United States	28%	\$700	0.04

Source: OECD Family Database, <http://www.oecd.org/els/family/database.htm>.

2017, 6.5 million households claimed the credit and received nearly \$3.7 billion in benefits for child care expenses for children under age 13, with an average credit of \$575.³¹ Some fraction of this total was used for infant and toddler child care and early education. Many states have established child care tax credits that offer further modest assistance with child care costs, and several of these do make their credits refundable to lower-income families with limited tax liability.

Unlike programs that give working families money to help with child care, Early Head Start (EHS) is a federal child development program that offers early care and education for children under age three in families living below the poverty level. EHS is much smaller than the Head Start program for three- and four-year-olds. It began in 1995, and since then its reach has grown; by 2018 it was serving 160,000 children. But this number represents only 7 percent of those meeting the income eligibility guidelines and 1.3 percent of all infants and toddlers.³²

Total US public spending for child care and education of children younger than age three, including CCDBG, EHS, and tax

credit expenditures, amounts to just \$700 per child, or .04 percent of the nation's gross domestic product (GDP), placing the United States 36th of 38 developed countries when it comes to spending on young children's early care and education. Other large countries with advanced economies, including France, Germany, Japan, and Korea, each spend five to 10 times as much, both per child and as a share of their national income for public investments (table 1). Countries with the most public investment per child, such as France and Korea, have a much larger proportion of very young children enrolled in licensed, formal early care and education—twice as large as in the United States.³³

Public investments in child care and early education for children younger than three (as well as for three- and four-year-olds) are also just a tiny fraction of the 3.3 percent of GDP the United States commits in public expenditures for K–12 education and the 1.0 percent for higher education, both of which are on par with its peers among countries with advanced economies.³⁴

Since funding for child care subsidies is very limited overall relative to the number of families who are eligible and could use them, most states have program features that effectively restrict or prioritize the available assistance. Though states rely broadly on federal guidelines to manage their subsidy programs, their child care policies and rules vary widely.³⁵ States establish many of the policy parameters, including eligibility for the program, family copayments, payment rates for care providers, and administrative procedures for applying for and continuing to receive subsidies. For example, the income eligibility thresholds states set for child care subsidy assistance are generally much lower than those recommended by federal guidelines, and by the same token, many states have relatively steep copayment schedules that exceed those recommended by federal guidelines. These and other policies serve to direct a disproportionate share of limited funds to the poorest families. More than half of all child care subsidies serve families making less than the federal poverty level (\$21,330 for a family of three).³⁶ A great many more families with only slightly higher incomes have just as limited or even less access to care; many care settings remain unaffordable for them without assistance.

A lot of states also set their subsidy payment rates for providers very low, which means that many providers, including those who might offer high-quality care, choose not to participate. Low-income families receiving subsidies are often limited to the lowest-cost providers in their communities because those tend to be the providers who will accept subsidies. In 2012, 11 percent of infants and toddlers in families with incomes up to 100 percent of the FPL were in

center-based care; most of those families either received child care subsidies or had a child enrolled in Early Head Start. Among families with incomes between 100 and 300 percent of the FPL, 10 percent of infants and toddlers were in center-based care, and only 1.5 percent received publicly supported care through subsidies or other programs.³⁷

In addition to disparities by family income, we see racial and ethnic disparities in subsidy access. Hispanic children have historically been enrolled in the subsidy program at somewhat lower rates than other groups. In 2018, Hispanic children made up 36 percent of all children in poverty and 37 percent of all children enrolled in EHS, yet they constituted only 22 percent of children receiving child care subsidies. Non-Hispanic black children, who made up 25 percent of children in poverty, were enrolled in EHS at a similar rate (29 percent) but they accounted for a disproportionately higher share of children receiving child care subsidies (39 percent).³⁸

How Is Child Care Quality Measured?

Although experts agree that the quality of children's care is important for their learning and development, there is no consensus on how to best measure quality and what factors are most important. Growing evidence points to a multifaceted definition of quality that encompasses structural factors and child care processes or interactions.³⁹ Structural factors include the adult-to-child ratio, group size, and physical space; the extent of caregivers' education and specialized training; use of an evidence-based curriculum;

and health and safety standards, such as caregiver background checks. These factors can generally be regulated through licensing and monitoring, though licensing requirements and minimum qualifications for child care providers and early childhood teachers vary across states.

Child care processes are children's experiences in the care setting, such as their interactions with caregivers and peers. Caregiver-child interactions are a key predictor of children's learning and development and are arguably the most critical component of child care quality.⁴⁰ Infants in particular thrive most when they have healthy attachment relationships with adult caregivers who are warm and sensitive, engage in "serve and return" interactions (that is, respond appropriately to a child's signals or needs), and provide a secure base for exploration.⁴¹

Observational tools are commonly used to assess the care environment and aspects of process quality. For example, center-based classrooms that serve children under age three use the Infant-Toddler Environment Rating Scale, which measures the organization of physical space and furnishings, the presence of books and learning materials, and structured opportunities for learning activities that foster language, motor, social-emotional, and creative development. A similar observational tool measures structural quality features in home-based child care programs but is designed for a broader age range of infants through school-age children. The Classroom Assessment Scoring System (CLASS) is used in classrooms to measure teacher-child interactions. The CLASS has infant and toddler versions, each of which measures

both emotional support children receive in the classroom (for example, in the form of teacher sensitivity) and academic support for early learning and language development. The infant version focuses more heavily on verbal and physical interactions, such as helping infants explore their environment, and less on behavior management. Other tools attend more narrowly to the quality of caregiver-child interactions and less to the care environment and emotional climate.

Because of the expense of collecting reliable process data, structural quality indicators are often used as proxy measures for quality. Elements of structural quality such as small group size, good child-to-adult ratio, or a degreeed teacher, however, don't guarantee process quality, given the complexity of other influential factors. Certain teaching beliefs, such as being child-centered and following developmentally appropriate practice, as well as the teachers' career motivation (seeing teaching as a way to get a paycheck, or as more than that), also predict quality caregiving and teaching.⁴²

Early childhood program accreditation can also serve as a proxy for high-quality child care. Accreditation standards account for structural components of quality; accrediting organizations often require smaller group sizes and child-to-adult ratios and higher minimum staff education levels than state licensing standards do. Accreditation procedures include observing the caregiving environment.

On a continuum of quality, at a minimum, care environments should be safe and keep children free from harm. As quality improves, environments will be more

organized, better managed, and full of stimulating and developmentally appropriate materials, and caregivers will be warm, sensitive, and responsive and foster language and early learning.

The evidence suggests that smaller groups and lower child-to-teacher ratios are particularly important with very young children, who need more individualized caregiver attention.

Associations between Structural and Process Quality

Research clearly shows the relationship between structural factors such as group size and teacher qualifications and process quality.⁴³ Caregivers who work with smaller groups and lower child-to-adult ratios, for example, can better manage children's behaviors and more easily interact with them positively. The evidence suggests that smaller groups and lower child-to-teacher ratios are particularly important with very young children, who need more individualized caregiver attention. In a sample of 104 child care centers in three states, group size was found to be negatively associated with observed quality in toddler classrooms but not in preschool classrooms, after controlling for teacher education and training.⁴⁴ A study of 217 caregivers in child care centers in the Netherlands found improvements in the quality of teacher-child interactions when ratios of children to teachers dropped from five to one to three to one, especially with infants and toddlers.⁴⁵ Children cooperated

better in groups of three, and caregivers displayed more support and regard for autonomy.

Although most research on the effects of early childhood teachers' educational background and training focuses on center-based programs for preschoolers, the few studies that incorporate infant-toddler caregivers and educators point to a link between educational attainment and care quality. In the National Institute of Child Health and Human Development (NICHD) Study of Early Child Care, more teacher education (on a continuous measure) predicted more positive caregiving in centers and homes when children were 24 and 36 months old.⁴⁶ In the EHS Family and Child Experiences Survey, teachers with a bachelor's degree or higher supported toddlers' early learning better than teachers without a degree, according to observational measures.⁴⁷

Associations between Child Care Quality and Child Development

Experimental evaluations as well as observational studies indicate a link between child care quality and child outcomes; higher quality predicts stronger language, cognitive, and social skills and fewer problem behaviors.⁴⁸ Two closely studied experimental interventions from the 1970s and '80s are the Abecedarian Project and the Infant Health and Development Program, which provided high-quality, center-based early care and education to low-income infants and toddlers. Researchers followed children over time and found that program participants performed better academically in reading and math than did children who were randomly assigned to the control groups. By age 21, Abecedarian participants had completed more years of education, were more likely to have gone to

college, and were less likely to have been a teenage parent or to have committed a crime. These programs demonstrate that significant effects are possible and that gains can be maintained into adulthood when services are of high quality, comprehensive (with attention to child health and nutrition and family engagement), and delivered over multiple years.⁴⁹ Evidence from a multisite randomized controlled trial of EHS similarly found that the amount of time spent in a program matters. At many sites, the number of days children spent in center care was quite low, weakening impacts on their development.

A recent experimental study examined Educare, a center-based program model subsidized by a mix of public and private funding that provides comprehensive early care and education services to children ages zero to five from low-income families. The researchers found that when children from low-income families received high-quality early education for longer than one year, they transitioned to kindergarten with language and social skills near the national average and performed better academically than children with similar economically disadvantaged backgrounds who didn't attend an early education program. Educare participants also had more positive interactions with their parents and showed fewer problem behaviors. Gains in English language ability were strongest for dual language learners, signaling that early language exposure is important for this group of children.⁵⁰

Nonexperimental studies using observational data further illustrate that the relationship between child care quality and child outcomes is complex. First, patterns of associations are notably stronger between more closely aligned quality measures and

child outcomes—for example, there is a stronger relationship between teachers' language modeling and quality of feedback, on the one hand, and child language development, on the other. Second, meta-analyses and secondary data analysis of national early childhood studies indicate that while higher quality is associated with better child outcomes, the relationship is not linear.⁵¹ Instead, research points to a curvilinear relationship in which positive child outcomes are more evident when programs meet a threshold of quality (specifically, in the good to high range) and when the dosage (the child's length of exposure to quality care) is sufficient.⁵² Recent evidence from the EHS Family and Child Experiences Survey also found threshold effects for the CLASS-Toddler measure; scores above five (out of seven) for emotional and behavioral support were the minimum level at which significant improvements in children's social-emotional outcomes were seen.⁵³

Quality of US Infant-Toddler Child Care

To examine the quality of care that infants and toddlers experience, we turn to three sets of measures: national estimates of structural indicators of quality, including group size, adult-to-child ratio, and caregiver educational attainment; observational data from national surveys using validated tools; and program accreditation.

Evidence of Structural Quality

Child care programs serving infants and toddlers generally have more stringent maximum group sizes and child-to-teacher ratios than do programs serving preschoolers. A 2012 national survey of child care centers found that median group sizes were 5.8 for

infants under one year and 9 for toddlers ages 12 to 36 months. Child-to-adult ratios were 2.6 to one for infants and four to one for toddlers. These figures are close to federal recommendations, although some programs have larger groups and higher ratios.⁵⁴

Lead infant and toddler teachers are generally required to hold a child development associate credential, if anything. In contrast, half of states plus the District of Columbia require lead teachers in public prekindergarten programs to hold a minimum of a bachelor's degree.⁵⁵ No state requires a bachelor's degree for home-based providers, and 24 don't require any formal education or training for lead caregivers in small home-based settings.⁵⁶

About half of center-based teaching staff across age groups have a postsecondary degree (36 percent hold a bachelor's degree or higher and 17 percent hold an associate degree).⁵⁷ However, education levels are lower among teachers serving younger children. In programs that serve only preschoolers, 49 percent of teachers hold a bachelor's degree or higher, compared with 30 percent in centers serving children birth through five and 16 percent in centers serving only infants and toddlers.⁵⁸ Among all home-based providers, 18 percent hold a bachelor's degree or higher and 11 percent hold an associate degree.⁵⁹

EHS may be unique among early care and education programs serving infants and toddlers because its child-to-adult ratio—three to one—is lower than the average. EHS teachers are also more likely to have a postsecondary degree: 33 percent hold a bachelor's degree or higher, and 39 percent hold an associate degree.⁶⁰ More than 80 percent of EHS teachers receive benefits,

including health insurance and retirement contributions, and they have greater exposure to staff professional development than do teachers in centers that receive other types of funding.⁶¹ The reported annual turnover rate among EHS teachers is 12 percent, compared with 21 percent among center-based teachers of toddlers, and they are less likely to report moderate to high depressive symptoms than are early care and education teachers overall.⁶² Observed quality in EHS classrooms averages medium to high for emotional and behavioral support (5.3 out of 7), though it's lower (3.6 out of 7) for engaged support for learning.⁶³ Thus EHS quality is promising. But, as we've mentioned, EHS enrolls just 7 percent of infants and toddlers whose family incomes fall below the federal poverty level.

Evidence from Observational Quality Measures

Most studies that include observational measures of child care quality have focused on classrooms in publicly funded Head Start programs and public prekindergartens. Fewer large-scale studies have assessed the quality of care for children under age three. Although it's nearly 20 years old, the Early Childhood Longitudinal Study, Birth Cohort provides some of the best data available. The study followed a nationally representative sample of 14,000 US children born in 2001 through kindergarten. At age two, 49 percent of children were in nonparental care; to gather data on the quality of these arrangements, researchers then observed a subsample of 1,400 children regularly receiving such care. Observers measured the quality of both center-based and home-based care, including care from relatives and unrelated individuals. They found that the majority of

toddlers experienced poor to mediocre care and that quality was lower in home-based arrangements. Specifically, among children in centers, 9 percent received low-quality care, 66 percent medium-quality (that is, adequate) care, and 24 percent high-quality care. In home-based arrangements, 36 percent of children received low-quality care, 57 percent medium-quality care, and only 7 percent high-quality care.⁶⁴

Analyses of the data found large differences in quality ratings between classrooms and homes. Quality was significantly higher in formal classrooms, even after researchers controlled for child characteristics that can influence quality ratings. These differences in quality translated into differences in children's early math and reading skills at age five—children who had attended center-based early care and education programs performed at a higher level.⁶⁵

Because informal care is generally not subject to state licensing requirements, the care that a significant number of children under age three receive is unlicensed and unregulated, and its quality is therefore unknown.

Program Accreditation

Nationally, 11 percent of child care facilities are accredited by the National Association for the Education of Young Children or the National Association for Family Child Care—the two most commonly recognized child care accrediting bodies in the United

States. To become accredited, facilities must meet standards for all the age groups they serve. The proportion of accredited child care centers and homes ranges from a low of 1 percent in South Dakota to a high of 46 percent in Connecticut and 56 percent in the District of Columbia. However, only 64 percent of accredited centers serve children under three years, and only 42 percent serve infants under 12 months.⁶⁶ Most very young children are cared for in settings that are not accredited.

Aspects of Quality in Home-Based Care

Overall, research has focused less on the quality of home-based child care than the quality of center care, even though many more infants and toddlers are cared for by home-based providers. Because informal care by relatives, friends, and neighbors is generally not subject to state licensing requirements, the care that a significant number of children under age three receive is unlicensed and unregulated, and its quality is therefore unknown. License-exempt, home-based providers play an especially important role in meeting the child care needs of families with infants and other families who otherwise face significant challenges finding care—families living in rural areas, families in which the parents work nontraditional hours, or families that have children with special needs, for example.⁶⁷

A key aspect of home-based child care is that it's often based on family ties and thus offers the potential for more continuity in children's relationships with caregivers, compared to other care settings.⁶⁸ Some children in home-based care benefit from the long-term relationship they have with an individual provider, particularly when the provider is a relative who has an ongoing relationship

with the child beyond the care arrangement. Children in center-based programs are typically cared for by multiple staff members in a single day. They often change teachers year to year as they move from infant to toddler classrooms and then to preschool. A trusting relationship with a consistent single caregiver is an attractive feature of home-based care.⁶⁹

According to national survey data, a primary motivation for informal providers, whether paid or unpaid, is to help children's parents, whereas listed providers (that is, those running a home business) view their work primarily as a personal calling or career.⁷⁰

Given this diversity, a recent expert review of the research points to the need to define quality in home-based child care more broadly. A broader definition would incorporate factors such as the provider's ability to build relationships with families and community partners and to support learning through culturally relevant experiences.⁷¹

Caregivers' Capacity and Wellbeing

Studies of how early childhood programs are implemented highlight additional factors that are often absent in quality measures. Most critical is the teacher's or caregiver's own health, wellbeing, and job satisfaction, which can affect the quality of their relationships with children as well as their length of tenure or turnover.

Studies that examine early childhood educators' wellbeing find that they struggle with high levels of economic insecurity, depression, anxiety, and stress.⁷² In a survey of more than 600 early childhood educators in child care centers, more than half said they worried about their family's economic security, expressing concern about how they

would pay for housing (63 percent), cover routine health care costs (71 percent), pay monthly bills (73 percent), and save for retirement (80 percent).⁷³ According to multiple studies, about one in four early childhood teachers meet the criteria to be diagnosed with clinical depression.⁷⁴ Their physical and mental health is often worse than that of US women with similar sociodemographic characteristics as a whole.⁷⁵ Home-based child care providers may have it even tougher; unlike center-based staff, who interact daily with coworkers, they often work in isolation and do so with a large child-to-caregiver ratio. One caregiver, for example, may be responsible for up to five or six children of mixed ages.⁷⁶ In focus groups, center-based and home-based providers mentioned that interacting with difficult parents and the public perception that they're "babysitters" caused them stress. They also discussed how work stress affects their personal wellbeing, manifesting itself in exhaustion, sleep disturbances, and physical health problems.⁷⁷

Multiple studies show a link between early childhood teachers' own wellbeing and the quality of their interactions with children.⁷⁸ The EHS Family and Child Experiences Survey found that toddler teachers with more symptoms of depression and lower job satisfaction scored lower in emotional and behavioral support and provided less support for learning in their classrooms.⁷⁹ Fewer researchers have focused specifically on infant-toddler caregivers in other settings compared with those working with preschool-age children, but the challenges are similar. A study of Head Start classrooms in Pennsylvania found that more workplace stress was related to greater conflict in the teacher-child relationship.⁸⁰

In studies of preschool classrooms, depressive symptoms in teachers were associated with lower teacher sensitivity and lower ratings on instructional quality.⁸¹

Poor mental health and wellbeing among teachers contributes to high turnover in child care and early education. In a national survey of early childhood educators, teachers who were more emotionally exhausted and teachers who rated their working conditions poorly were more likely to say that they intended to leave the field.⁸² The average staff turnover rate in centers nationally is about 13 percent; for-profit private centers have a rate twice as high, while publicly funded programs like Head Start have lower turnover.⁸³ Staff retention is greater when wages are higher; when teachers are older and have more tenure, work experience, responsibility, and job satisfaction; and when the employer is a publicly operated or nonprofit center that meets accreditation or policy standards.⁸⁴

With a median wage of \$11.17 per hour (or \$23,240 per year full time) in 2018, teaching in child care programs is among the lowest-paid occupations in the United States.⁸⁵ By comparison, in 2017 kindergarten teachers earned a median annual wage of \$54,230. National estimates show significant wage disparities between infant-toddler teachers and preschool teachers, including for teachers with the same level of education. Teachers with a bachelor's or graduate degree suffer a predicted wage penalty of \$4.04 per hour for working with infants and toddlers compared to working with children ages three to five. No states set required compensation standards for child care and early education outside of public prekindergarten, including for infant and toddler teachers.⁸⁶

Low compensation undermines program quality and makes it hard to recruit and retain a highly qualified workforce. Despite mounting evidence from brain science that the first three years of life are critical in children's development and evidence that qualified early educators are key to children's early learning experiences, wages are barely above the federal poverty line—even for infant-toddler teachers who have earned higher credentials and degrees.

Instability of Birth-to-Three Child Care Arrangements

In conceptualizing access to high-quality child care, researchers have pointed to the importance of child care stability and continuity of child-caregiver relationships.⁸⁷ As Stacey Doan and Gary Evans note elsewhere in this issue, instability characterizes many aspects of children's home and care environments. Children often transition from one care setting to another, moving, for example, around age three or four from home-based to center- and school-based programs serving preschoolers. They also frequently transition within a setting, moving from one classroom or group to another, typically changing teachers or caregivers. Though some transitions are expected as children's needs and family circumstances change, changes that are unexpected, frequent, or abrupt can disrupt children's sense of security and learning.⁸⁸

Researchers have examined the frequency of child care changes in early childhood, the reasons for those changes, and the outcomes for children. The NICHD Study of Early Child Care and Youth Development found that nearly 40 percent of infants who start child care before they are 12 months

old experience at least one arrangement change by the time they reach 15 months. Earlier national longitudinal surveys found that the average arrangement lasts 12 months; more recent studies of low-income working families and families that receive child care subsidies report much shorter arrangements.⁸⁹

Instability in nonparental care arrangements is associated with poorer socioemotional outcomes. Analyses of data from the Fragile Families and Child Wellbeing Study found that long-term instability between birth and age three is associated with higher levels of externalizing behavior problems (for example, shows of aggression and hyperactivity) regardless of gender, family income, or type of care.⁹⁰ The NICHD Study of Early Child Care found that the number of care arrangements between 12 and 24 months is positively associated with mother-reported problem behaviors and observed noncompliance in child care at 24 months; negative outcomes were more prevalent for younger toddlers between 12 and 24 months.⁹¹ These poor social-emotional outcomes may stem from children's inability to develop secure relationships with caregivers; during early developmental periods, children need secure attachment to confidently explore and interact with their environment. One study found that infants and toddlers transitioning to a new caregiver showed increased levels of distress that persisted for an average of three weeks and that distress was greatest among the youngest children.⁹²

Child care instability not only affects child outcomes but can also disrupt parents' work. When parents don't have reliable, stable care, they may need to miss work to care for their children. Repeated child care issues can

lead to parents losing their jobs; low-income workers are particularly at risk of losing their jobs in such circumstances, as they don't tend to get paid sick leave or personal time off.⁹³

Among low-income families, loss of child care subsidies can cause major disruptions in child care and work. A study of more than 600 child care subsidy recipients in Illinois and New York showed that about half of families switched providers during gaps in subsidies or after leaving the subsidy program.⁹⁴

The impacts of a care change depend on the circumstances surrounding it, such as whether the change is planned or forced and the quality of care before and after the transition. A transition from lower- to higher-quality care may be temporarily disruptive but may benefit the child in the long term. Recent qualitative work that explored low-income mothers' child care experiences found that if transitions were planned, families were able to use preferred arrangements and child and family wellbeing was enhanced. Forced transitions that occurred when mothers were dissatisfied with their providers and had to quickly change arrangements without much notice were unsupportive and stressful.⁹⁵

In sum, positive and stable relationships with providers are critical for young children's development, particularly when it comes to social competence and emotion regulation. Yet change in itself doesn't signal negative instability; changes that are planned and lead to high-quality or desired arrangements can ultimately support children and families.

Initiatives to Improve Quality

Both the federal government and the states have introduced a number of

initiatives to improve child care quality in recent years, including quality rating and improvement systems (QRISs) and initiatives to professionalize the early childhood workforce. The American Recovery and Reinvestment Act of 2009 provided new federal funding opportunities including Race to the Top Early Learning Challenge grants and Preschool Development Grants. Dozens of states used these funds to build and evaluate QRISs and to develop standards for their workforces.

A QRIS is a systemic approach to assessing, improving, and communicating the level of quality in early care and education programs. Like rating systems for restaurants and hotels, QRISs award quality ratings to child care and early education programs that meet a set of defined program standards. The QRIS framework aims to increase the availability of high-quality programs, deliver professional development and quality supports to providers, and strengthen consumer education, specifically parents' understanding of the importance of quality care and their ability to identify quality. As of late 2020, 41 states and the District of Columbia have an active QRIS and eight others are piloting or developing them.

A few states mandate participation in a QRIS and automatically enroll all licensed providers, while others mandate participation for providers that use the child care subsidy system, but in many states participation is voluntary. As an incentive to increase participation, 31 states offer higher child care subsidy payments or tiered reimbursements for center providers that improve their quality, while 30 states have tiered rates for family child care providers. Across states, participation in QRISs has been increasing. In 2010, in more than half of the

22 states that were implementing a QRIS, less than one-third of eligible center-based programs participated. By 2016, 22 of the 41 implemented QRISs reported that more than half of eligible center-based programs were participating, and 16 reported that more than half of eligible family child care programs were participating.⁹⁶

States are also increasingly including requirements specific to infant and toddler care in QRIS ratings; for example, at least 30 states use the Infant-Toddler Environment Rating Scale and 11 use the CLASS Infant and Toddler observational measures to assess infant-toddler classroom quality.

State efforts to support quality improvement and enhance the care supply have emphasized formal settings, especially center-based programs. Centers have much higher participation rates in state QRISs than do home-based care providers. Several states don't include home-based child care in their QRIS at all, and those that do limit participation to licensed or registered providers. Unlicensed home-based providers who are seeking to provide quality caregiving have fewer avenues of support.⁹⁷

One strategy to improve home-based care quality involves creating family child care networks that connect providers to each other and to useful community resources. For example, All Our Kin in New Haven, CT, is one of several organizations nationally that offer targeted training and coaching to family child care providers in an effort both to support workforce development for business owners and to improve child care quality.

States have also focused on developing professional standards that identify the skills, knowledge, and attitudes early childhood educators should possess in an attempt to

improve and professionalize this workforce. Three states—Maine, New Hampshire, and New York—have separate standards for professionals who work with infants and toddlers. More than 38 state or regional early childhood workforce registries have been created to unify and recognize the workforce, capture data on employment history and qualifications, and track and verify professional development. Several states are formalizing career ladders for child care workers, providing tuition assistance to help them attain two- and four-year degrees, and offering bonuses to encourage personal advancement and support retention. Yet only limited public financing exists in the form of scholarships, bonus incentives, and student loan forgiveness for workers trying to meet rising educational requirements or to advance along their career pathways.

In 2015, the National Academies of Sciences, Engineering, and Medicine released a landmark report that closely examined the state of the early childhood workforce and made detailed recommendations for strengthening the knowledge and skills of early care and education professionals.⁹⁸ In response, a task force of 15 national organizations that represent early childhood professionals launched Power to the Profession—a national collaboration to define the early childhood profession by establishing a unifying framework for career pathways, workforce competencies and qualifications, and compensation. These initiatives are promising, yet financing such changes will require additional resources. The National Academies report estimated that it will cost at least \$140 billion per year to make high-quality early care and education accessible to all young children from birth until kindergarten, including support for a highly qualified and adequately compensated

workforce, with the largest share allocated to infant-toddler care.⁹⁹

Policy Directions

The United States' public investment in and policy support for programs designed to help meet the developmental needs of very young children with quality child care and early education is relatively minimal. But several recent developments signal increased attention to child care and early education in the United States. These include the reauthorization of the main federal child care law, additional federal appropriations for the child care subsidy program, the creation of new program service models to extend higher quality standards to more infant and toddler care providers, and increased federal funding to states to support improved planning and systems for integrating care for infants and toddlers within a birth-to-five continuum.

In 2014, Congress reauthorized the CCDBG for the first time in nearly 20 years, and in 2016 the Administration for Children and Families instituted new rules governing states' administration of child care programs. The reauthorization strengthened the child development focus of the block grant program. Several provisions aim to establish higher and more uniform health and safety licensing standards (for example, by requiring mandatory training, background checks, and monitoring), which had previously varied tremendously across states. To help increase stability in child care arrangements, families are granted subsidy approval for a minimum of 12 months before they must submit paperwork to verify their continued eligibility. Half of states previously had shorter eligibility periods.

Notably, the reauthorization didn't increase funding, hampering states' efforts to

implement its provisions and rule changes. However, for fiscal years 2018 and 2019 Congress increased federal child care appropriations, which had remained relatively stagnant for most of the previous seventeen years, by \$2.4 billion annually, the largest annual increase in federal child care investment ever. For fiscal year 2020, Congress increased the \$2.4 billion appropriation by another \$550 million. States report that the additional funding has been used to implement new quality provisions, increase pay rates for providers, improve policies that help families continue to receive subsidies with less interruptions, and broaden eligibility.¹⁰⁰ More than half of the states anticipate serving more children as a result of the new funding, even though the initial state response to these historic new investments hasn't primarily been to increase access but rather to fix problematic aspects of the child care system: to manage health and safety issues, increase workforce training, and raise provider payment rates. Some states had to make these changes to meet new federal requirements and regulatory changes. Other changes came in response to conditions that had worsened across many states over the years of nearly flat federal funding, which, once inflation is taken into account, represented a significant erosion in support. With the continuation and further expansion of federal CCDBG funding, many states are more likely to view these as higher baseline funding levels that can be sustained and therefore will be willing to commit more of the resources to serving additional children, expanding eligibility, and reducing parent copayments.

While EHS has capacity for just 7 percent of children in families with incomes below the poverty level, this still represents positive growth in recent years. The number

of pregnant women and children served through EHS nearly doubled between 2008 and 2017, from 84,000 to 162,000. Furthermore, in an effort to expand the reach of EHS, the federal government created the Early Head Start–Child Care Partnerships in 2014 to help extend EHS program supports and program standards to infant and toddler child care providers. Approximately 250 partnerships across the country were initially awarded to serve about 27,000 children enrolled in infant and toddler child care.

Bolder policy proposals are being developed to remedy the historic lack of investment in early childhood care and education.

Congress also established the Preschool Development Grant Birth-through-Five program, which provides competitive grant funding to help states improve their early childhood systems. Funded with an initial annual appropriation of \$250 million, the program awarded 12-month grants to 46 states and territories beginning in December 2018. The grants are designed to support state-level needs assessments and strategic planning; the goal is to improve services and systems across the birth-to-five continuum, focusing explicitly on birth-to-three services and the quality of early care and education programs. Twenty states and territories have since been awarded three-year grants to implement the strategic plans they developed, and another six states and territories that didn't previously receive funding have received initial planning grants.

Finally, bolder policy proposals are being developed to remedy the historic lack of investment in early childhood care and education, such as the Child Care for Working Families Act that was introduced in the 2019 Congressional session and is still on the table in 2020. This legislation proposes that early care and education program resources be treated as an entitlement that would make child care affordable to all eligible families rather than financed through a block grant.

If enacted, it would guarantee subsidy support to all families earning up to 150 percent of their state's median income, and participating families would be expected to contribute no more than 7 percent of their household income toward the cost of child care and early education. Subsidies would support the costs of high-quality care, workforce provisions would support higher compensation for all teaching staff, and lead teachers with similar education would receive pay on par with that of early elementary school educators. Under this law, much of the earliest investments would be dedicated to developing infrastructure for high-quality care and to increasing the supply of licensed care to further families' options. Finally, recognizing the most acute need in early care and education, the legislation would increase the federal share of the costs of infant and toddler care. While the near-term prospects for this type of transformative investment are uncertain, the legislation nevertheless signals a clear recognition of the scale of the problems in access, affordability, and quality of child care and early education, as well as growing

support for federal investments on the scale needed to address the challenges we face.

Conclusions

For more than two decades now, the United States has suffered from inadequate infrastructure to support young children's early care and education, despite the reality that six to seven million babies and toddlers have working parents and are attending child care every work day.

Over that same period, research has shown time and again that the early childhood years are the most rapid period of human development, when investments in children can be particularly effective for developing early skills that serve as the building blocks for increasing their capacities over time.

Children experience a diverse array of nonparental child care and early education that varies based on their families' resources. Families' choices for infant and toddler child care are constrained by cost and supply limitations and family circumstances. The early developmental settings where very young children receive care lack sufficient resources, and the caregivers who provide it are underpaid. This is part of the reason that most care is merely adequate and fails to meet the threshold of high quality. In recent years, increased attention and resources have been directed toward building and improving states' quality provisions and on stabilizing subsidies at both the federal and state level. But much more remains to be done to offer our youngest children the care and early education they need.

Endnotes

1. Jack P. Shonkoff and Deborah A. Phillips, eds., *From Neurons to Neighborhoods: The Science of Early Childhood Development* (Washington, DC: National Academy Press, 2000).
2. National Scientific Council on the Developing Child, “The Timing and Quality of Early Experiences Combine to Shape Brain Architecture,” working paper, Center on the Developing Child at Harvard University, Cambridge, MA, 2008.
3. Ajay Chaudry et al., *Cradle to Kindergarten: A New Plan to Combat Inequality* (New York: Russell Sage Foundation, 2017).
4. US Bureau of Labor Statistics, “Employment Characteristics of Families—2019,” table 5, <https://www.bls.gov/news.release/pdf/famee.pdf>.
5. Kristin Smith, *Who’s Minding the Kids? Child Care Arrangements: Spring 1997*, Current Population Reports P70-86 (Washington, DC: US Census Bureau, 2002); Lynda Laughlin, *Who’s Minding the Kids? Child Care Arrangements: Spring 2011*, Current Population Reports P70-135 (Washington, DC: US Census Bureau, 2013).
6. Laughlin, *Who’s Minding the Kids?*
7. Laughlin, *Who’s Minding the Kids?*; Saida Mamedova and Jeremy Redford, *Early Childhood Program Participation, from the National Household Education Surveys Program of 2012* (Washington, DC: National Center for Education Statistics, Institute of Education Sciences, US Department of Education, 2015); Lisa Corcoran and Karina Steinley, *Early Childhood Program Participation, from the National Household Education Surveys Program of 2016* (Washington, DC: National Center for Education Statistics, Institute of Education Sciences, US Department of Education, 2019); NSECE Project Team, *Early Care and Education Usage and Households Out-of-Pocket Costs: Tabulations from the NSECE, OPRE Report 2016-19* (Washington, DC: Office of Planning Research and Evaluation, Administration for Children and Families, 2016).
8. Chaudry et al., *Cradle to Kindergarten*.
9. Laughlin, *Who’s Minding the Kids?*
10. Kimberly Burgess et al., *Trends in the Use of Early Care and Education, 1995-2011: Descriptive Analysis of Child Care Arrangements from National Survey Data* (Washington, DC: US Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation, 2014).
11. Laughlin, *Who’s Minding the Kids?*; US Census Bureau, *Trends in Child Care Arrangements of Working Mothers*, Current Population Reports P23-117 (Washington, DC : Government Printing Office, 1982).
12. Chaudry et al., *Cradle to Kindergarten*.
13. Danielle Crosby et al., *Hispanic Participation in Early Care and Education: Types of Care by Household Nativity State, Race/Ethnicity, and Child Age* (Bethesda, MD: National Research Center on Hispanic Children and Families, 2016).
14. Ajay Chaudry et al., *Child Care Choices of Low-Income Working Families* (Washington, DC: Urban Institute, 2011).
15. Corcoran and Steinley, *Early Childhood Program Participation*.
16. Child Care Aware of America, *The United States and the High Cost of Child Care* (Arlington VA: Child Care Aware of America, 2018).
17. NSECE Project Team, *Early Care and Education Usage*.
18. Ibid.

19. Rasheed Malik, *Working Families Spending Big Money on Child Care* (Washington, DC: Center for American Progress, 2019).
20. Steven Jessen-Howard et al., *Understanding Infant and Toddler Child Care Deserts* (Washington, DC: Center for American Progress, 2018).
21. NSECE Project Team, *Early Care and Education Usage*.
22. Julia R. Henly and Gina Adams, *Increasing Access to Quality Care for Four Priority Populations* (Washington, DC: Urban Institute, 2018).
23. NSECE Project Team, *Provision of Early Care and Education during Non-Standard Hours*, Report #2015-44 (Washington, DC: Office of Planning Research and Evaluation, Administration for Children and Families, 2015).
24. Laughlin, *Who's Minding the Kids?*
25. Francine Blau and Lawrence Kahn, "Female Labor Supply: Why is the United States Falling Behind?," *American Economic Review* 103 (2013): 251–6, <https://doi.org/10.1257/aer.103.3.251>; María Enchautegui et al., *Effects of the CCDF Subsidy Program on the Employment Outcomes of Low Income Mothers* (Washington, DC: US Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation, 2016); Taryn Morrissey, "Child Care and Parent Labor Force Participation: A Review of the Research Literature," *Review of Economics of the Household* 15 (2017): 1–24, <https://doi.org/10.1007/s11150-016-9331-3>.
26. Blau and Kahn, "Female Labor Supply"; Alan Krueger, *Where Have All the Workers Gone? An Inquiry into the Decline of the U.S. Labor Force Participation Rate* (Washington, DC: Brookings Papers on Economic Activity, 2017).
27. Anne Mitchell, Louise Stoney, and Harriet Ditcher, *Financing Child Care in the United States* (Kansas City, MO: Ewing Marion Kaufmann Foundation, 2001); Chaudry et al., *Cradle to Kindergarten*.
28. Semhar Gebrekristos and Gina Adams, *Do Parents Get Child Care Assistance for Education and Training?* (Washington, DC: Urban Institute, 2019).
29. "Child Care and Development Fund Expenditure Data: List of All Years," Administration for Children and Families, Office of Child Care, <https://www.acf.hhs.gov/occ/resource/ccdf-expenditure-data-all-years>.
30. Nina Chien, *Fact Sheet: Estimates of Child Care Eligibility and Receipt for Fiscal Year 2015* (Washington, DC: US Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation, 2019).
31. "Dependent Care Credits, 1976–2017" Tax Policy Center, October 2, 2019, <https://www.taxpolicycenter.org/statistics/dependent-care-credits>.
32. Office of Head Start, *Early Head Start Services Snapshot National* (2018–19) (Washington, DC: Administration for Children and Families, 2019).
33. OECD, Social Policy Division, Directorate of Employment, Labour and Social Affairs, "Public Spending on Early Childhood Education and Care," April 2, 2019, http://www.oecd.org/els/soc/PF3_1_Public_spending_on_childcare_and_early_education.pdf.
34. OECD, Social Policy Division, Directorate of Employment, Labour and Social Affairs, "Public Spending on Education," October 9, 2016, http://www.oecd.org/els/soc/PF1_2_Public_expenditure_education.pdf.
35. Chaudry et al., *Cradle to Kindergarten*.
36. Chien, *Fact Sheet*.
37. NSECE Project Team, *Early Care and Education Usage*.

38. Office of Head Start, *Early Head Start Services Snapshot*; Office of Child Care, Administration for Children and Families, "FY 2017 Final Data," table 12, December 3, 2019, <https://www.acf.hhs.gov/occ/resource/fy-2017-final-data-table-12>; "Children in Poverty by Race and Ethnicity in the United States," Kids Count Data Center, Annie E. Casey Foundation, <https://datacenter.kidscount.org/data/tables/44-children-in-poverty-by-race-and-ethnicity>.
39. Deborah Lowe Vandell and Barbara Wolfe, *Child Care Quality: Does It Matter and Does It Need to be Improved?* (Washington, DC: Office of the Assistant Secretary for Planning and Evaluation, 2000.)
40. Bridget K. Hamre, "Teachers' Daily Interactions with Children: An Essential Ingredient in Effective Early Childhood Programs," *Child Development Perspectives* 8 (2014): 223–30, <https://doi.org/10.1111/cdep.12090>.
41. "Serve and Return," Center on the Developing Child at Harvard University, accessed October 24, 2019, <https://developingchild.harvard.edu/science/key-concepts/serve-and-return>.
42. K. Alison Clarke-Stewart et al., "Do Regulable Features of Child-Care Homes Affect Children's Development?," *Early Childhood Research Quarterly* 17 (2002): 52–86, [https://doi.org/10.1016/S0885-2006\(02\)00133-3](https://doi.org/10.1016/S0885-2006(02)00133-3); Nicole Forry et al., "Predictors of Quality and Child Outcomes in Family Child Care Settings," *Early Childhood Research Quarterly* 28 (2013): 893–904, <https://doi.org/10.1016/j>.
43. Rebecca Madill et al., *Review of Selected Studies and Professional Standards Related to the Predictors of Quality Included in the National Survey of Early Care and Education*, Report #2015-93b (Washington, DC: Office of Planning, Research, and Evaluation, Administration for Children and Families, 2015).
44. Deborah Phillips et al., "Within and Beyond the Classroom Door: Assessing Quality in Child Care Centers," *Early Childhood Research Quarterly* 15 (2001): 475–96, <https://doi.org/10.1016/S0885->
45. Elle J. De Schipper, J. Marianne Riksen-Walraven, and Sabine A. E. Geurts, "Effects of Child-Caregiver Ratio on the Interactions between Caregivers and Children in Child Care Centers: An Experimental Study," *Child Development* 77 (2006): 861–74, <https://doi.org/10.1111/j.1467-8624.2006.00907.x>.
46. NICHD Early Child Care Research Network, "Characteristics and Quality of Child Care for Toddlers and Preschoolers," *Applied Developmental Science* 4 (2000): 116–35, https://doi.org/10.1207/S1532480XADS0403_2.
47. Nikki Aikens et al., *Early Head Start Home Visits and Classrooms: Stability, Predictors, and Thresholds of Quality*, OPRE Brief 2015-34 (Washington, DC: Office of Planning, Research, and Evaluation, Administration for Children and Families, 2015).
48. Margaret R. Burchinal et al., "Relating Quality of Center-Based Child Care to Early Cognitive and Language Development Longitudinally," *Child Development* 71 (2000): 339–57, <https://doi.org/10.1111/1467-8624.00149>.
49. Frances A. Campbell et al., "Early Childhood Education: Young Adult Outcomes from the Abecedarian Project," *Applied Developmental Science* 6 (2002): 42–57, https://doi.org/10.1207/S1532480XADS0601_05.
50. Amanda Stein, Nathan Simon, and Jelene Britten, *Demonstrating Results: Educare Prepares Young Children for Success; Executive Summary* (Chicago: Ounce of Prevention Fund, 2016).
51. Margaret Burchinal et al., *Early Care and Education Quality and Child Outcomes* (Washington, DC: Child Trends, 2009).
52. Margaret Burchinal, Martha Zaslow, and Louisa Tarullo, *Quality Dosage, Thresholds, and Features in Early Childhood Settings: A Review of the Literature*, OPRE Brief 2011-5 (Washington, DC: Office of Planning, Research, and Evaluation, Administration for Children and Families, 2010).
53. Aikens et al., *Early Head Start Home Visits and Classrooms*.

54. Office of Child Care, “Ratio and Group Size,” accessed October 24, 2019, <https://www.childcare.gov/consumer-education/ratios-and-group-sizes>.
55. Allison H. Friedman-Krauss, et al., *The State of Preschool 2018: State Preschool Yearbook*. (New Brunswick, NJ: National Institute for Early Education Research, 2019).
56. Marcy Whitebook et al., *Early Childhood Workforce Index 2018* (Berkeley, CA: Center for the Study of Child Care Employment, 2018).
57. Erica Greenberg, Olivia Healy, and Teresa Derrick-Mills, *Assessing Quality across the Center-Based Early Care and Education Workforce* (Washington, DC: Urban Institute, 2018).
58. Ibid.
59. NSECE Project Team, *Characteristics of Home-Based Early Care and Education Providers: Initial Findings from the National Survey of Early Care and Education*, OPRE Report 2016-13 (Washington, DC: Office of Planning, Research, and Evaluation, Administration for Children and Families, 2016).
60. Administration for Children and Families, *The Faces of Early Head Start: A National Picture of Early Head Start Programs and the Children and Families They Serve*, OPRE Report 2015-29 (Washington, DC: Office of Planning, Research, and Evaluation, Administration for Children and Families, 2015).
61. Ibid; Greenberg, Healy, and Derrick-Mills, *Assessing Quality*.
62. Daphna Bassok et al, “Within- and Between-Sector Quality Differences in Early Childhood Education and Care,” *Child Development* 87 (2016): 1627–645, <https://doi.org/10.1111/cdev.12551>.
63. Administration for Children and Families, *Faces of Early Head Start*.
64. Gail M. Mulligan and Kristin Flanagan, *Findings from the 2-Year-Old Follow-Up of the Early Childhood Longitudinal Study, Birth Cohort (ECLS-B)* (Washington, DC: National Center for Education Statistics, 2006.)
65. Bassok et al., “Within- and Between-Sector Quality Differences.”
66. “National Survey of Early Care and Education (NSECE) [United States], 2010-2012,” ICPSR 35519, vol. 13, childandfamilydataarchive.org, analysis run on March 12, 2020 (10:00 a.m. EDT) using SDA 3.5, <https://doi.org/10.3886/ICPSR35519.v13>.
67. Henly and Adams, *Increasing Access*.
68. Amy Blasberg et al., *A Conceptual Model for Quality in Home-Based Child Care*, OPRE Report 2019-37 (Washington, DC: Office of Planning, Research, and Evaluation, Administration for Children and Families, 2019).
69. Chaudry et al., *Child Care Choices*.
70. NSECE Project Team, *Characteristics of Home-Based Early Care and Education Providers*.
71. Blasberg et al., *A Conceptual Model*.
72. Emily Gerber, Marcy Whitebook, and Rhona S. Weinstein, “At the Heart of Child Care: Predictors of Teacher Sensitivity in Center-Based Child Care,” *Early Childhood Research Quarterly* 22 (2007): 327–46, <https://doi.org/10.1016/j.ecresq.2006.12.003>; Anna Johnson et al., *Associations between Early Care and Education Teacher Characteristics and Observed Classroom Processes* (Washington, DC: Urban Institute, 2019).
73. Marcy Whitebook, Deborah Phillips, and Carollee Howes, *Worthy Work, STILL Unlivable Wages: The Early Childhood Workforce 25 Years after the National Child Care Staffing Study* (Berkeley, CA: Center for the Study of Child Care Employment, University of California, Berkeley, 2014).

74. Gerber, Whitebook, and Weinstein, "At the Heart of Child Care"; Robert C. Whitaker et al., "The Physical and Mental Health of Head Start Staff: The Pennsylvania Head Start Staff Wellness Survey, 2012," *Preventing Chronic Disease* 10 (2013): 130–71, <https://doi.org/10.5888/pcd10.130171>.
75. Whitaker et al., "Physical and Mental Health"
76. Julie Rusby et al., "Associations of Caregiver Stress with Working Conditions, Caregiving Practices, and Child Behaviour in Home-Based Child Care," *Early Child Development and Care* 183 (2013): 1589–1604, <https://doi.org/10.1080/03004430.2012.742992>.
77. Monica Faulkner, Paula Gerstenblatt, and Ahyoung Lee, "Childcare Providers: Work Stress and Personal Well-Being," *Journal of Early Childhood Research* 14 (2016): 280–93, <https://doi.org/10.1177/1476718X14552871>.
78. Burchinal et al., "Relating Quality."
79. Administration for Children and Families, *Faces of Early Head Start*.
80. Robert C. Whitaker, Tracy Dearth-Wesley, and Rachel A. Gooze, "Workplace Stress and the Quality of Teacher-Children Relationships in Head Start," *Early Childhood Research Quarterly* 30 (2015): 57–69, <https://doi.org/10.1016/j.ecresq.2014.08.008>.
81. Gerber, Whitebook, and Weinstein, "At the Heart of Child Care"; Johnson et. al., *Associations*.
82. Ashley A. Grant, Leony Jeon, and Cynthia K. Buettner, "Relating Early Childhood Teachers' Working Conditions and Well-Being to Their Turnover Intentions," *Educational Psychology* 39 (2019): 294–312, <https://doi.org/10.1080/01443410.2018.1543856>.
83. Whitebook et al., *Worthy Work*.
84. Casey J. Totenhagen et al., "Retaining Early Childhood Education Workers: A Review of the Empirical Literature," *Journal of Research in Childhood Education* 3 (2016): 585–99, <https://doi.org/10.1080/02568543.2016.1214652>.
85. US Bureau of Labor Statistics, "Occupational Employment and Wages, May 2019," July 6, 2020, <https://www.bls.gov/oes/current/oes399011.htm>.
86. Whitebook et al., *Early Childhood Workforce Index*.
87. Sarah Friese et al., *Defining and Measuring Access to High Quality Early Care and Education: A Guidebook for Policymakers and Researchers*, OPRE Report 2017-08 (Washington, DC: Office of Planning, Research, and Evaluation, Administration for Children and Families, 2017).
88. Heather Sandstrom and Sandra Huerta, *Negative Effects of Instability on Child Development: A Research Synthesis* (Washington, DC: Urban Institute, 2013); Ajay Chaudry, *Putting Children First: How Low-Wage Working Mothers Manage Child Care* (New York: Russell Sage Foundation, 2004); Henry Tran and Marsha Weinraub, "Child Care Effects in Context: Quality, Stability, and Multiplicity in Nonmaternal Child Care Arrangements during the First 15 Months of Life," *Developmental Psychology* 42 (2006): 566–82, <https://doi.org/10.1037/0012-1649.42.3.566>.
89. Kendall Swenson and Kimberly Burgess, *Child Care Subsidy Duration and Caseload Dynamics: A Multi-State Examination from 2004–2014* (Washington, DC: Office of the Assistant Secretary for Planning and Evaluation, 2018).
90. Alejandra Ros Pilarz and Heather Hill, "Unstable and Multiple Child Care Arrangements and Young Children's Behavior," *Early Childhood Research Quarterly* 24 (2014): 471–83, <https://doi.org/10.1016/j.ecresq.2014.05.007>.

91. NICHD Early Child Care Research Network, “Early Child Care and Self-Control, Compliance, and Problem Behavior at Twenty-Four and Thirty-Six Months,” *Child Development* 69 (1998): 1145–70, <https://doi.org/10.2307/1132367>.
92. Debby Cryer, Laura Wagner-Moore, and Margaret Burchinal, “Effects of Transitions to New Child Care Classes on Infant/Toddler Distress and Behavior,” *Early Childhood Research Quarterly* 20 (2005): 37–56, <https://doi.org/10.1016/j.ecresq.2005.01.005>.
93. Heather Boushey, *Staying Employed after Welfare: Work Supports and Job Quality Vital to Employment Tenure and Wage Growth*, briefing paper (Washington, DC: Economic Policy Institute, 2003); Sandra Hofferth and Nancy Collins, “Child Care and Employment Turnover,” *Population Research and Policy Review* 19 (2000): 357–95, <https://doi.org/10.1023/A:1026575709022>.
94. Julia Henly et al., *Determinants of Subsidy Stability and Child Care Continuity* (Washington, DC: Urban Institute, 2015).
95. Katherine E. Speirs, Colleen Vesely, and Kevin Roy, “Is Stability Always a Good Thing? Low-Income Mothers’ Experiences with Child Care Transitions,” *Children and Youth Services Review* 53 (2015): 147–56, <https://doi.org/10.1016/j.childyouth.2015.03.026>.
96. Kathryn Tout et al., *Validation of the Quality Ratings Used in Quality Rating and Improvement Systems (QRIS): A Synthesis of State Studies*, OPRE Report 2017-92 (Washington, DC: Office of Planning, Research, and Evaluation, Administration for Children and Families, 2017).
97. Henly and Adams, *Increasing Access*; Tout et al., *Validation*.
98. Institute of Medicine and National Research Council, *Transforming the Workforce for Children Birth Through Age 8: A Unifying Foundation* (Washington, DC: National Academies Press, 2015.)
99. National Academies of Sciences, Engineering, and Medicine, *Transforming the Financing of Early Care and Education* (Washington, DC: National Academies Press, 2018).
100. Patti Banghart et al., *States’ Use of the Child Care and Development Block Grant Funding Increase* (Washington, DC: Child Trends, 2019).

Family Income and Young Children's Development

Christopher Wimer and Sharon Wolf

Summary

Is income during children's earliest years a key determinant of long-term child and adult success in the longer run? The research to date, Christopher Wimer and Sharon Wolf write, suggests that it is.

Wimer and Wolf review substantial descriptive evidence that income can enhance child development and later adult outcomes, and that it does so most strongly during children's earliest years. Next they wrestle with the question of whether this relationship is causal. After outlining the challenges in identifying such causal relationships, they describe a number of studies that purport to overcome these challenges through quasi- or natural experiments.

Among other topics, the authors examine how family income affects the outcomes of young children compared to those of older children, and how its effects vary among poor, low-income, and higher-income families. They also look at the evidence around other dimensions of income, including nonlinear relationships between income and key outcomes, instability in income versus the absolute level of income, and various forms of income, and they review the evidence for impacts of in-kind or near-cash income supports.

Finally, Wimer and Wolf highlight some recently launched studies that will shed further light on the relationship between income and development in children's earliest years, and they suggest how policy might better provide income support to low-income families and their children.

www.futureofchildren.org

Christopher Wimer is co-director of the Center on Poverty and Social Policy and a senior research scientist at the Columbia University School of Social Work. Sharon Wolf is an assistant professor in human development and quantitative methods at the University of Pennsylvania Graduate School of Education.

As this issue of the *Future of Children* makes clear, the period from pregnancy to age three is a critical window for influencing children's long-term development. Many factors that affect children and families during this window matter, but in this article, we consider one of the more contested of these influences: the role of the income and economic resources that parents have at their disposal as they raise young children.

We have long known that children from higher-income families go on to achieve greater levels of academic and economic success later in life. A key question has always been whether income itself determines these later outcomes. Parents with higher incomes, for example, may have other assets such as more education, greater knowledge of effective parenting practices, and social capital that facilitates their children's development and wellbeing. If these factors are simply associated with income, it may be the case that income itself doesn't matter all that much and that these other factors are more significant in long-term developmental differences. If income itself leads to better outcomes for children and families, policy makers could facilitate change by bolstering the incomes of disadvantaged parents. But if income on its own doesn't lead to better outcomes for children, then it would make more sense to focus on improving the environments that children are exposed to early in life. Though these two approaches aren't mutually exclusive by any means, it's important to understand whether income during children's earliest years is indeed a key determinant of long-term child and adult success in the longer run. The research to date suggests that it is.

Given this research, the implications for policy are clear. Young children, especially the poorest young children, stand to benefit in both the short and long term through investments in family income. Yet many of our public policies exclude cash support to the neediest families. Major programs delivering cash to low-income families, such as the Earned Income Tax Credit (EITC) and the Child Tax Credit, require substantial earnings before full benefits are delivered. Cash welfare assistance, though still important for some families, has been largely dismantled for the poorest and also remains strictly tied to employment. The poorest families may be able to cobble together an existence using food stamps and other "near cash" benefits, but they don't have the cash necessary to function from day to day in modern society. A bipartisan National Academy of Sciences report recently provided a set of policy proposals that together would cut child poverty in the United States in half, and cash assistance is central to the recommendations. As our review shows, cash assistance is likely to have profound benefits for young children and improve their chances for long-term success.

Poverty and Family Income among Children

Poverty is defined as not having enough income to meet some specified definition of need. *Income* is typically defined as the total dollars that a person, family, or household receives from various sources over a specified time period. In the United States, the US Census Bureau defines income as a family's total cash income before taxes. Imagine a family of four, with two married parents and two biological children. The census would count this as

one household, made up of one family and four individuals. Now imagine that a second, unrelated married couple is living with this group of four. The census would still count this as one household but now made up of two families and six individuals. This is important, because the census determines how much income is at each individual's disposal, and therefore their poverty status, by aggregating income to the family level, not the individual or household level. The census also adds up a family's income across a calendar year to ascertain both that family's total income and its poverty status.

To calculate income poverty, the federal government compares families' pretax cash incomes to a poverty threshold (often referred to as a *poverty line*). For a family of four in the United States, the poverty line is a bit over \$26,000 in 2020. Poverty lines vary with the number of adults and children in the family because larger families need more income to make ends meet and adults and children may have different needs. In the United States, official poverty statistics also treat the poverty line as absolute, meaning it is fixed and only changes from year to year based on inflation or on changes in the prices of goods and services. Other countries use a relative poverty line, which changes year to year relative to some point in the population's income distribution, usually its midpoint.

This means that, in the United States, to be considered poor, a family of four would need to have less than roughly \$26,000 over the course of calendar year 2020. The definition of income is also important here. Pretax cash income doesn't include cash income that families may receive after filing their taxes, such as tax credits like the EITC. Nor does it include the value

of so-called in-kind benefits, or benefits that have monetary value but don't come in the form of cash. These may include, for example, benefits from the Supplemental Nutrition Assistance Program (SNAP)—formerly known as food stamps—or a housing voucher. Unlike official measures, the census's Supplemental Poverty Measure (SPM) does count these additional sources as income. It also subtracts nondiscretionary expenses like work, childcare, and medical costs from income to arrive at a figure closer to disposable income, or income available to meet basic needs. This expanded definition of income (or resources) is compared to a poverty line that is relative rather than absolute and tied to the distribution of families' spending on a core basket of necessities like food and shelter. In describing the income and poverty status of families with young children here, we use the SPM, given that it's a more comprehensive measure of families' economic situation.¹

Poverty rates among young children (and children more generally) have declined substantially since the 1960s, at least according to the fuller picture of family income provided by the SPM.² Nevertheless, poverty rates among children are higher than those among working-aged adults and adults older than 65.³ Young children have some of the highest poverty rates on record, second only to young adults ages 18–24.⁴

Table 1 shows SPM poverty rates for young children as well as select demographic characteristics. Overall, children zero to three years of age have an SPM poverty rate of 17.0 percent. But the rate varies dramatically by demographic characteristics. Young children in married families have a lower poverty rate (10.1 percent) than

Table 1. SPM Poverty Rates Among Young Children Ages Zero to Three

	Poverty Rate
All Young Children	17.0%
<i>Family Structure</i>	
Married	10.1%
Cohabiting	23.2%
Single	40.3%
<i>Race (of child)</i>	
White, Non-Hispanic	9.8%
Black, Non-Hispanic	28.6%
American Indian, Non-Hispanic	23.5%
Asian/Pacific Islander, Non-Hispanic	14.8%
Other, Multi-racial, Non-Hispanic	14.8%
Hispanic	25.0%
<i>Highest Educated Adult in Family</i>	
Less Than High School	47.1%
High School or Equivalent	30.2%
Some College, No Degree	19.9%
Associate Degree	13.8%
Bachelor's Degree	7.9%
Graduate Degree	4.5%

Source: Authors' calculations using the US Census Bureau's Annual Social and Economic Supplement. Data downloaded from the University of Minnesota's Integrated Public Use Microdata Series (IPUMS): Sarah Flood, Miriam King, Renae Rodgers, Steven Ruggles and J. Robert Warren, *Integrated Public Use Microdata Series, Current Population Survey: Version 8.0* [dataset] (Minneapolis, MN: IPUMS, 2020), <https://doi.org/10.18128/D030.V8.0>.

young children in cohabiting or single-parent families (23.2 percent and 40.3 percent, respectively). Black non-Hispanic, American Indian, and Hispanic children all have an elevated poverty rate of roughly 25 percent, give or take; Asian, Pacific Islander, and other multiracial children have a poverty rate of nearly 15 percent; white non-Hispanic children have the lowest poverty rate at 9.8 percent. Lastly, poverty falls precipitously as adults' education levels rise. Nearly half of children in families where the highest educated adult has less than a high school education are living in poverty. But among families where the highest educated adult has a bachelor's or graduate degree, the

poverty rate for children is well under 10 percent.

Table 2 reports the resources that children's families have at their disposal, providing descriptive evidence about the income levels, income components, and poverty rates of young children from birth to age three. We separate total family post-tax income into four components:

1. Pretransfer cash income (predominantly earnings from work but also dividends, alimony, rental income, etc.).
2. Cash transfers (Social Security, Supplemental Security Income [SSI], unemployment insurance [UI], and cash welfare);
3. In-kind transfers (SNAP, the Special Supplemental Nutrition Program for Women, Infants, and Children [WIC], the National School Lunch Program, the Low-Income Heating and Energy Assistance Program, and the value of government housing subsidies); and
4. Refundable tax credits (EITC, Child Tax Credit).

Importantly, total income isn't the same as disposable income. Families also face various nondiscretionary expenses such as medical care, childcare, and work-related expenses. So table 2 also shows average expenses in these three categories alongside income components.

The table, which reports information for the period 2014–18 and thereby provides a representative sample of children broken down by age, takes data from the Current

Table 2. Income and Expenses among Families of Children Ages Zero to Three, by Income to Needs Level

	Pretax/Pretransfer Income	Cash Transfers	In-Kind Transfers	Tax Credits	Medical Expenses	Care Expenses	Child Work Expenses
<i>Mean Dollars</i>							
Under 50%	\$8,298	\$886	\$2,756	\$1,332	\$5,954	\$733	\$802
50–100%	\$19,961	\$2,168	\$4,758	\$3,712	\$3,149	\$1,035	\$1,675
100–200%	\$49,212	\$1,650	\$2,259	\$3,228	\$3,818	\$1,455	\$2,582
200–300%	\$95,871	\$1,454	\$447	\$730	\$5,573	\$2,781	\$3,232
300% or more	\$206,076	\$1,110	\$181	\$179	\$6,494	\$4,506	\$3,364
<i>As Percent of Pretax/Pretransfer Income</i>							
Under 50%		10.7%	33.2%	16.1%	71.8%	8.8%	9.7%
50–100%		10.9%	23.8%	18.6%	15.8%	5.2%	8.4%
100–200%		3.4%	4.6%	6.6%	7.8%	3.0%	5.2%
200–300%		1.5%	0.5%	0.8%	5.8%	2.9%	3.4%
300% or more		0.5%	0.1%	0.1%	3.2%	2.2%	1.6%

Source: Authors' calculations using the US Census Bureau's Annual Social and Economic Supplement. Data downloaded from the University of Minnesota's Integrated Public Use Microdata Series (IPUMS): Sarah Flood, Miriam King, Renae Rodgers, Steven Ruggles and J. Robert Warren, *Integrated Public Use Microdata Series, Current Population Survey: Version 8.0* [dataset] (Minneapolis, MN: IPUMS, 2020), <https://doi.org/10.18128/D030.V8.0>.

Population Survey's Annual Social and Economic Supplement, a large household survey used to document annual changes in income and poverty, among other demographics. The table shows income components and expenses across the income distribution, including children in five groups: deep poverty (under 50 percent of the poverty threshold), nondeep poverty (50–100 percent of the poverty threshold), low income (100–200 percent of the poverty threshold), moderate income (200–300 percent of the poverty threshold), and higher income (over 300 percent of the poverty threshold). The top panel shows the average values of each income or expense component, and the bottom panel shows individual income and expense components as a percentage of pretax/pretransfer incomes.

The lowest-income families with young children have the lowest pretax/pretransfer

incomes, at only about \$8,300 per year. Among the next highest group, this figure more than doubles to nearly \$20,000, and it rises substantially from there. The poorest families have substantial resources coming into their households from government transfers, which together amount to about 60 percent of the value of their pretax/pretransfer incomes. Transfer levels among the nondeep poor are much higher in absolute terms, over twice the value of that among the deep poor and sometimes nearly triple the value in the case of tax credits. Nevertheless, in percentage terms, transfers among deep poor families still constitute over half the value of their pretax/pretransfer incomes. From there, transfer amounts decline with income, as expected, and constitute a far smaller percentage value relative to pretax/pretransfer incomes. Among the low-income group, this stands at about 15 percent, and it declines to just

3 percent and less than 1 percent in the moderate- and higher-income groups.

Expenses also vary a lot by family income. The poorest group, the deep poor, face quite high medical expenses relative to their incomes. These high expenses are part of the reason these families are counted as living in deep poverty—in the SPM, these expenses are subtracted from income. Among the rest of the income groups, expenses rise with income, but they also constitute a smaller and smaller fraction of pretax/pretransfer incomes. Thus the lower-income groups are spending a greater fraction of their incomes on nondiscretionary expenses, which means that these families' budgets are stretched further and they have less of a cushion than their higher-income peers. The poorest families have very low incomes to begin with, and they rely much more than higher-income families on government transfers, much of which come in the form of in-kind assistance or once-a-year tax credits.

Why Income May Affect Young Children's Development

Poverty and the stresses that go along with it can shape children's development in powerful ways, which may lead directly to poorer outcomes later in life. Evidence from both human and animal studies highlights that early childhood is critically important for brain development and for setting in place the foundational structures that shape future cognitive, social, emotional, and health outcomes.⁵ Research suggests that poverty experienced during early childhood has worse consequences on long-term outcomes than poverty experienced

later in childhood and that children whose socioeconomic circumstances are difficult lag in health and cognitive development early in life.⁶ For example, differences in children's language skills by income and poverty level have been identified as early as 18 months, and they grow larger between 18 and 24 months.⁷ Why might these differences emerge so early in children's lives? Two primary ways through which income affects child development have been identified, both of which focus largely on the most immediate, family-based environments: family stress and family investments.

The *family stress model* focuses on the economic hardship that comes along with low income and poverty.⁸ This hardship impairs family functioning, increasing parents' stress and undermining their mental health, family interactions, and ultimately children's development. Policies that increase family income can directly reduce stress and improve parents' wellbeing. For example, a study of the EITC found that it improved mothers' mental health and reduced risky levels of biomarkers related to inflammation.⁹ For the youngest children, family stress affects development primarily through their relationships with parents, and stress can affect children even before birth. One study found that a drop in income during pregnancy increased mothers' levels of the stress hormone cortisol, which was then correlated with children's IQ and educational attainment at age seven. These associations were much larger for mothers with low education levels, suggesting that greater resources (in this case in the form of education) allow a mother to buffer her child from the adverse effects of stress.¹⁰ Thus prenatal stress may play a role in the intergenerational persistence of poverty.

After birth, stress can interfere with the development of strong parent-child bonds and supportive parenting practices, leading to harsher, less warm parenting.¹¹ In addition, the stress associated with poverty has been linked to reduced mental bandwidth—that is, the cognitive power that would otherwise go to less pressing concerns, to planning ahead, and to problem solving—making parents more preoccupied with the stress at hand than with investments in their children.¹² Thus, income alone could reduce some forms of economic hardship, improve family functioning and parent-child relationships, and, as a result, narrow socioeconomic gaps in young children's development. Research has found broad support for the family stress model across different countries and among different racial and ethnic groups. Finally, family stress processes seem to better predict children's emotional and behavior outcomes than their achievement-related outcomes.¹³

The *family investment model* is rooted in economic principles of human development. It theorizes that limited economic and time resources restrict parents' ability to invest in their children.¹⁴ Poor parents have less access to different forms of capital—including financial (for example, income), social (for example, status), and human (for example, education) capital—than wealthier parents do. The lack of capital often means a lack of investments in a range of things that support a young child's development, including learning materials, quality housing, quality childcare, and even health care. Families with greater economic resources can make significant investments in their children, whereas poor families must invest in more immediate family needs.¹⁵ Other forms of capital

are also consequential.¹⁶ Social capital, often associated with greater income, may influence the ways that parents value and prioritize their parenting strategies, for example, increasing the time they spend in cognitively stimulating activities with their children.¹⁷ Human capital and education, which are also associated with greater income, may lead parents to foster academic and social competence in an attempt to develop their children's own human capital.¹⁸ Increasing a family's income could directly increase the amount of resources that parents have to invest in their children. Note that income may allow parents to purchase investments for children, but for those investments to pay off, studies (and common sense) suggest that actually using the materials is critical. Thus income alone may be insufficient for translating investments into positive child outcomes.

For such positive interactions to occur, parents must spend time with their children. There may also be a tradeoff between employment and time investments, particularly during the first year of a child's life, given the importance of this period in forming secure and positive attachments with caregivers. More mothers have joined the workforce over the past several decades, and with only 17 percent of civilian workers having access to paid parental leave, questions have been raised about how this affects children's development.¹⁹ A review of relevant studies examined how mothers' employment in children's first year of life affected the children's cognitive and social-emotional development.²⁰ The reviewers found mixed results—for all children, there were no associations with children's later social-emotional outcomes, negative associations with behavior problems, and negative

associations with cognitive development for non-Hispanic white children later in childhood. The authors concluded that, on balance, the associations between mothers' employment in a child's first year and later child development were neutral, because negative effects were offset by positive ones. The detailed findings provide more nuance: the effects of mothers' employment depend on the type of childcare that children are exposed to and the type of job the mother has and her income level, among other factors.

Overall, the impact of these two processes—family stress and family time and material investments—on child development is backed up by a good deal of evidence from many studies that observed families and children over time. But whether increases in income per se actually cause changes in these processes and thereby improve children's health and development is more controversial. In the next section, we review the best evidence that researchers have established on this key question.

Causal Effects of Income for Infants and Toddlers

Many researchers have examined the associations between income and child development. This research was extensively covered in an earlier issue of the *Future of Children*.²¹ Here we briefly summarize some of the key takeaways before examining the causal evidence on whether income matters. First, the evidence suggests that the *depth* of poverty matters. The scarcer the resources, the more detrimental it is for children's development. In fact, the relationship between income and most important

child outcomes is nonlinear, meaning that income seems to matter most at the very bottom of the income distribution and much less if at all at higher levels of income. Second, the *duration* of poverty matters. The longer a child lives without the necessary income to make ends meet, the worse are the child's ultimate developmental outcomes. Third, the *timing* of poverty matters. Income seems especially important for developmental outcomes in early childhood, which is often defined as ages zero to five, compared to during older childhood or adolescence. This is not to say that income doesn't matter for older children, only that research suggests early childhood may be a particularly vulnerable time where scarcity of income is particularly problematic. Though the evidence for the importance of depth, duration, and timing of poverty is broadly consistent, it often comes from examining the associations between income and child outcomes, typically achievement or behavioral/emotional outcomes, as well as longer-term outcomes like educational attainment. A key question, therefore, is whether these associations are causal. That is, if you did nothing else but give a family more income, would you then see improvements in children's developmental outcomes?

The depth, duration and timing of poverty all matter.

It's difficult to conclusively prove that income plays a causal role in promoting positive effects on children's short- and long-term development. Consider two families: the Joneses, who have a relatively

high income of \$100,000 per year, and the Smiths, who are living in poverty with an income of \$10,000 per year. We might observe that the Joneses' children enter kindergarten more ready to learn, score better on standardized tests, receive better grades, go on to a high-quality college or university, and begin careers that earn them high incomes themselves during adulthood. The Smiths' children struggle; they lag behind the Joneses' children on key markers of school readiness, score less well on tests, receive lower grades, and don't go to a college or university. Their incomes in adulthood remain lower than those of the Joneses' children. Did the Joneses' higher income play a causal role (and if so, how large?) in producing the better outcomes that we observe for their children later in childhood and adulthood? That is, would giving the Smiths more money when their children are young produce measurable improvements in their development and their wellbeing later in life?

We can't observe a world in which the Smiths have a higher income, so we can't directly answer the question. And any number of other things might differentiate the Joneses and the Smiths. Some of those we may observe—such as the Joneses' access to better schools and neighborhoods for their children—but many others we may not. This makes it very difficult to conclusively determine the answer to our key question about income and the role it played in how the Smiths' and Joneses' lives unfolded. Compounding this problem is the fact that many of the things we can observe might also be affected by changes in income, meaning that we can't simply "control them away," which would be the standard approach in many traditional studies.

To solve this problem, many social scientists would want to run a *social experiment*, where one group of families, for example, is randomly given more income than other families. A recent set of randomized experiments in New York City and Tennessee provided what's called *conditional cash transfers* to families.²² These are cash payments tied to specific activities and behaviors by participating families and children, such as attending school regularly or engaging in activities that promote health. Though these programs boosted family incomes and reduced poverty, they did little to change other outcomes. But it's hard to disentangle the effects of cash income from the effects of the structure of the program and the conditional nature of the cash income, so we can't conclude too much from these experiments about the causal effects of income. Fortunately, researchers are currently conducting a new random assignment study, which we describe in our conclusion, that addresses the issue of cash income and early childhood development directly. But absent a social experiment, what some researchers do is look for situations in which families' incomes differ only because of some external factor outside of their control. We call these *natural experiments* or *quasi-experiments*. The change in income is not truly random or administered in a controlled manner, but it can still provide convincing evidence that the outcomes we see down the road for families and children are most likely driven by the change in income generated by the external factor outside of families' control. We know of a handful of such studies, which we describe next. Taken together, they do suggest that income itself matters during early childhood, especially for families in poverty or with low incomes

to begin with. Note that these causal studies don't exclusively focus on ages zero to three. Throughout the discussion, we attempt to note which age groups the underlying evidence comes from.

The EITC has been among the most important policies aiming to reduce the risk of child poverty.

Perhaps one of the most exciting and compelling of these studies involves a comprehensive examination of the Mother's Pension Program, which was implemented in the early 20th century (1911–35) to provide a universal subsidy to families with dependent children and without an adult man's income.²³ It was the precursor to the Aid to Dependent Children program, which later became Aid to Families with Dependent Children (AFDC), commonly known as *cash welfare* or just *welfare*. The researchers conducting the study assembled a remarkable data set that links historical administrative records from the program with multiple sources containing information on male children of mothers who received income from the program (girls weren't included since changes to last names upon marriage make linking such data incredibly difficult). They then compared mothers who received income from the pensions to mothers who applied, were initially deemed eligible, but were then denied benefits following further review. Key here is that these mothers were ultimately rejected because they were somewhat more affluent. Despite

these differences, boys in households who received income support from the program were born healthier, completed more education, earned more income, and wound up living a year longer on average than the boys of rejected applicants.

The EITC provides another natural experiment to study how income affects child and family development in more recent times. The EITC has been among the most important policies aiming to reduce the risk of child poverty. It was created in the 1970s and was originally quite modest in size. But over the decades, the program has been expanded a number of times, sometimes quite substantially. In 2018, the maximum credit that a family could receive was \$6,431, which provides a considerable boost to low-income families' total resources.²⁴ A study published in 2012 harnessed this variation in credit amounts, driven by changes in tax law, to examine changes in children's later math and reading test scores.²⁵ The researchers found that every \$1,000 in income generated by changes in the EITC resulted in a modest increase in math and reading test scores over one year. If transfers were larger than \$1,000 and occurred year after year, the effects of income on achievement could be quite substantial. A number of other studies have used similar approaches to understand the effects of income on other outcomes such as birth weight, child maltreatment, behavior problems, and home environments.²⁶

A third approach harnesses multiple social experiments during the time of welfare reform that sought to promote employment among mothers receiving welfare and boost their earnings and

incomes. As we've noted, the AFDC program historically delivered cash assistance to low-income families with dependent children. In 1996, the Clinton administration and Congress passed a comprehensive welfare reform bill, which changed the name of the program to Temporary Assistance for Needy Families and essentially turned it into a block grant to the states, making cash assistance no longer a federal entitlement for low-income families. Around the same time, many states were testing similar ideas to promote "welfare-to-work"—trying to help mothers on welfare find paying jobs so that they could increase their earnings and income. Though the individual studies are too numerous to detail, a 2011 study led by Greg Duncan, an economist at the University of California, Irvine, made use of data from 16 experimental evaluations of these programs and took advantage of the fact that some of them targeted only employment and welfare use while others were also designed to boost incomes.²⁷ Looking at early childhood, the authors found that results for young children's academic achievement were quite similar to those found in the EITC study. Though the magnitude of the effect of \$1,000 might seem small, the authors noted, interventions that have produced much larger effects also cost far more than \$1,000 per family.

Another instructive set of studies don't use a policy analysis but what might be better described as a fortunate set of circumstances for researchers. The Great Smoky Mountains Study was in the midst of looking at changes in young people's mental health in certain portions of North Carolina, using both an American Indian and non-American Indian sample of

families, when, about halfway through the study period, the tribal government opened a casino and made the decision to distribute its profits to all adult tribal members. This income transfer was thus independent of people's choices and applied only to the American Indian portion of the sample. A 2011 study exploited this development to trace the effects of this new income on children's later outcomes.²⁸ As with the other studies we've mentioned, the results were positive. Children whose families received extra income completed an additional year of schooling and were also less likely to engage in criminal activity later in life. And the effects were largest for the most disadvantaged. While increased income in this study didn't go exclusively to families with very young children, the findings are consistent with the other quasi- and natural experimental evidence we've described.

Another study in this vein comes from Canada, where the authors used variation in child benefits across provinces over time, which also varied by family type, to examine the effects on children's outcomes, such as test scores, mental and physical health, and material deprivation in the form of reported hunger.²⁹ And again, consistent with the other studies we've described, children showed improvements on a number of key outcomes. Another set of studies led by economist Katrine V. Løken from the Norwegian School of Economics used evidence from the Norwegian oil boom to examine the effects of income in that country, finding that income affected academic outcomes, though only for the most disadvantaged families. Taken together, the set of studies we've reviewed

in this section imply that income may indeed have positive causal effects on children's developmental outcomes and that these effects unfold over time. As we'll discuss later in this article, other social experiments now under way may provide further evidence on this point.

Experimental Evidence from Developing Countries

Although this issue of the *Future of Children* focuses on the United States, evaluations of income support experiments in developing countries offer additional insights into how income can affect families and young children. These studies generally haven't focused on parenting outcomes, but the results indicate that such programs can reduce parental stress and hardship, with measurable improvements in self-reported psychological wellbeing, select improvements in adult health, and reductions in economic hardship.³⁰ A meta-analysis of 21 studies across Africa, the Americas, and Southeast Asia found strong evidence that cash transfers improved adults' mental health, moderate evidence that they had a positive effect on children's school attendance, and suggestive but inconclusive evidence that they contributed to dietary diversity and food security.³¹ One recent study in Burkino Faso looked at a program specifically for families with young children that provides unconditional cash transfers to pregnant mothers through their children's first two years of life; it found that the program improved dietary diversity among mothers and children but had mixed impacts on children's health, with improvements in some areas but not others.³² Finally, a conditional cash

transfer program in Honduras targeting health behaviors focused on families with children from birth to five years; it led to improved cognitive development for young children.³³ Taken together, the evidence from low- and middle-income countries indicates that income support alone can improve families' access to healthy and nutritious food, increase parents' wellbeing, and improve some elements of young children's cognitive and health outcomes. This jibes with the evidence we've outlined from the United States, Canada, and Norway: income does appear to directly improve young children's wellbeing.

Income Instability

So far, we've considered only research on average levels of income. In another vein, evidence is emerging that income instability may have distinct consequences for families and children.³⁴ The reality for most Americans is that economic life is dynamic. Household earnings and income, as well as eligibility for social assistance programs, fluctuate from month to month and year to year.³⁵ Disadvantaged families face this problem the most: they experience greater instability in economic resources than do higher-income families, and the degree to which they face instability has been increasing over the past 30 years.³⁶ Major income changes (or shocks, as economists call them), which many families experience, are related to poorer health among young children and even greater mortality among adults.³⁷ Though much of this emerging evidence isn't causal in nature, we describe it here because income instability is potentially quite important.

Unpredictable swings in household resources can interfere with planning for basic or future needs. This can contribute to stress and other negative outcomes. Income instability has been linked to both key pathways through which income affects young children—family stress and investments. Among parents, job loss is related to poorer mental health and depression, and drops in income are related to increased economic stress and poorer parenting quality.³⁸ And when their income drops, families make adjustments in their investments in children. Those who experience sharp decreases in income may change their spending habits and have trouble paying bills.³⁹ Job loss has been linked to loss of childcare subsidies and lowered use of health care.⁴⁰ It also constrains household budgets and increases the likelihood of food insecurity.⁴¹

The challenges posed by unpredictable, unstable income likely affect young children's wellbeing. Income instability has been linked to poorer educational and behavioral outcomes for children.⁴² Evidence also suggests that economic instability adversely affects children's health—particularly young children of parents with less education.⁴³ Research finds that when families, particularly vulnerable immigrant families, go off welfare (and presumably see a sharp decrease in household resources because they're receiving fewer public benefits), their preschool-aged children are likely to experience poorer health.⁴⁴ Although substantial income increases may have opposing, beneficial effects, income volatility may contribute to poorer outcomes more than a stable low income would. Further, the experience of economic instability during childhood

appears to have lasting detrimental effects into adulthood, specifically by lowering educational attainment.⁴⁵ However, the nature of economic instability, along with the fact that it often goes hand in hand with other phenomena like housing instability, material hardship, and family instability, makes it hard to draw causal inferences.

Near-Cash Benefits and Child Outcomes

This article focuses on family income, thus far treating income as synonymous with cash. But many families, particularly poor and low-income families, receive a substantial portion of their total resources in the form of what's called *near-cash* or *in-kind* benefits. Examples include food assistance through the Supplemental Nutrition Assistance Program (SNAP), formerly known as the Food Stamp Program. Under SNAP, families receive a monthly allotment of dollars on an electronic benefit transfer (EBT) card but can only use them to purchase food. Similarly, the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) gives low-income pregnant women and their children checks or vouchers (and, increasingly, EBT cards) that cover specified food items and formula. Other families may receive vouchers through the Section 8 program to help pay for housing or to secure a reduced-rent apartment through public housing authorities. The Low-Income Home Energy Assistance Program helps some people pay for heating and cooling their homes. In fact, the United States has increasingly come to rely on in-kind programs to provide material assistance to young children in lieu of cash.⁴⁶ The reasons are complex and may partially be

attributable to paternalism—the idea that policy makers and elites know what’s best for the poor.⁴⁷ Nevertheless, these programs do provide real material support to poor and low-income families with young children and thus may have effects on children’s development that should be understood alongside those of cash.

The United States has increasingly come to rely on in-kind programs to provide material assistance to young children in lieu of cash.

Though none of these in-kind programs deliver cash to families, they all clearly provide families with resources that could improve children’s health and development and thus their longer-term outcomes. They therefore operate like cash in many ways. And as with cash income, many researchers are seeking to understand whether these programs have a causal effect on childhood and later adult outcomes. A series of studies uses the fact that the Food Stamp Program was rolled out gradually across the country as a way to assess its impacts on children whose families participated in the program. This means that some Americans received food stamps and others did not based solely on when the program arrived in their community, thus providing the conditions for a sort of quasi-experiment that allowed researchers to assess the program’s impact. These studies generally find a host of positive short- and long-term benefits to children who received resources from the program, including in

the areas of health, educational attainment, economic self-sufficiency, and even longevity.⁴⁸ A similarly designed study of WIC found that the program measurably improves birth outcomes.⁴⁹ (Marianne Bitler, an economist from the University of California, Davis, has reviewed these and other studies comprehensively.⁵⁰) With regard to government housing assistance, we are aware of very few high-quality causal estimates, though those that exist show either mixed results or no benefits for children’s development.⁵¹

Conclusions and Implications for Policy

It’s indisputable that children from middle- and upper-income families fare better than those from low-income families in nearly every domain. A number of high-quality studies suggest that income itself is the cause of some of these disparities. Recent advances in developmental neurobiology have taught us much about the developing brain, including that early childhood is a period when the brain is particularly sensitive and responsive to the environment. The stress and deprivation associated with lack of income and with income volatility are likely to have a particular impact during children’s first few years of life. These facts support the idea of creating and designing income support policies for families, particularly during early childhood.⁵²

In this article, we reviewed the evidence of how income and poverty affect young children and their families. We showed that during these first few years of a child’s life, family income is the lowest and expenses are highest (as a proportion of total income). We saw that for young

children who are fully dependent on their caregivers, the effects of income and poverty are felt primarily through family processes such as stress and investments. This reality suggests that families most need income support during this period of their lives. Though we have ample evidence that income directly impacts family stress and families' ability to invest in the resources that support children's development, there is less evidence on the direct causal effects of income on infants and toddlers. However, the limited empirical evidence suggests that income can, in fact, directly impact both mothers' and children's health, as well as children's early cognitive outcomes and even some of their longer-run adult outcomes.

Given the evidence, a recent panel assembled by the National Academy of Sciences and Medicine recommended that income-transfer policies, such as the Child Tax Credit and the EITC, be expanded to more families with children and that the benefits be larger for families with young children. Furthermore, the panel recommended modifications to childcare subsidies, changes in the federal minimum wage, and a scale-up of promising training and employment programs. The panel also proposed two new programs that come from other countries: a child allowance as an extension of the federal child tax credit and a child support assistance program.⁵³ Based on a review of the evidence from other industrialized countries, others have proposed an unconditional child allowance, positing that an allowance of between \$250 and \$300 per month for families with children under the age of five would reduce child poverty by 40 percent and deep poverty by 50 percent.⁵⁴ Such a universal child benefit would be available

to all families, regardless of income level, and could help them weather the spells of income instability that are associated with so much disruption and harm.

Another step might be to redesign some features of public assistance, such as income limit cutoffs and recertification periods, that may currently increase income instability and uncertainty for families, particularly for families on the margin of eligibility. The extent to which these policy design features mitigate or aggravate income instability, loss of resources, and family stress is not well understood, but it's an area to consider for supporting families with young children.

Despite all the evidence we have, a central policy-relevant question remains untested: Is providing cash more effective than providing and expanding direct services to poor families? For example, would we see similar or larger effects on family wellbeing and early child development by providing the same dollar amount of resources such as food or high-quality childcare and education? These are important questions that have yet to be tested but deserve further scrutiny. Importantly, both types of programs (cash and services) may produce benefits to both children and families. For example, income transfer programs could reduce parents' stress and also improve children's health and safety. Quality childcare programs could permit parents to work, thereby increasing their families' economic status while their children simultaneously receive early education. Nor do we necessarily have to choose one type of program over another. Income transfer programs and high-quality services might build on each other to produce large

benefits for low-income children and their families.

Supporting families with young children should not come at the expense of investing in families later in children's lives. But we see compelling evidence that income support during the early years may be a particularly cost-effective investment, and so it is an element that should be considered for any government policy. As noted, the first random assignment causal study of the impacts of income on families with newborn children in the United States is currently under way; it will directly examine questions of how income support, with no strings attached, affects young children and their families.⁵⁵ Among 1,000 mothers recruited to the study, 400 will receive \$4,000 per year while the remaining 600 receive a token amount.

This study will hopefully give us a more definitive estimate of how income impacts the youngest children in our society—and their families—across a range of outcomes so that we can better design cash assistance programs.

Evidence is growing that income matters and is a key ingredient for supporting the healthy development of our nation's youngest children. At the same time, if income can help young children and their families, then removing sources of income and resources (for example, through cuts to social safety net programs) will very likely have negative consequences for these same families. We suggest that policy makers consider this evidence seriously, as an investment in the youngest of our population would likely more than pay for itself in the outcomes of the next generation.

Endnotes

1. Liana Fox et al., "Waging War on Poverty: Poverty Trends Using a Historical Supplemental Poverty Measure," *Journal of Policy Analysis and Management* 34 (2015): 567–92, <https://doi.org/10.1002/pam.21833>; Liana Fox, *The Supplemental Poverty Measure: 2018* (Washington, DC: US Census Bureau), <https://www.census.gov/content/dam/Census/library/publications/2019/demo/p60-268.pdf>.
2. Jessica Pac et al., "Young Child Poverty in the United States: Analyzing Trends in Poverty and the Role of Anti-Poverty Programs Using the Supplemental Poverty Measure," *Children and Youth Services Review* 74 (2017): 35–49, <https://doi.org/10.1016/j.childyouth.2017.01.022>; Christopher Wimer et al., "Trends in Child Poverty Using an Improved Measure of Poverty," *Academic Pediatrics* 16, no. 3 (2016): S60–S66, <https://doi.org/10.1016/j.acap.2016.01.007>.
3. Fox, *Supplemental Poverty Measure*.
4. Christopher Wimer et al., "Young Adult Poverty in Historical Perspective: The Role of Policy Supports and Early Labor Market Experiences," *Social Science Research* 86 (2020): 102390, <https://doi.org/10.1016/j.ssresearch.2019.102390>.
5. Deborah Phillips and Jack P. Shonkoff, *From Neurons to Neighborhoods: The Science of Early Childhood Development* (Washington, DC: National Academies Press, 2000).
6. Greg J. Duncan, Kathleen M. Ziol-Guest, and Ariel Kalil, "Early-Childhood Poverty and Adult Attainment, Behavior, and Health," *Child Development* 81 (2010): 306–25, <https://doi.org/10.1111/j.1467-8624.2009.01396.x>.
7. Anne Fernald, Virginia A. Marchman, and Adriana Weisleder, "SES Differences in Language Processing Skill and Vocabulary Are Evident at 18 Months," *Developmental Science* 16 (2012): 234–48, <https://doi.org/10.1111/desc.12019>.
8. Rand D. Conger and Katherine J. Conger, "Resilience in Midwestern Families: Selected Findings from the First Decade of a Prospective, Longitudinal Study," *Journal of Marriage and Family* 64 (2002): 361–73, <https://doi.org/10.1111/j.1741-3737.2002.00361.x>.
9. William Evans and Craig Garthwaite, "Giving Mom a Break: The Impact of Higher EITC Payments on Maternal Health," working paper, National Bureau of Economic Research, Cambridge, MA, August 2010, <https://www.nber.org/papers/w16296>.
10. Anna Aizer, Laura Stroud, and Stephen Buka, "Maternal Stress and Child Outcomes: Evidence from Siblings," working paper, National Bureau of Economic Research, Cambridge, MA, September 2012, <https://www.nber.org/papers/w18422>.
11. Tama Leventhal and Jeanne Brooks-Gunn, "Moving to Opportunity: An Experimental Study of Neighborhood Effects on Mental Health," *American Journal of Public Health* 93 (2003): 1576–82, <https://doi.org/10.2105/ajph.93.9.1576>; Vonnie C. Mcloyd, "Socioeconomic Disadvantage and Child Development," *American Psychologist* 53 (1998): 185–204, <https://doi.org/10.1037/0003-066x.53.2.185>.
12. Sendhil Mullainathan and Eldar Shafir, *Scarcity: Why Having Too Little Means So Much* (New York: Times Books/Henry Holt, 2013).
13. Rand D. Conger et al., "Economic Pressure in African American Families: A Replication and Extension of the Family Stress Model," *Developmental Psychology* 38 (2002): 179–93, <https://doi.org/10.1037/0012-1649.38.2.179>; Gary W. Evans and Kimberly English, "The Environment of Poverty: Multiple Stressor Exposure, Psychophysiological Stress, and Socioemotional Adjustment," *Child Development* 73 (2002): 1238–48, <https://doi.org/10.1111/1467-8624.00469>; April S. Masarik and Rand D. Conger, "Stress and Child Development: A Review of the Family Stress Model," *Current Opinion in Psychology* 13 (2017): 85–90, <https://doi.org/10.1016/j.copsyc.2016.05.008>; Rand D. Conger and M. Brent Donnellan, "An Interactionist Perspective on the Socioeconomic Context of Human Development," *Annual Review of Psychology* 58 (2007): 175–99, <https://doi.org/10.1146/annurev.psych.58.110405.085551>.

14. Gary S. Becker and Nigel Tomes, "Human Capital and the Rise and Fall of Families," *Journal of Labor Economics* 4 (1986): S1–S39, <https://doi.org/10.1086/298118>.
15. Robert H. Bradley and Robert F. Corwyn, "Socioeconomic Status and Child Development," *Annual Review of Psychology* 53 (2002): 371–99, <https://doi.org/10.1146/annurev.psych.53.100901.135233>.
16. Rand D. Conger and M. Brent Donnellan, "An Interactionist Perspective on the Socioeconomic Context of Human Development," *Annual Review of Psychology* 58 (2007): 175–99, <https://doi.org/10.1146/annurev.psych.58.110405.085551>.
17. Rachel Chazan-Cohen et al., "Low-Income Childrens School Readiness: Parent Contributions Over the First Five Years," *Early Education & Development* 20 (2009): 958–77, <https://doi.org/10.1080/10409280903362402>; Robert H. Haveman and Barbara L. Wolfe, *Succeeding Generations: On the Effects of Investments in Children* (New York: Russell Sage Foundation, 1994).
18. Greg J. Duncan and Katherine A. Magnuson, "Off with Hollingshead: Socioeconomic Resources, Parenting, and Child Development," in *Socioeconomic Status, Parenting, and Child Development*, ed. Marc H. Bornstein and Robert H. Bradley (Mahwah, NJ: Lawrence Erlbaum, 2003), 83–106; Greg J. Duncan and Katherine A. Magnuson, "The Nature and Impact of Early Achievement Skills, Attention Skills, and Behavior Problems," in *Whither Opportunity: Rising Inequality, Schools, and Children's Life Chances*, ed. Greg J. Duncan and Richard J. Murnane (New York: Russell Sage, 2011), 47–69; Jessica F. Harding, Pamela A. Morris, and Diane Hughes, "The Relationship between Maternal Education and Children's Academic Outcomes: A Theoretical Framework," *Journal of Marriage and Family* 77 (2015): 60–76, <https://doi.org/10.1111/jomf.12156>.
19. "Access to Paid and Unpaid Family Leave in 2018," US Bureau of Labor Statistics, February 27, 2019, <https://www.bls.gov/opub/ted/2019/access-to-paid-and-unpaid-family-leave-in-2018.htm>.
20. Jeanne Brooks-Gunn, Wen-Jui Han, and Jane Waldfogel, "Maternal Employment and Child Cognitive Outcomes in the First Three Years of Life: The NICHD Study of Early Child Care," *Child Development* 73 (2002): 1052–72, <https://doi.org/10.1111/1467-8624.00457>.
21. Greg J. Duncan, Katherine Magnuson, and Elizabeth Votruba-Drzal, "Boosting Family Income to Promote Child Development," *Future of Children* 24, no. 1 (2014): 99–120, www.jstor.org/stable/23723385.
22. Cynthia Miller et al., *Effects of a Modified Conditional Cash Transfer Program in Two American Cities: Findings from Family Rewards 2.0* (New York: MDRC, 2016); James Riccio et al., *Conditional Cash Transfers in New York City: The Continuing Story of the Opportunity NYC-Family Rewards Demonstration* (New York: MDRC, 2013); Marion R. Sills et al., "Association between Parental Depression and Children's Health Care Use," *Pediatrics* 119 (2007): e829–e36, <https://doi.org/10.1542/peds.2006-2399>.
23. Anna Aizer et al., "The Long-Run Impact of Cash Transfers to Poor Families," *American Economic Review* 106 (2016): 935–71, <https://doi.org/10.1257/aer.20140529>.
24. See "Earned Income Tax Credit Income Limits and Maximum Credit Amounts," US Internal Revenue Service, <https://www.irs.gov/credits-deductions/individuals/earned-income-tax-credit/eitc-income-limits-maximum-credit-amounts>.
25. Gordon B. Dahl and Lance Lochner, "The Impact of Family Income on Child Achievement: Evidence from the Earned Income Tax Credit," *American Economic Review* 102 (2012): 1927–56, <https://doi.org/10.1257/aer.102.5.1927>.
26. Rita Hamad and David H. Rehkopf, "Poverty, Pregnancy, and Birth Outcomes: A Study of the Earned Income Tax Credit," *Paediatric and Perinatal Epidemiology* 29 (2015): 444–52, <https://doi.org/10.1111/ppe.12211>; Hilary Hoynes, Doug Miller, and David Simon, "Income, the Earned Income Tax Credit, and Infant Health," *American Economic Journal: Economic Policy* 7 (2015): 172–211,


- <https://doi.org/10.1257/pol.20120179>; Kate W. Strully, David H. Rehkopf, and Ziming Xuan, "Effects of Prenatal Poverty on Infant Health," *American Sociological Review* 75 (2010): 534–62, <https://doi.org/10.1177/0003122410374086>; Lawrence M. Berger et al., "Income and Child Maltreatment in Unmarried Families: Evidence from the Earned Income Tax Credit," *Review of Economics of the Household* 15 (2017): 1345–72, <https://doi.org/10.1007/s11150-016-9346-9>.
27. Greg J. Duncan, Pamela A. Morris, and Chris Rodrigues, "Does Money Really Matter? Estimating Impacts of Family Income on Young Children's Achievement with Data from Random-Assignment Experiments," *Developmental Psychology* 47 (2011): 1263–79, <https://doi.org/10.1037/a0023875>.
 28. Randall K. Q. Akee et al., "Parents' Incomes and Children's Outcomes: A Quasi-Experiment Using Transfer Payments from Casino Profits," *American Economic Journal: Applied Economics* 2 (2010): 86–115, <https://doi.org/10.1257/app.2.1.86>.
 29. Kevin Milligan and Mark Stabile, "Do Child Tax Benefits Affect the Well-Being of Children? Evidence from Canadian Child Benefit Expansions," *American Economic Journal: Economic Policy* 3 (2011): 175–205, <https://doi.org/10.1257/pol.3.3.175>.
 30. Johannes Haushofer and Jeremy Shapiro, "The Short-Term Impact of Unconditional Cash Transfers to the Poor: Experimental Evidence from Kenya," *Quarterly Journal of Economics* 131 (2016): 1973–2042, <https://doi.org/10.1093/qje/qjw025>; Lisa Hjelm et al., "Poverty and Perceived Stress: Evidence from Two Unconditional Cash Transfer Programs in Zambia," *Social Science & Medicine* 177 (2017): 110–17, <https://doi.org/10.1016/j.socscimed.2017.01.023>.
 31. Frank Pega et al., "Unconditional Cash Transfers for Reducing Poverty and Vulnerabilities: Effect on Use of Health Services and Health Outcomes in Low- and Middle-Income Countries," *Cochrane Database of Systematic Reviews* (2017): CD011135, <https://doi.org/10.1002/14651858.cd011135.pub2>.
 32. Freddy Houngebe et al., "Unconditional Cash Transfers Do Not Prevent Children's Undernutrition in the Moderate Acute Malnutrition Out (MAM'Out) Cluster-Randomized Controlled Trial in Rural Burkina Faso," *Journal of Nutrition* 147 (2017): 1410–17, <https://doi.org/10.3945/jn.117.247858>.
 33. Florencia Lopez Boo and John Creamer, "Cash, Conditions, and Child Development: Experimental Evidence from a Cash Transfer Program in Honduras," *Economía* 19 (2019): 169–96, <https://doi.org/10.1353/eco.2019.0005>.
 34. Heather D. Hill et al., "The Consequences of Income Instability for Children's Well-Being," *Child Development Perspectives* 7 (2013): 85–90, <https://doi.org/10.1111/cdep.12018>.
 35. Molly Dahl, Thomas Deleire, and Jonathan A. Schwabish, "Estimates of Year-to-Year Volatility in Earnings and in Household Incomes from Administrative, Survey, and Matched Data," *Journal of Human Resources* 46 (2011): 750–74, <https://doi.org/10.1353/jhr.2011.0000>; Peter Gottschalk and Robert Moffitt, "The Rising Instability of U.S. Earnings," *Journal of Economic Perspectives* 23, no. 4 (2009): 3–24, <https://doi.org/10.1257/jep.23.4.3>; Sharon Wolf et al., "Patterns of Income Instability Among Low- and Middle-Income Households with Children," *Family Relations* 63 (2014): 397–410, <https://doi.org/10.1111/fare.12067>.
 36. Pamela A. Morris et al., *Income Volatility in U.S. Households with Children: Another Growing Disparity between the Rich and the Poor?*, discussion paper, no. 1429–15, Institute for Research on Poverty, Madison, WI, July 2015.
 37. Lindsay R. Pool et al., "Association of a Negative Wealth Shock with All-Cause Mortality in Middle-Aged and Older Adults in the United States," *JAMA* 319 (2018): 1341–50, <https://doi.org/10.1001/jama.2018.2055>; Sharon Wolf and Taryn Morrissey, "Economic Instability, Food Insecurity, and Child Health in the Wake of the Great Recession," *Social Service Review* 91 (2017): 534–70, <https://doi.org/10.1086/694111>.

38. Ralph Catalano et al., "The Health Effects of Economic Decline," *Annual Review of Public Health* 32 (2011): 431–50, <https://doi.org/10.1146/annurev-publhealth-031210-101146>; Joann Prause, David Dooley, and Jimi Huh, "Income Volatility and Psychological Depression," *American Journal of Community Psychology* 43 (2009): 57–70, <https://doi.org/10.1007/s10464-008-9219-3>; Tytti Solantaus, Jenni Leinonen, and Raija-Leena Punamäki, "Children's Mental Health in Times of Economic Recession: Replication and Extension of the Family Economic Stress Model in Finland," *Developmental Psychology* 40 (2004): 412–29, <https://doi.org/10.1037/0012-1649.40.3.412>.
39. W. Jean Yeung and Sandra L. Hofferth, "Family Adaptations to Income and Job Loss in the U.S.," *Journal of Family and Economic Issues* 19 (1998): 255–83, <https://doi.org/10.1023/a:1022962824012>; Gregory B. Mills and Joe Amick, *Can Savings Help Overcome Income Instability?* (Washington, DC: Urban Institute, 2010), <https://www.urban.org/research/publication/can-savings-help-overcome-income-instability>.
40. Julia R. Henly et al., "What Explains Short Spells on Child-Care Subsidies?," *Social Service Review* 91 (2017): 488–533, <https://doi.org/10.1086/693751>; Sills et al., "Association."
41. Dahl, Deleire, and Schwabish, "Year-to-Year Volatility"; Alison Jacknowitz, Taryn Morrissey, and Andrew Brannegan, "Food Insecurity across the First Five Years: Triggers of Onset and Exit," *Children and Youth Services Review* 53 (2015): 24–33, <https://doi.org/10.1016/j.childyouth.2015.03.012>; Laura Leete and Neil Bania, "The Effect of Income Shocks on Food Insufficiency," *Review of Economics of the Household* 8 (2009): 505–26, <https://doi.org/10.1007/s11150-009-9075-4>; Craig G. Gundersen and Joseph Gruber, "The Dynamic Determinants of Food Insufficiency," in *Second Food Security Measurement and Research Conference*, volume 2, ed. Margaret S. Andrews and Mark A. Prell (Washington, DC: US Department of Agriculture, 2001), 91–109.
42. Lisa A. Gennetian et al., "Intrayear Household Income Dynamics and Adolescent School Behavior," *Demography* 52 (2015): 455–83, <https://doi.org/10.1007/s13524-015-0370-9>; Bradley L. Hardy, "Childhood Income Volatility and Adult Outcomes," *Demography* 51 (2014): 1641–65, <https://doi.org/10.1007/s13524-014-0329-2>; Taryn W. Morrissey, Lindsey Hutchison, and Adam Winsler, "Family Income, School Attendance, and Academic Achievement in Elementary School," *Developmental Psychology* 50 (2014): 741–53, <https://doi.org/10.1037/a0033848>; Elizabeth O. Ananat et al., "Linking Job Loss, Inequality, Mental Health, and Education," *Science* 356 (2017): 1127–28, <https://doi.org/10.1126/science.aam5347>; Ariel Kalil and Patrick Wightman, "Parental Job Loss and Children's Educational Attainment in Black and White Middle-Class Families," *Social Science Quarterly* 92 (2011): 57–78, <https://doi.org/10.1111/j.1540-6237.2011.00757.x>; Ariel Kalil and Kathleen M. Ziol-Guest, "Single Mothers Employment Dynamics and Adolescent Well-Being," *Child Development* 76 (2005): 196–211, <https://doi.org/10.1111/j.1467-8624.2005.00839.x>.
43. Wolf and Morrissey, "Economic Instability."
44. Ariel Kalil and Danielle Crosby, "Welfare Leaving and the Health of Young Children in Immigrant and Native Families," *Social Science Research* 39 (2010): 202–14, <https://doi.org/10.1016/j.ssresearch.2009.08.002>.
45. Hardy, "Childhood Income Volatility."
46. Pac et al., "Young Child Poverty."
47. Janet Currie and Firouz Gahvari, "Transfers in Cash and In-Kind: Theory Meets the Data," *Journal of Economic Literature* 46 (2008): 333–83, <https://doi.org/10.1257/jel.46.2.333>.
48. Douglas Almond, Hilary Hoynes, and Diane Whitmore Schanzenbach, "Inside the War on Poverty: The Impact of Food Stamps on Birth Outcomes," working paper, National Bureau of Economic Research, Cambridge, MA, September 2008, <https://doi.org/10.3386/w14306>; Hilary Hoynes, Diane Whitmore Schanzenbach, and Douglas Almond, "Long-Run Impacts of Childhood Access to the Safety Net," *American Economic Review* 106 (2016): 903–34, <https://doi.org/10.1257/aer.20130375>; Martha Bailey

- et al., "Is the Social Safety Net a Long-Term Investment? Large-Scale Evidence from the Food Stamps Program," working paper, National Bureau of Economic Research, Cambridge, MA, April 2020, <https://doi.org/10.3386/w26942>.
49. Hilary Hoynes, Marianne Page and Ann Huff Stevens, "Can Targeted Transfers Improve Birth Outcomes? Evidence from the Introduction of the WIC Program," *Journal of Public Economics* 95 (2011): 813–27, <https://doi.org/10.1016/j.jpubeco.2010.12.006>.
50. Marianne P. Bitler and Arian Seifoddini, "Health Impacts of Food Assistance: Evidence from the United States," *Annual Review of Resource Economics* 11 (2019): 261–87, <https://doi.org/10.1146/annurev-resource-100518-093823>.
51. Natalie Slopen et al., "Housing Assistance and Child Health: A Systematic Review," *Pediatrics* 141 (2018): e20172742, <https://doi.org/10.1542/peds.2017-2742>; Brian A. Jacob, Max Kapustin, and Jens Ludwig, "The Impact of Housing Assistance on Child Outcomes: Evidence from a Randomized Housing Lottery," *Quarterly Journal of Economics* 130 (2014): 465–506, <https://doi.org/10.1093/qje/qju030>; Brian A. Jacob, "Public Housing, Housing Vouchers and Student Achievement: Evidence from Public Housing Demolitions in Chicago," *American Economic Review* 94 (2004): 233–58, <https://doi.org/10.1257/000282804322970788>.
52. National Academies of Sciences, Engineering, and Medicine, *A Roadmap to Reducing Child Poverty* (Washington, DC: National Academies Press, 2019), <https://doi.org/10.17226/25246>.
53. Ibid.
54. Irwin Garfinkel et al., *Doing More for Our Children: Modeling a Universal Child Allowance or More Generous Child Tax Credit* (New York: Century Foundation, 2016), <https://tcf.org/content/report/doing-more-for-our-children>; H. Luke Shaefer et al., "A Universal Child Allowance: A Plan to Reduce Poverty and Income Instability among Children in the United States," *RSF: The Russell Sage Foundation Journal of the Social Sciences* 4, no. 2 (2018): 22–42, <https://doi.org/10.7758/rsf.2018.4.2.02>.
55. Greg J. Duncan and Kimberly Noble, "Baby's First Years," <https://clinicaltrials.gov/ct2/show/NCT03593356>, accessed September 26, 2019.

The views expressed in this publication are those of the authors and do not necessarily represent the views of the Woodrow Wilson School at Princeton University or the Brookings Institution.

Copyright © 2020 by The Trustees of Princeton University

 This work is licensed under the Creative Commons Attribution-NoDerivs 3.0 Unported License, <http://creativecommons.org/licenses/by-nd/3.0>. Articles may be reproduced with proper attribution: “From *The Future of Children*, a collaboration of the Woodrow Wilson School of Public and International Affairs at Princeton University and the Brookings Institution.”

To download a free electronic copy or sign up for our e-newsletter, go to our website, www.futureofchildren.org. If you would like additional information about the journal, please send questions to foc@princeton.edu.

www.futureofchildren.org

