

IN BRIEF

A World of Differences: The Science of Human Variation

For the full paper on which this InBrief is based, see Working Paper 17:
A World of Differences: The Science of Human Variation Can
Drive Early Childhood Policies and Programs to Bigger Impacts

It is now widely accepted that investing in early childhood development helps build the foundations of a healthy, productive, and equitable society. Guided by that knowledge, a range of broad-based programs and targeted services make a significant difference for millions of young children, yet a closer look shows that some children benefit greatly, some benefit less, and some not at all. Within this variation lies opportunity. Increasing effects for all children—especially those who benefit the least—may be the key that unlocks greater impacts for society.

Science provides two explanations for why the same conditions affect children differently. The first, *between-group differences*, categorizes people according to demographic factors (e.g. parent education, family income, race, ethnicity, and community context) and focuses on differences between groups in terms of access to opportunities and outcomes in health, educational achievement, and lifetime earnings. Within every demographic group, however, outcomes among *individuals* also vary widely. This is the concept of *within-group variation*. Many programs attempt to address between-group differences, but few account for variation within groups. Service providers often make adjustments for individual children, but lessons learned are not disseminated widely or built into policies and systems. Programs and policies that are designed, implemented, and evaluated to account for variation in their effectiveness are better positioned to achieve larger benefits for society than current best practices because improved outcomes for more children will boost overall impacts.

Individual Variation Is the Norm, Not the Exception

1

Early experiences, starting prenatally, interact with genes to shape the development of the brain and other biological systems.

All individuals carry their own set of genetic instructions that shape how the body develops *in response to what it experiences*. These external influences activate molecular markers that attach to individual genes in unique “signatures” that affect whether, how, and when in development the gene is expressed. This dynamic interaction shapes how each child will react to both positive and negative experiences in the future. Just as the sound of a violin is determined by its structure, materials, and size, but also by the player’s technique, the musical composition, and the acoustics where it is being played, the impact of our genes is incomplete without the experiences and contexts that bring them to life in distinctive ways.

2

Experiences and exposures vary widely within families and communities.

A child’s social environment may consist of a combination of positive experiences (such as responsive “serve and return” interactions and predictable daily routines) as well as negative experiences (such as abuse, neglect, or the stresses of poverty and/or racism). Children are also exposed to many influences in their physical environment—both positive (such as green space and stable housing) and negative (such as excessive heat, air pollution, and lead in drinking water). These factors all differ in how long they last; how frequently they happen; whether they are expected or unpredictable, powerful or mild, positive or negative; and the child’s age when they occur. Complex interactions among experiences, exposures, and developing biological systems ultimately shape how the body will adapt over the life course.

3

The timing of when an experience or exposure occurs during development affects its impact.

There are periods in the development of the brain, as well as the immune and metabolic systems, that are highly responsive to the surrounding environment. Whether or not a child has experiences that support healthy development *during these sensitive periods* is an important factor in how that child will respond to future opportunities or threats. The biology of development is naturally inclined toward adaptations that help us survive and thrive in a wide range of conditions. Although personal circumstances change significantly over the life course, earlier adaptations may remain, whether or not they are appropriate for later contexts and experiences. For example, a biological response to early trauma that is designed to provide protection (e.g. persistent activation of the stress system) may exact a high price in adulthood (e.g. greater risk for stress-related disease as a result of early toxic stress) even in the absence of continuing adversity.

4

Both positive and negative experiences affect development, and some children are more sensitive to one or both.

People often respond differently to the same stressor—something that feels intensely threatening to one person may feel less significant to another. Neither response is “normal” or “abnormal.” For example, experiencing significant adversity at a young age can be particularly disruptive for children whose stress response system is triggered more easily and stays active longer. Those whose stress response ramps up quickly and powerfully are more likely to experience negative effects from adversity, but they may also benefit *more* from supportive circumstances than children who are less reactive.

Between-Group Differences Are Rooted in Social and Economic Inequities

1 Systemic racism, intergenerational poverty, and other structural inequities lead to higher levels of adversity for some neighborhoods, families, and individuals compared to others.

There are no genetic or biological boundaries where racial or ethnic categories begin and end. These categories have been and still are used to extend opportunities to some and deny them to others. Public health research has long employed these socially constructed identifiers to document disparities in diseases and mortality rates. The physical and psychological disruptions of racism; unequal treatment in health care, education, and child welfare systems; and barriers to economic advancement all challenge well-being and increase the risk (but not inevitability) of negative life outcomes.

2 Communities vary in the availability of protective factors that can prevent or reduce early life adversity or mitigate its effects.

Community conditions and social structures can be sources of either hardship or protection. Differences between neighborhoods in the same metropolitan area, as well as among rural communities, are often associated with significant disparities in access to assets and opportunities that promote well-being across all ages. Increasing the availability of quality childcare, affordable housing, healthy food, and well-paying jobs provides a more stable and predictable environment that strengthens the capacity of parents and other caregivers to promote the healthy development of their children.

3 The environments in which children are raised offer widely varying opportunities to develop a “toolkit” of adaptive skills that affect responses to new situations.

Executive function skills, including problem-solving and self-regulation, are important building blocks of resilience in the face of adversity as well as for success throughout life. There is substantial *individual variation* in when and how well children develop these skills, but there are also *between-group differences*. The remarkable adaptive strategies exhibited by families facing challenges such as poverty or discrimination are examples of ingenuity in the face of adversity. Child-rearing practices also reflect differences in cultural values (e.g. a communal versus individualistic orientation), which can lead to variations in child behavior that are viewed favorably within that culture yet might be seen differently in others. All responses are thus viewed best in relation to context, particularly when a response may be adaptive in some circumstances but seen as problematic in others.

Implications for a Mindset Shift in Policy and Practice

Understanding that all children have universal needs, but variation occurs naturally *among individuals* as well as *between groups*, highlights the urgency of supporting the healthy development of young children in a way that addresses both kinds of variation. Programs that are designed to *expect and measure variation* and plan for *flexible implementation* are better positioned to achieve larger effects for all children. Policies and funders that incentivize program leaders and practitioners to co-create best practices with families and communities, as well as adapt to group and individual differences, will likely get better returns on their investments and generate greater benefits to society as a whole.

Investments that address multiple levels of variation take three complementary approaches:

- **Broad-based programs and policies** to ensure as many children as possible have their basic needs met (e.g. universal access to health care).
- **Strategic targeting of resources** to address needs and assets identified by different communities (e.g. low income) and demographic groups (e.g. racial or ethnic minority).
- **Flexible implementation** that enables staff to account for individual variation by adjusting their approach and making referrals to specialized expertise when needed.

Policies and service systems would be enhanced by employing the following strategies and evaluating their impacts and costs:

- **Support programs that engage in continuous quality improvement focusing on both increasing average effects and addressing variation in effectiveness.** When evaluators find out who is not responding as well as who is—and why—implementors can use that information to modify their practices and assess the results. The improvement process begins with soliciting input from program participants, practitioners, supervisors, and administrators to understand the challenges they are facing and drive potential solutions.

- **Strengthen the capacity of the early childhood workforce** to anticipate and respond to variation through training focused on the science of child development; provision of flexible curricula and access to specialists when needed; and boosting recruitment and reducing turnover through appropriate compensation and continuing professional development.
- **Pay greater attention to developmental timing** by focusing on the foundations of healthy development when children are most sensitive to both positive and negative influences, particularly during the prenatal period and first two to three years after birth.
- **Develop a manageable range of variation profiles.** Service providers, families, and researchers could identify common characteristics of children who are not benefiting from evidence-based programs, design and implement modified approaches, evaluate their impacts, and disseminate lessons learned through a broadly accessible platform.
- **Screening for Adverse Childhood Experiences (ACEs) should be supplemented by additional data and capacity to provide services.** To avoid inappropriate labeling of children as “at risk for health problems” based solely on elevated ACE scores or similar screeners, practitioners need to collect data on a wider range of stressors, protective factors, and age of exposure, as well as conduct individualized assessments to measure variation in sensitivity to adversity. When indicated, access to trauma-informed care should be available.