

Toward an Integrated Science of PACEs

Craig McEwen (with Dennis Haffron)

Bowdoin College

January 21, 2022

Copyrighted (permission granted for unlimited circulation in print or electronically
and for unlimited quotation with citation)

Suggestions for improvement of this evolving draft will be welcomed –
cmcewen@bowdoin.edu

What Is an Integrated PACEs Science?

An integrated natural and social science of PACEs refers to the research about the significant potential effects of positive and adverse childhood experiences (PACEs) on brain and body, how adverse and positive experiences are distributed within populations, and how these experiences work together to affect lives, organizations, systems and communities. It comprises:

1. **The fundamental insights coming from the CDC-Kaiser Permanente ACE Study** by Felitti, Anda and colleagues¹ that showed that the accumulation of adversity in childhood can have long-term effects on adult health. Subsequent research has enlarged the limited definition of adversity in the CDC research and has focused attention on the developmental consequences of adversity for children and its impact on children's health and life chances. That research has also identified positive childhood (and adult) experiences that can buffer the effects of adversity.
2. **The brain science -- the neurobiology of toxic stress – that helps explain the impact that childhood adversity can have on the brain and body.** It shows how toxic stress caused by childhood adversity can disrupt the development and function of young brains and bodies in ways that can have long term effects and that are at the root of health disparities.² Positive and adverse childhood experiences can alter the expression of genes, and some of these changes may be transmitted across generations (epigenetics). Brain science underlines the ways in which brain plasticity creates opportunities to repair brain architecture through social interventions and positive relationships.
3. **The social science of PACEs** which examines the interconnections between the neurobiology of toxic stress and the social and cultural circumstances of children and families. The original ACE study was social scientific research in social epidemiology. Continuing research includes studies of the positive experiences that buffer children from adversity and the interventions that can redirect brain development in positive ways. It informs public health strategies and public policies for primary prevention, identifies the economic implications of early intervention, and through the study of flourishing and resilience helps identify needed supports for families and caregivers. It acknowledges the presence of childhood adversity and positive childhood experiences at all income levels

and in all social groups but emphasizes, at the same time, their unequal frequency across class, race, ethnicity and place. It draws attention to the significant impacts of ongoing racism and recognizes both historical and intergenerational trauma.

4. **The risks of negative developmental, physical and mental health consequences of toxic stress caused by adversity.** For infants and children, developmental delay and diminished executive control and regulation of mood are among the possible effects of toxic stress. Long-term health implications for adults include potential impacts on every part of the body, including autoimmune diseases, such as arthritis, as well as heart disease, breast cancer, lung cancer, etc. Behavioral health problems such as smoking, alcohol and drug abuse are more common for those experiencing toxic stress, as is depression.
5. **Ways of preventing toxic stress and of overcoming its effects, especially by supporting positive childhood experiences and resilience building.** Building on the knowledge that the brain is plastic and the body has the capacity to heal, this part of PACEs science includes evidence-based practices by people, organizations and communities that are adopting trauma-informed and resilience-building practices. These range from looking at how the brain of a teen with a high ACE score can be healed with cognitive behavior therapy, to how schools can integrate trauma-informed and resilience-building practices that result in an increase in students' scores, test grades and graduation rates
6. **The basis for trauma-informed approaches that alter institutional and professional practices in order to provide support for individuals who have experienced childhood trauma as a result of adversity.** Trauma-informed approaches enable institutions such as schools and courts and social service and physician practices to recognize signs of trauma, to respond appropriately and to avoid re-traumatizing individuals.
7. **Lessons for designing social policies that reduce childhood adversity and promote positive childhood experiences.** In the context of the findings of brain science, research about the distribution of adverse and positive childhood experiences in states and communities points the way to policies that should reduce adversity, increase positive childhood experiences and strengthen resilience in communities. Reports from the CDC, the California Funders' Group, Harvard Center on the Developing Child, and the National Academy of Science provide convergent recommendations.
8. **Support for a common language to talk about adverse and positive childhood experiences and their effects on children and adults.** PACEs science employs concepts that have implications for messaging and for translating science into practice and policy. A common language is an important part of an integrated PACEs Science in order to create consistency and clarity of understanding.
9. **Encouragement of the careful and appropriate use and interpretation of data and evidence.** PACEs science relies on evidence from research that must be carefully presented and interpreted. For example, much PACEs research, including the original Felitti, Anda, et al. study, provides data at the population level and should not be applied to predict individual outcomes.

1. PACEs Are Much More than ACEs

PACEs are positive and adverse childhood experiences that are shaped by the social circumstances of children in their homes and communities. These, in turn, are affected by community resources and public policies. Adverse childhood experiences can disrupt developing brain architecture with short- and long-term consequences for mental and physical health, behavior and learning. Positive childhood experiences – particularly the support of caring adults – can prevent or limit the disruption of brain architecture or support its rebuilding. Adversity can make life less predictable and manageable whereas positive experiences make it more predictable and manageable.

Childhood adversity and ACEs

“ACEs” comes originally from the [CDC-Kaiser Adverse Childhood Experiences Study](#), a groundbreaking public health (epidemiological) study begun over 20 years ago that discovered that the number of categories of childhood adversity reported by adults ([ACE score](#)) were related to higher likelihood of diseases such as ischemic heart disease, cancer, chronic lung disease, obesity, and depression and behavioral health issues such as drug abuse and alcoholism.³

The 10 ACEs the researchers measured in a largely white and middle-class adult population were physical, sexual and verbal abuse, physical and emotional neglect, witnessing a mother being abused, the presence of a family member who was depressed or mentally ill or addicted to alcohol or another substance, and having a family member in prison. Losing a parent to separation or divorce was added later.

Even with a focus on households, the ACE measure misses a significant cause of toxic stress in children -- household chaos. Children who experience a crowded, noisy home which lacks structures and routines are likely to show signs of stress.⁴ Such conditions reduce predictability and lower the chance for stable, nurturing relationships to develop.

Widening the Concept of Childhood Adversity beyond the Household: The adversities identified in the CDC-Kaiser Permanent ACE research reflected concerns about the potential effects of child abuse in families but did not examine toxic environmental stressors surrounding families. Since that research was undertaken, a much broader view of childhood adversity has developed as the understanding of toxic stress has grown.

The idea of Adverse Community Experiences (making a [Pair of ACEs](#)) has since been proposed to represent some of the broader community adversities that affect children and their development and that help shape experiences in households. These include poverty, discrimination, community disruption, poor and unaffordable housing, community violence, and limited economic opportunity, mobility and social capital. These adverse community experiences not only increase the likelihood of the ten ACE items but also themselves can directly increase the chances of toxic stress in children.

A “[Third Realm of ACEs](#)” – adverse climate/environmental experiences -- highlights the effects of climate change as well as of natural disasters, pandemics and unhealthy air, water and living environments which can harm physical health directly and provoke chronic and toxic stress.⁵

This broader view that imbeds childhood adversity in social, cultural and environmental context is implicit in the [ACE Pyramid](#)⁶ and has also been captured in the widely adopted [Social Determinants of Health \(SDOH\)](#) framework that is central to public health research and practice. According to the CDC, these social determinants “are conditions in the places where people live, learn, work, and play that affect a wide range of health and quality-of life-risks and outcomes.”⁷ The CDC has established a “place-based” social determinants framework that highlights⁸

- Health Care access and quality including access to primary care and health insurance
- Education access and quality such as early childhood education, high school graduation
- Social and community contexts including social cohesion and resources, workplace conditions, racism, discrimination and structured inequality
- Economic stability including poverty, food security, housing stability
- Neighborhood and built environment including housing quality, transportation, healthy air and water, levels of crime/violence

For adults, a crucial element of the social determinants is the experience of lack of control. The classic Whitehall Study of British civil servants found that the risk of coronary heart disease increased as the degree of control over work decreased.⁹ For children an unstructured and chaotic environment reduces predictability and thus sense of control. For both children and adults, toxic stress increases with the sense of diminished control.

Other researchers have created alternative measures of adverse childhood experiences that include, for example, poverty or economic insecurity and experience of discrimination. The ACE measure employed in the important and widely reported [National Survey of Children’s Health \(NSCH\)](#)¹⁰ includes being treated unfairly because of one’s race or ethnicity, witnessing neighborhood violence, and economic insecurity. Importantly, this measure is not *retrospective* but rather is based on self-reports of parents of children through age 18. Retrospective ACE research in Philadelphia adds witnessed violence, felt discrimination, lived in unsafe neighborhood, experienced bullying, and lived in foster care to the household ACE items in the original ACE study.¹¹ There is no agreed upon list of adverse childhood experiences which could also include placement in foster care, dislocation through migration, warfare, natural disasters and pandemics, forced separation from parents, and much more.¹²

The California [PEARLS \(Pediatric ACEs and Related Life Events\)](#) instrument used for screening pediatric patients employs an adapted version of the traditional ACE survey. Part 2, which is not required for screenings, taps Related Life Events and draws on a Social Determinants of Health framework: witnessed/experienced community violence, experienced discrimination, faced housing or food insecurity, separated from parents.

It Matters When Adversities Occur: Neuroscience research suggests that children are most vulnerable to adversity in the early years. Similarly, research on epigenetics (see below) makes clear that adversity has particular impacts during sensitive periods in brain development – roughly before the age of 5 or earlier.¹³

It Matters What the Child’s Subjective Experience of Adversity Is: Although we talk about adversities and traumas as if they can be defined by events or conditions, psychologist Seth Pollak points out that we too often leave out the perceptions of the children/individuals who experience these events or conditions.¹⁴ The term trauma applies to a particular set of responses to adversities, not to the events leading to those responses.

Strong adult or community supports could turn what might be a problematic experience – divorce or housing insecurity, for example – into a life challenge to be overcome together. Variation in response to adversity is also shaped by individual biology, with some individuals much more susceptible to toxic stress (see below) or traumatic response and others less so. Thus, there is far more adversity in the world than there is toxic stress!

Further research is needed to understand better what adversities or events, in what contexts, for which individuals, at what times in their lives lead to toxic stress or a traumatic response.

It Matters Which Adversities Are Counted: “No ACEs lists or screening tools identify all childhood adversities, but those that do not include adversity related to social disadvantage are likely to overlook [or undercount] children in specific [income], racial or ethnic groups, who are disproportionately affected [by adversity].”¹⁵

Including Adverse Community Experiences as both sources of toxic stress themselves and as the context for household adversities also has consequences for action. Exclusive focus on household ACEs promotes a focus on therapeutic interventions for individuals (adults and children) and provision of adult supports for children experiencing these adversities. By contrast, inclusion of the social context encourages a broad focus on policies including public health policies and on the availability of community resources that reduce or buffer those toxic stressors. The examination of household stressors and their community context are complementary, not mutually exclusive approaches.

Positive Childhood Experiences or PCEs and Resilience

Childhood adversity tells only part of the story. An understanding of toxic stress in children also requires attention to positive childhood experiences -- protective factors or buffers that prevent prolonged activation of the stress response even in the face of adversity. Protective factors come from strong, warm, caring adult relationships that can buffer the effects of stressful circumstances and diminish the stress response.¹⁶ Positive experiences come especially from primary caregivers but also from teachers, child-care staff, mentors, and other adults.¹⁷

A study in Wales found that the frequency of poor childhood health among children with four or more ACEs declined by 64% when they were treated fairly, had supportive friends, had the chance to use their abilities, and were connected to a trusted adult they could look up to.¹⁸ Research using the National Survey of Children’s Health demonstrated that positive parenting

practices protected against socio-emotional deficits and risks of developmental delay in the context of adversity.¹⁹ Adult flourishing is correlated in step-wise fashion with scores on a “7-item scale assessing parental attention, affection, and communication during childhood.”²⁰ This positive association was also present across levels of ACEs and childhood socio-economic difference.

Resilience: The resources supporting positive childhood experiences can be viewed as aspects of resilience. Resilience must be understood not primarily as an individual trait but rather in bioecological context – a recognition that child development occurs as the child interacts with an immediate and more distant social environment.²¹ Thus, family and community resources are crucial aspects of resilience for individuals and both support and complement individual qualities of resilience.²² Among the implications of this approach is that broader social and cultural environments matter for child development. That means that one can expect significant differences in the availability of protective factors or buffers across social groups with differing social and cultural arrangements. In particular, those with greater resources are more likely to have stronger support systems to buffer children from adversities.

2. What’s the Neurobiology of Toxic Stress?

An infant and child’s developing brain is shaped by social interactions and circumstances. Strong adult supports and “serve and return” interactions with an infant and child help build strong brain architecture.²³ However, adversity that produces toxic stress disrupts that development, affects the body’s organ systems, and can lead to chronic, systemic inflammation.²⁴ Importantly, positive childhood experiences, carefully designed school programs and therapeutic supports such as meditation can help repair that architecture.

Toxic stress occurs when the stress is chronic, and there are insufficient strong, caring adult supports to protect against it. Toxic stress is the kind of stress that can come in response to living for months or years with a screaming alcoholic father, a severely depressed and neglectful mother or living with sustained poverty, racism or neighborhood violence that create unrelenting anxiety and uncertainty.²⁵ By contrast, much stress and the body’s response to it is short-lived. *Positive stress* -- the first day of school, a big exam, a sports challenge -- is a normal part of life, and parents or caregivers help children prepare for and learn how to handle it. *Tolerable stress* comes from out-of-the-ordinary threats – a car accident or a house fire -- and with support from a caring adult recedes after the threat is removed.

Stress is a biological phenomenon when the body reacts with increases in heart and breathing rates, increased blood pressure, activation or suppression of the immune system, release of insulin and glucose to increase metabolism, and release of cortisol that halts nonessential bodily processes such as digestion and growth.²⁶ A temporary stress response is protective, but chronic or toxic stress creates wear and tear of the body’s systems. That means that the body’s systems – neuroendocrine, immune, gut and metabolic, heart and cardiovascular, brain and autonomic nervous system -- that normally are carefully coordinated and balanced get out of synch with one another.

As [Working Paper 15²⁷](#) of the National Scientific Council on the Developing Child reports: this imbalance has both short- and long-term effects that could include “maladaptive behaviors (e.g.,

difficulties with impulse control, addictions), a ‘weathering’ effect that accelerates the aging process, chronic illness in adulthood, and a shortened lifespan.” With this wear and tear people can become more sensitive to trauma or stress, developing a hair-trigger response to events that other people shrug off. In children it also weakens the development of executive function (ability to plan, shift attention, apply information from memory) and self-regulation (ability to control emotions, thoughts and behavior).²⁸ Adult care-givers and school programs can build such skills when they are weakened by toxic stress.

Neurobiology also makes clear that some people are more biologically vulnerable to toxic stress arising from adversity. Although most children have stress circuitry that reacts minimally to adversity – the “*dandelions*” -- about one-fifth of children have circuitry that is extremely sensitive to and affected by adversity – the “*orchids*.”²⁹ Orchid children, however, are also especially likely to thrive with warm, nurturing adults. These biological differences help account for the fact that many children experiencing adversity do perfectly well while others do not. They also underline the value of positive childhood experiences for all children.

Research from [epigenetics](#) — the study of how social and physical environments turn our genes on and off — shows that toxic stress and positive experiences can actually alter how our genes function, which may lead to short- or long-term changes in parts of our bodies and brains. Epigenetic changes are more likely during sensitive periods of child development, especially prior to the age of five. What’s more, these changes can be transferred from generation to generation.³⁰

3. The Social Science of PACEs

Positive and adverse childhood experiences occur within and are shaped by social context. The social science of PACEs examines the interconnections between the neurobiology of toxic stress and the social and cultural circumstances of children and families, including the positive experiences that buffer children from adversity and the interventions that can redirect brain development in positive ways.

The original ACE study was research in social epidemiology, a social science that is ‘concerned with the way that social structures, institutions, and relationships influence health.’³¹ A central focus of social epidemiology is the examination, description and explanation of social inequalities in health that inform public health policies that can reduce those risk factors that are related to higher frequencies of health issues.³²

As noted, the CDC-Kaiser Permanente research on ACEs was undertaken with a population that was largely white and middle class. Later research using the CDC Behavioral Risk Factor Surveillance System has reached more representative populations in many states. This research makes clear “that childhood adversity is common across sociodemographic characteristics, but some groups of individuals are at higher risk of experiencing ACEs than others.”³³

Differential Risk of Adversity: Differentials in risk matter for public health and public policy and reflect the social determinants of health. Using data from 214,000 respondents in 23 states, researchers found that average ACE scores were 55% higher for households with income less

than \$15,000 than for households with incomes of \$50,000 or greater. Average ACE scores were 60% greater for individuals with less than high school education and 21% greater for high school graduates than for those with college degrees. Respondents who were unemployed had ACE scores 46% greater than those employed. Multiracial respondents had ACE scores 66% higher than whites, and Blacks had scores 11% greater. Self-identified adult bisexuals had ACE scores 96% greater than self-identified straight adults while gay/lesbian respondents had scores 37% higher.³⁴

Employing a different measure of childhood adversity, the National Survey of Children's Health (NSCH) paints a similar portrait of the social distribution of adversity. Data from that survey³⁵ show that Black children are 56% more likely to experience two or more of the ACEs than are non-Hispanic White children. Children in the lowest income households are nearly three times as likely as children in the highest income group to have two or more ACEs and children from households with adults who have less than a high school education are almost twice as likely as those from households with college-educated adults to experience two or more ACEs. Significant variation in adversity also exists across geographic regions and neighborhoods.³⁶ For example, the proportion of children experiencing two or more adversities as measured by the National Survey of Children's Health was 26% in Alaska and Arkansas, 28% in Oklahoma, 14% in California and 12% in New Jersey.³⁷

If adverse community experiences were included in ACE measures, these disparities across race, ethnicity, income and place would be even greater. The existence of such disparities signals policymakers about inequities that can be addressed through policy and resource allocation that aim at primary prevention by reducing adversity.

Differential availability of positive childhood experiences (PCEs). Positive childhood experiences are also unevenly distributed in the population in parallel ways to the unequal distribution of adversity.³⁸ Research using data from the National Survey of Children's Health concluded that "Children of minority race or ethnicity were less likely to have a mentor for advice or guidance, live in a safe neighborhood, or live in a supportive neighborhood, and less likely to experience three or more PCEs." A similar pattern holds for children from households with the lowest incomes compared to those with incomes at or above 200% of the federal poverty level.³⁹ Thus, those children most exposed to adversity also have the least access to community social supports.

Racism and its impact: The National Scientific Council on the Developing Child observes that "well-documented racial disparities in health, independent of socioeconomic status, may be rooted in the effects of both individual and systemic racism on early childhood development." These effects may come from day-to-day stresses that affect caregivers and that are compounded by the legacy of racism in laws and structured inequality in schooling, health care, housing, community and individual resources.⁴⁰

At the same time, for African Americans – and for other racial and ethnic groups -- there are culturally specific methods of coping with adversity that can reduce its impact – for example, spirituality, community activism, and racial reframing that support collective coping.⁴¹

Intergenerational or historical trauma can have effects across generations – including epigenetic effects. For example, [research](#)⁴² has documented higher rates of depression, learning difficulties and suicide among children and even grandchildren of Canadian indigenous peoples who were forced to attend Residential Schools. The “devastating collective, intergenerational massive group trauma and compounding discrimination, racism, and oppression” experienced by indigenous peoples in the U. S. have left their mark as well.⁴³ High rates of psychological problems have been reported for children of Holocaust survivors.⁴⁴ Historic and ongoing racism and racial discrimination affect African-American parents and children.⁴⁵ Similar patterns have been found for Asian-Americans and Pacific Islanders⁴⁶ and Mexican-Americans⁴⁷ and Latinx.⁴⁸

4. What are the Health Effects of Toxic Stress?

The original ACE study by the CDC-Kaiser Permanente found that as the number of kinds of adverse childhood experiences increased so did rates of adult physical, mental and behavioral health problems.⁴⁹ Depression, asthma, chronic obstructive pulmonary disease, stroke, kidney and coronary heart disease, cancer, diabetes and obesity occur at higher rates for those who experienced more childhood adversity compared to those who experienced less adversity. So also do health risk behaviors such as smoking and heavy drinking.

PACEs are important to children’s health, learning and behavior as well as to adults. The National Survey of Children’s Health (NSCH) point to a wide range of developmental, behavioral and physical health issues among children and adolescents that appear connected to *early* adversity.

For example, using the NSCH ACE data, the [Robert Wood Johnson Foundation](#) reports that:

- “Children ages 3 to 5 who have had two or more ACEs are over four times more likely to have trouble calming themselves down, be easily distracted, and have a hard time making and keeping friends.
- More than three out of four children ages 3 to 5 who have been expelled from preschool also had ACEs.
- Children ages 6 to 17 who have had two or more ACEs are twice as likely to be disengaged from school than are peers who have had no ACEs”⁵⁰

Children with 2 or more ACEs as measured in the National Survey of Children’s Health are also more likely than those with no ACEs to be

- at high risk for developmental delay,
- to experience asthma,
- to be diagnosed with ADHD,
- to be overweight or obese,
- to have a behavior problem and
- to bully others.⁵¹

Much of the neuroscience research that provides the basis for ACEs Science uses sustained household poverty in early childhood as the measure of adversity, not an ACE score.⁵² This research has established strong relationships between extended early childhood poverty and neurocognitive development. Toxic stress appears to disrupt the development of “the prefrontal cortex, hippocampus, amygdala and reward system structures that are needed for the regulation of mood and stress response throughout life”⁵³ Further, the impairment of executive function and working memory in childhood and adulthood correlates with early life economic disadvantage.⁵⁴

Thus, the evidence from neuroscience research highlights the potential impacts on children’s behavior and achievement that result from toxic social circumstances.⁵⁵ That research also emphasizes the plasticity of the brain and the importance of positive experiences and carefully crafted interventions that can buffer adversity and reshape brain development in positive directions.⁵⁶

5. How Can Toxic Stress Be Prevented or Its Effects Ameliorated?

The good news is that because the brain is plastic, the effects of toxic stress on brain and body development may be compensated for through positive supports from the social environment. .

Stressful circumstances need not lead to toxic stress.⁵⁷ The engagement of caring adults in providing nurture and support means that many children experiencing toxic circumstances do not experience toxic stress. As described above, nurturing adult relationships and positive childhood experiences can buffer the effects of adversity and prevent stress from becoming toxic.

Evidence-based models of home visiting have documented impacts on child development, school readiness and positive parenting.⁵⁸ These programs focus on “at-risk” communities and bring trained early childhood practitioners into homes to support parents. Evaluations of high-quality parenting education programs demonstrates their effects in reducing problem-behavior and increasing pro-social behavior in at-risk children.⁵⁹ A report of the National Academies of Science, Engineering and Medicine on *Parenting Matters: Supporting Parents of Children 0-8* underlines the importance of what happens in the home and reviews evidence of effective interventions to support parents of young children.⁶⁰

Once toxic stress has occurred, social interventions such as carefully crafted preschool programs can help compensate for early childhood adversity. Nobel Prize winning economist, James Heckman has proposed The [Heckman Curve](#) which “shows the economic benefits of investing early and building skill upon skill to provide greater success to more children and greater productivity and reduce social spending for society.”⁶¹ [The Abecedarian Project](#)⁶² and the [Perry School Project](#) both document through longitudinal research the positive social consequences of high-quality early childhood programs. Similar findings come from longitudinal research about [Early Head Start](#) which improves educational outcomes in high school and college and supports positive self-esteem and positive parenting.⁶³

Therapeutic interventions can help as well. here is well documented research on how individuals’ brains and bodies become healthier through mindfulness practices, exercise, good nutrition, adequate sleep, and healthy social interactions. [Mindfulness approaches](#)⁶⁴ give promise to address emotional, mental or behavioral conditions that may arise in part from childhood adversity. Examples of therapeutic interventions for adults and children have been identified by [SAMHSA](#)⁶⁵ and in other writings.⁶⁶

More broadly, the Building Community Resilience model aims to “improve the health of communities by enabling cross-sectoral partners to align policy, programs and practice to address adverse childhood experiences in the context of adverse community environments—the Pair of ACEs.”⁶⁷ A major goal of building community resilience is to strengthen supports for Positive Childhood Experiences by enriching community and household environments to support developing children.⁶⁸ The Center on the Developing Child points to elements in the social environment that help create resilient responses:

1. “facilitating supportive adult-child relationships;
2. building a sense of self-efficacy and perceived control;
3. providing opportunities to strengthen adaptive skills and self-regulatory capacities;
4. mobilizing sources of faith, hope, and cultural traditions.”⁶⁹

The Center for Community Resilience also focuses on working with local public health departments to build a national collaborative network aimed at “Reducing and eliminating adversity by fostering equity through policy, practice and program change to build resilience.”⁷⁰ Research in the state of Washington demonstrated that community resilience measures – for example, social capital and social cohesion and supports for youth through families, peers, schools and community – mitigated the effects of childhood adversity on rates of mental and physical health challenges and of problem-behaviors, as well as school and work outcomes.⁷¹

6. What Are Trauma-Informed Practices?

Trauma-informed approaches enable institutions such as schools and professional practices such as social work to recognize signs of trauma, to respond appropriately and to resist re-traumatizing individuals.

According to the [Substance Abuse and Mental Health Services Administration](#) (SAMHSA)⁷² of the U.S. Department of Health and Human Services, a trauma-informed approach refers to how an organization or community thinks about and responds to children and adults who have experienced or may be at risk for experiencing trauma. In this approach, the whole community understands the prevalence and impact of PACEs, the role trauma can play in people’s lives, and the complex and varied paths for healing and recovery.

Adversity does not equal trauma. Trauma is rather a particular and severe reaction to adversity. According to SAMHSA, “Individual trauma results from an event, series of events, or set of circumstances that is experienced by an individual as physically or emotionally harmful or life

threatening and that has lasting adverse effects on the individual’s functioning and mental, physical, social, emotional, or spiritual well-being.”

A trauma-informed approach asks: "What happened to you?" instead of "What's wrong with you?" and builds strength-based approaches built on answers to “What’s going well with you?” It is designed to avoid re-traumatizing already traumatized people, with a focus on "safety first" (including emotional safety), and a commitment to do no harm. Other principles of a trauma-informed approach as outlined by SAMHSA⁷³ are trustworthiness and transparency, peer support, collaboration and mutuality, empowerment, voice and choice; and recognition of cultural, historical, and gender issues.

Restorative practices in schools,⁷⁴ for example, provide positive and respectful alternatives to punitive responses to children that acknowledge the underlying sources of a students’ hurtful actions and rebuild their connections to school communities.

The Campaign for Trauma-Informed Practice⁷⁵ provides trauma-informed resources and has a policy vision that “embraces a public health framework, addressing the social determinants of health and supporting the integration of promotion, prevention, resilience-building, and healing activities.”

7. What Does PACEs Science Tell Us About Public Policies to prevent Childhood Experiences and Promote Positive Childhood Experiences and Resilience?

Childhood adversity is a solvable problem, and solutions will have significant benefits for society – for example, thriving children, lower health care costs, more productive workers.⁷⁶ As economic analyses reflected in the Heckman Curve⁷⁷ make clear, strategic early investments in young children and the adults who care for them can improve the prospects of gains in early learning and long-term physical and mental health. Brain plasticity means that the possibility exists for remediation at any age, but outcomes are better and easier to achieve when interventions are provided earlier in life. Promoting the healthy development of biological systems from the beginning is better and more cost-effective, than trying to fix them later.

Felitti, Anda and colleagues pointed to the importance of social policy in their original report of ACEs research in 1998: “Primary prevention of adverse childhood experiences has proven difficult and will ultimately require societal changes that improve the quality of family and household environments during childhood.”⁷⁸ Since then, much thinking has gone into imagining how programs and policies could improve the quality of household environments.

The Harvard Center on the Developing Child identifies *Three Principles To Improve Outcomes for Children and Families*.⁷⁹ They are:

- Strengthen core life skills of executive function and self-regulation⁸⁰
- Support responsive relationships (positive childhood experiences)

- Reduce sources of stress such as “deep poverty, systemic racism, intergenerational trauma, community violence, interpersonal discrimination, parental substance abuse and/or mental illness”

The first of these principles focuses attention, for example, on pre-school and school programs and adult supports to develop those skills even in the face of toxic stress. The latter two principles direct attention to public policies that can build support for families and caregivers and that prevent adversities and toxic stress to begin with.

These approaches addressing public policy and community resources highlight differential patterns of adversity and availability of positive childhood experiences that might be addressed by health and social policy. This perspective shapes many of the recommendations for primary prevention of childhood adversity that are found in the CDC’s *Preventing Adverse Experiences: Leveraging the Best Available Evidence*,⁸¹ California Funder’s Group, *Beyond Screening: Achieving California’s Bold Goal of Reducing Exposure to Childhood Trauma*,⁸² the National Academy of Science’s *Vibrant and Healthy Kids: Aligning Science, Practice, and Policy to Advance Health Equity*⁸³ and Harvard Center on the Developing Child’s *From Best Practices to Breakthrough Impacts*⁸⁴ and *Three Principles To Improve Outcomes for Children and Families*.⁸⁵

These recommendations include: strengthening economic supports for families; promoting social norms to resist violence and adversity; increasing access to affordable housing; ensuring strong starts for children through high quality day care, pre-school and schools; funding programs focused on building self-regulation and executive function; coaching caregivers and supporting two-generation programs; and connecting youth to caring adults.

To confront the effects of systemic and cultural racism requires attending, for example, to reducing income and racial segregation in housing, closing racial gaps in wealth and income and place-based investments in community transformation such as the Harlem Children’s Zone.⁸⁶

8. Creating a Common Language

Adversity does not equal trauma.⁸⁷

As Jessica Dym Bartlett and Vanessa Sacks point out

Trauma is one possible outcome of exposure to adversity. Trauma occurs when a person perceives an event or set of circumstances as extremely frightening, harmful, or threatening—either emotionally, physically, or both. With trauma, a child’s experience of strong negative emotions (e.g., terror or helplessness) and physiological symptoms (e.g., rapid heartbeat, bedwetting, stomach aches) may develop soon afterward and continue well beyond their initial exposure.⁸⁸

Because of protective factors, many adverse experiences do not produce traumatic responses or toxic stress, Further research is needed to understand which adversities, in what contexts, for which individuals, at what times in their lives lead to trauma and/or toxic stress. But it is important not to conflate adversity (or ACEs) with trauma. The terms should not be used interchangeably.

The language of trauma focusses attention on individuals and on healing. However, it tends to deflect attention from adversities and their prevention and from positive experiences and community supports that support resilience. This deflection has implications for action.

ACEs and adversity do not inevitably produce toxic stress and toxic stress may occur without the experience of trauma

Protective factors and resilience make it possible for many children experiencing adversity to resist toxic stress. And living with chronic stressors such as grinding poverty or racism can produce sustained stress responses that are toxic as families face anxiety and uncertainty on a daily basis even without experiencing trauma.

ACEs and Childhood Adversity

No ACE measure encompasses all of childhood adversity and the term ACE should not be used as a substitute for the broader concept of childhood adversity. How adverse childhood experiences are defined matters for how we respond to them.

Positive Childhood Experiences

Positive childhood experiences come in many forms but have in common relationships with nurturing adults or peers. Research and practice regarding adverse childhood experiences needs to be paired with research about and awareness of positive childhood experiences and the social conditions that foster both adversity and resilience, including childhood family connection.⁸⁹

Resilience and protective factors

Resilience is not primarily a characteristic of individuals but rather of individuals in their social context. Protective factors – positive childhood experiences -- that create resilience for children reside in the relationships with caring adults inside or outside the home. Resilience ultimately is the capacity in that context to adapt effectively to adversity. Community resilience is the capacity of communities to respond and support members as they face adversity.

9. Data on PACEs Predict for Populations Rather than for Individuals

Dr. Robert Anda observed that: “The ACE score is a powerful tool for describing the population impact of the cumulative effect of childhood stress and provides a framework for understanding how prevention of ACEs can reduce the burden of many public health problems and concerns. However, the ACE score is neither a diagnostic tool nor is it predictive at the individual level.”⁹⁰

Many reports of ACE data emphasize the ratios of likelihood of adult health issues for those with four or more ACEs compared to those with none; such reporting disguises what may be low probabilities of these outcomes for individuals. This proves to be highly misleading when the apparent power of prediction provided by a retrospective ACE score is applied at an individual

level.⁹¹ Not only does using ACE scores wrongly identify many individuals as high risk, but it also could lead to ignoring other individuals at high risk despite low ACE scores.

How ACE data can mislead

A recently published Report about ACEs in California⁹² illustrates the ways that presentations of ACE data can mislead as well as inform us.

The report graphs the relative frequency of various adult health issues by the number of self-reported ACEs. One bar graph shows, that 9.5 % of those with no ACEs report fair or poor health compared to 17.6% of those with four or more ACEs. The interpretation of that bar graph is that those with 4+ ACEs are “2.0 times as likely to report fair/poor self-rated health” as those with no ACEs.

That is a profoundly important difference in the likelihood of fair to poor health. But roughly 83% of those with 4+ ACEs do **not** report experiencing fair to poor health. That means that if we use the ACE score of four to predict that an *individual's* health status is fair to poor, we would be wrong about 83% of the time. Many more factors shape adult health status than ACEs.

Another example shows that 1.3% of those with 4 or more ACEs experience heart disease compared to only .9% of those with no ACEs. The bolded interpretation emphasizes that those with four or more ACEs are “1.5 times as likely to have heart disease,” despite the very low likelihood for all BRFSS respondents. Predicting an individual adult would have heart disease by their high ACE score would be in error almost 99% of the time.

How ACE data can be used

What value then do the ACE data have? As social epidemiology they provide important information about the presence of risk in a population, not individuals. Thus, the entire population or segment of the population is the focus of the response. The population predictions coming from these ratios can help guide public health strategies that reduce adversity for large populations where these odds hold. For example, strategies that lower the number of people experiencing adversities should reduce the frequency of fair/poor health (as compared to good/excellent health) and of heart disease.

Retrospective use of ACE scores by individuals makes sense, however, even if prospective use of those scores does not. As PACEsConnection has made clear, the retrospective understanding that individuals achieve as they recognize the ways that their own childhood adversities may have affected them can be powerful tool for understanding and healing.

Highlighted references available online

¹ Felitti, Anda, and colleagues, “Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults. The Adverse Childhood Experiences (ACE) Study,” *Am. J. Prev. Med.* 1998 May;14(4): 245-58, [https://www.ajpmonline.org/article/S0749-3797\(98\)00017-8/pdf](https://www.ajpmonline.org/article/S0749-3797(98)00017-8/pdf)

² Shonkoff, Boyce and McEwen, “Neuroscience, Molecular Biology, and the Childhood Roots of Health Disparities: Building a New Framework for Health Promotion and Disease Prevention,” *JAMA*, 301(21):2252-9 (2009), <https://pubmed.ncbi.nlm.nih.gov/19491187/>

³ <https://www.cdc.gov/violenceprevention/aces/index.html>

⁴ Marsh, Dobson and Maddison (2020) The relationship between household chaos and child, parent, and family outcomes: a systematic scoping review. *BMC Public Health* 20:513. <https://doi.org/10.1186/s12889-020-08587-8>

⁵ Ferguson KT, Cassells RC, MacAllister JW, Evans GW, The physical environment and child development: an international review. *Int J Psychol.* 2013;48(4):437-68. doi:10.1080/00207594.2013.804190.

⁶ <https://www.cdc.gov/violenceprevention/aces/about.html>

⁷ <https://www.cdc.gov/socialdeterminants/about.html>

⁸ <https://www.cdc.gov/socialdeterminants/about.html>

⁹ Marmot MG, Bosma H, Hemingway H, Brunner E, Stansfeld S (1997) Contribution of job control and other risk factors to social variations in coronary heart disease incidence, *Lancet* 350:235-239. [https://doi.org/10.1016/s0140-6736\(97\)04244-x](https://doi.org/10.1016/s0140-6736(97)04244-x)

¹⁰ <https://www.childhealthdata.org/learn-about-the-nsch/NSCH>. The NSCH is conducted annually by the Bureau of the Census and typically includes data about roughly 30,000 children.

¹¹ Cronholm, Forke, Wade, et al., “Adverse Childhood Experiences: expanding the concept of adversity,” *Am J Prev Med.* 2015;49(3):354–361; Wade R Jr., Cronholm PF, Fein JA, et al. “Household and community-level Adverse Childhood Experiences and adult health outcomes in a diverse urban population,” *Child Abuse & Neglect*, 2016;52:135–145.

¹² Afifi, et al. “Confirmatory factor analysis of adverse childhood experiences (ACEs) among a community-based sample of parents and adolescents,” *BMC Pediatrics* 20, 178 (2020). <https://doi.org/10.1186/s12887-020-02063-3>

¹³ Dunn, et al. “Sensitive periods for the effect of childhood adversity on DNA methylation: Results from a prospective, longitudinal study,” *Biol Psychiatry*, 85(10): 838–849 (2019); Marini, “Adversity exposure during sensitive periods predicts accelerated epigenetic aging in children.” *Psychoneuroendocrinology*, 113: 104484 (2020); Humphreys, “Evidence for a sensitive period in the effects of early life stress on hippocampal volume, *Developmental Science*,” 22:e12775 (2019).

¹⁴ <https://knowablemagazine.org/article/health-disease/2021/studying-poverty-through-childrens-eyes>

¹⁵ <https://www.childtrends.org/blog/adverse-childhood-experiences-different-than-child-trauma-critical-to-understand-why>

¹⁶ Center on the Developing Child. Supportive Relationships and Active Skill-Building Strengthen the Foundations of Resilience. Cambridge, MA: Harvard Center on the Developing Child; 2015. <http://developingchild.harvard.edu/wp-content/uploads/2015/05/The-Science-of-Resilience.pdf>.

¹⁷ Christina Bethell, “Positive Childhood Experiences,” <https://www.acesconnection.com/resource/ep-65-positive-childhood-experiences>

¹⁸ Bellis, et al., “Adverse Childhood Experiences and Sources of Resilience: A Retrospective Study of Their Combined Relationships with Child Health and Educational Attendance,” *BMC*

Public Health, June 26, 2018.

<https://bmcpublihealth.biomedcentral.com/articles/10.1186/s12889-018-5699-8>

¹⁹ Yui Yamaoka and David E Bard, Positive Parenting Matters in the Face of Early Adversity *Am. J. of Prev. Med.*, 2019 Apr;56(4):530-539.

²⁰ Whitaker, Dearth-Wesley, and Herman, “Childhood family connection and adult flourishing: associations across levels of childhood adversity,” *Academic Pediatrics*, Published online March 10, 2021.

²¹ Center on the Developing Child. Supportive Relationships and Active Skill-Building Strengthen the Foundations of Resilience. Cambridge, MA: Harvard Center on the Developing Child; 2015. <http://developingchild.harvard.edu/wp-content/uploads/2015/05/The-Science-of-Resilience.pdf>.

²² Bronfenbrenner, and Evans, Developmental science in the 21st century: Emerging questions, theoretical models, research designs and empirical findings. *Social Development*, 9(1), 115-125 (2000).

²³ Alberta Family Wellness Center, *How Brains Are Built: Introducing the Brain Story*, <https://www.frameworksinstitute.org/external-article/how-brains-are-built-introducing-the-brain-story/>.

²⁴ Furman, et al. Chronic inflammation in the etiology of disease across the life span, *Nature Medicine*. 2019 Dec; 25(12): 1822–1832

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7147972/>

²⁵ The Brain Architects Podcast Toxic Stress: Protecting the Foundation

<https://devhcdc.wpeengine.com/resources/the-brain-architects-podcast-toxic-stress-protecting-the-foundation/>; Talking about Toxic Stress: A Communications Toolkit

<https://developingchild.harvard.edu/resources/talking-about-toxic-stress-a-communications-toolkit/>

²⁶ Harvard Medical School, Understanding the stress response,

<https://www.health.harvard.edu/staying-healthy/understanding-the-stress-response>

²⁷ Connecting the Brain to the Rest of the Body: Early Childhood Development and Lifelong Health Are Deeply Intertwined, <https://developingchild.harvard.edu/resources/connecting-the-brain-to-the-rest-of-the-body-early-childhood-development-and-lifelong-health-are-deeply-intertwined/>

²⁸ Harvard Center on the Developing Child, Executive Function and Self-Regulation,

<https://developingchild.harvard.edu/science/key-concepts/executive-function/>

²⁹ Boyce, Why Some Children Are Orchids and Others Are Dandelions

<https://www.psychologytoday.com/us/articles/201901/why-some-children-are-orchids-and-others-are-dandelions>.

³⁰ Epigenetics and Child Development: How Children’s Experiences Affect Their Genes,

<https://developingchild.harvard.edu/resources/what-is-epigenetics-and-how-does-it-relate-to-child-development/>.

³¹ Berkman, Kawachi, and Glymour(Eds.), 2014. *Social Epidemiology*, 2nd ed.

Oxford University Press, New York, p. 2.

³² Kawachi and Subramanian, “Social epidemiology for the 21st century,” *Social Science & Medicine*, 196 (2018): 240-245.

³³ Merrick, et al., “Prevalence of Adverse Childhood Experiences From the 2011-2014 Behavioral Risk Factor Surveillance System in 23 States,” *JAMA Pediatrics*, 172: 1038-1044 (2018).

³⁴ Merrick, et al., “Prevalence of Adverse Childhood Experiences From the 2011-2014 Behavioral Risk Factor Surveillance System in 23 States,” *JAMA Pediatrics*, 172,: 1038-1044 (2018).

³⁵ Data extracted from the 2018-19 surveys using the interactive data search tool at <https://www.childhealthdata.org/browse/survey>

³⁶ For evidence of variation by county in social and economic conditions and measures of health, see County Health Rankings, <https://www.countyhealthrankings.org/>.

³⁷ <https://datacenter.kidscount.org/data/bar/9709-children-who-have-experienced-two-or-more-adverse-experiences?loc=1&loct=1#2/2-11/false/1648/any/18962>.

³⁸ Crouse, et al., “Racial/ethnic differences in positive childhood experiences across a national sample,” *Child Abuse & Neglect* 115 (2021).

³⁹ Data extracted from the 2018-19 surveys using the interactive data search tool at <https://www.childhealthdata.org/browse/survey>

⁴⁰ Connecting the Brain to the Rest of the Body: Early Childhood Development and Lifelong Health Are Deeply Intertwined <https://developingchild.harvard.edu/resources/connecting-the-brain-to-the-rest-of-the-body-early-childhood-development-and-lifelong-health-are-deeply-intertwined/> page 5; How Racism Can Affect Child Development, <https://devhcdc.wpengine.com/resources/racism-and>; Shonkoff, Slopen, and Williams, “Early Childhood Adversity, Toxic Stress, and the Impacts of Racism on the Foundations of Health,” *Ann. Rev. of Public Health*, 42:115–34 (2021), <https://www.annualreviews.org/doi/full/10.1146/annurev-publhealth-090419-101940>; Giovanelli and Reynolds, “Adverse childhood experiences in a low-income black cohort: The importance of context,” *Preventive Medicine*, 148 (July 2021).

⁴¹ Hampton-Anderson, et al. “Adverse Childhood Experiences in African Americans: Framework, Practice, and Policy,” *American Psychologist*, 76: 314-325 (2021).

⁴² Tori DeAngelis, *The Legacy of Trauma*, <https://www.apa.org/monitor/2019/02/legacy-trauma>

⁴³ Yellow Horse Brave Heart, Chase, Elkins and Altschul,(2011) “Historical Trauma Among Indigenous Peoples of the Americas: Concepts, Research, and Clinical Considerations,” *Journal of Psychoactive Drugs*, 43:4, 282-290 (2011).

⁴⁴ Tori DeAngelis, *The Legacy of Trauma*, <https://www.apa.org/monitor/2019/02/legacy-trauma>

⁴⁵ Hampton-Anderson, et al. “Adverse Childhood Experiences in African Americans: Framework, Practice, and Policy,” *American Psychologist*, 76: 314-325 (2021).

⁴⁶ Patel and Nagata, “Historical Trauma and Descendants Well-Being,” *AMA Journal of Ethics* (2021) <https://journalofethics.ama-assn.org/article/historical-trauma-and-descendants-well-being/2021-06>.

⁴⁷ Orozco-Figueroa, “The Historical Trauma and Resilience of Individuals of Mexican Ancestry in the United States: A Scoping Literature Review and Emerging Conceptual Framework,” *Genealogy*, 5, 32 (2021), <https://doi.org/10.3390/genealogy5020032>

⁴⁸ Cerdeña, Rivera and Spak, “Intergenerational trauma in Latinxs: A scoping review,” *Social Science & Medicine*, 270 (2021).

⁴⁹ <https://www.cdc.gov/vitalsigns/aces/pdf/vs-1105-aces-H.pdf>

⁵⁰ <https://www.rwjf.org/en/library/articles-and-news/2017/10/traumatic-experiences-widespread-among-u-s--youth--new-data-show.html>

⁵¹ Bethell, Newacheck, Hawes, and Halfon, “Adverse Childhood Experiences: Assessing The Impact On Health And School Engagement and The Mitigating Role of Resilience,” *HEALTH AFFAIRS* 33; 2106–2115 (2014).

<https://www.healthaffairs.org/doi/full/10.1377/hlthaff.2014.0914>

⁵² Wolfe, Evans, Seeman, eds. *The Biological Consequences of Socioeconomic Inequalities*. New York, NY: Russell Sage; 2012; Shonkoff, Boyce, and McEwen, “Neuroscience, molecular biology, and the childhood roots of health disparities: building a new framework for health promotion and disease prevention,” *JAMA*, 301(21):2252–2259 (2009). Brondolo, Gallo, and Myers. “Race, racism and health: disparities, mechanisms, and interventions,” *Journal of Behavioral Medicine*, 32(1):1–8 (2009)

⁵³ Farah, “Socioeconomic status and the brain: prospects for neuroscience-informed policy,” *Nature Reviews Neuroscience* 19, 428–438, p. 433

⁵⁴ Evans, Farah, and Hackman, “Early Childhood Poverty and Adult Executive Functioning: Distinct, Mediating Pathways for Different Domains of Executive Functioning,” *Developmental Science*, January 2021.

⁵⁵ Farah, et al. “Childhood poverty: specific associations with neurocognitive development.” *Brain Research*, 2006; 1110(1):166–174 (2006); Hackman, Farah, and Meaney, “Socioeconomic status and the brain: mechanistic insights from human and animal research.” *Nature Reviews. Neuroscience*, 11, 651–659 (2010).

⁵⁶ <https://developingchild.harvard.edu/resources/inbrief-the-science-of-resilience/>

⁵⁷ National Scientific Council on the Developing Child (2015). *Supportive Relationships and Active Skill-Building Strengthen the Foundations of Resilience: Working Paper No. 13*. Retrieved from www.developingchild.harvard.edu.

⁵⁸ Evidence-based home visiting to enhance child health and child development and to support families, <https://www.apa.org/pi/families/resources/newsletter/2012/07/home-visiting>

⁵⁹ Saunders, et al., “An Evaluation of Parent Training Interventions in Scotland: The Psychology of Parenting Project (PoPP),” *Journal of Child and Family Studies*, 29:3369–3380 (2020).

⁶⁰ <https://www.nap.edu/catalog/21868/parenting-matters-supporting-parents-of-children-ages-0-8>

⁶¹ <https://heckmanequation.org/resource/the-heckman-curve/>

⁶² <https://evidencebasedprograms.org/document/abecedarian-project-evidence-summary/> and <https://highscope.org/perry-preschool-project/>

⁶³ Schanzenbach and Bauer, “The long-term impact of the Head Start program,”

<https://www.brookings.edu/research/the-long-term-impact-of-the-head-start-program/>

⁶⁴ Bethell, et al., “Adverse Childhood Experiences, Resilience and Mindfulness-Based Approaches: Common Denominator Issues for Children with Emotional, Mental, or Behavioral Problems,” *Child and Adolescent Psychiatric Clinics of North America*, 25: 139-156 (2016). <https://www.ncbi.nlm.nih.gov/entrez/eutils/elink.fcgi?dbfrom=pubmed&retmode=ref&cmd=prlinks&id=26980120> .

⁶⁵ https://www.samhsa.gov/sites/default/files/programs_campaigns/childrens_mental_health/atc-whitepaper-040616.pdf

⁶⁶ Larkin , Felitti and Anda, “Social Work and Adverse Childhood Experiences Research: Implications for Practice and Health Policy,” *Social Work in Public Health*, 29:1, 1-16 (2014), DOI: 10.1080/19371918.2011.619433.

⁶⁷ Center for Community Resilience, 2020 Annual Report.

<https://ccr.publichealth.gwu.edu/sites/ccr.publichealth.gwu.edu/files/CCR%202020%20Annual%20Report%20Final.pdf>, p. 1; see also Ellis and .Dietz, “A New Framework for Addressing

Adverse Childhood and Community Experiences: The Building Community Resilience Model,” *Academic Pediatrics*, 17, 7S: S86-S93 (2017).

⁶⁸ <https://ccr.publichealth.gwu.edu/sites/ccr.publichealth.gwu.edu/files/CCR%202020%20Annual%20Report%20Final.pdf>

⁶⁹ <https://developingchild.harvard.edu/science/key-concepts/resilience/>

⁷⁰ <https://ccr.publichealth.gwu.edu/resilience-catalysts>

⁷¹ Longhi, Brown, and Reed, “Community-Wide Resilience Mitigates Adverse Childhood Experiences on Adult and Youth Health, School/Work, and Problem Behaviors,” *American Psychologist*, 76: 216-219 (2021).

⁷² https://ncsacw.samhsa.gov/userfiles/files/SAMHSA_Trauma.pdf

⁷³ https://www.cdc.gov/cpr/infographics/6_principles_trauma_info.htm

⁷⁴ <https://www.edutopia.org/article/bringing-restorative-practices-to-your-school-laura-mcclure>

⁷⁵ <https://www.ctipp.org>

⁷⁶ Sweetland, Reframing Childhood Adversity: Promoting Upstream Approaches, <https://www.frameworksinstitute.org/publication/reframing-childhood-adversity-promoting-upstream-approaches/>

⁷⁷ <https://heckmanequation.org/resource/the-heckman-curve/>

⁷⁸ Felitti, Anda, and colleagues, “Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults. The Adverse Childhood Experiences (ACE) Study,” *Am. J. Prev. Med.* 1998 May;14(4): 245-58, p. 255;

[https://www.ajpmonline.org/article/S0749-3797\(98\)00017-8/pdf](https://www.ajpmonline.org/article/S0749-3797(98)00017-8/pdf)

⁷⁹ https://developingchild.harvard.edu/resources/three-early-childhood-development-principles-improve-child-family-outcomes/?utm_source=newsletter&utm_campaign=april_2021

⁸⁰ Harvard Center on the Developing Child, Executive Function and Self-Regulation,

<https://developingchild.harvard.edu/science/key-concepts/executive-function/>

⁸¹ <https://www.cdc.gov/violenceprevention/pdf/preventingACES.pdf>

⁸² <https://blueshieldcafoundation.org/publications/prevention-institute-beyond-screening-achieving-californias-bold-goal-reducing-exposure>

⁸³ <https://www.nap.edu/catalog/25466/vibrant-and-healthy-kids-aligning-science-practice-and-policy-to>

⁸⁴ Harvard Center on the Developing Child, From Best Practices to Breakthrough Impacts,

https://46y5eh11fhgw3ve3ytpwxt9r-wpengine.netdna-ssl.com/wp-content/uploads/2016/05/From_Best_Practices_to_Breakthrough_Impacts-4.pdf

⁸⁵ https://developingchild.harvard.edu/resources/three-early-childhood-development-principles-improve-child-family-outcomes/?utm_source=newsletter&utm_campaign=april_2021

⁸⁶ Shonkoff, Slopen, and Williams, “Early Childhood Adversity, Toxic Stress, and the Impacts of Racism on the Foundations of Health,” *Annual Review of Public Health*, 42:115–34 (2021),

<https://www.annualreviews.org/doi/full/10.1146/annurev-publhealth-090419-101940>.

⁸⁷ <https://www.childtrends.org/blog/adverse-childhood-experiences-different-than-child-trauma-critical-to-understand-why>

⁸⁸ <https://www.childtrends.org/blog/adverse-childhood-experiences-different-than-child-trauma-critical-to-understand-why>

⁸⁹ Bethell, et al., “Positive Childhood Experiences and Adult Mental and Relational Health in a Statewide Sample Associations Across Adverse Childhood Experiences Levels,” *JAMA Pediatrics*, (online Sept., 2019); Crouch, et al., “Racial/ethnic differences in positive childhood experiences across a national sample,” *Child Abuse & Neglect* 115: (online Feb., 2021); Whitaker, Dearth-Wesley and Herman, “Childhood family connection and adult flourishing: associations across levels of childhood adversity,” *Academic Pediatrics*, (online March, 2021).

⁹⁰ Anda, Portman and Brown, “Inside the Adverse Childhood Experience Score: Strengths, Limitations, and Misconceptions,” *American Journal of Preventive Medicine*, 59: P293-P295 (2020), [https://www.ajpmonline.org/article/S0749-3797\(20\)30058-1/fulltext](https://www.ajpmonline.org/article/S0749-3797(20)30058-1/fulltext) at P. 294).

⁹¹ Baldwin, et al., “Population vs Individual Prediction of Poor Health From Results of Adverse Childhood Experiences Screening,” *JAMA Pediatrics* (online January, 2021).

⁹² California Department of Public Health, Adverse Childhood Experience Data Report: Behavioral Risk Surveillance System (2011-2017) (2020) https://www.cdph.ca.gov/Programs/CCDC/DCDC/SACB/CDPH%20Document%20Library/Essentials%20for%20Childhood%20Initiative/ACEs-BRFSS-Update_final%2010.26.20.pdf