Executive Summary


Adverse Childhood Experiences (ACEs) and toxic stress represent an urgent public health crisis with wide-reaching health and societal impacts, from heart disease to homelessness. According to recent data, 62.3% of California adults have experienced at least one ACE, and 16.3% have experienced four or more ACEs (2011-2017 data).

ACEs are 10 categories of adversities in three domains experienced by age 18 years: child abuse (physical, emotional, or sexual); neglect (physical or emotional); and household challenges (growing up with household incarceration, mental illness, substance dependence, parental separation or divorce, or intimate partner violence).

The high prevalence of ACEs, along with the intergenerational accumulation of impacts for individuals, families, and communities, have resulted in a public health crisis, with the greatest impacts on already disadvantaged individuals and communities. The time to act on this crisis is now.

ACEs are strongly associated, in a dose-response fashion, with some of the most common and serious health and social conditions facing our society, including nine of the 10 leading causes of death in the United States (US, Table 1), and with earlier mortality.

Table 1. Association of ACEs with leading causes of death in the US

<table>
<thead>
<tr>
<th>Leading causes of death in the U.S. (2017)</th>
<th>Odds ratios for ≥ 4 ACEs (relative to no ACEs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Heart disease</td>
<td>2.1</td>
</tr>
<tr>
<td>2. Cancer</td>
<td>2.3</td>
</tr>
<tr>
<td>3. Accidents (unintentional injuries)</td>
<td>2.6</td>
</tr>
<tr>
<td>4. Chronic lower respiratory disease</td>
<td>3.1</td>
</tr>
<tr>
<td>5. Stroke</td>
<td>2.0</td>
</tr>
<tr>
<td>6. Alzheimer’s disease or dementia</td>
<td>11.2</td>
</tr>
<tr>
<td>7. Diabetes</td>
<td>1.4</td>
</tr>
<tr>
<td>8. Influenza and pneumonia</td>
<td>unknown</td>
</tr>
<tr>
<td>9. Kidney disease</td>
<td>1.7</td>
</tr>
<tr>
<td>10. Suicide (attempts)</td>
<td>37.5</td>
</tr>
</tbody>
</table>

In addition, ACEs are associated with our most pressing social problems, including learning, developmental, and behavior problems, high school noncompletion, unemployment, poverty, homelessness, and felony charges—many of which can serve as additional vectors for the intergenerational transmission of adversity.\textsuperscript{11,12,15-21}

When their root causes are inadequately addressed, the health and other effects of ACEs are also very costly.\textsuperscript{3,5,22,23} For example, a recent estimate based on 2013 expenditures revealed that ACEs cost California $112.5 billion overall annually ($10.5 billion in personal healthcare spending and $102 billion in years of productive life lost), and may cost over $1.2 trillion in the next 10 years. This estimate only considers impacts from eight common ACE-Associated Health Conditions (AAHCs): asthma, arthritis, chronic obstructive pulmonary disorder (COPD), depression, cardiovascular disease, smoking, heavy drinking, and obesity.\textsuperscript{3,4} The real cost impacts are likely to be much greater.

ACEs may cost over $1.2 trillion in the next 10 years in CA

In 2020, multiple simultaneous public health emergencies have laid bare the substantial structural and systemic forces that imperil health and well-being. These include the coronavirus disease 2019 (COVID-19) pandemic; the devastating impacts of climate change, including wildfires; and the deep-rooted systemic racism in our society, which has been brought into sharper focus. It is clear that vulnerable and systematically overlooked communities bear the brunt of each new crisis, and that these communities deserve a much more effective set of buffering systems and supports.

ACEs impact all communities; however, some populations are affected disproportionately.

The original ACE Study was conducted among a population that was largely White, middle class, college-educated, and privately insured.\textsuperscript{7,8} Subsequent studies have found a higher prevalence of ACEs in individuals who are racially marginalized (Black, Latinx, Native American, or multi-racial), high school nongraduates, unemployed or unable to work, in lower income brackets, uninsured or underinsured, involved in the justice system, women, and/or identify as lesbian, gay, or bisexual.\textsuperscript{4,11,12,24-31}

To truly transform the negative outcomes associated with ACEs, California, as well as other states and nations, must act intentionally and inclusively to address the structural factors that result in disparities in health, social, and economic outcomes and opportunities.
THE TOXIC STRESS RESPONSE

We now understand that a key mechanism by which ACEs lead to increased health risks is through a health condition called the **toxic stress response**.\(^5\,\text{–}\,\text{12}\)

When significant adversity is experienced during critical and sensitive periods of early life development, without adequate buffering protections of safe, stable, and nurturing relationships and environments, it can lead to prolonged activation of the biological stress response, and to long-term disruption of neuro-endocrine-immune-metabolic and genetic regulatory mechanisms. These biological changes can also be transmitted to the next generation.\(^32\,\text{–}\,\text{33}\)

More research is needed to precisely identify clinically useful biomarkers to diagnose and follow risk of toxic stress longitudinally, as well as more specific therapeutic targets.

LINKS TO CORONAVIRUS DISEASE 2019 (COVID-19)

ACEs (acting through the toxic stress response) increase the burden of AAHCs such as heart disease, diabetes, kidney disease and obesity, which, in turn, predispose to a more severe COVID-19 disease and increased risk of death. Further, those with a history of ACEs may also be more susceptible to the health effects of acute or chronic stress. Thus, the biological condition of being stress-sensitized also increases the risk of stress-related chronic disease exacerbations associated with living through the pandemic.

Exposure to ACEs can also set up transmission of health risks across generations by altering gene expression (epigenetics) in parents to be, which can affect the development and health of their children, and future generations to come.\(^32\,\text{–}\,\text{33}\) Intergenerational transmission of toxic stress physiology can also perpetuate and exacerbate socially rooted inequities in health, achievement, socioeconomic mobility, and mortality.\(^11\,\text{–}\,\text{17}\,\text{,}\,34\,\text{–}\,\text{35}\)

ADDITIONAL RISK FACTORS FOR TOXIC STRESS

In addition to the original 10 ACEs, other adversities, including racism and poverty, are also risk factors for developing a toxic stress response.\(^34\,\text{–}\,\text{43}\) Further research is currently underway to assess the extent to which these and other important social determinants of health, such as food and housing insecurity, may act directly through the toxic stress pathway or may mediate or modulate the toxic stress response.

For more detail and information, read Roadmap for Resilience: The California Surgeon General’s Report on Adverse Childhood Experiences, Toxic Stress, and Health at [https://osg.ca.gov/](https://osg.ca.gov/)
PRIMARY, SECONDARY, AND TERTIARY PREVENTION OF ACES AND TOXIC STRESS

This first California Surgeon General’s report serves a blueprint for how to transform outcomes by engaging a cross-sector approach to cutting the burden of ACEs and toxic stress in half in a generation, using California’s nation-leading efforts as an exemplar.

A public health approach to preventing ACEs and healing toxic stress involves prevention at three levels—primary, secondary, and tertiary—or prevention, early detection, and early intervention, to reverse or prevent further harms. None of these strategies is sufficient alone, and each extends the reach of the others. The synergistic effect of primary, secondary and tertiary prevention is illustrated by the US response to the human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS) epidemic. Coordinated efforts for public awareness and prevention, testing for early detection, and effective treatment were all necessary for achieving a reduction in the AIDS mortality rate of more than 87% in one generation (from 50,628 deaths in 1995 to 6,465 deaths in 2015).

This report specifies a sector-specific and cross-sector blueprint for achieving these goals at the state level, in the service of prioritizing prevention, upstream strategies, equity in outcomes, and enhancing coordination across the following sectors:

| Healthcare | Public Health | Social Services | Early Childhood | Education | Justice |

PRIMARY PREVENTION

These efforts target healthy individuals and aim to prevent harmful exposures from ever occurring. In the example of HIV, primary prevention includes promoting public education, condom use, and needle exchange practices to prevent acquisition of HIV during sex or other high-risk activities.47

For ACEs and toxic stress, primary prevention strategies are designed to prevent and reduce the likelihood of ACEs and other risk factors for toxic stress from ever occurring. Investments in cross-sector policies and programs that promote stable, safe, and nurturing relationships and environments, and optimizing the systems and structural conditions that “set the odds” for health and well-being. These include:48-50

- Mechanisms to address poverty and food insecurity, including economic supports and family-friendly work policies like paid family leave;
- Models to enhance parenting efficacy, resilience, attachment, and family bonds, including high-quality child care and early childhood home visitation;
- Public education campaigns to raise awareness of ACEs and toxic stress, and to arm the public with science-based solutions for reducing the impact of ACEs on children and adults, paired with policy strategies to support safe, stable, and nurturing relationships and environments.
- Access to high-quality mental and physical healthcare, including family-centered treatments;
- Enabling opportunities for stress-buffering activities such as access to nature, mindfulness activities, physical activity, and sufficient and high-quality sleep;
- Providing high-quality early and ongoing learning opportunities, including for social-emotional learning, executive function skills, healthy relationship skills, and responding to challenges;
- Cross-sector and sector-specific training in trauma-informed tools, approaches, and strategies for all providers engaging with children and families; and
- Public health surveillance and policy-oriented applications of population-level indicators of exposure to ACEs and impacts of toxic stress.
SECONDARY PREVENTION

These efforts involve “screening to identify diseases in the earliest stages, before the onset of signs and symptoms, through measures such as mammography and regular blood pressure testing.” In the example of HIV prevention, this includes HIV testing to determine who is HIV+ and might benefit from treatment to prevent opportunistic infections.

In the case of ACEs and toxic stress, ACE screening can identify individuals at increased risk of having a toxic stress response and target interventions early, when they are likely to be more effective and less expensive. There is a consensus of scientific evidence that early detection and early intervention improves outcomes related to toxic stress.

California’s nation-leading ACEs Aware Initiative has trained over 15,000 healthcare providers to date to screen for ACEs, to recognize and respond to clinical evidence of toxic stress in primary care, and to address the role of toxic stress as a root cause for many chronic diseases. The ACEs Aware program, which reimburses Medi-Cal providers for conducting screening and response, is the most comprehensive approach in the nation for enacting large-scale screening and intervention for toxic stress in the healthcare sector (Figure 1).

Early detection of ACEs and other risk factors for toxic stress provides an opportunity to strengthen existing protective factors, initiate early buffering interventions, and ultimately prevent toxic stress physiology and downstream consequences, such as earlier-onset, more severe AAHCs or toxic stress-related social consequences.

The report outlines how each sector can coordinate to enhance early detection, including training of cross-sector personnel such as educators, law enforcement, and courts, to recognize the signs of toxic stress and refer affected individuals for appropriate care.

Figure 1. The spectrum of implementation strategies needed to achieve prevention, practice transformation, and research and innovation in addressing toxic stress.

Reproduced with permission from the Center for Youth Wellness.

TERTIARY PREVENTION

These efforts target individuals who have already developed a disease or social outcome, and aim to lessen the severity, progression, or complications associated with that outcome. In the example of HIV, tertiary prevention evolved from treatment of opportunistic infections in the 1980s to the modern era of more than 25 sophisticated antiretrovirals developed through the proliferation of basic, clinical, and translational research on HIV biology. As a result, AIDS-related deaths in the United States have declined by more than 87% from their peak in 1995.46

For ACEs and toxic stress, tertiary prevention targets individuals who have experienced ACEs and have developed consequences of the toxic stress response, such as earlier-onset or more severe AAHCs. The goal is to regulate the stress response system and counter-act the disruptions in neuro-endocrine-immune-metabolic and genetic regulatory function that characterize the toxic stress response.

Robust evidence demonstrates that enhancing supportive relationships, regular exercise, access to nature, sufficient and high-quality sleep, balanced nutrition, mindfulness practices, and mental and behavioral healthcare, can mitigate the neurologic, endocrine, immune, metabolic, and genetic regulatory derangements of the toxic stress response.54-56 Tertiary prevention of toxic stress in one generation can equate to primary prevention in the next—treating toxic stress in parents can prevent the passing down of health risks to the next generation.

Tertiary prevention involves interventions beyond the clinical setting.

This report outlines how each sector—healthcare, public health, social services, early childhood, education, and justice—can contribute to healing the harmful effects of ACEs and toxic stress. To truly achieve practice and population health transformation, coordinating a cross-sector network of highly effective and transformative referral and service options is imperative.

CONCLUSION

This report highlights the exciting work happening across California to recognize and respond to ACEs and toxic stress as a public health crisis. It also serves as a roadmap for other states or nations to replicate and innovate from California's experiences.

Examples of key policy tools for supporting California's public health approach to addressing ACEs and toxic stress are highlighted, including investments in:

- **Leadership**, such as Executive Order N-02-19,\textsuperscript{57} creating the Office of the California Surgeon General;

- **Legislation** to support early identification and early and effective intervention for ACEs and toxic stress;

- **Funding** for the ACEs Aware initiative and cross-sector supports for primary, secondary and tertiary prevention of toxic stress; and

- **Biomedical research**, such as funding for the California Initiative to Advance Precision Medicine\textsuperscript{58} to advance novel precision medicine approaches to assessing for and treating toxic stress, to take healthcare innovation to the next level.

While much work lies ahead, this California Surgeon General's report on ACEs and toxic stress provides a framework for shared understanding, shared language, and a shared vision with which state and local leaders can align cross-sector efforts for prevention, early detection, and effective intervention.
REFERENCES


For more detail and information, read *Roadmap for Resilience: The California Surgeon General’s Report on Adverse Childhood Experiences, Toxic Stress, and Health* at [https://osg.ca.gov/](https://osg.ca.gov/)


For more detail and information, read *Roadmap for Resilience: The California Surgeon General’s Report on Adverse Childhood Experiences, Toxic Stress, and Health* at [https://osg.ca.gov/](https://osg.ca.gov/)


47. Center for Substance Abuse Treatment, Substance Abuse and Mental Health Services Administration. Substance abuse treatment for persons with HIV/AIDS. (Treatment improvement protocol (TIP) series, no. 37.). Rockville, MD: Substance Abuse and Mental Health Services Administration, 2000.


For more detail and information, read *Roadmap for Resilience: The California Surgeon General's Report on Adverse Childhood Experiences, Toxic Stress, and Health* at https://osg.ca.gov/
