

Executive Summary



Roadmap for Resilience: The California Surgeon General’s Report on Adverse Childhood Experiences, Toxic Stress, and Health

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.¹⁻⁵ 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).⁶

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).⁷⁻⁹

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.^{1,10-14}

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

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

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/>



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.^{1,11,12,15-21}

When their root causes are inadequately addressed, the health and other effects of ACEs are also very costly.^{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

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

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.^{3,4} The real cost impacts are likely to be much greater.

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.^{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.^{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**.⁶⁻¹²

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.^{32,33}

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.^{32,33} Intergenerational transmission of toxic stress physiology can also perpetuate and exacerbate socially rooted inequities in health, achievement, socioeconomic mobility, and mortality.^{11,13,16,17,34,35}

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.^{34,36-43} 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.



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.^{44,45} **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).⁴⁶

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
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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.



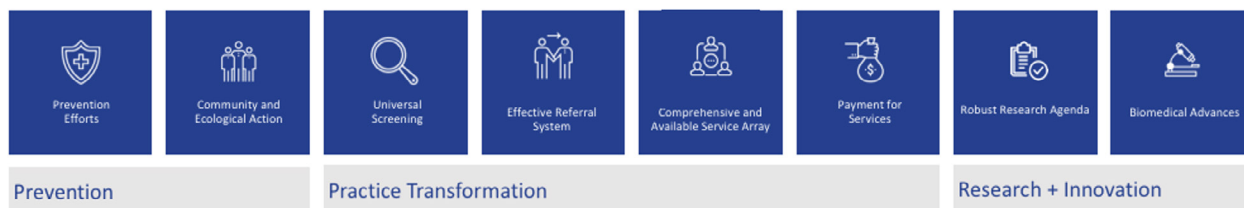
SECONDARY PREVENTION

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.”⁴⁴ In the example of HIV prevention, this includes HIV testing to determine who is HIV+ and might benefit from treatment to prevent opportunistic infections.^{47,51,52}

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.^{48,49,53} 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.⁶⁻¹² 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.



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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-02-19,⁵⁷ 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**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

1. Hughes K, Bellis MA, Hardcastle KA, et al. The effect of multiple Adverse Childhood Experiences on health: A systematic review and meta-analysis. *The Lancet Public Health* 2017; **2**(8): e356-e66.
2. Roos LE, Mota N, Afifi TO, Katz LY, Distasio J, Sareen J. Relationship between Adverse Childhood Experiences and homelessness and the impact of axis I and II disorders. *American Journal of Public Health* 2013; **103**(S2): S275-S81.
3. Miller TR, Waehrer GM, Oh DL, et al. Adult health burden and costs in California during 2013 associated with prior Adverse Childhood Experiences. *PLoS One* 2020; **15**(1): e0228019.
4. Waehrer GM, Miller TR, Silverio Marques SC, Oh DL, Burke Harris N. Disease burden of Adverse Childhood Experiences across 14 states. *PLoS One* 2020; **15**(1): e0226134.
5. Bellis MA, Hughes K, Ford K, Ramos Rodriguez G, Sethi D, Passmore J. Life course health consequences and associated annual costs of Adverse Childhood Experiences across Europe and North America: A systematic review and meta-analysis. *The Lancet Public Health* 2019; **4**(10): e517-e28.
6. California Department of Public Health, Injury and Violence Prevention Branch (CDPH/IVPB), California Department of Social Services, Office of Child Abuse Prevention, California Essentials for Childhood Initiative, University of California Davis, Violence Prevention Research Program, Firearm Violence Research Center. Adverse Childhood Experiences data report: Behavioral Risk Factor Surveillance System (BRFSS), 2011-2017: An overview of Adverse Childhood Experiences in California. California: California Department of Public Health and the California Department of Social Services, 2020.
7. Felitti VJ, Anda RF, Nordenberg D, et al. Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: The Adverse Childhood Experiences (ACE) Study. *American Journal of Preventive Medicine* 1998; **14**(4): 245-58.
8. Dube SR, Felitti VJ, Dong M, Giles WH, Anda RF. The impact of Adverse Childhood Experiences on health problems: Evidence from four birth cohorts dating back to 1900. *Preventive Medicine* 2003; **37**(3): 268-77.
9. Anda RF, Felitti VJ, Bremner JD, et al. The enduring effects of abuse and related adverse experiences in childhood: A convergence of evidence from neurobiology and epidemiology. *European Archives of Psychiatry and Clinical Neuroscience* 2006; **256**(3): 174-86.
10. Centers for Disease Control and Prevention. Ten leading causes of death and injury, United States, 2017. 2017. <https://www.cdc.gov/injury/wisqars/LeadingCauses.html> (accessed Sep 15, 2020).
11. Merrick MT, Ford DC, Ports KA, et al. Vital signs: Estimated proportion of adult health problems attributable to Adverse Childhood Experiences and implications for prevention—25 states, 2015-2017. *Morbidity and Mortality Weekly Report* 2019; **68**(44).
12. Center for Youth Wellness. A hidden crisis: Findings on Adverse Childhood Experiences in California 2014.



13. Brown DW, Anda RF, Tiemeier H, et al. Adverse Childhood Experiences and the risk of premature mortality. *American Journal of Preventive Medicine* 2009; **37**(5): 389-96.
14. Petruccelli K, Davis J, Berman T. Adverse Childhood Experiences and associated health outcomes: A systematic review and meta-analysis. *Child Abuse & Neglect* 2019; **97**: 104127.
15. Jäggi LJ, Mezuk B, Watkins DC, Jackson JS. The relationship between trauma, arrest, and incarceration history among Black Americans: Findings from the National Survey of American Life. *Society and Mental Health* 2016; **6**(3): 187-206.
16. Giovanelli A, Reynolds AJ, Mondri CF, Ou S-R. Adverse Childhood Experiences and adult well-being in a low-income, urban cohort. *Pediatrics* 2016; **137**(4): e20154016.
17. Cheng TL, Johnson SB, Goodman E. Breaking the intergenerational cycle of disadvantage: The three generation approach. *Pediatrics* 2016; **137**(6).
18. Burke NJ, Hellman JL, Scott BG, Weems CF, Carrion VG. The impact of Adverse Childhood Experiences on an urban pediatric population. *Child Abuse & Neglect* 2011; **35**(6): 408-13.
19. Metzler M, Merrick MT, Klevens J, Ports KA, Ford DC. Adverse Childhood Experiences and life opportunities: Shifting the narrative. *Children and Youth Services Review* 2017; **72**: 141-9.
20. Danese A, Moffitt TE, Harrington H, et al. Adverse Childhood Experiences and adult risk factors for age-related disease: Depression, inflammation, and clustering of metabolic risk markers. *Archives of Pediatrics & Adolescent Medicine* 2009; **163**(12): 1135-43.
21. Poulton R, Moffitt TE, Silva PA. The Dunedin Multidisciplinary Health and Development Study: Overview of the first 40 years, with an eye to the future. *Social Psychiatry and Psychiatric Epidemiology* 2015; **50**(5): 679-93.
22. Fang X, Brown DS, Florence CS, Mercy JA. The economic burden of child maltreatment in the United States and implications for prevention. *Child Abuse & Neglect* 2012; **36**(2): 156-65.
23. Safe & Sound. The economics of child abuse: A study of California: Safe & Sound, 2019.
24. Morris G, Berk M, Maes M, Carvalho AF, Puri BK. Socioeconomic deprivation, Adverse Childhood Experiences and medical disorders in adulthood: Mechanisms and associations. *Molecular Neurobiology* 2019; **56**(8): 5866-90.
25. Miller GE, Chen E, Parker KJ. Psychological stress in childhood and susceptibility to the chronic diseases of aging: Moving toward a model of behavioral and biological mechanisms. *Psychological Bulletin* 2011; **137**(6): 959-97.
26. Merrick MT, Ford DC, Ports KA, Guinn AS. Prevalence of Adverse Childhood Experiences from the 2011-2014 Behavioral Risk Factor Surveillance System in 23 states. *JAMA Pediatrics* 2018; **172**(11): 1038-44.



27. Maguire-Jack K, Lanier P, Lombardi B. Investigating racial differences in clusters of Adverse Childhood Experiences. *American Journal of Orthopsychiatry* 2019.
28. Liu SR, Kia-Keating M, Nylund-Gibson K, Barnett ML. Co-occurring youth profiles of Adverse Childhood Experiences and protective factors: Associations with health, resilience, and racial disparities. *American Journal of Community Psychology* 2019.
29. Liu SR, Kia-Keating M, Nylund-Gibson K. Patterns of adversity and pathways to health among White, Black, and Latinx youth. *Child Abuse & Neglect* 2018; **86**: 89-99.
30. Baglivio MT, Swartz K, Sayedul Huq M, Sheer A, Hardt NS. The prevalence of Adverse Childhood Experiences (ACEs) in the lives of juvenile offenders. *Journal of Juvenile Justice* 2014; **3**: 1-23.
31. Mersky JP, Janczewski CE, Topitzes J. Rethinking the measurement of adversity: Moving toward second-generation research on Adverse Childhood Experiences. *Child Maltreatment* 2017; **22**(1): 58-68.
32. Buss C, Entringer S, Moog NK, et al. Intergenerational transmission of maternal childhood maltreatment exposure: Implications for fetal brain development. *Journal of the American Academy of Child and Adolescent Psychiatry* 2017; **56**(5): 373-82.
33. McGowan PO, Matthews SG. Prenatal stress, glucocorticoids, and developmental programming of the stress response. *Endocrinology* 2018; **159**(1): 69-82.
34. McEwen CA, McEwen BS. Social structure, adversity, toxic stress, and intergenerational poverty: An early childhood model. *Annual Review of Sociology* 2017; **43**(1): 445-72.
35. Hughes K, Bellis MA, Sethi D, et al. Adverse Childhood Experiences, childhood relationships and associated substance use and mental health in young Europeans. *European Journal of Public Health* 2019; **29**(4): 741-7.
36. Bailey ZD, Krieger N, Agénor M, Graves J, Linos N, Bassett MT. Structural racism and health inequities in the USA: Evidence and interventions. *The Lancet* 2017; **389**(10077): 1453-63.
37. Pachter LM, Coll CG. Racism and child health: A review of the literature and future directions. *Journal of developmental and behavioral pediatrics* 2009; **30**(3): 255-63.
38. Paradies Y, Ben J, Denson N, et al. Racism as a determinant of health: A systematic review and meta-analysis. *PLoS One* 2015; **10**(9): e0138511.
39. Priest N, Paradies Y, Trenerry B, Truong M, Karlsen S, Kelly Y. A systematic review of studies examining the relationship between reported racism and health and wellbeing for children and young people. *Social Science & Medicine* 2013; **95**: 115-27.
40. Trent M, Dooley DG, Dougé J. The impact of racism on child and adolescent health. *Pediatrics* 2019; **144**(2): e20191765.
41. Johnson SB, Riis JL, Noble KG. State of the art review: Poverty and the developing brain. *Pediatrics* 2016; **137**(4): e20153075-e.



42. Miller GE, Chen E. Unfavorable socioeconomic conditions in early life presage expression of proinflammatory phenotype in adolescence. *Psychosomatic Medicine* 2007; **69**(5): 402-9.
43. Miller GE, Chen E, Fok AK, et al. Low early-life social class leaves a biological residue manifested by decreased glucocorticoid and increased proinflammatory signaling. *Proceedings of the National Academy of Sciences* 2009; **106**(34): 14716-21.
44. Centers for Disease Control and Prevention, National Center for Environmental Health. Picture of America –Our health and environment: Prevention, 2014.
45. Kisling LA, M Das J. Prevention strategies. StatPearls Publishing, Treasure Island (FL); 2020.
46. Centers for Disease Control and Prevention. CDC WONDER: Underlying cause of death dataset, 1999-2018. 2020. <https://wonder.cdc.gov/controller/saved/D76/D90F886> (accessed Sep 15, 2020).
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.
48. Centers for Disease Control and Prevention. Preventing Adverse Childhood Experiences: Leveraging the best available evidence. Atlanta, GA: National Center for Injury Prevention and Control, Centers for Disease Control and Prevention, 2019.
49. National Academies of Sciences, Engineering, and Medicine. Vibrant and healthy kids: Aligning science, practice, and policy to advance health equity. Washington, DC: The National Academies Press, 2019.
50. Bethell CD, Solloway MR, Guinosso S, et al. Prioritizing possibilities for child and family health: An agenda to address Adverse Childhood Experiences and foster the social and emotional roots of well-being in pediatrics. *Academic Pediatrics* 2017; **17**(7): S36-S50.
51. Centers for Disease Control and Prevention. Pre-exposure prophylaxis (PrEP). 2020. <https://www.cdc.gov/hiv/basics/prep.html> (accessed Oct 20, 2020).
52. Department of Health and Human Services (DHHS) Panel on Antiretroviral Guidelines for Adults and Adolescents. Guidelines for the use of antiretroviral agents in adults and adolescents with HIV. Clinicalinfo, 2019.
53. Garner AS, Shonkoff JP, Committee on Psychosocial Aspects of Child and Family Health, Committee on Early Childhood, Adoption, and Dependent Care, Section on Developmental and Behavioral Pediatrics. Early childhood adversity, toxic stress, and the role of the pediatrician: Translating developmental science into lifelong health. *Pediatrics* 2012; **129**(1): e224-e31.
54. Gilgoff R, Singh L, Koita K, Gentile B, Marques SS. Adverse Childhood Experiences, outcomes, and interventions. *Pediatric Clinics* 2020; **67**(2): 259-73.
55. Korotana LM, Dobson KS, Pusch D, Josephson T. A review of primary care interventions to improve health outcomes in adult survivors of adverse childhood experiences. *Clinical Psychology Review* 2016; **46**: 59-90.



56. Purewal Boparai SK, Au V, Koita K, et al. Ameliorating the biological impacts of childhood adversity: A review of intervention programs. *Child Abuse & Neglect* 2018; **81**: 82-105.
57. Governor of California. Executive Order N-02-19. 2019.
58. Governor's Office of Planning and Research. California Initiative to Advance Precision Medicine. 2020. <https://opr.ca.gov/ciapm/> (accessed October 6, 2020).