March 23, 2022

The Power of Science: The Journey to Cut ACEs and Toxic Stress by Half in a Generation

Dr. Nadine Burke Harris, MD, MPH, FAAP
California Surgeon General

ACES & TOXIC STRESS ARE A PUBLIC HEALTH

CRISIS

EXPOSURE TO ACES DURING COVID-19

- More intense exposure to ACEs (e.g. substance misuse, intimate partner violence) and toxic stress;
- Reduction in child abuse reports;
- Increase in substance use overdose deaths;
- Significant increase in mental health concerns among children and adults; and
- Communities of color experience disproportionate rates of illness and death from COVID-19.

PUBLIC HEALTH EMERGENCIES HIGHLIGHT URGENT NEED FOR EFFECTIVE BUFFERING SYSTEMS AND SUPPORTS

- Multiple simultaneous public health emergencies
  - COVID-19 pandemic
  - Impacts of climate change – including wildfires
  - Sharper focus on the deep-rooted systemic racism in our society

- Vulnerable and systematically overlooked communities bear the brunt of each new crisis

Trauma-informed systems have never been more important!

ADVERSE CHILDHOOD EXPERIENCES (ACES)

Abuse

Physical | Emotional | Sexual

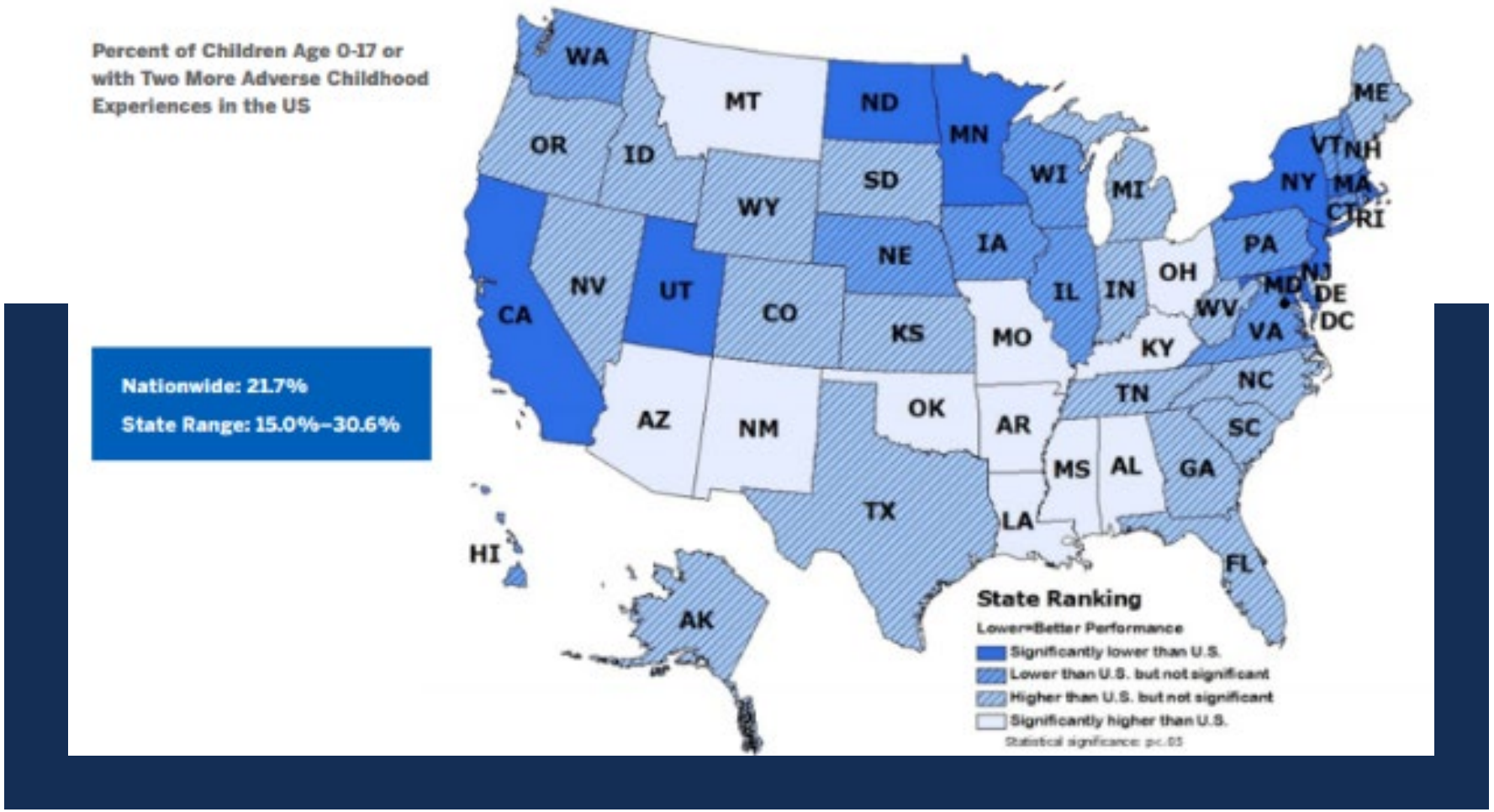
Neglect

Physical | Emotional

Household Challenges

Mental Illness | Intimate Partner Violence | Parental Separation or Divorce | Incarceration | Substance Misuse or Dependence

~2 IN 3 US ADULTS HAVE 1 ≥ ACE
~1 IN 8 HAVE ≥ 4 ACES



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ACES DRAMATICALLY INCREASE RISK FOR 8 OUT OF THE 10 LEADING CAUSES OF DEATH IN THE U.S.

Leading Causes of Death in the U.S., 2019		Odds Ratios for ≥ 4 ACEs (relative to no ACEs)
1	**Heart disease**	2.1
2	**Cancer**	2.3
3	COVID-19	Unknown
4	**Accidents** (unintentional injuries)	2.6
5	**Stroke**	2.0
6	**Chronic lower respiratory disease**	3.1
7	**Alzheimer's disease** or dementia	11.2
8	**Diabetes**	1.4
9	Influenza and pneumonia	Unknown
10	**Kidney disease**	1.7

ACE-ASSOCIATED HEALTH CONDITIONS: MATERNAL HEALTH

Symptom or Health Condition	Odds Ratio
Pregnancy loss	≥ 5 ACE: 1.7[2]
Low birth weight	≥ 5 ACE: 1.4[3]
Preterm birth	≥ 5 ACE: 1.5[3]
Mental health in pregnancy: **Prenatal depressive symptoms** **PTSD** **Postpartum depression risk**	≥ 1 ACE: 1.3[5] ≥ 3 ACEs: 1.3[6] ≥ 5 ACEs: 4.2[7] ≥1 ACE: 1.34[5]
Substance use in pregnancy: **Smoking** **Alcohol** **Illicit drugs**	≥ 3 ACEs: 2.6[8] ≥ 3 ACEs: 3.7[8] ≥ 3 ACEs: 6.1[8]
Undesired* pregnancy**	≥ 3 ACEs: 2.6[10]
Risk of adult male with ACEs impregnating a teen**	≥ 5 ACE: 2.6[1]

MATERNAL ACE ASSOCIATED HEALTH CONDITIONS

Symptom or Health Condition	Odds Ratio
One or more of these prenatal or perinatal risk factors: • **Diabetes during pregnancy** • **Hypertension during pregnancy** • **Thyroid problems during pregnancy** • **Injury to abdomen** • **Loss of fetal movement** • **Infant low birth weight** • **Gestation <37 weeks** • **Infant need for intensive care; need for oxygen/ventilation; or need for transfer to special hospital**	2.2[4] (≥ 4 ACE)
One or more of these psycho-social risk factors: • **Single parent** • **Teenage mother** • **Low family income** • **Low maternal education** • **Marital conflict** • **Maternal depression**	4.5[4] (≥ 4 ACE)

Madigan et. all J Pediatr 2017

COSTS ASSOCIATED WITH ACES

Cost to California	Cost to North America & Europe
$112.5 billion	**$1.3 trillion**
• Asthma • Arthritis • COPD • Depression • Smoking • Cardiovascular disease • Heavy Drinking • Obesity	• Smoking • Anxiety • Respiratory diseases • Cancer

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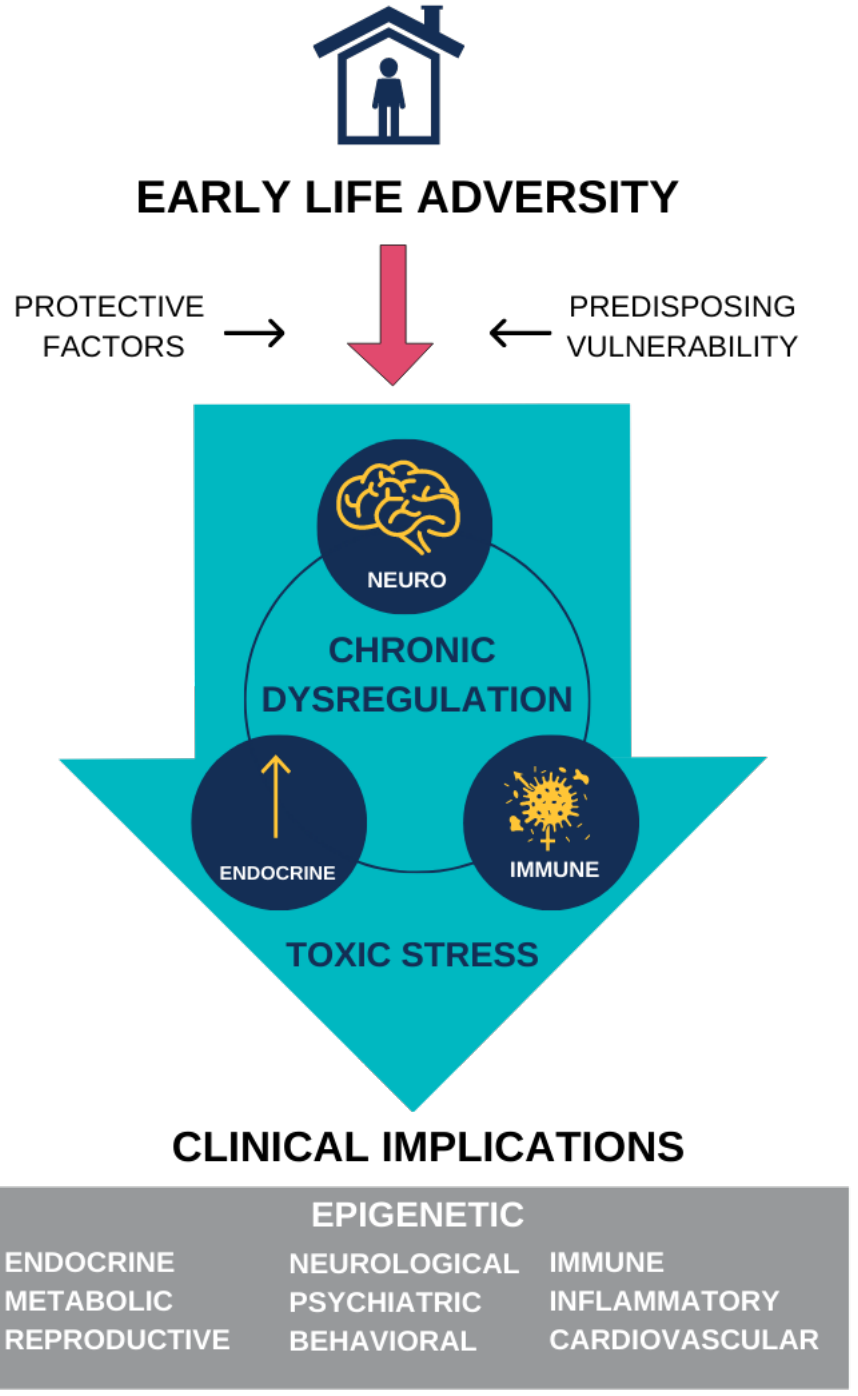
THE BIOLOGY OF ADVERSITY

THE TOXIC STRESS RESPONSE

"prolonged activation of the stress response systems that can disrupt the development of brain architecture and other organ systems, and increase the risk for stress-related disease and cognitive impairment, well into the adult years…"



BIOLOGICAL SYSTEMS DISRUPTED BY TOXIC STRESS

System	Mechanism(s)	Health Impact
Neurologic; Neuroendocrine	Dysregulation of SAM and HPA axes; autonomic imbalance	Difficulty modulating, sustaining, or dampening the stress response; heightened or blunted stress sensitivity
	Altered reactivity and size of the amygdala	Increased fear responsiveness, impulsivity, and aggression
	Inhibition of the prefrontal cortex	Impaired executive function, with poorer planning, decision-making, impulse control, and emotion regulation
	Hippocampal neurotoxicity	Difficulty with learning and memory
	VTA and reward processing dysregulation	Increased risky behaviors and risk of addiction
Immunologic; Inflammatory	Increased inflammatory markers, especially Th2 response; inhibition of anti-inflammatory pathways; gut microbiome dysbiosis	Increased risk of infection, auto-immune disorders, cancers, chronic inflammation; cardiometabolic disorders
Endocrine; Metabolic	Changes in growth hormone, thyroid hormone, and pubertal hormonal axes	Changes in growth, development, basal metabolism, and pubertal events
	Changes to leptin, ghrelin, lipid and glucose metabolism, and other metabolic pathways	Increased risk of overweight, obesity, cardiometabolic disorders, and insulin resistance
Epigenetic; Genetic	Sustained changes to the way DNA is read and transcribed	Mediates all aspects of the toxic stress response
	Telomere erosion, altered cell replication, and premature cell death	Increased risk for disease, cancer, and early mortality

Bhushan D, Kotz K, McCall J, Wirtz S, Gilgoff R, Dube SR, Powers C, Olson-Morgan J, Galeste M, Patterson K, Harris L, Mills A, Bethell C, Burke Harris N, Office of the California Surgeon General. *Roadmap for Resilience: The California Surgeon General's Report on Adverse Childhood Experiences, Toxic Stress, and Health*. Office of the California Surgeon General, 2020. DOI: 10.48019/PEAM8812.

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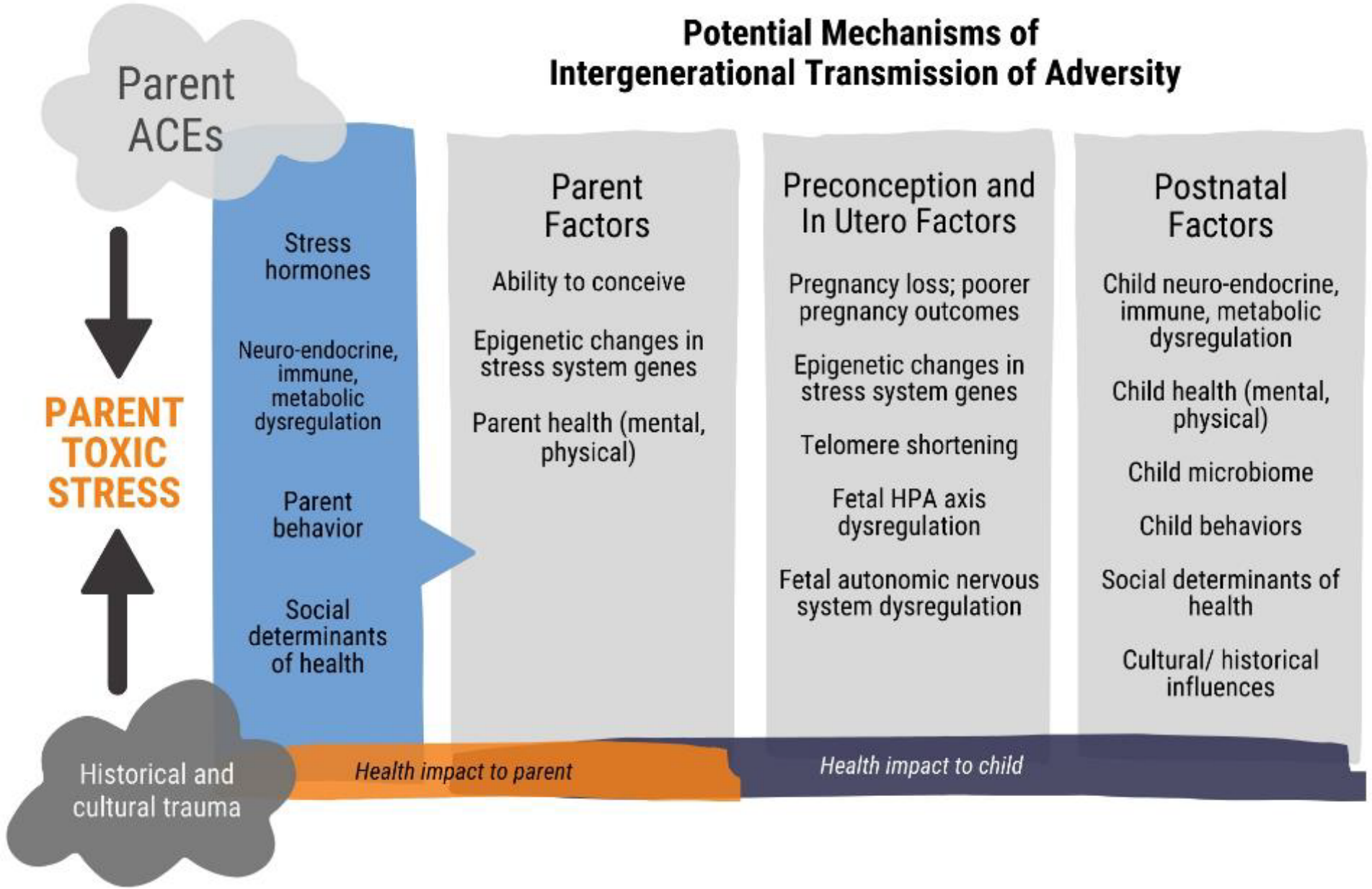
Potential Mechanisms of Intergenerational Transmission of Adversity



Source: Bhushan D, Kotz K, McCall J, Wirtz S, Gilgoff R, Dube SR, Powers C, Olson-Morgan J, Galeste M, Patterson K, Harris L, Mills A, Bethell C, Burke Harris N, Office of the California Surgeon General. Roadmap for Resilience: The California Surgeon General's Report on Adverse Childhood Experiences, Toxic Stress, and Health. Office of the California Surgeon General, 2020.

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ACES ARE NOT THE ONLY RISK FACTORS FOR TOXIC STRESS

Source: National Academies of Sciences, Engineering, and Medicine. Vibrant and healthy kids: Aligning science, practice, and policy to advance health equity. Washington, DC: National Academies Press, 2019.; Nelson CA, Bhutta ZA, Burke Harris N, Danese A, Samara M. Adversity in childhood is linked to mental and physical health throughout life. BMJ (Clinical Research Edition) 2020; 371: m3048.

THE EFFECTS OF ACES ARE PREVENTABLE

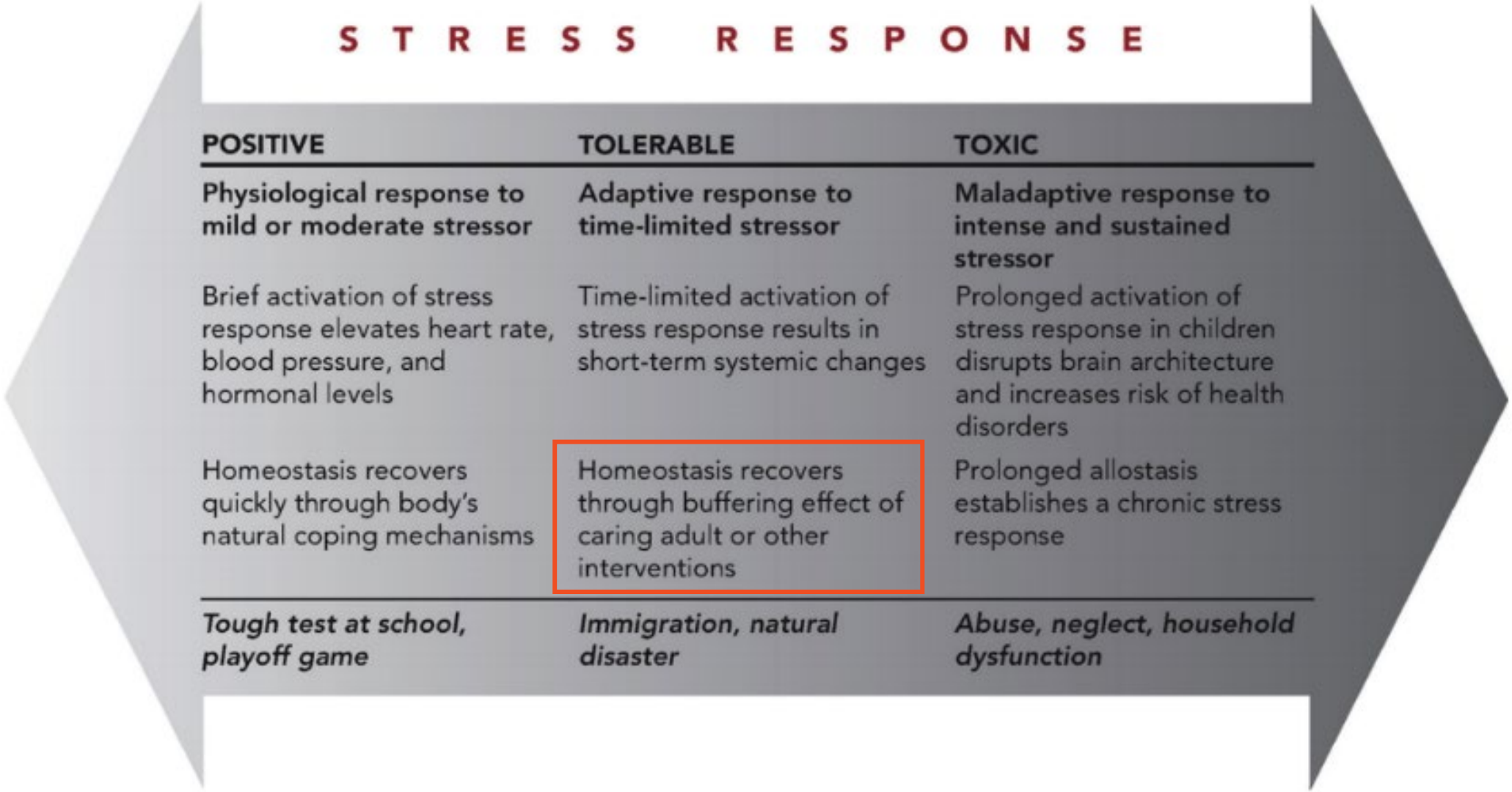


Fig. 2. Spectrum of the stress response: positive, tolerable, and toxic.

Source: Bucci, M., S. S. Marques, D. Oh, and N. B. Harris. 2016. Toxic stress in children and adolescents. *Advances in Pediatrics* **63**(1):403–428.

TOXIC STRESS IS AMENABLE TO TREATMENT

- New opportunities to more precisely **interrupt the toxic stress response**, break the intergenerational cycle of ACEs and toxic stress, and promote an intergenerational cycle of health.
- **Early intervention** can improve brain, immune, hormonal, and genetic regulatory control of development.
- Treatment of toxic stress in adults may **prevent transmission** of neuro-endocrine-immune-metabolic and genetic regulatory disruptions in offspring.

WE CAN ADDRESS ACES & TOXIC STRESS

PREVENT ACES & OTHER STRESSORS

External Events and Environment

TREAT TOXIC STRESS PHYSIOLOGY

Internal Biology and Clinical Interventions

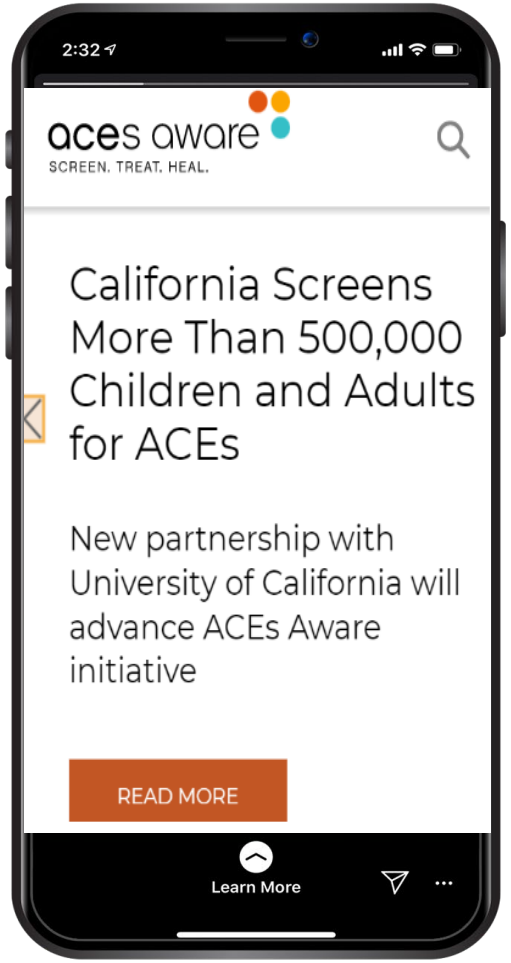
IMPROVED HEALTH

A PUBLIC HEALTH APPROACH IS NECESSARY TO CUTTING ACES AND TOXIC STRESS BY HALF IN A GENERATION

- Must Raise Public Awareness
- Cross-Sector Training is Imperative
- Cross-Sector Coordination & Alignment Required
- Continued Research Needed

THE ACES AWARE INITIATIVE

- Training primary care clinicians on how to screen for ACEs and toxic stress
- Medicaid (Medi-Cal) payment for conducting ACE screenings for children and adults
- Focusing on buffering supports and providing trauma-informed care
- Building cross-sector networks of care to support children and families



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ACE SCREENING

- ACE screening is **feasible**.
- ACE screening **fits within busy** clinic visit times.
- Can **improve health** care utilization.
- Can **improve** the patient-provider relationship.
- Creates path to offer **supportive links** to needed services.
- **Enables opportunities** for prevention, early identification, and prompt intervention for toxic stress.
- **Identifies people at high risk** of toxic stress who might otherwise be missed.

(Glowa, Olson and Johnson, 2016; Purewal *et al.*, 2016; Conn *et al.*, 2018; Flanagan *et al.*, 2018; Kalmakis *et al.*, 2018; Koita *et al.*, 2018; Choi *et al.*, 2019; Kia-Keating *et al.*, 2019; Marie-Mitchell *et al.*, 2019; Marsicek *et al.*, 2019; Selvaraj *et al.*, 2019; Young-Wolff *et al.*, 2019; DiGangi and Negriff, 2020; Gillespie, 2019)

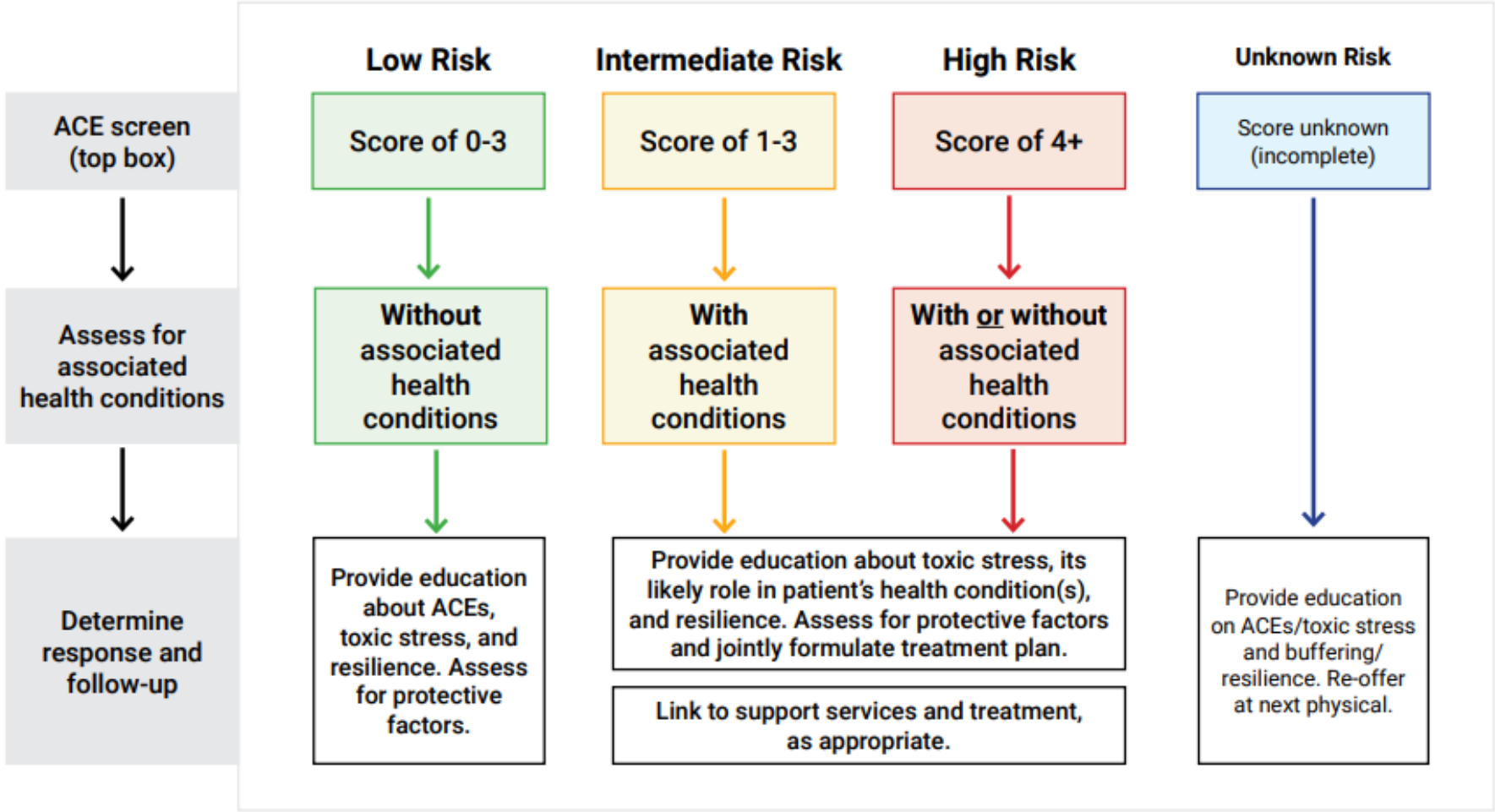
ACE SCREENING IN PRENATAL CARE

- Pilot study to screen pregnant women (at ~14-23 weeks of gestation)
- 54% reported 0 ACEs, **28%** reported 1-2 ACEs, and 18% reported ≥3 ACEs.
- Most patients were somewhat or very comfortable completing the questionnaires **(91%)** and discussing ACEs with their clinician **(93%)**
- Most patients strongly or somewhat strongly agreed that clinicians should ask their prenatal patients about ACEs **(85%).**
- Clinicians' willingness to screen for ACEs was contingent on adequate training, streamlined workflows, inclusion of resilience screening, and availability of mental health, parenting, and social work resources.

Flanagan T, Alabaster A, McCaw B, Stoller N, Watson C, Young-Wolff KC. J Womens Health. 2018

ACES AND TOXIC STRESS RISK ASSESSMENT ALGORITHM – ADULTS

Full algorithm is available at: ACEsAware.org/clinical-assessment



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CLINICAL RESPONSE TO ACES AND TOXIC STRESS

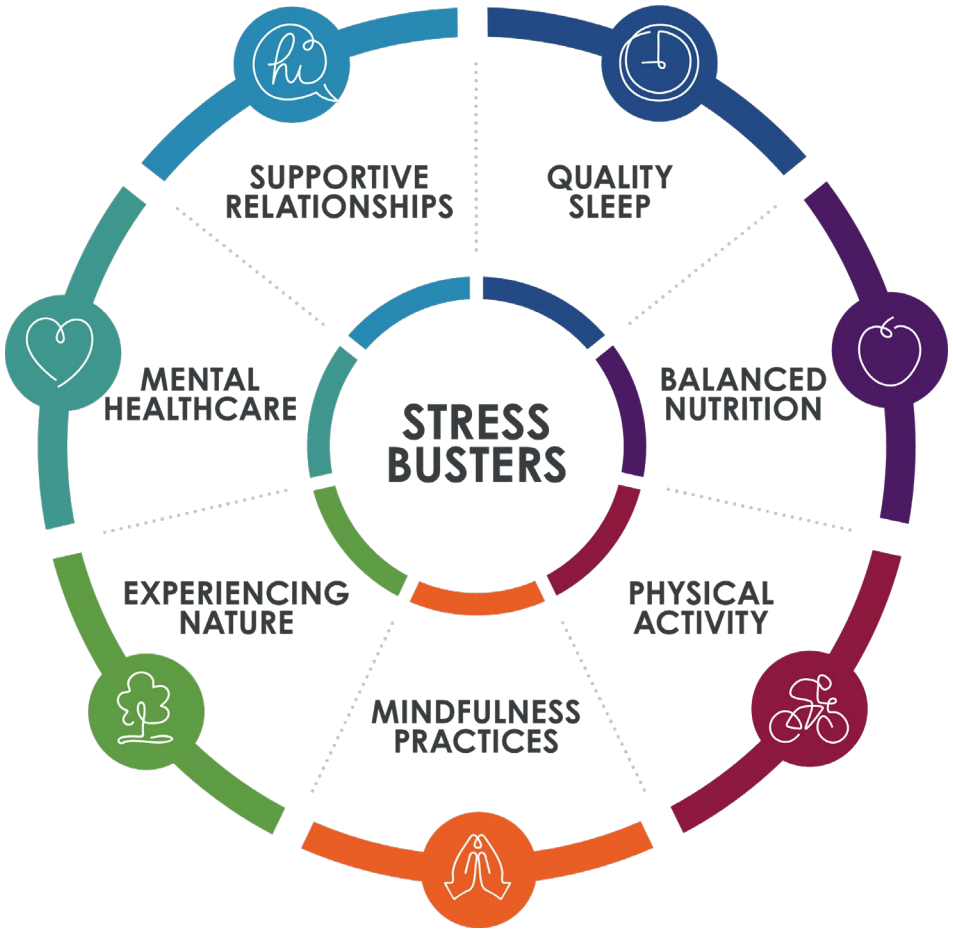
1. Applying principles of **trauma-informed care** including establishing trust, safety, and collaborative decision-making.
2. Supplementing usual care for ACE-Associated Health Conditions by providing **patient education** on toxic stress and offering **strategies to regulate the stress response** (using seven evidence-based strategies for toxic stress regulation).
3. Validating existing **strengths and protective factors.**
4. **Referrals** to patient resources or interventions, such as educational materials, social work, school agencies, care coordination or patient navigation, community health workers.
5. **Follow-up** as necessary, using the presenting ACE-Associated Health Condition(s) as indicators of treatment progress.

TRAUMA-INFORMED CARE

- Establish the physical and emotional **safety** of patients and staff
- **Build trust** between providers and patients
- **Recognize** the signs and symptoms of trauma exposure on physical and mental health
- Promote **patient-centered, evidence-based care**
- Ensure provider and patient **collaboration** by bringing patients into the treatment process and discussing mutually agreed upon goals for treatment
- Provide care that is sensitive to the patient's **racial, ethnic, and cultural background, and gender identity**

ACEs Aware. Trauma-informed care overview. California Department of Health Care Services, 2020. https://www.acesaware.org/treat/principles-of-trauma-informed-care/. Adapted from the Substance Abuse and Mental Health Services Administration. SAMHSA's concept of trauma and guidance for a trauma-informed approach. Rockville, MD: US Department of Health and Human Services, 2014.

EVIDENCE-BASED STRATEGIES FOR REGULATING THE TOXIC STRESS RESPONSE



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WHAT TREATING TOXIC STRESS MIGHT LOOK LIKE IN PERINATAL HEALTH

- If we know that women with high ACE scores are at higher risk for depression and substance use, **how might we connect them to services and support systems sooner?**

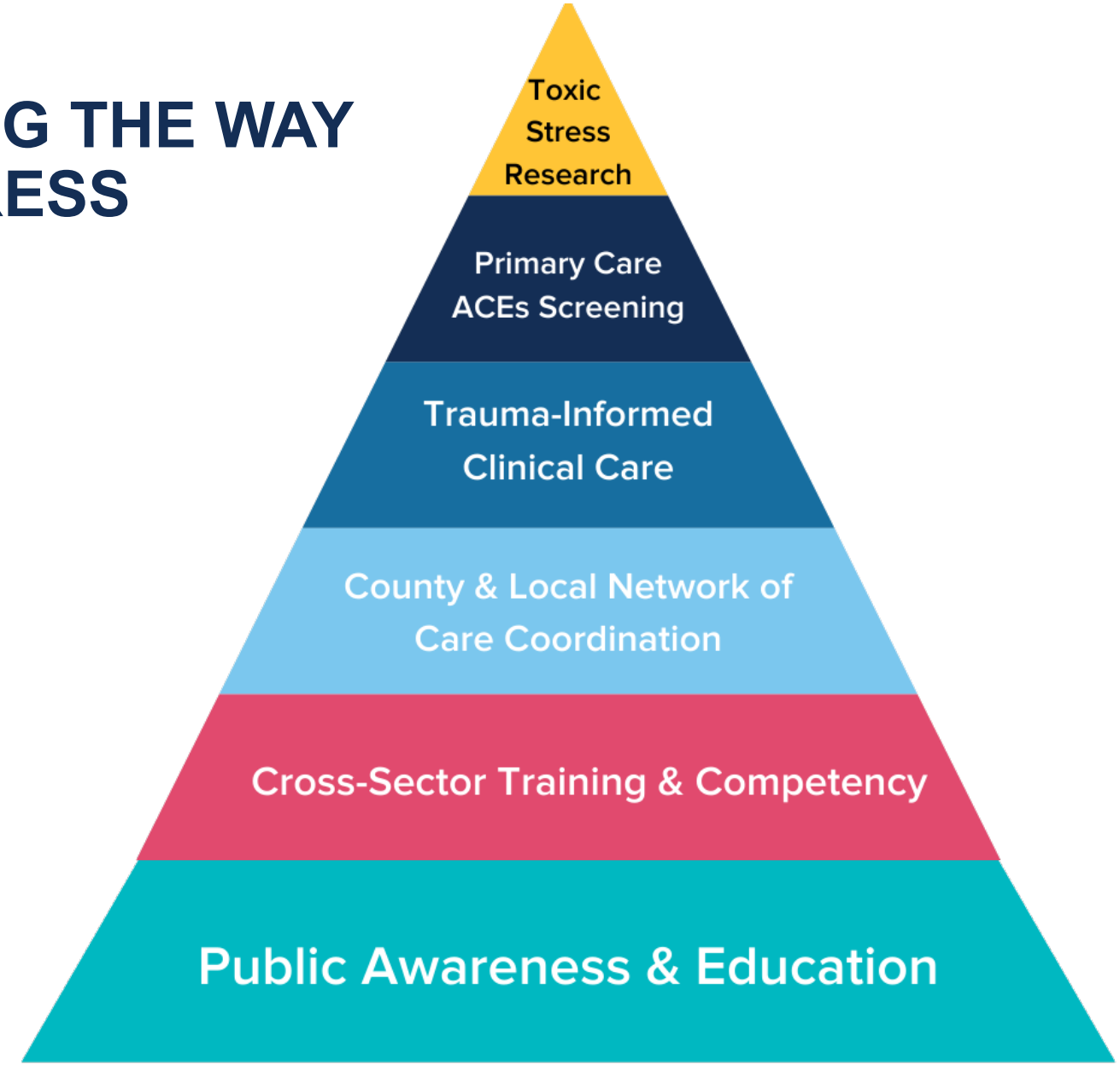
- If we know that ACEs increase the risk for toxic stress and neurologic, endocrine and immune dysregulation **– could addressing this underlying physiology decrease pregnancy loss, low birth weights and preterm births?**

- If we know that toxic stress may lead to alterations in glucocorticoid and oxytocin receptor regulation**, how does this impact fetal development, uterine contractions, milk production, and mother-infant bonding?** And how might we treat these alterations to prevent poor outcomes?

WE CAN

DO THIS!

CALIFORNIA IS CHANGING THE WAY WE ADDRESS TOXIC STRESS



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NEW ACES EQUITY ACT SIGNIFICANTLY EXPANDS ACE SCREENING IN CALIFORNIA

- Builds on the success of the ACEs Aware initiative to train health care providers to identify ACEs and toxic stress and respond with evidence-based interventions
- Increases coverage beyond Medi-Cal to include private health plans and insurers
- Moves us closer to goal of cutting ACEs and toxic stress by half in a generation

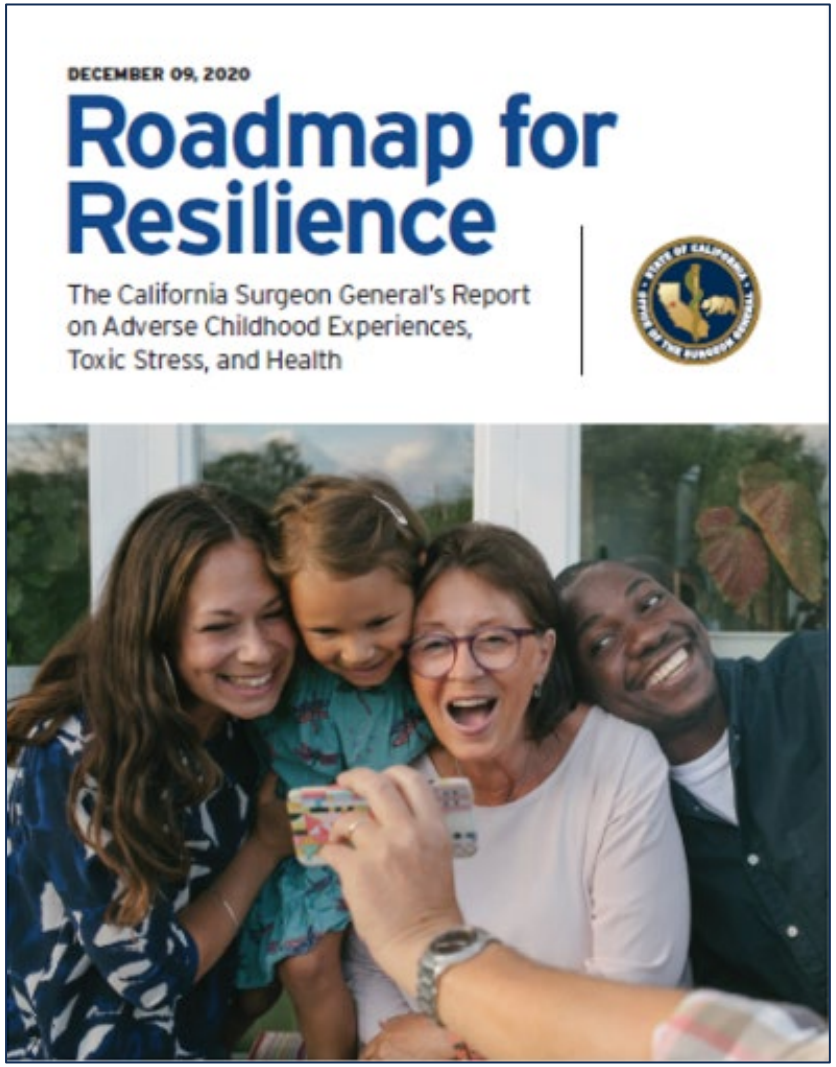
UC San Diego

PRIORITIZING PRECISION MEDICINE RESEARCH

ROADMAP FOR RESILIENCE HIGHLIGHTS ROLE OF RESEARCH

- ✓ **Check out the CA Surgeon General's Roadmap for Resilience at osg.ca.gov/sg-report**

"Investment in research is necessary to advance the science to prevent, measure, and treat the effects of toxic stress in children and adults.
Clinical diagnostic criteria for toxic stress, viable biomarkers for diagnosis and monitoring treatment efficacy, and therapeutic targets for interrupting the toxic stress response are imperative for improving quality and efficacy of care. Treatment guidelines for addressing the role of toxic stress in specific AAHCs (such as asthma and heart disease) are called for."



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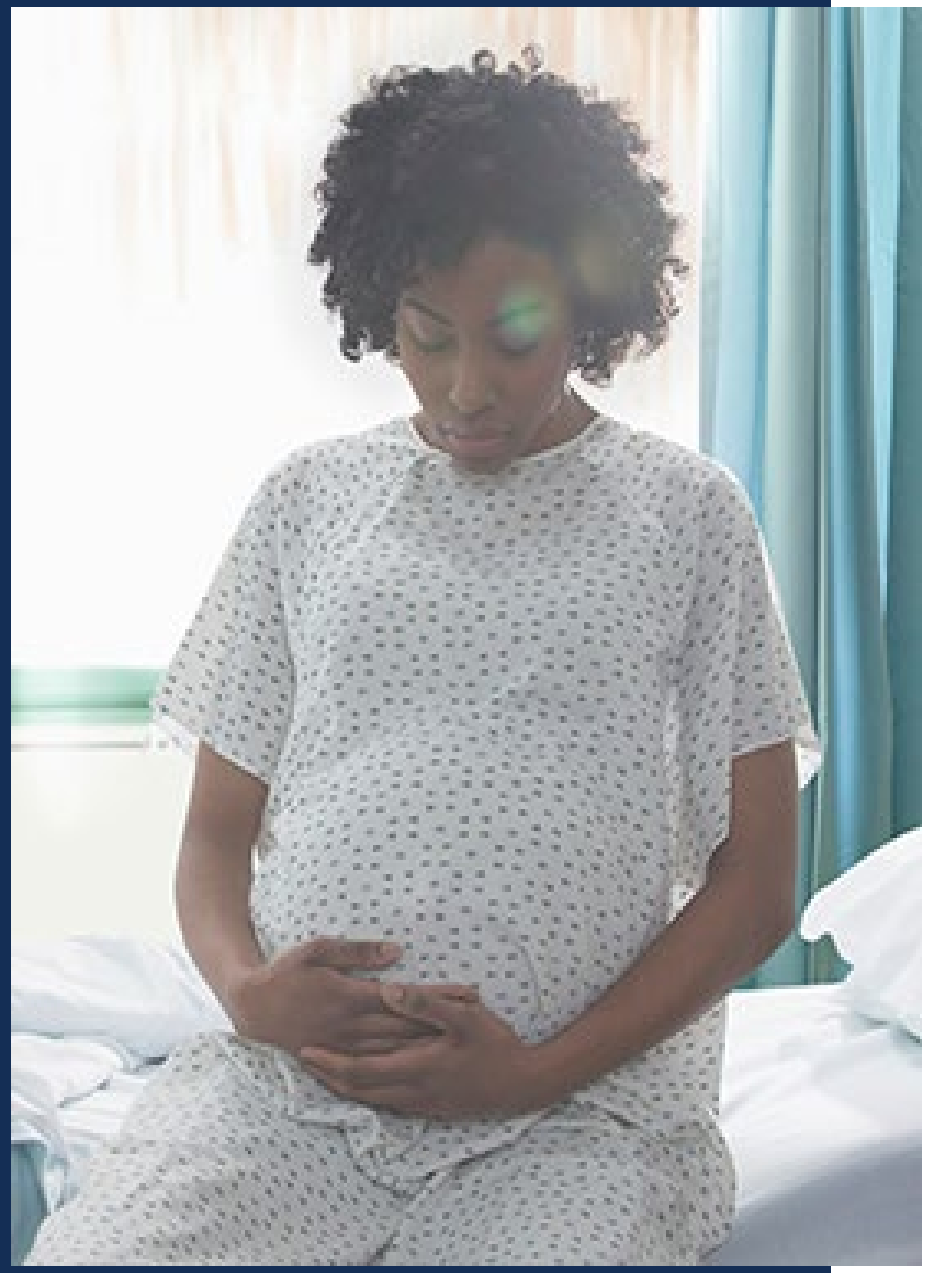

CALIFORNIA IS A LEADER IN MATERNAL & INFANT HEALTH

- SB 65 California Momnibus Act
- CMQCC is a multi-stakeholder organization committed to ending preventable morbidity, mortality and racial disparities in California maternity care
- Extending Medi-Cal eligibility for postpartum people, expand coverage for doulas
- Providing easier access to CalWORKs for pregnant people
- Establishing a guaranteed income pilot program that prioritizes pregnant Californians with low incomes

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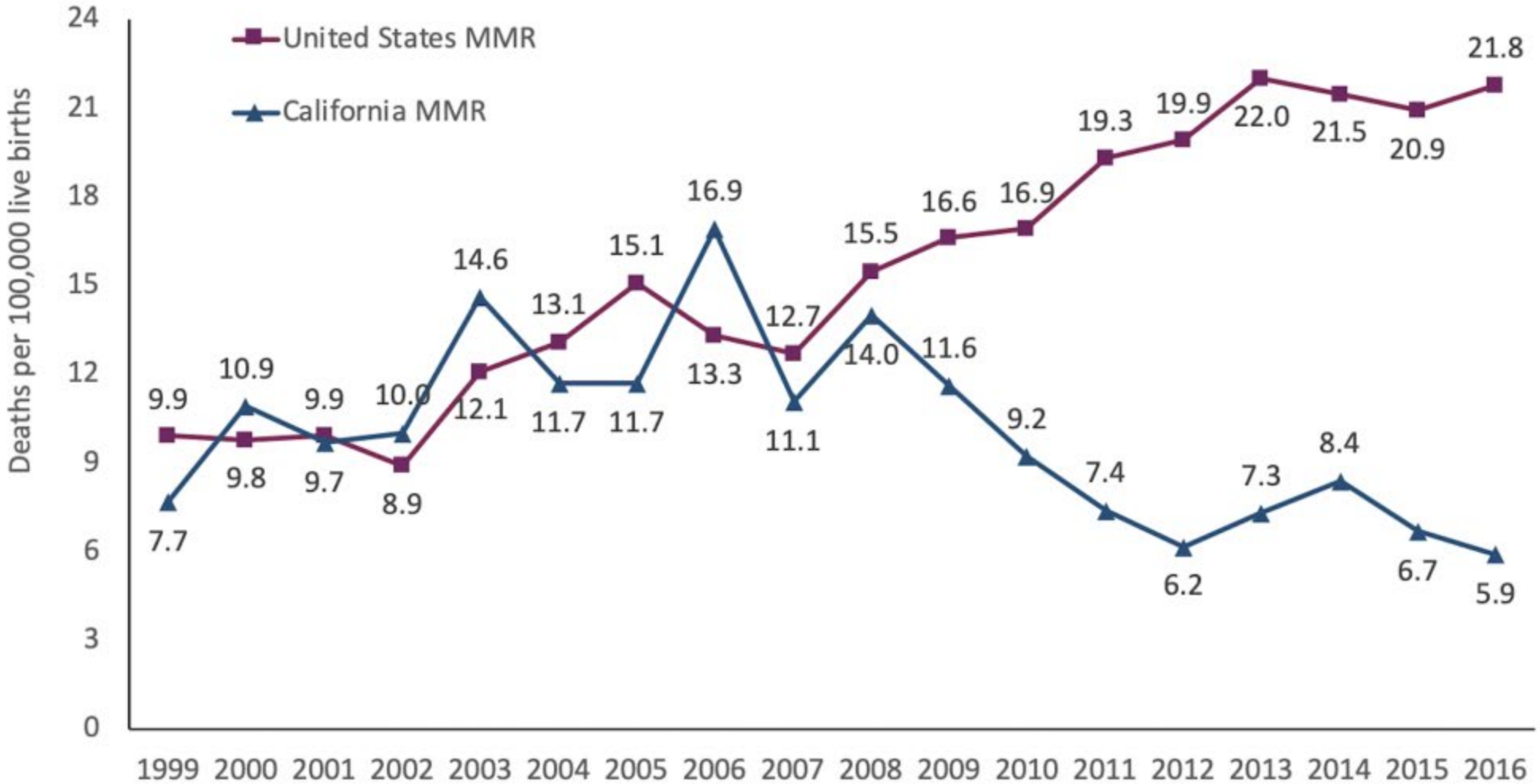
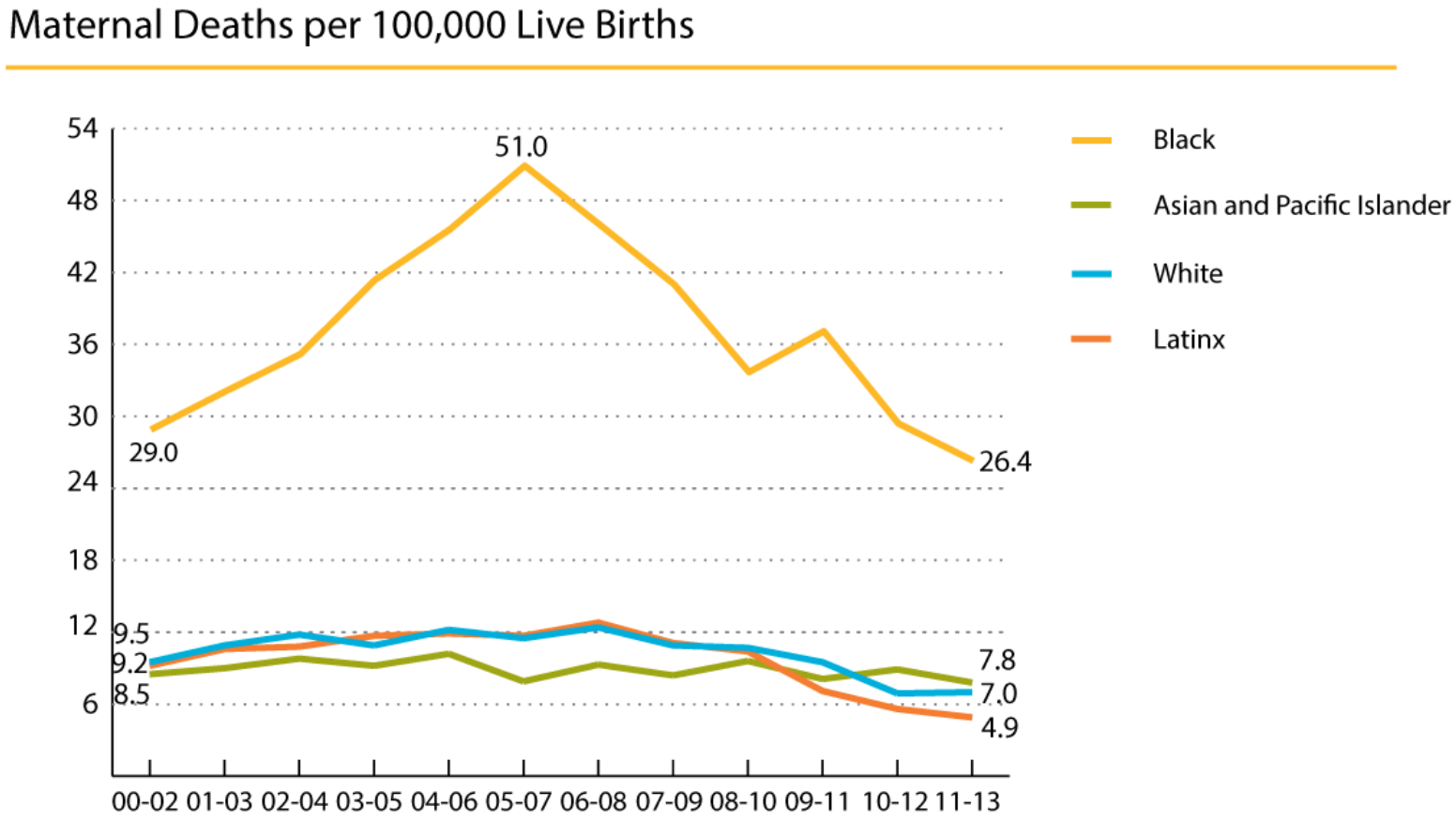
Figure 1: Maternal Mortality Ratio in U.S. and California, 1999-2016



Maternal mortality ratio (MMR) = Number of maternal deaths per 100,000 live births, up to 42 days after the end of pregnancy. Maternal deaths in California were identified using ICD-10 cause of death classification for obstetric deaths (codes A34, O00-O95, O98-O99) from the California death certificate data (1999-2013) and the California pregnancy status errata file (2014-2016). Data on U.S. maternal deaths are published by the National Center for Health Statistics and found in the CDC WONDER Database for years 2008 or later (accessed at http://wonder.cdc.gov on February 25, 2020).

MATERNAL MORTALITY RATE FOR BLACK WOMEN HAS BEEN PERSISTENTLY HIGHER THAN RATES FOR WOMEN OF OTHER RACES & ETHNICITIES



Note: Data reflect a three-year moving average. Race and ethnicity categories are mutually exclusive. Maternal mortality is defined as the death of a woman while pregnant or within 42 days of the end of pregnancy.
Source: California Department of Public Health

California Budget & Policy Center
Independent Analysis. Shared Prosperity.

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THANK YOU!