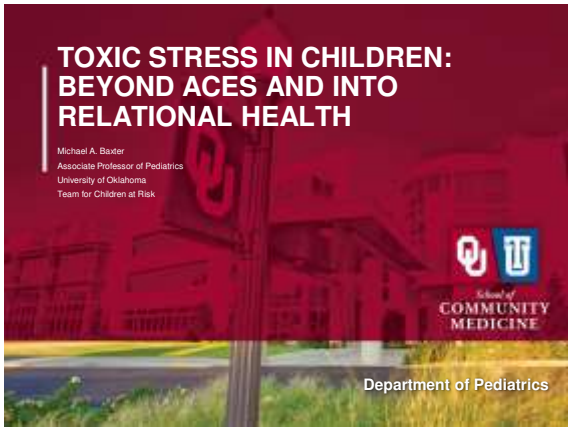


DISCLOSURE

Neither I nor any member of my immediate family has a financial relationship or interest with any proprietary entity producing health care goods or services related to the content of this CME activity.

I do not intend to discuss an unapproved or investigative use of commercial products or devices.

ADDITIONAL DISCLOSURE:

This lectures involves discussing child maltreatment with some graphic photographs which can be disturbing to some participants

The child and family featured in this talk have signed a legal release allowing them to be represented.

LEARNING OBJECTIVES

- Identify key factors of toxic stress in children
- Detect biological impacts toxic stress has on a child's developing body
- Develop a plan for treating toxic stress in children

PROFESSIONAL PRACTICE GAP

Addressing the need for awareness and appropriate treatment strategies related to toxic stress beyond being aware of adverse childhood experiences.

EARLY LIFE ADVERSITY

- Adverse Childhood Experiences
  - 1995-1997 study
  - Two Waves
    - 1st wave: looked at abuse & household dysfunction
    - 2nd wave: neglect items added

EARLY LIFE ADVERSITY

- Adverse Childhood Experiences
  - Abuse
    - Psychological
    - Physical
    - Sexual
  - Neglect
    - Emotional
    - Physical

EARLY LIFE ADVERSITY

- Adverse Childhood Experiences
  - Household dysfunction
    - Divorce or separation
    - Intimate partner violence
    - Substance use
    - Mental illness
    - Criminal behavior

EARLY LIFE ADVERSITY

- Adverse Childhood Experiences
  - Around 63% of adults have at least 1 ACE
  - 12% have 4 or more ACEs
- Behavioral Risk Factor Surveillance
  - Found similar data to ACE study
- Study of children show similar data

EARLY LIFE ADVERSITY

- Adverse Childhood Experiences
  - Health outcomes
    - Dose response theory
    - Increase risk of leading causes of death
- Additional research shows similar risk across populations
  - Including pediatric patients
- Risk of death increases

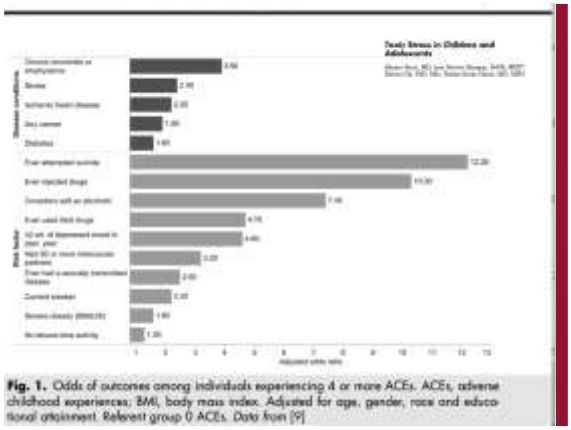
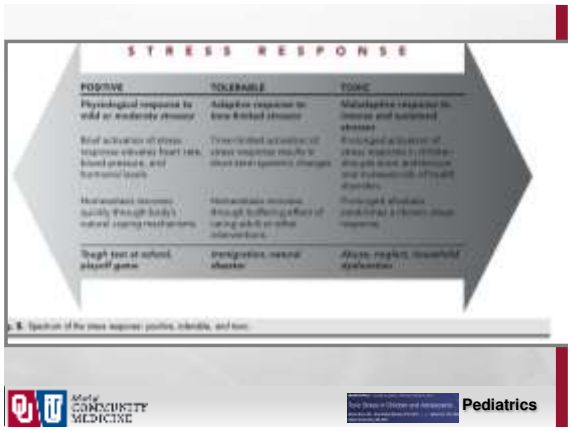


Fig. 1. Odds of outcomes among individuals experiencing 4 or more ACEs. ACEs, adverse childhood experiences; BMI, body mass index. Adjusted for age, gender, race and educational attainment. Referent group 0 ACEs. Data from [9]

EARLY LIFE ADVERSITY

- There are additional traumatic & stressful events
  - Community violence
  - Bullying
  - Experiencing houseless-ness
  - Parental stress
  - Economic hardship
  - Racism
  - Historical trauma
  - Discrimination

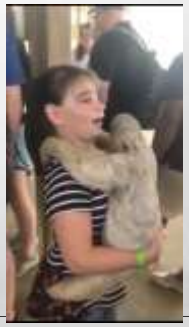
TOXIC STRESS



MEET JOY

TYPES OF STRESS

Positive



TYPES OF STRESS

Tolerable

TYPES OF STRESS

Toxic Stress

STRESS RESPONSE: BIOLOGY

- The Stress Response
  - Central Nervous System
    - Amygdala
    - Hypothalamus
    - Hippocampus
    - Prefrontal cortex
    - Brainstem
      - Locus coeruleus
      - Medulla oblongata

STRESS RESPONSE: BIOLOGY

- The Stress Response
  - Peripheral Nervous System
    - Sympatho-adrenomedullary (SAM)
    - Hypothalamic-pituitary-adrenal
      - Adrenal medulla
      - Adrenal cortex
      - Peripheral changes

STRESS RESPONSE: BIOLOGY

Hypothalamus	⇨	Corticotropin-releasing hormone
Hypothalamus/Pituitary gland	⇨	Arginine vasopressin
Pituitary gland	⇨	Adrenocorticotropin hormone
Medulla and locus coeruleus	⇨	Norepinephrine
Adrenal medulla	⇨	Epinephrine
Adrenal cortex	⇨	Glucocorticoids

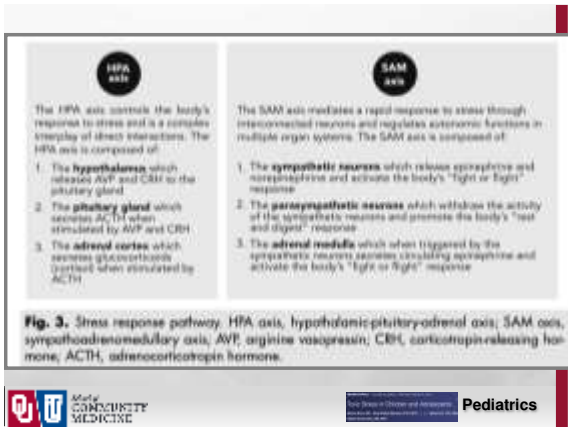


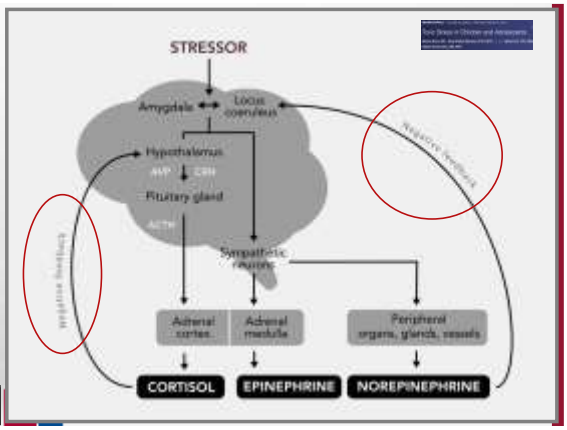
Fig. 3. Stress response pathway. HPA axis, hypothalamic-pituitary-adrenal axis; SAM axis, sympathoadrenomedullary axis; AVP, arginine vasopressin; CRH, corticotropin-releasing hormone; ACTH, adrenocorticotropin hormone.

STRESS RESPONSE: EFFECTS

- Classic Flight-or-Fight-or-Freeze
  - Blood circulation
  - Respiration
  - Metabolism

STRESS RESPONSE: EFFECTS

- Behavioral Changes
  - Increased arousal
  - Improved cognition
  - Euphoria
  - Decreased pain perception
  - Rise in body temperature



TOXIC STRESS: DYSREGULATION

- Loss of homeostasis of the system
  - Prolonged exposure disrupts these mechanism
    - Decrease ability to regulate SAM and HPA
      - Prolong activation leads to:
        - Alteration in stress hormones
          - Initially excessive
          - Eventually deficient

TOXIC STRESS: DYSREGULATION

- Biological alterations
  - Nervous
  - Endocrine
  - Immune

TOXIC STRESS: CLINICAL OUTCOMES

- Systemic alterations
  - Neurological
  - Psychiatric
  - Behavioral
  - Endocrine
  - Metabolic

TOXIC STRESS: CLINICAL OUTCOMES

- Systemic alterations
  - Cardiac
  - Reproductive
  - Immune
  - Inflammatory
  - Genetic

"Approaches to minimizing toxic stress that only look at measures of adversity, such as ACE scores or biomarkers, will miss out on opportunities to support the relational health that promotes flourishing despite adversity."

- AAP Preventing Childhood Toxic Stress: Partnering with Families and Communities to Promote Relational Health

TOXIC STRESS VS RELATIONAL HEALTH

Toxic Stress: defines the problem.

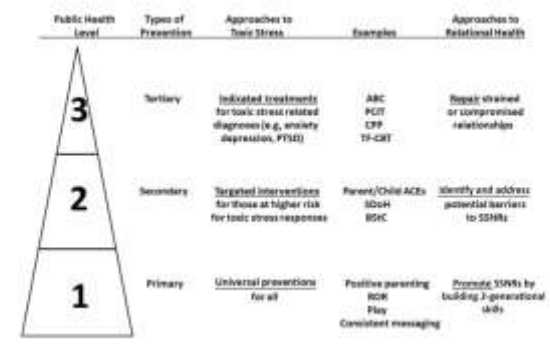
"Toxic stress explains how many of our society's most intractable problems (disparities in health, education, and economic stability) are rooted in our shared biology but divergent experiences and opportunities."

Relational Health: defines the solution.

"Relational health explains how the individual, family, and community capacities that support the development and maintenance of SSNRs also buffer adversity and build resilience across the life course."

TOXIC STRESS VS RELATIONAL HEALTH

- Relational Health
  - Definition
  - Contribution
  - Clinical care
  - Prevention
    - Primary
    - Secondary
    - Tertiary



APPLICATIONS TO PRACTICE

- Applications to Practice
  - Promote Safe Stable Nurturing Relationships (SSNRs)
    - Core focus of Family Center Pediatric Medical Homes
  - Reduce Sources of Stress within Families
  - Core Life Skills

FUTURE APPLICATIONS

- Population-Level Changes
  - Training program
  - System-wide changes in appointments
  - Coordination across systems
  - Focus on Social Determinants of Health
    - Racism
    - Historical trauma
    - Poverty
    - Demographic risk factors

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MIKE SIMONS/Tulsa World

OPPORTUNITIES TO IMPROVE: AAP POLICY STATEMENT

- "Expand Toolbox of Effective Strategies for Strengthening the Foundations of Healthy Development in the Face of Adversity"
  - AAP projects show how we can enact change
    - Immunizations
    - Back to Sleep
    - Car Seats
  - The "Next Great Projects"
    - Relationship between childhood experiences and adult disease
    - Biology, Physical, and Social Environments
    - Reducing Global Poverty

OPPORTUNITIES TO IMPROVE: AAP POLICY STATEMENT

- "Compelling Need to Revisit the Criteria Used to Designate an Intervention as Evidence Base and to Strengthen Measurement Capacity in the Early Childhood Period"
  - Challenging Federal Guidelines on outcome measurements
  - Improving measurement capacity

OPPORTUNITIES TO IMPROVE: AAP POLICY STATEMENT

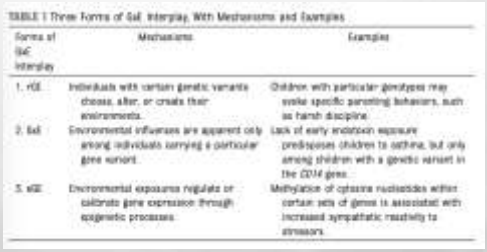
- "The Potential Benefits of 2 Complementary Pathways Toward Greater Impact on the Health and Development of Young Children and Families Facing Adversity."
  - Pathway 1
  - Pathway 2

GENE ENVIRONMENT TIME FRAMEWORK

TOXIC STRESS: GENES

Gene-environment correlation (rGE)	Genetic variation & environmental exposures are correlated, but not casually interactive
Specific environmental conditions (GxE)	Variations happen only in specific environmental exposures
Epigenetic gene-regulatory processes (eGEs)	Environmental exposures regulate or calibrate level of gene expression

TOXIC STRESS: GENES



Forms of G×E Interplay	Mechanisms	Examples
1. rGE	Individuals with certain genetic variants choose, alter, or create their environments.	Children with particular genotypes may evoke specific parenting behaviors, such as harsh discipline.
2. G×E	Environmental influences are apparent only among individuals carrying a particular gene variant.	Lack of early endotoxin exposure predisposes children to asthma, but only among children with a genetic variant in the *CD14* gene.
3. eGE	Environmental exposures regulate or calibrate gene expression through epigenetic processes.	Methylation of cytosine nucleotides within certain sets of genes is associated with increased sympathetic reactivity to stressors.

TOXIC STRESS: ENVIRONMENTS

- Environmental Stressors
  - Trigger adaptive mechanisms
  - Increase inflammation
    - Systemic stressors
    - Recessions
    - Poor parenting
  - Microbiome
  - Buffers

TOXIC STRESS: TIME

- Critical periods in brain development
- Cells build capacity to change
- Differential plasticity over time
- Timing of experiences