



Adverse Childhood Experiences and their Impact on Tennesseans

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You are allowed to be
both a
Masterpiece
and a
Work in Progress,
simultaneously.

THE SCIENCE

Brain Development

Early Brain Development is Rapid

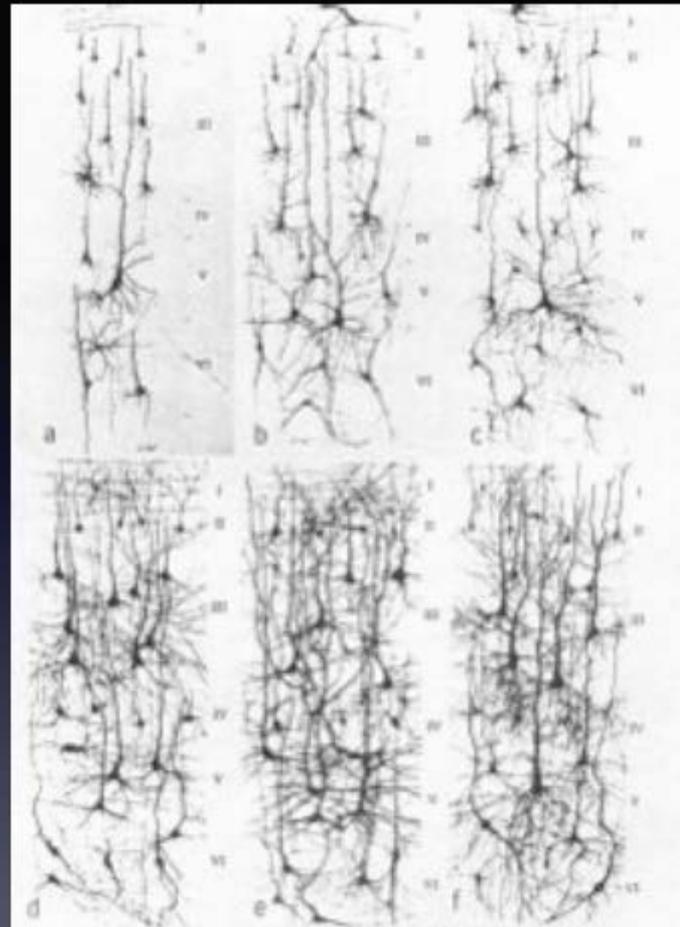


A BABY'S BRAIN DOUBLES IN SIZE
DURING THE FINAL 6 WEEKS OF
PREGNANCY

BY AGE 3, A CHILD'S BRAIN IS
ALREADY 80% OF IT'S ADULT
VOLUME

Image Source: "Three Core Concepts in Early Development." Center for the Developing Child, Harvard University.
http://developingchild.harvard.edu/resources/multimedia/videos/three_core_concepts/

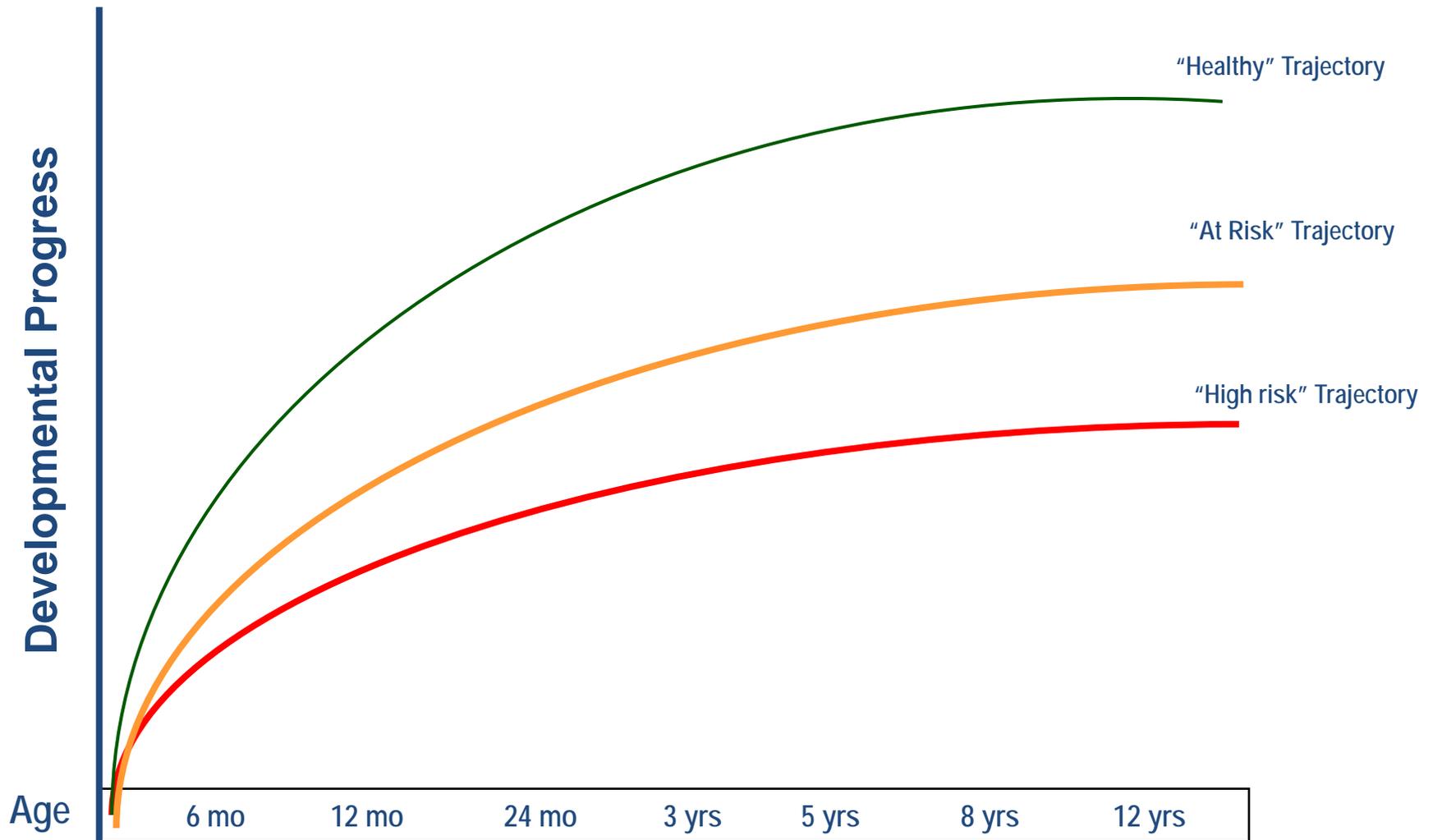
700 New Neural Connections per Second



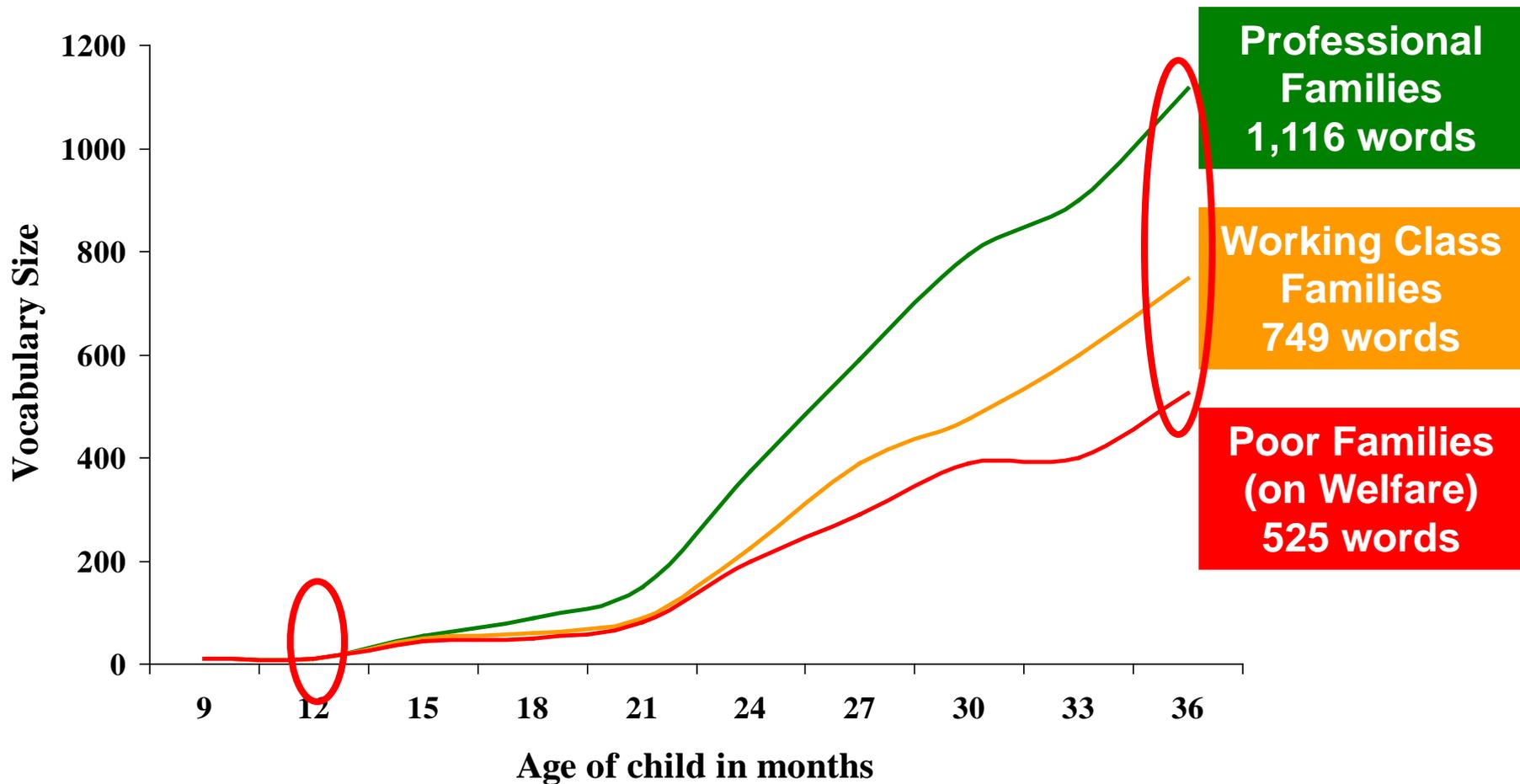
Postnatal development of human cerebral cortex around Broca's Area (FCBm); camera lucida drawings from Golgi-Cox preparations. a: newborn; b: 1 month; c: 3 months; d: 6 months; e: 15 months; f: 24 months.

(from Conel, 1939-1959)

Early Period Sets the Trajectory



Example: Language Trajectory



Source: Hart, B. and Risley, T. R. (2003). "The Early Catastrophe: The 30 Million Word Gap by Age 3."

THE SCIENCE Toxic Stress

Positive Stress



Short, stressful events like meeting new people or starting the first day of school are healthy for brain development. They prepare the brain and body for stressful situations later in life.

Tolerable Stress



Tragic, unavoidable events like a natural disaster or losing a loved one aren't good for us. But if supportive caregivers are around to buffer the stress response, these events won't do lasting damage to the brain and body.

Toxic Stress



Ongoing, repeated exposure to abuse or neglect is bad for brain development. If no supportive adults are present to help buffer the stress response, stress hormones will damage developing structures in the child's brain. The result is an increased vulnerability to lifelong physical and mental health problems, including addiction.

Toxic

Prolonged activation of stress response systems
in the absence of protective relationships.

Source: Center on the Developing Child at Harvard University

Impacts:

Brain Architecture

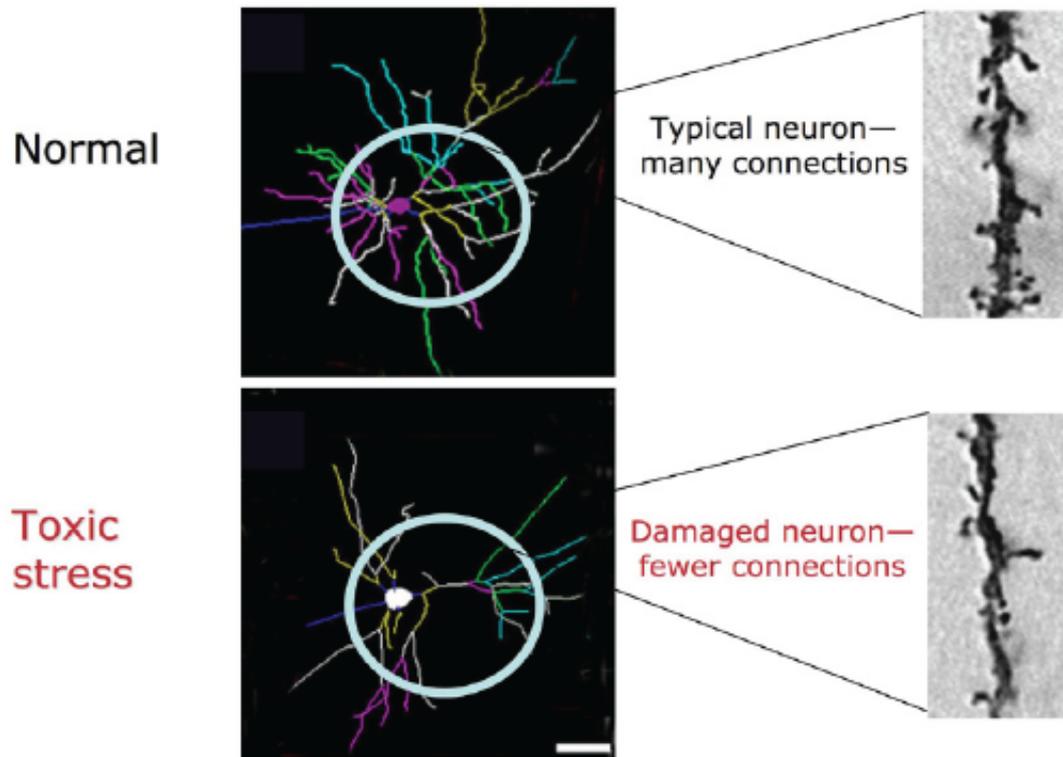
Gene Expression

Biology and Physiology



Toxic Stress Changes the Brain

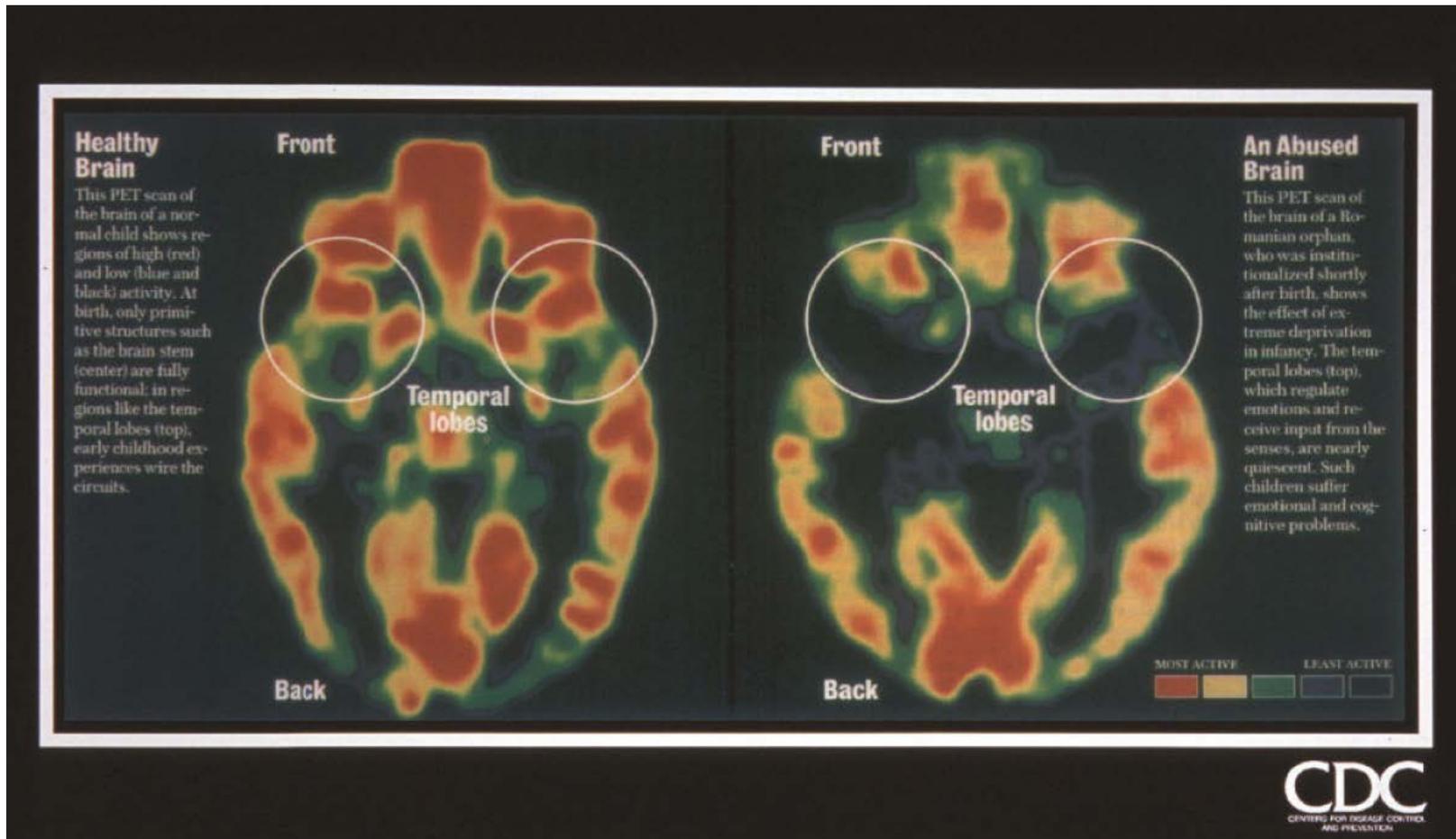
Persistent Stress Changes Brain Architecture



Prefrontal Cortex and
Hippocampus

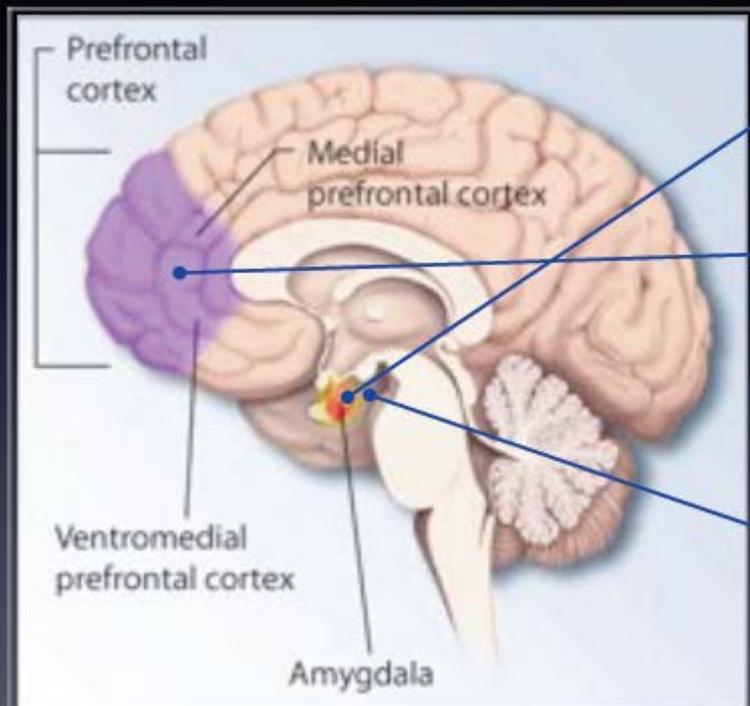
Sources: Radley et al. (2004)
Bock et al. (2005)

Normal vs. Neglected Brain



As cited by Felitti & Anda, 2003; source CDC

What happens?



Amygdala:

activates the stress response

Toxic stress: enlargement

Prefrontal cortex:

usually a check to the amygdala

Toxic stress: loss of neurons, less able to function

Hippocampus:

major role in memory and mood

Toxic stress: impairment in understanding and emotion

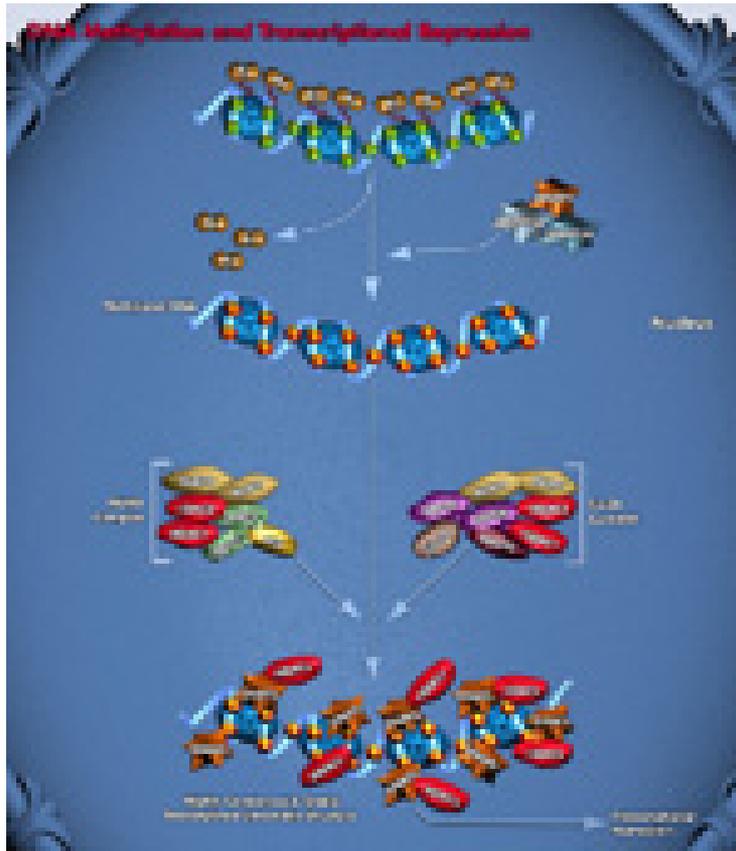
Freely-reproducible image from the National Institutes of Health



Executive Function Skills are Compromised by Toxic Stress

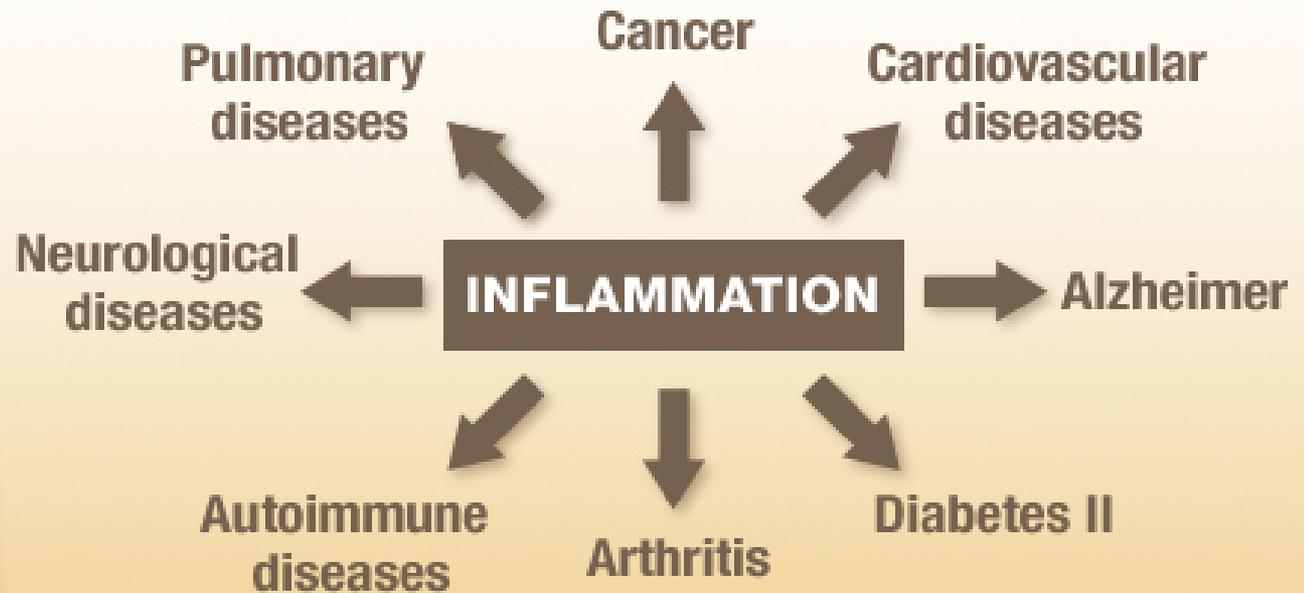
- **Impulse Control**
 - Filter distractions
 - Resist temptation
 - Maintain focus
 - Persist
 - Think before acting
- **Working Memory**
 - Hold onto info while working on something else
 - Follow multi-steps
- **Mental Flexibility**
 - Easily switch gears
 - Multitask
 - Alter strategies
 - Innovate

Toxic Stress Changes Gene Expression



Intergenerational Transmission of Stress Response in Male Rats

Toxic Stress Changes Biology

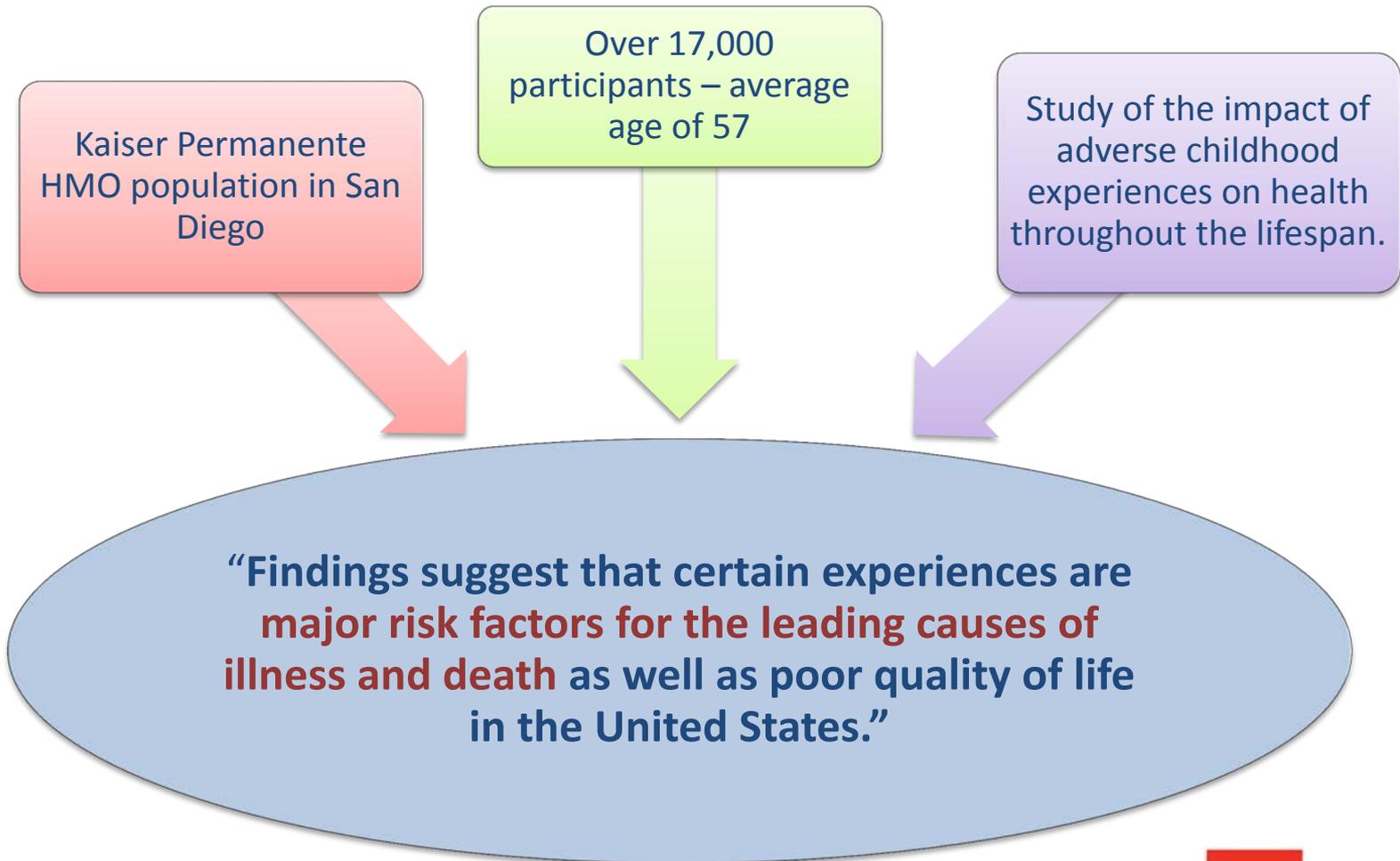


THE RESEARCH

The Original ACEs Study

Adverse Childhood Experiences (ACE) Study

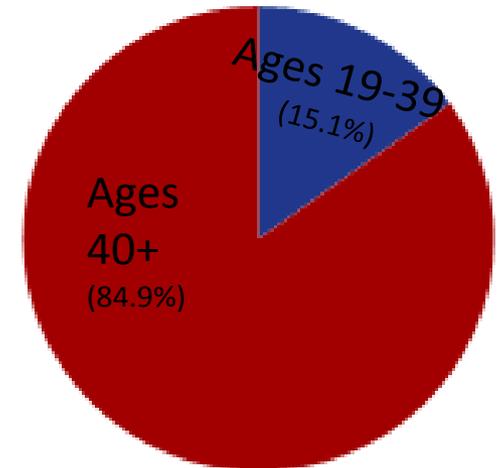
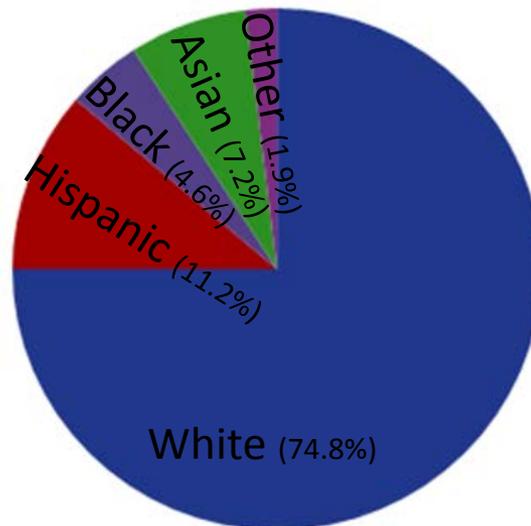
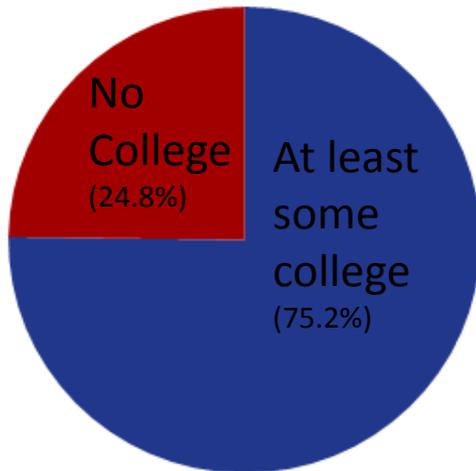
A Collaborative Effort of Kaiser Permanente and the CDC





ACE Study

Participants were mostly white, middle-aged, college educated, and insured.



Adverse Childhood Experiences include the following:

Abuse and Neglect

1. Child physical abuse
2. Child sexual abuse
3. Child emotional abuse
4. Emotional neglect
5. Physical neglect

Indicators of Family Dysfunction

6. Mentally ill, depressed, or suicidal person in the home
7. Drug addicted or alcoholic family member
8. Witnessing domestic violence against the mother
9. Parental discord – indicated by divorce, separation, abandonment
10. Incarceration of any family member

ACE Study Findings

Of the 17,337 individuals:

- ~2/3 had at least 1 ACE 
- ~1/5 reported 3 or more ACEs 



ACE Study Findings

Health-risk Behaviors

- Sexual promiscuity
- Sexual perpetration
- Alcohol abuse
- Illicit/injected drug use
- Smoking
- Physical Inactivity

Disease and Injury

- STDs, including HIV
- Gynecological problems
- Heart disease
- Diabetes
- Stroke
- Cancer
- Suicide
- Obesity and Overweight

Mental health and Well-being

- Depression, PTSD
- Aggression
- Anxiety
- Somatic complaints
- Attempted suicide
- Social ostracism
- Anxiety
- Academic achievement
- Re-victimization
- Unwanted pregnancy

Job Problems

- Absenteeism/Lost time from work
- Impaired productivity



ACE Score

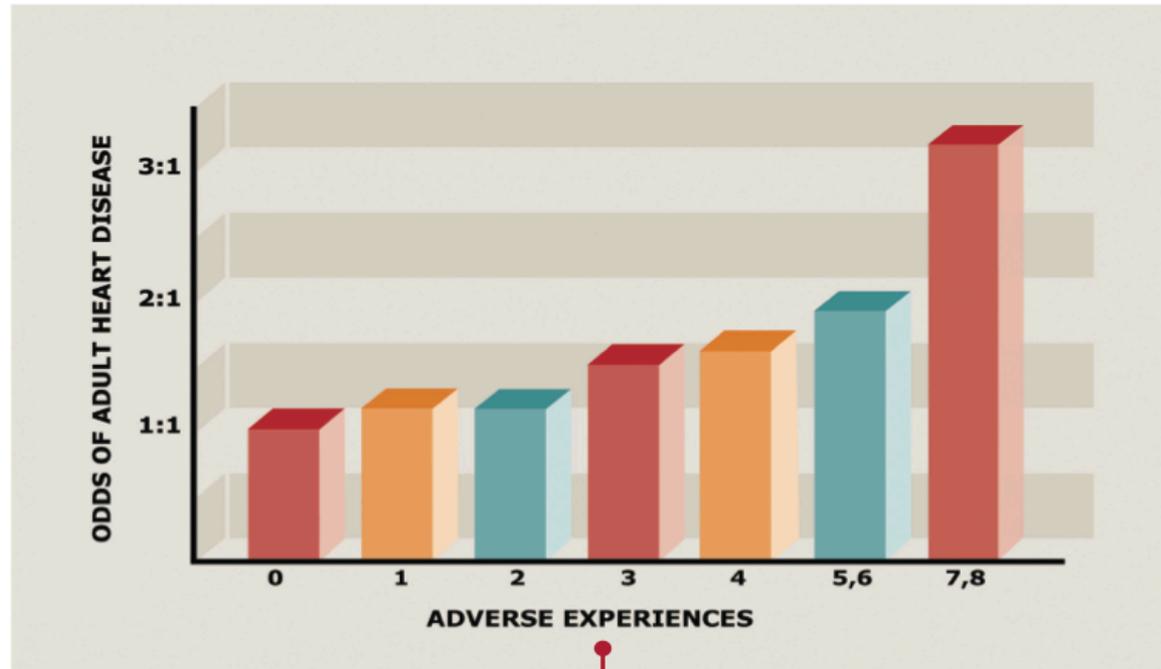


RISK



Department of
Health

3:1 3:1 ODDS OF ADULT HEART DISEASE AFTER 7-8 ADVERSE CHILDHOOD EXPERIENCES



4

Early experiences actually get into the body, with lifelong effects—not just on cognitive and emotional development, but on long term physical health as well. A growing body of evidence now links significant adversity in childhood to increased risk of a range of adult health problems, including diabetes, hypertension, stroke, obesity, and some forms of cancer. This graph shows that adults who recall having 7 or 8 serious adverse experiences in childhood are 3 times more likely to have cardiovascular disease as an adult. And children between birth and three years of age are the most likely age group to experience some form of maltreatment—16 out of every thousand children experience it.

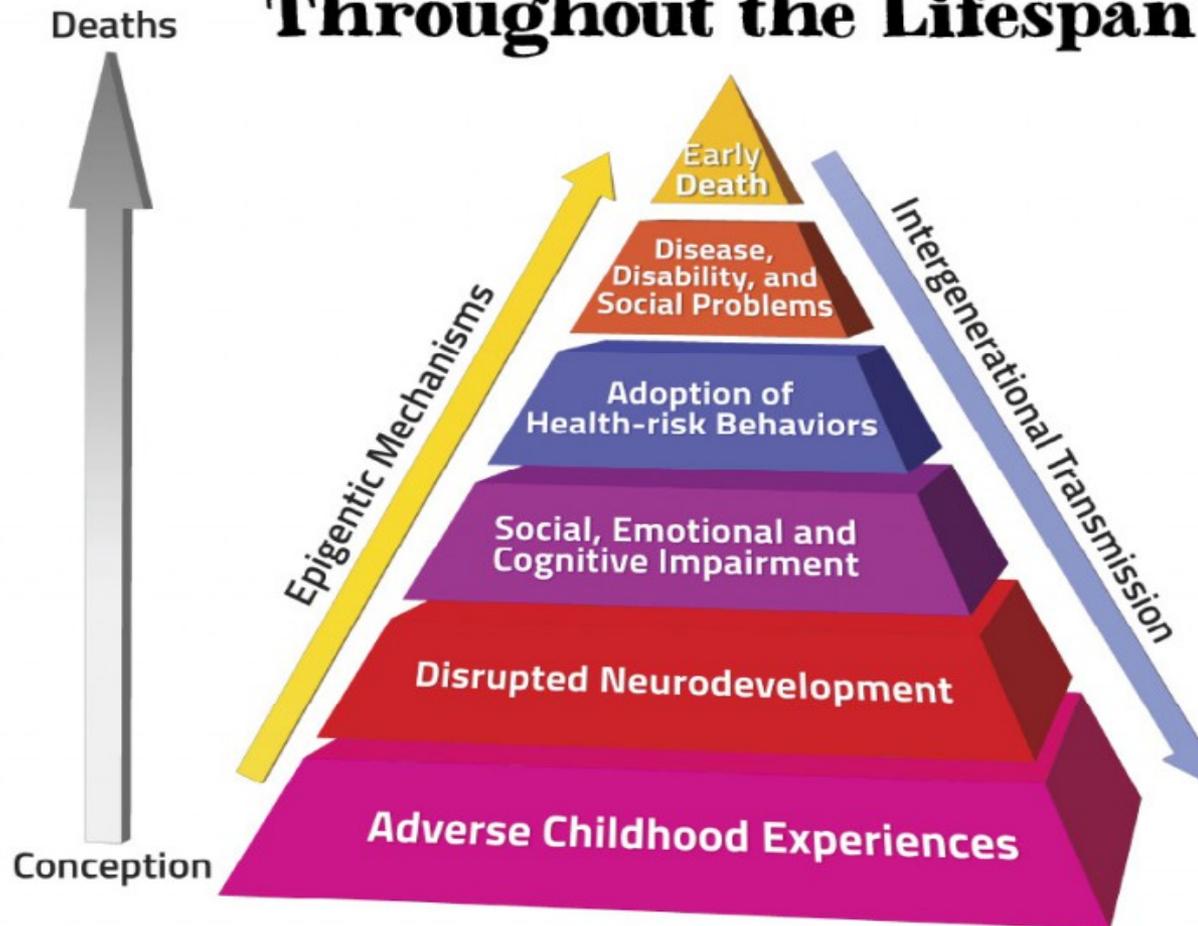
Source: Dong et al. (2004)

ACE Study Findings

“When we as children encounter sudden or chronic adversity, excessive stress hormones cause powerful changes in the body, altering our body chemistry. The developing immune system and brain react to this chemical barrage by permanently resetting our stress response to “high,” which in turn can have a devastating impact on our mental and physical health.”

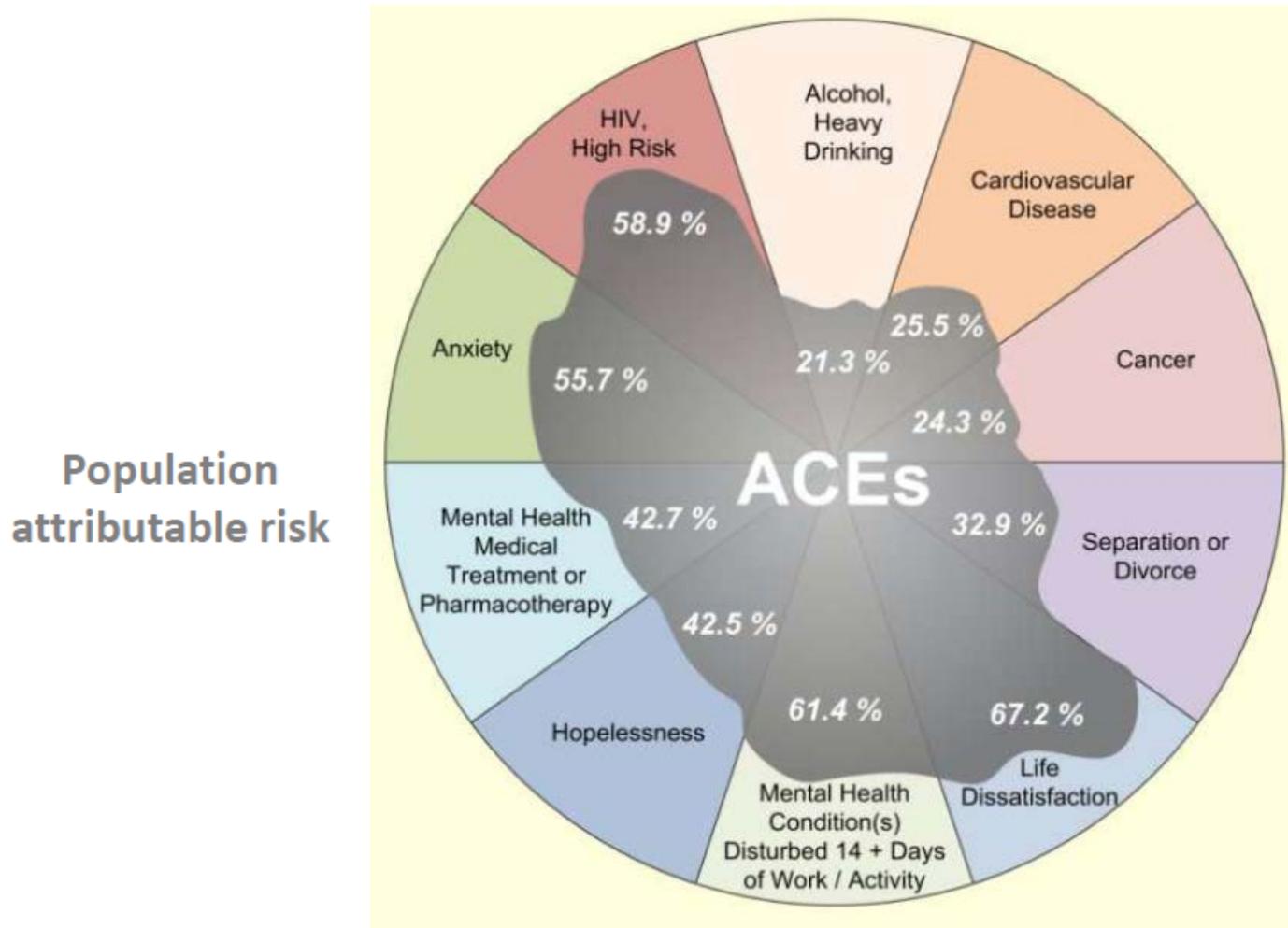
Childhood Disrupted, 2015

Mechanisms by which Adverse Childhood Experiences Influence Health and Well-being Throughout the Lifespan



Slide Courtesy of Rob Anda, MD, MS

Magnitude of the Solution



ACE reduction reliably predicts simultaneous decrease in all of these conditions

Opportunities for Future Studies of ACEs

Intensity and Duration

Death of a Parent

Bullying and Community
Violence

Institutional Racism

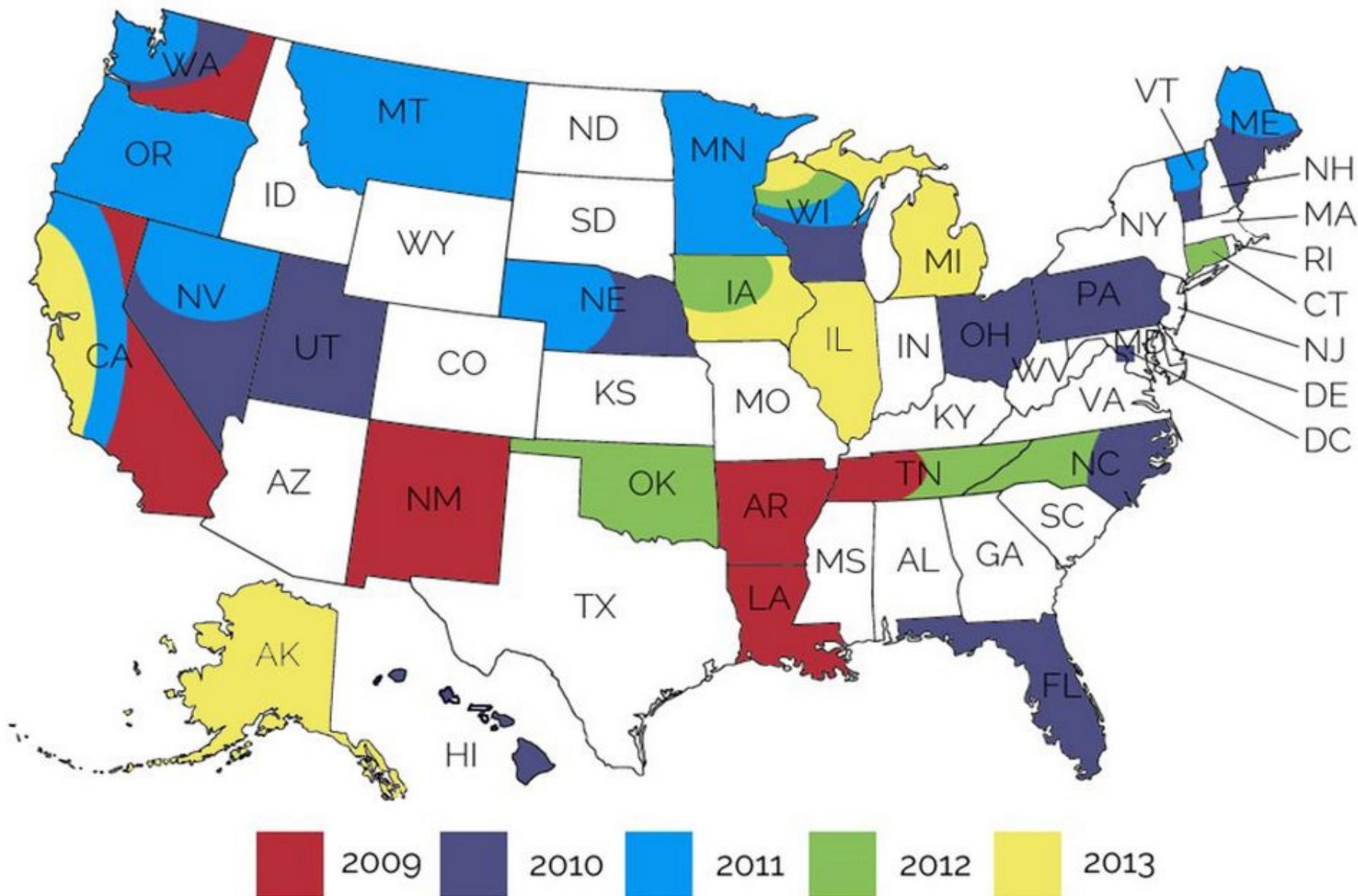
Poverty

THE RESEARCH

The Tennessee Study

States Collecting ACEs Data 2009 - 2013

Source: CDC National Center for Injury Prevention & Control



2012 Tennessee Specific ACEs Data

ACE Module added to the Behavioral Risk Factor Surveillance System (BRFSS) in 2012

BRFSS Sample =7,056 non-institutionalized adults in Tennessee with either a land line or cellular telephone. Those answering at least one question in the ACE module were included in the analysis (n=6,918) .



Results of ACEs Data Collection at The Family Center

74%

- Have 4 or more ACEs
- Results in 5 – 10 years earlier death
- Compare to 13% from original ACE study

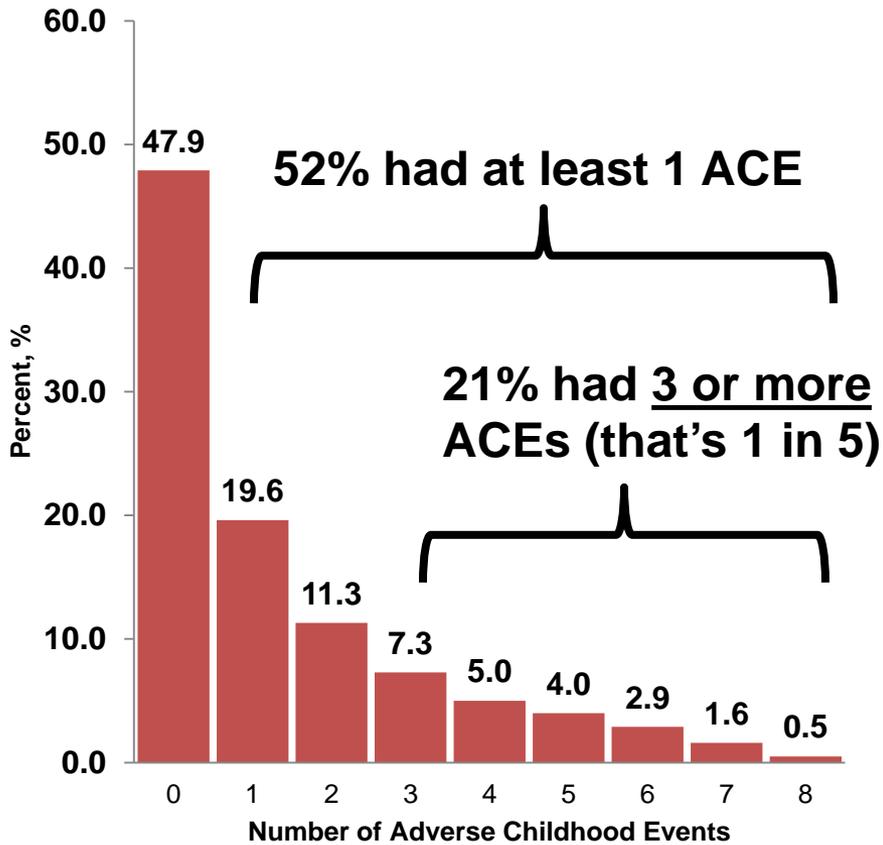
44%

- Have 7 or more ACEs
- Results in 20 years earlier death

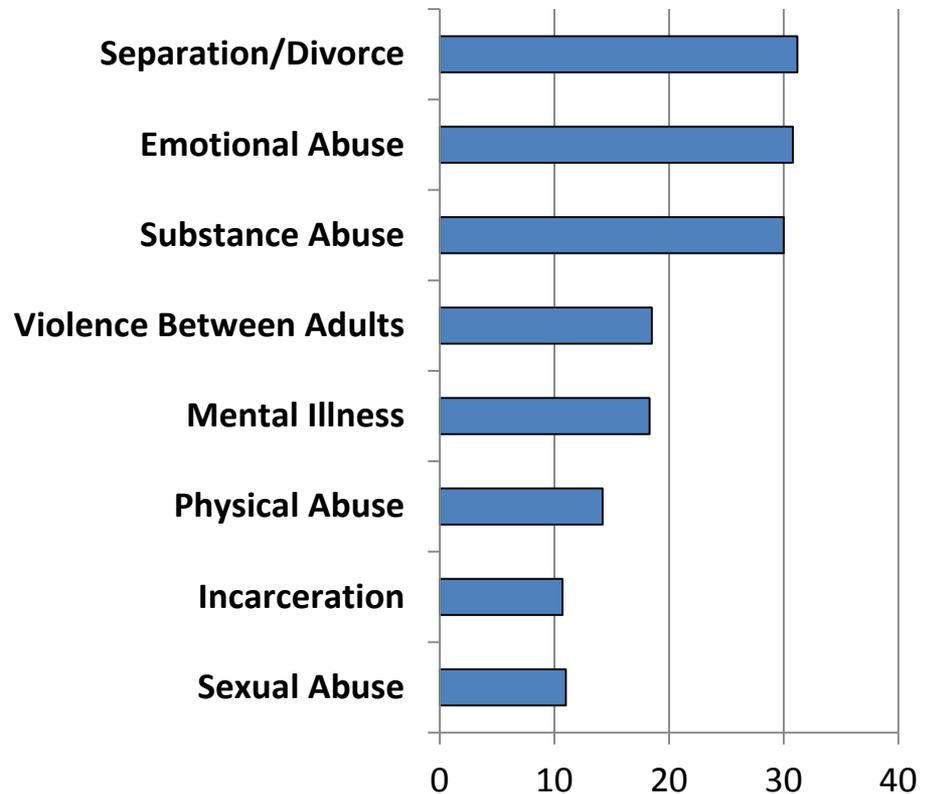
Slide courtesy of Jennifer Drake Croft– The Family Center

ACEs in TN (2012)

Prevalence of Adverse Childhood Experiences in Tennessee, 2012

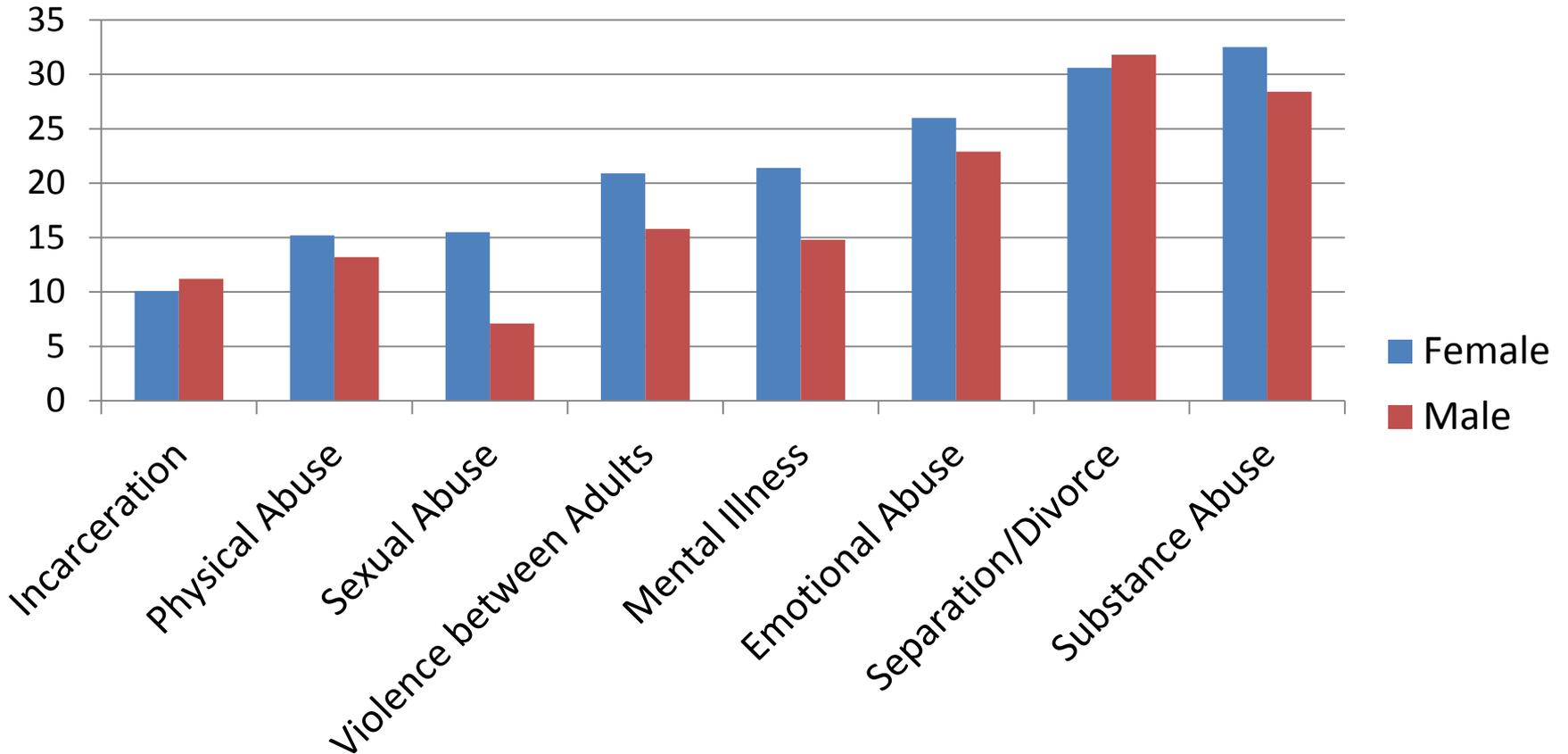


Prevalence of Adverse Childhood Experiences in Tennessee by Category, 2012



Source: Tennessee Behavioral Risk Factor Surveillance System (BRFSS), 2012.

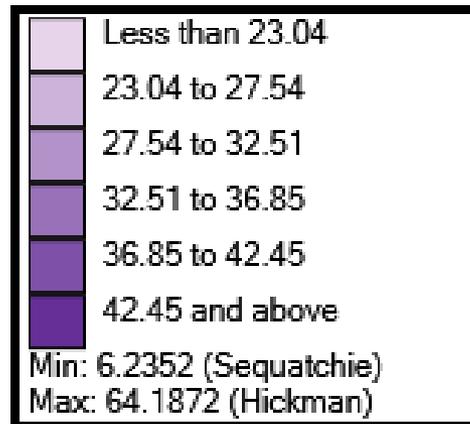
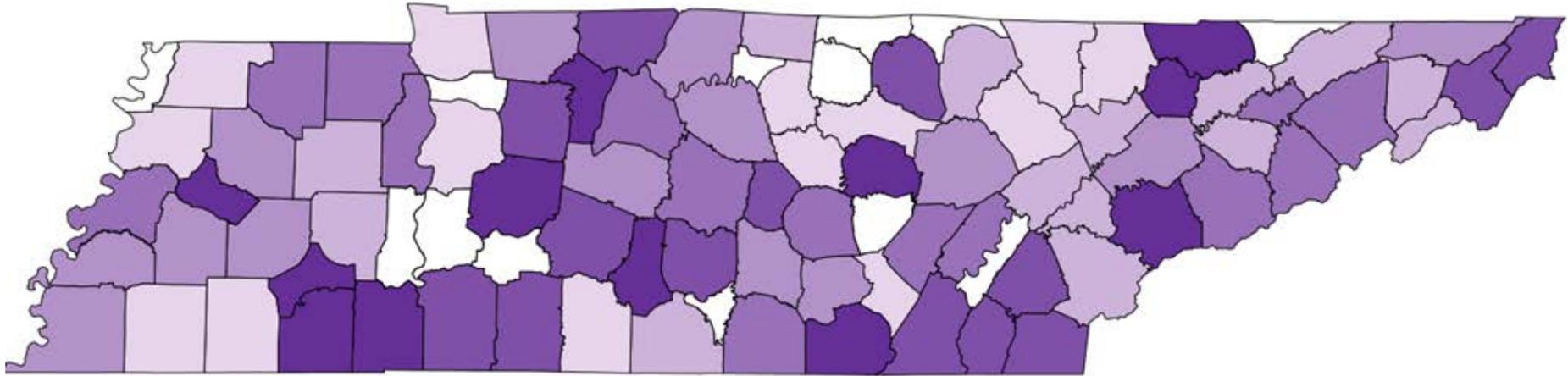
Figure 2: Prevalence of Specific ACEs in TN by Gender



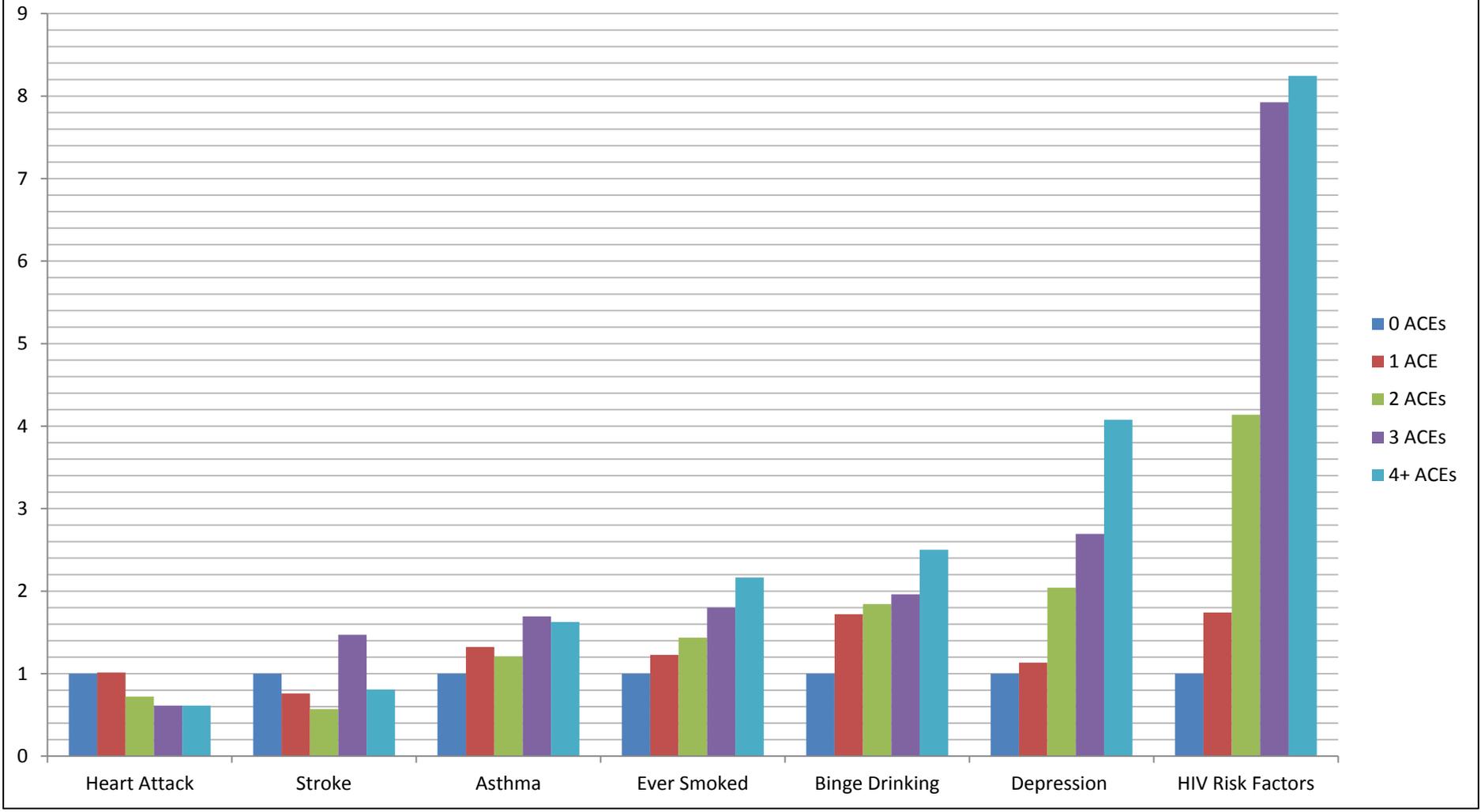
Source: Tennessee Behavioral Risk Factor Surveillance System (BRFSS), 2012.

Geographic Distribution

***Percentage of population that has 2 or more ACEs**

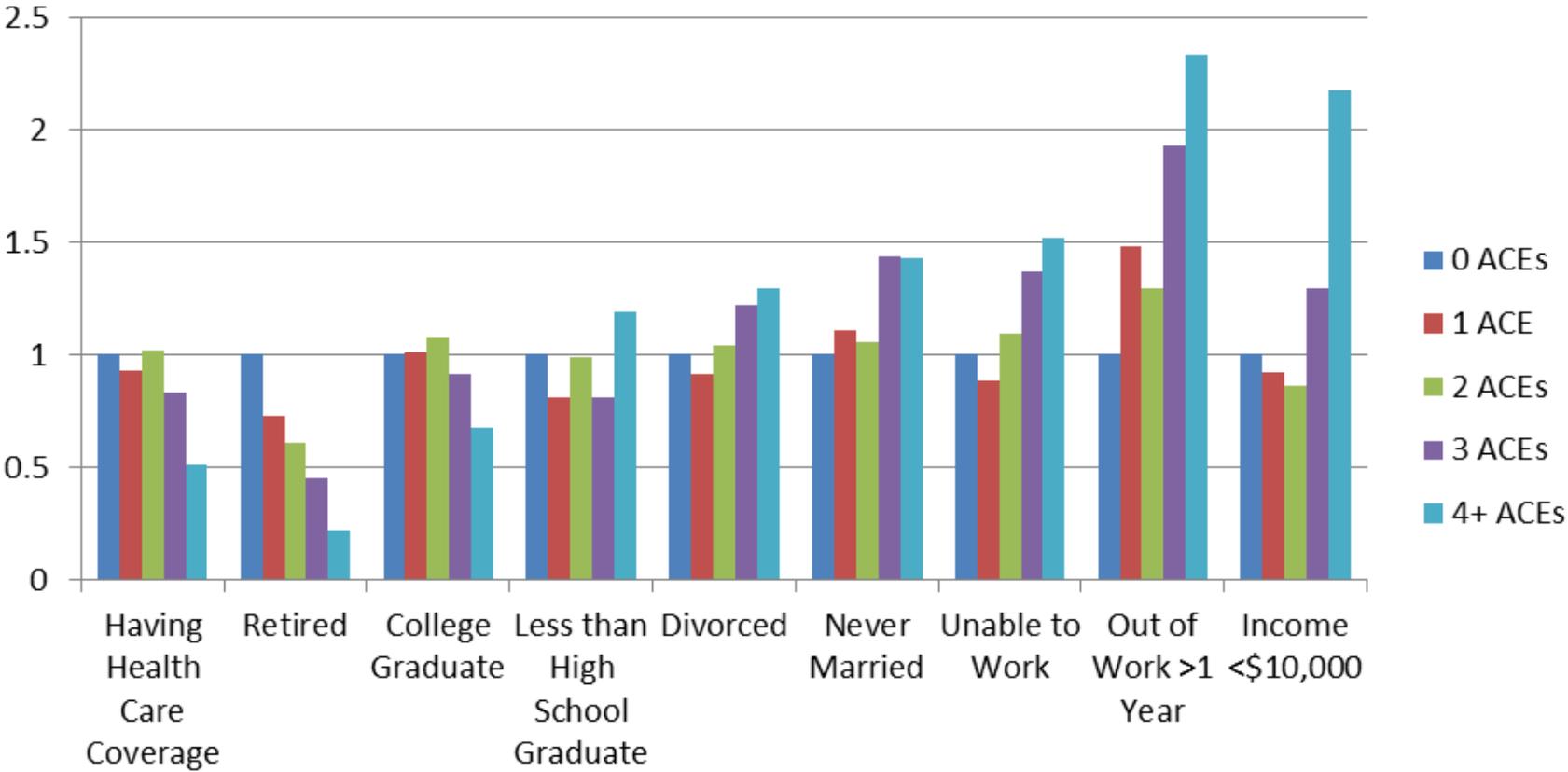


Association of Health Outcomes and Behaviors by ACE Score*



* = All significant $p \geq 0.05$

Association of Economic Outcomes by ACE Score*



* = All significant $p \geq 0.05$

THE OPPORTUNITIES



Reasons to Hope

- Resiliency buffers the effects of trauma.
- Social support and resources are protective factors that build resiliency at any age.
- Safety can be created from multiple sources and a little may go a long way.
- Brain development is far more dynamic than we used to think.



Overall Focus is to Implement Recommendations to Prevent and Respond to Toxic Stress from the CDC

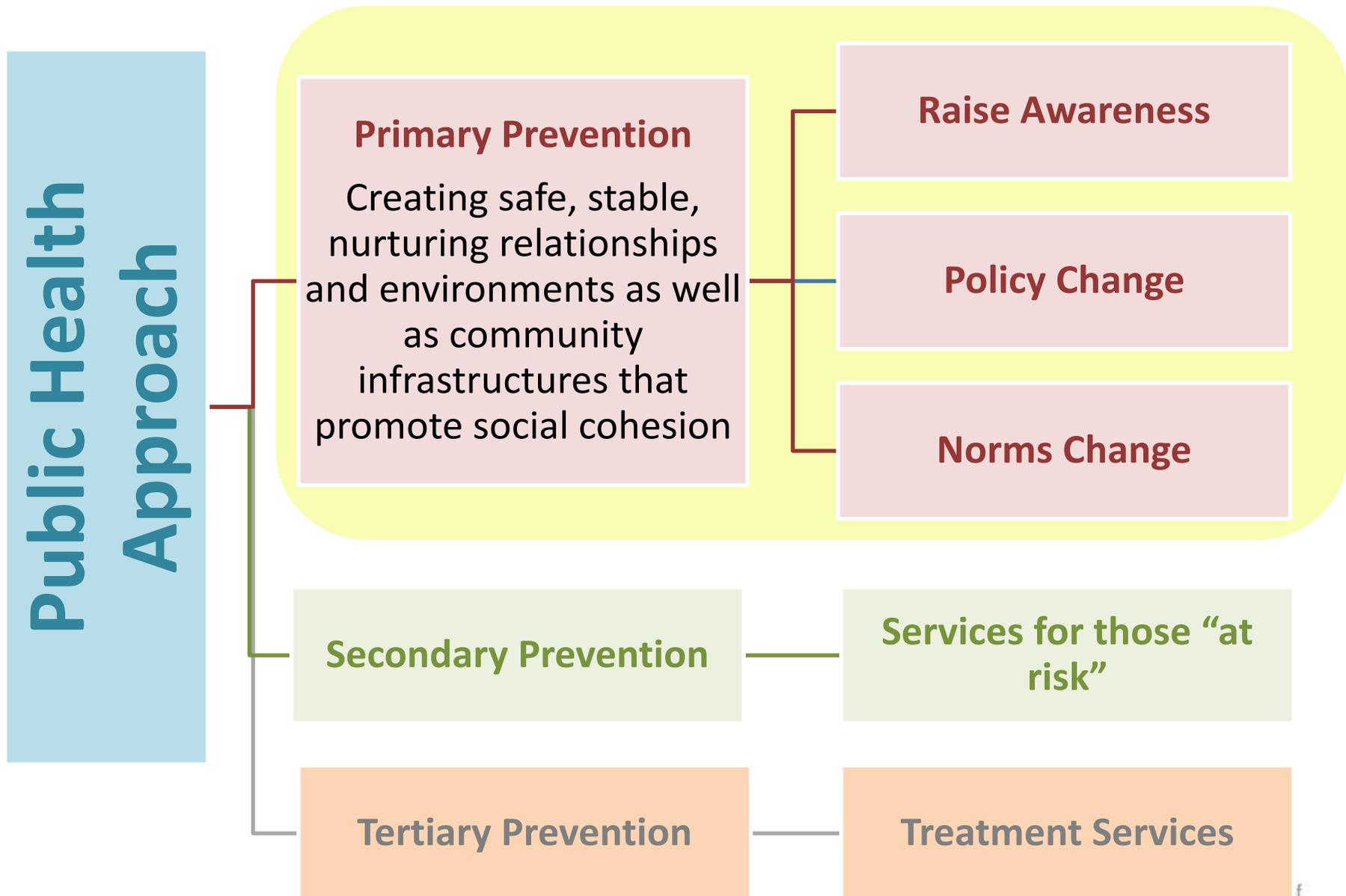
Safe

Stable

Nurturing

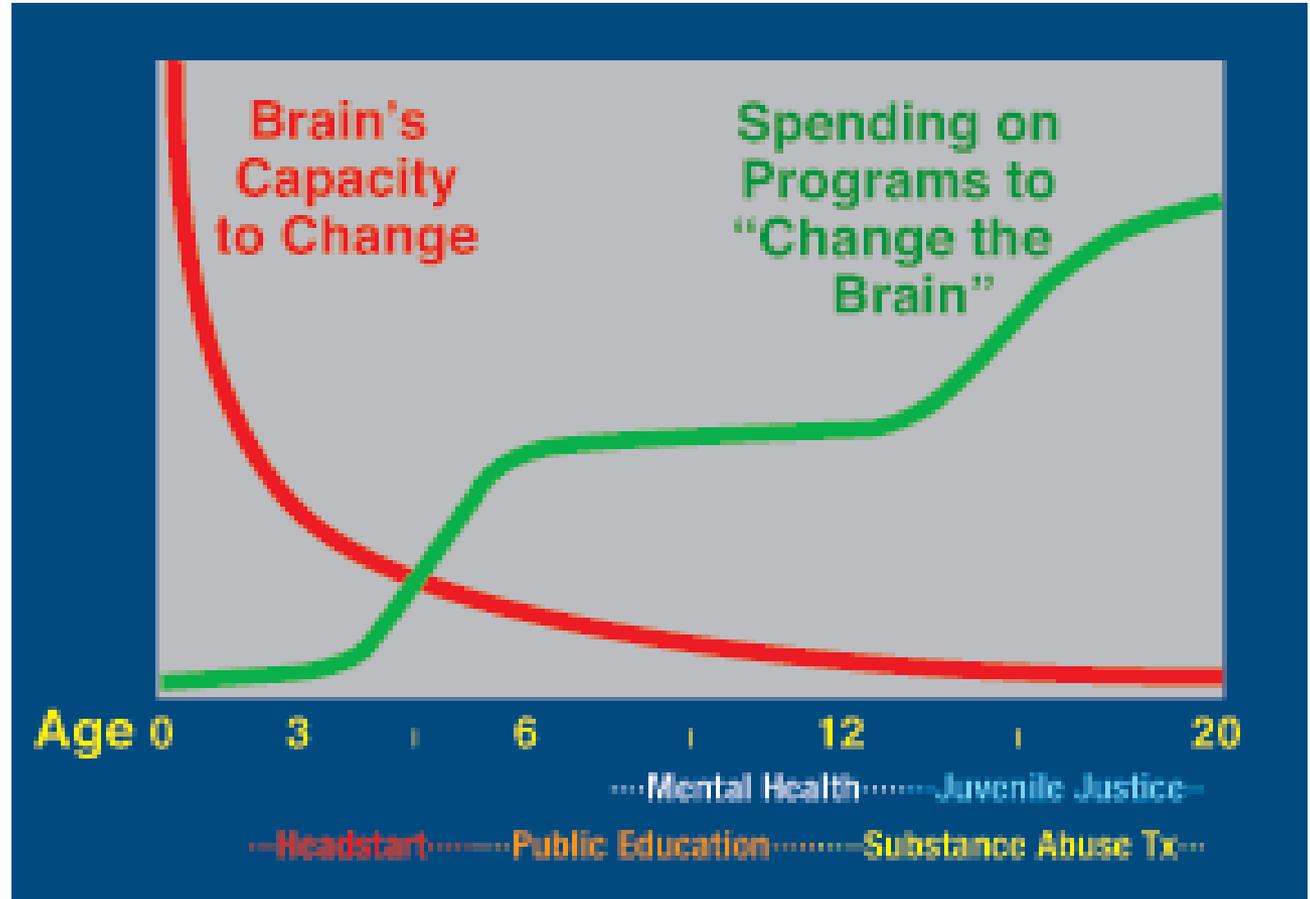
Relationships and Environments

One Step Further: ACEs and Public Health



Moving the Needle

**Primary
prevention
saves
money**



Shifting the Conversation...

What is wrong with you?

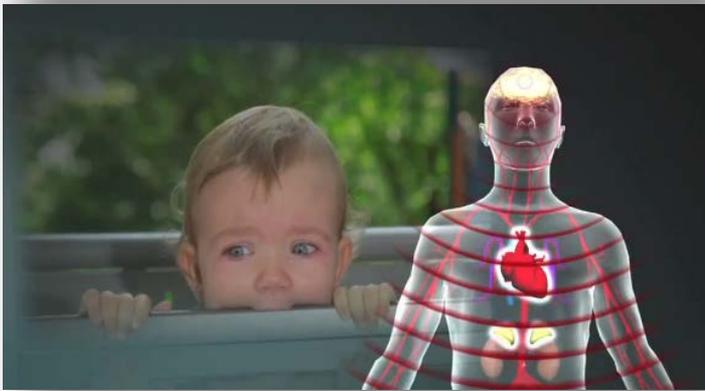
TO

What has happened to you?

Summary



The brains of infants and young children are rapidly developing (700 synapses per second are forming).



“Toxic Stress” damages brain development and inhibits synaptic growth.



Safe, stable, nurturing relationships and environments promote optimal brain development and synaptic growth.

Stressful and traumatic childhood experiences literally become “biology” affecting brain structure and function (as well as endocrine, immune, and other biologic functions) thus leading to persistent effects.

Until now, these persistent effects were “hidden” from the view of both neuroscientists and public health researchers.

This is no longer the case. In fact, with this information comes *the responsibility to use it.*

Dr. Robert Anda, ACE Study

What are you going to do
to become a champion?

In seven days from now....

In one month from now...

In six months from now...