EARLY CHILDHOOD DEVELOPMENT

TENNESSEE COMMISSION ON CHILDREN AND YOUTH

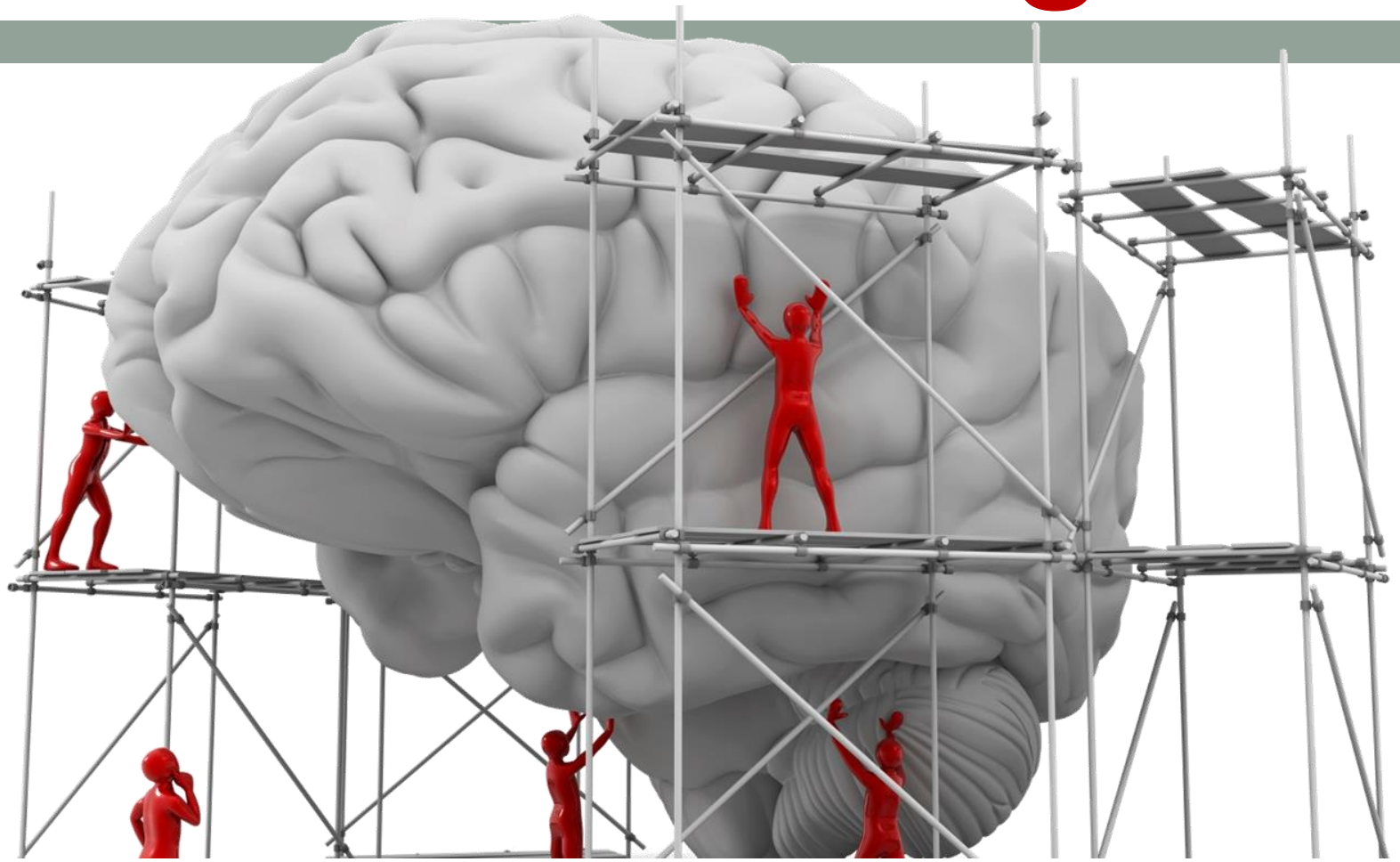
The Early Brain

Center on the Developing Child

Harvard University

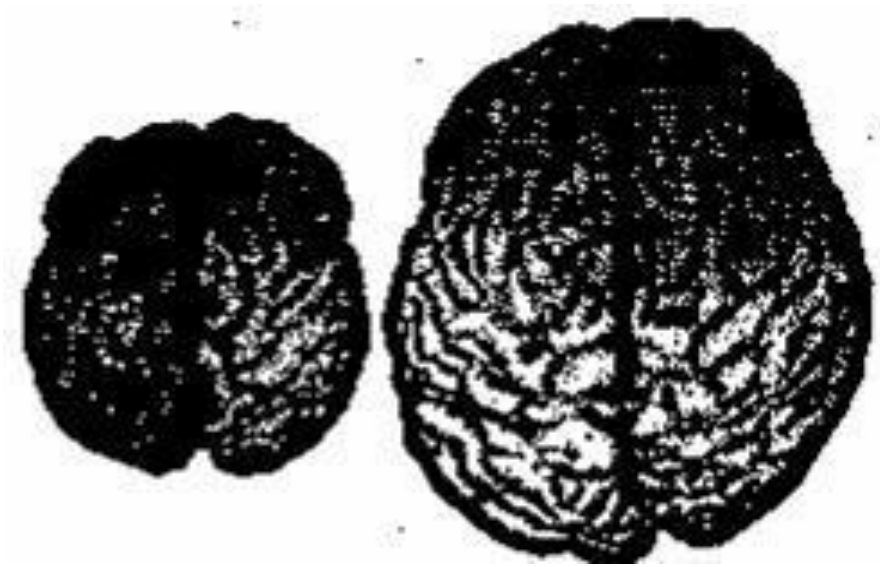
- Key Concepts
  - Brain Architecture
  - Serve and Return
  - Toxic Stress

Where to Begin



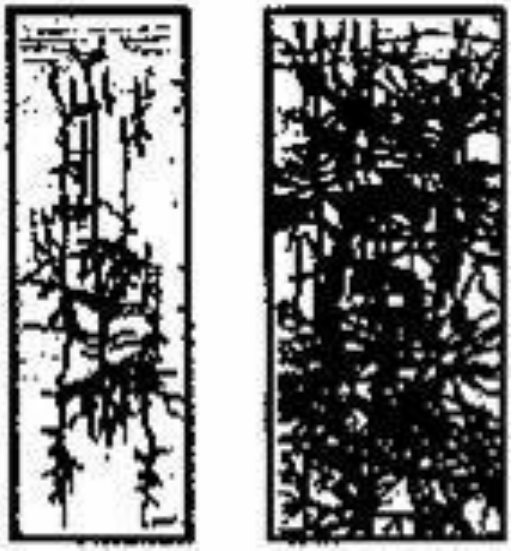
Brain Architecture

Normal Brain Development



Newborn

6-year-old

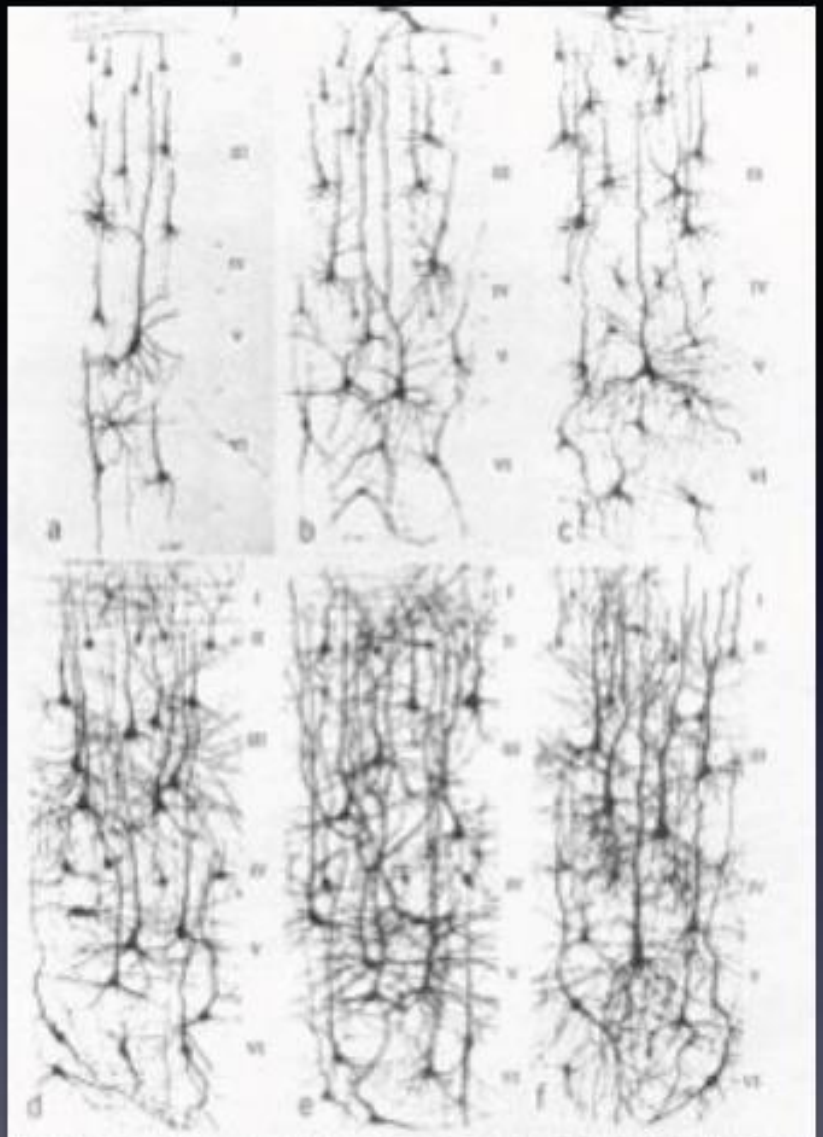


Newborn

6-year-old

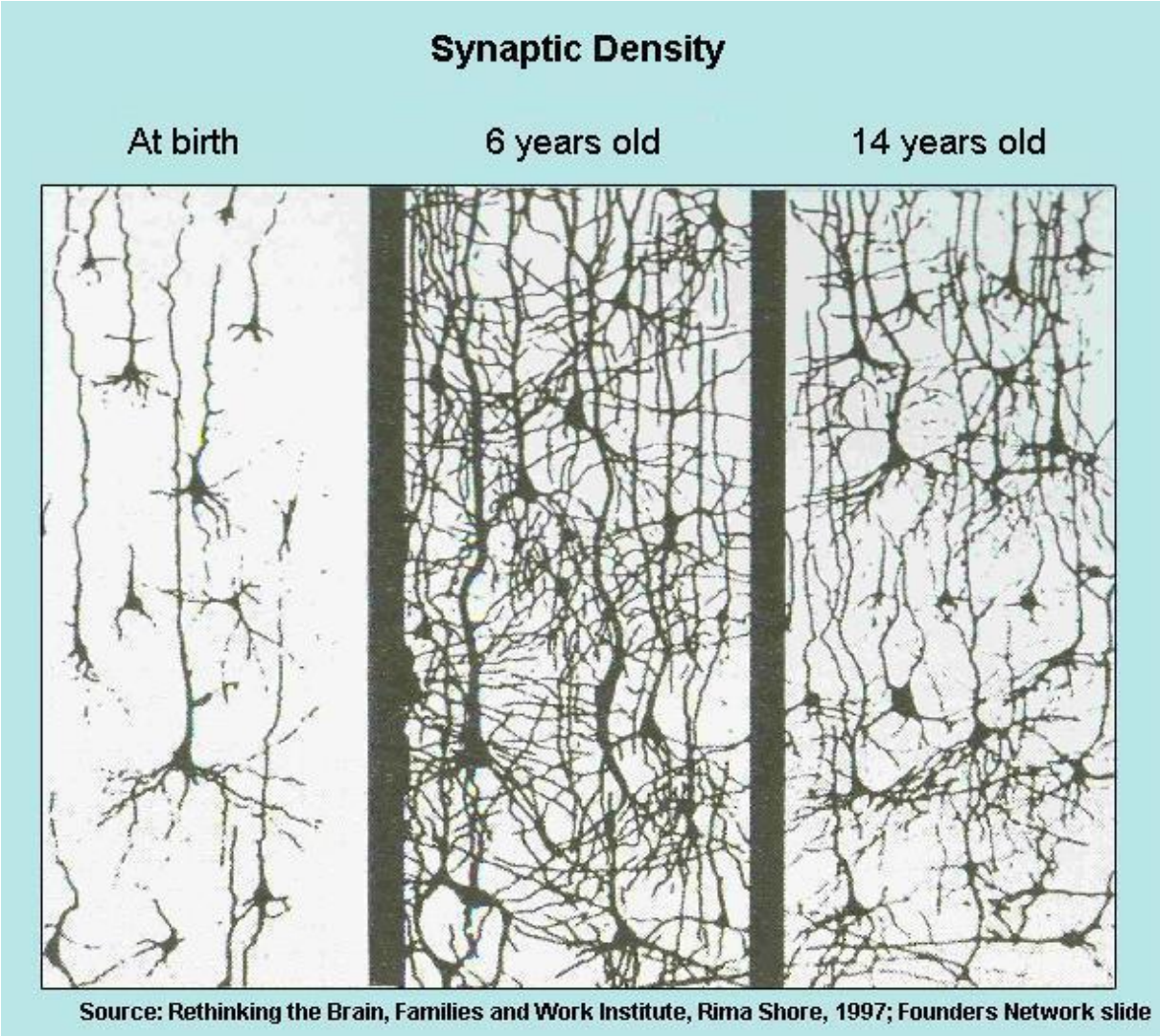
700

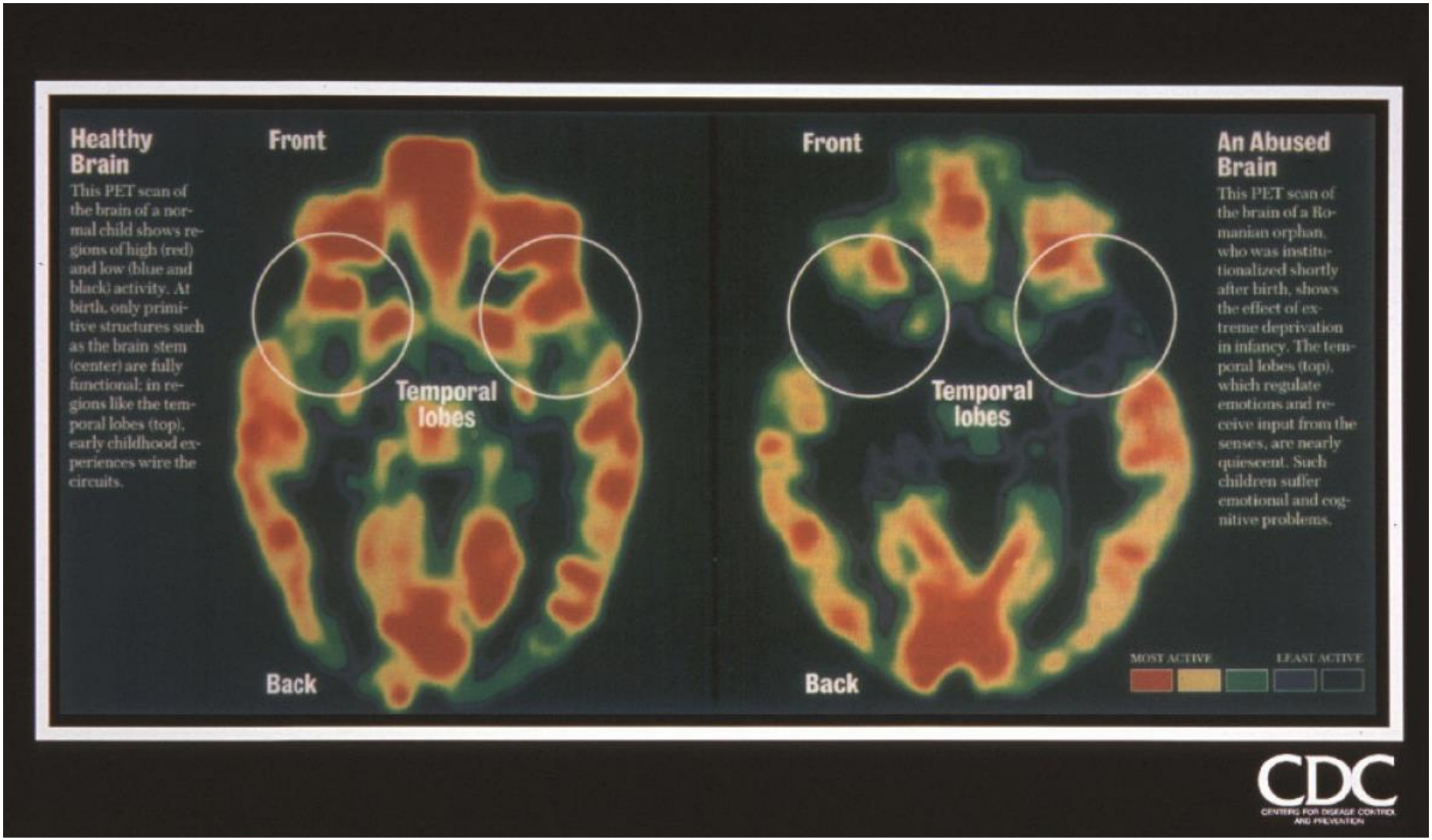
New Neural Connections per Second



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)

Neuron Development/Pruning




Healthy Brain
This PET scan of the brain of a normal child shows regions of high (red) and low (blue and black) activity. At birth, only primitive structures such as the brain stem (center) are fully functional; in regions like the temporal lobes (top), early childhood experiences wire the circuits.
Front
Temporal lobes
Back
Front
Temporal lobes
Back
An Abused Brain
This PET scan of the brain of a Romanian orphan, who was institutionalized shortly after birth, shows the effect of extreme deprivation in infancy. The temporal lobes (top), which regulate emotions and receive input from the senses, are nearly quiescent. Such children suffer emotional and cognitive problems.
MOST ACTIVE
LEAST ACTIVE
CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

Slide courtesy of Dr. Patti van Eys, Omni Visions, Inc.

Brain Architecture

Serve and Return

- Shapes brain architecture
- Like a game of tennis or volleyball
- It is about

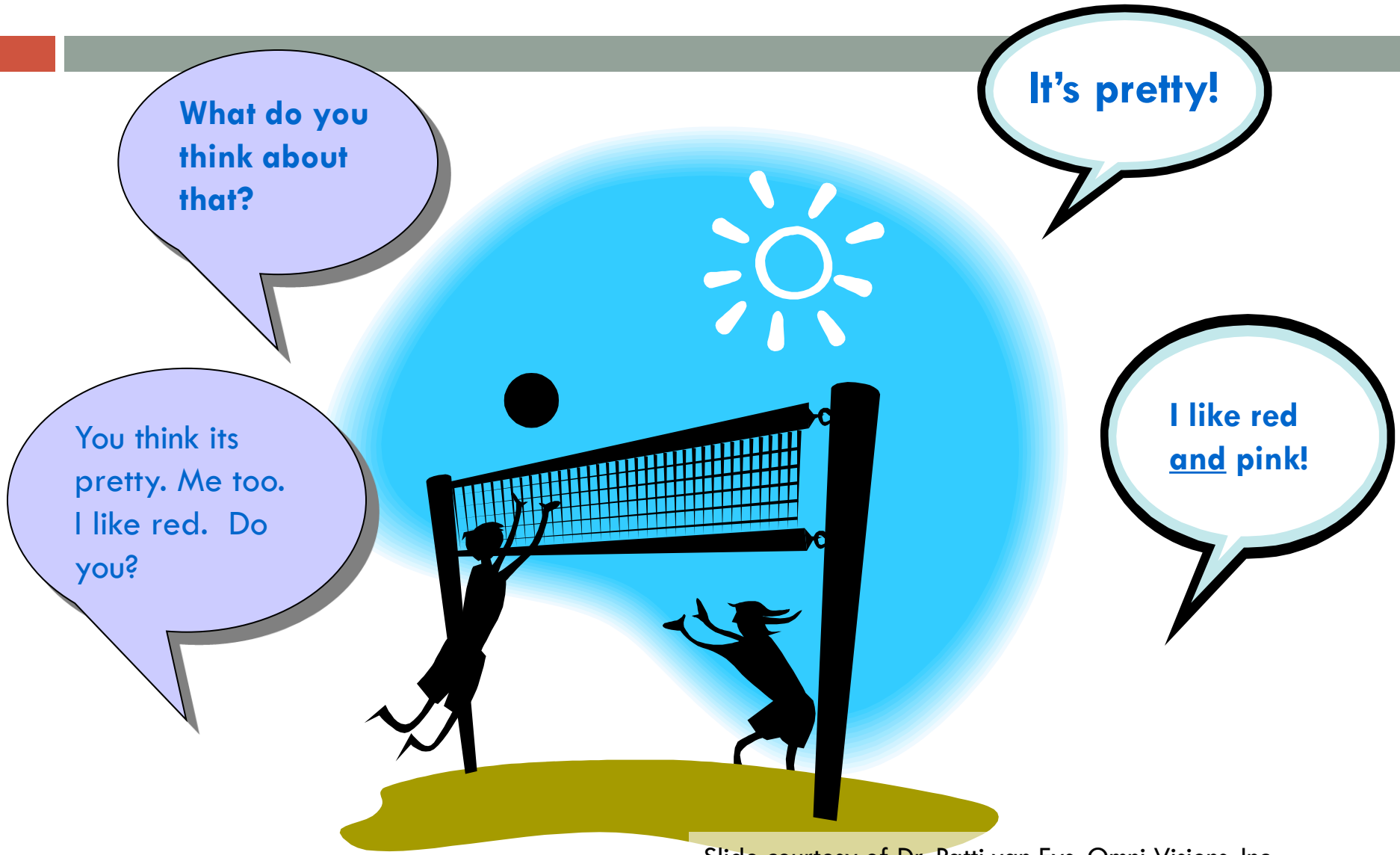
  responsive

  relationships and

  building adult

  capabilities.

Serve and Return



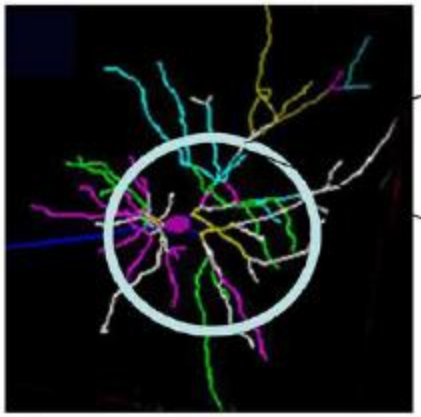
Slide courtesy of Dr. Patti van Eys, Omni Visions, Inc.

Toxic Stress

Center on the Developing Child
HARVARD UNIVERSITY

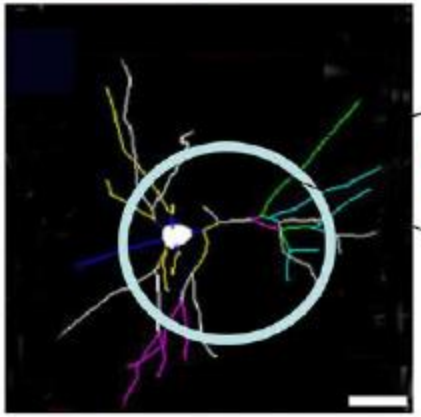
Persistent Stress Changes Brain Architecture

Normal



Typical neuron—
many connections

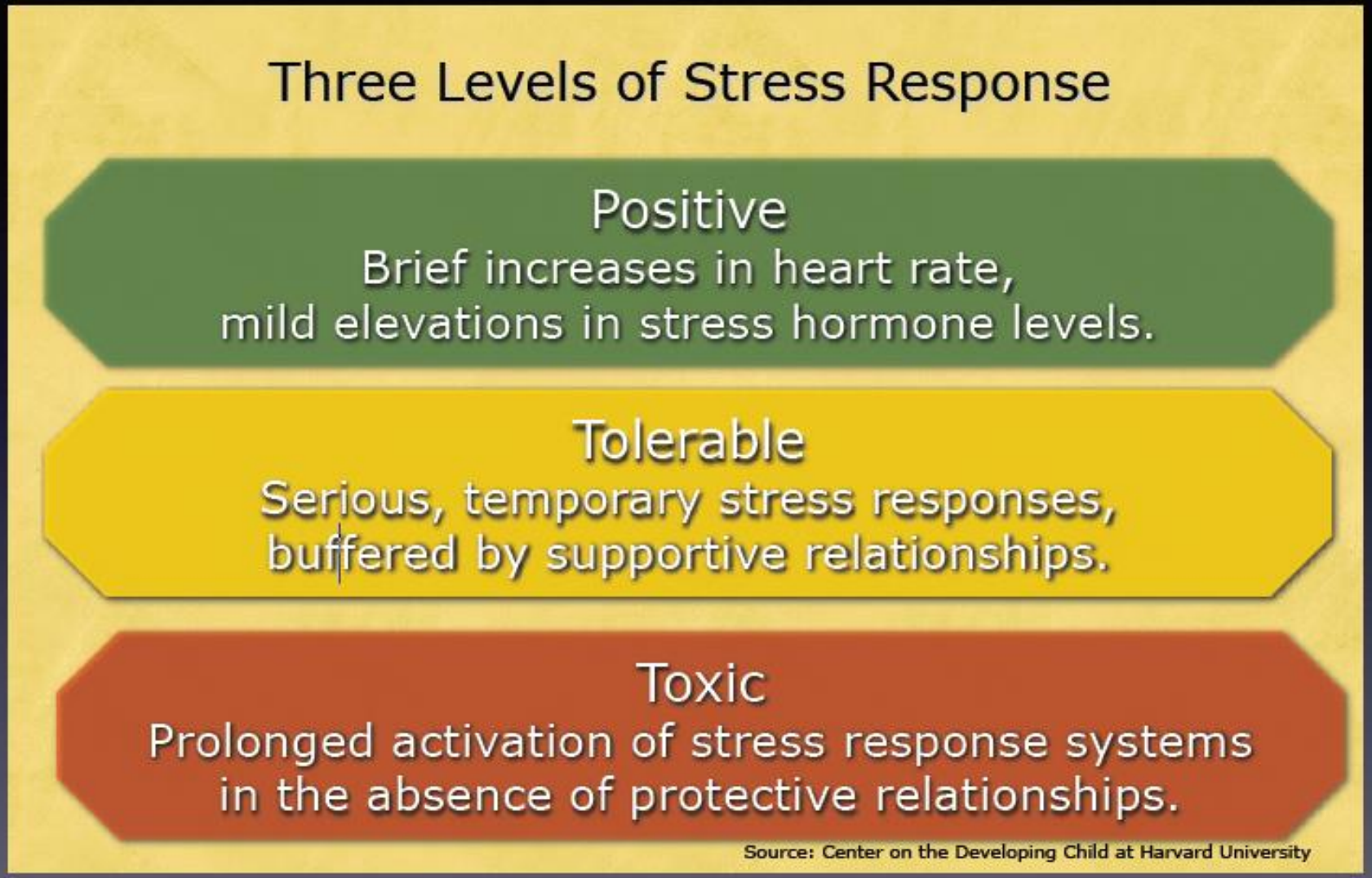
Toxic
stress



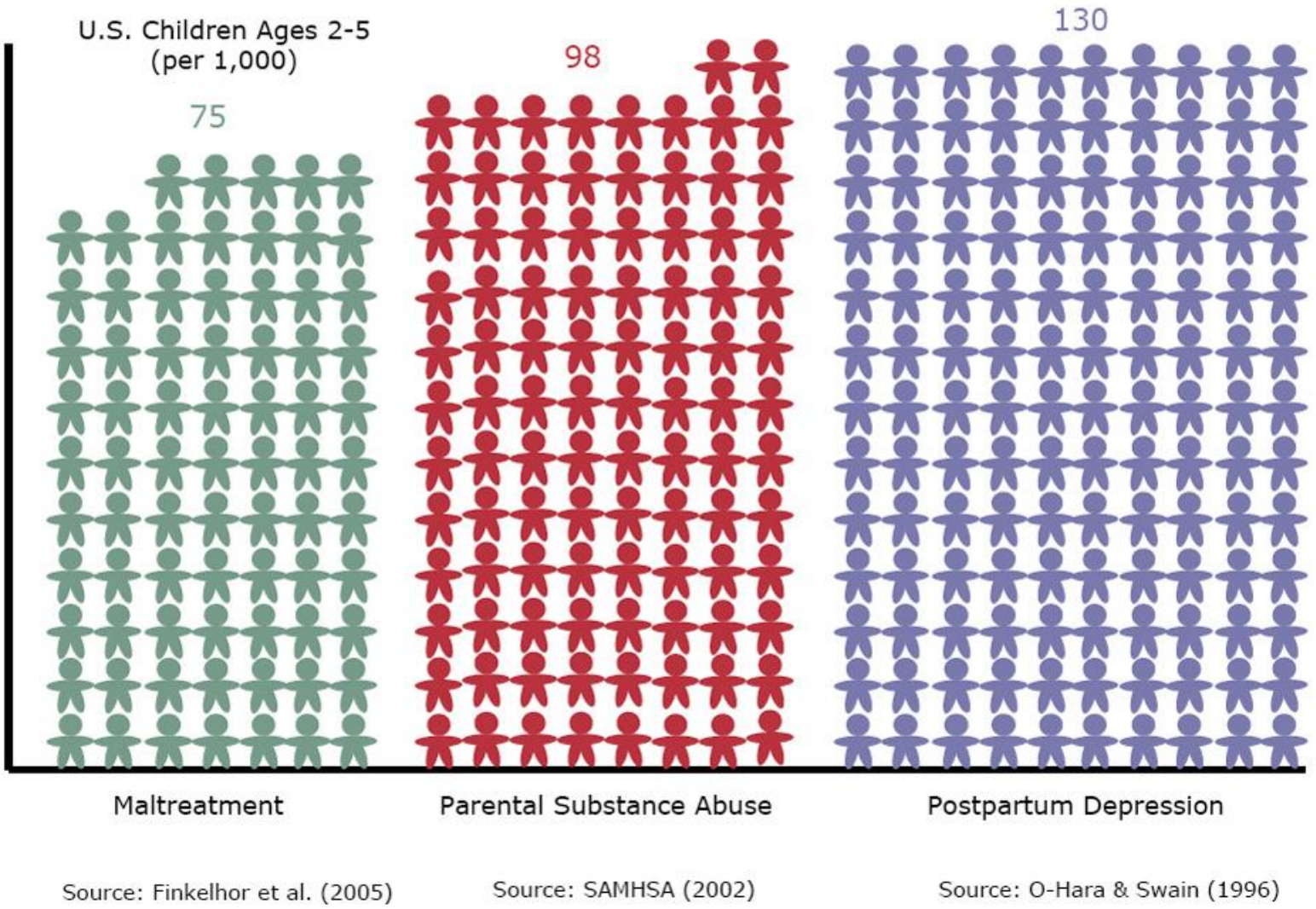
Damaged neuron—
fewer connections

Prefrontal Cortex and
Hippocampus

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


Three Levels of Stress Response
Positive
Brief increases in heart rate,
mild elevations in stress hormone levels.
Tolerable
Serious, temporary stress responses,
buffered by supportive relationships.
Toxic
Prolonged activation of stress response systems
in the absence of protective relationships.
Source: Center on the Developing Child at Harvard University

Sources of Toxic Stress in Young Children



Slide courtesy of Dr. Patti van Eys, Omni Visions, Inc.

Toxic Stress and Early Brain Development

- ***The Adverse Childhood Experiences (ACE) Study***
- **www.ACESTUDY.org**

- Involved ~17,000 patients at Kaiser Permanente Hospital

- Results "reveal staggering proof of the health, social, and economic risks that result from childhood trauma."
  - www.acestudy.org

Adverse Childhood Experiences (ACE) Study:

surveyed >17,000 middle-class adults

Adverse HEALTH Outcomes

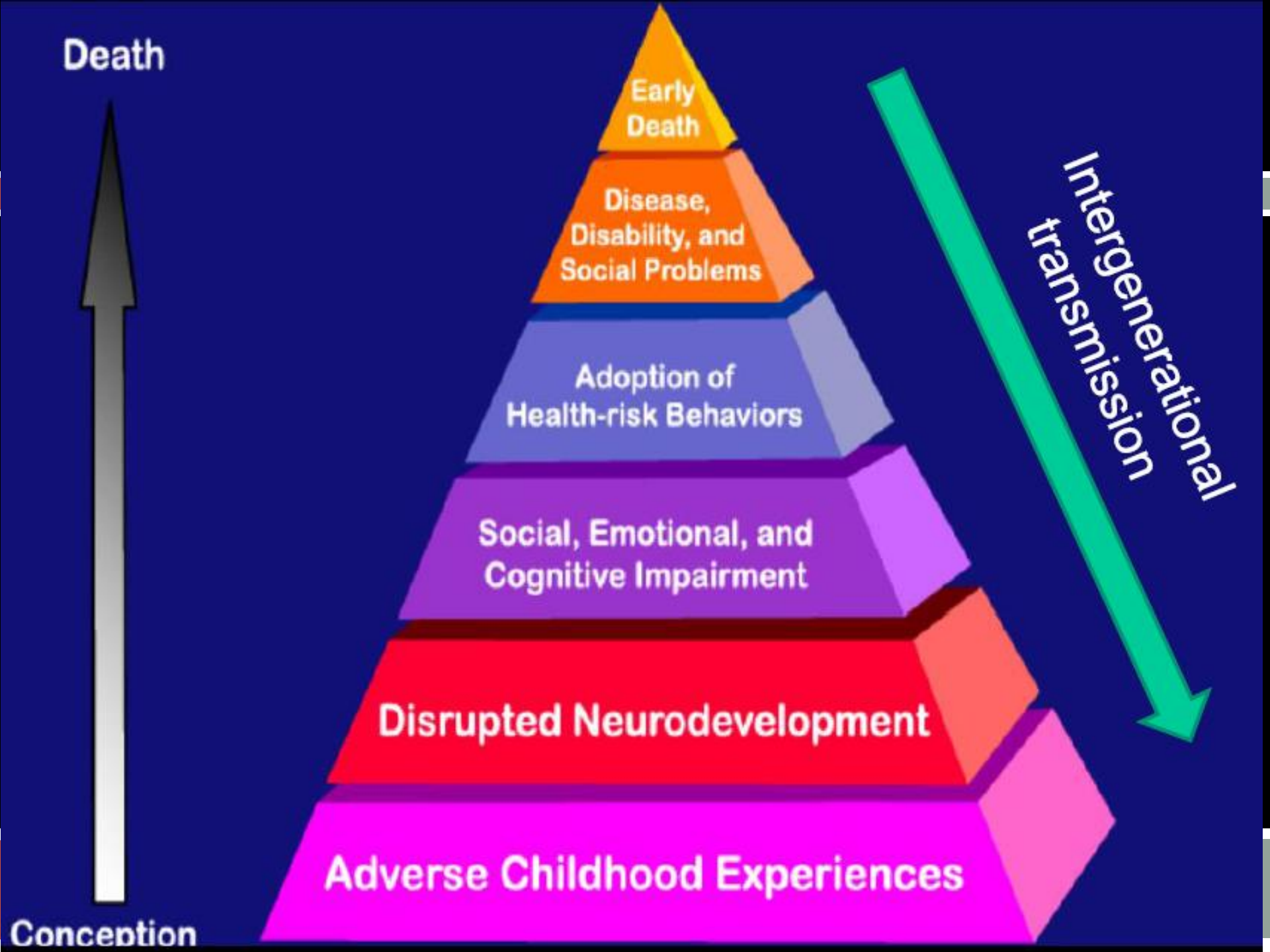
Poor SOCIAL OUTCOMES

Adverse *MENTAL* HEALTH Outcomes

Dr. Vincent Felitti – Kaiser Permanente

Dr. Robert Anda – Center for Disease Control and Prevention

Slide courtesy of Dr. Patti van Eys, Omni Visions, Inc.


Death
Early Death
Disease, Disability, and Social Problems
Adoption of Health-risk Behaviors
Social, Emotional, and Cognitive Impairment
Disrupted Neurodevelopment
Adverse Childhood Experiences
Intergenerational transmission
Conception

ACE Questionnaire

- *Consists of 10 questions*
- *Is not all encompassing*
- *Categories*
  - *Abuse / Neglect*
    - Recurrent Emotional (by parents)
    - Recurrent Physical (by parents)
    - Emotional / Physical neglect
    - Sexual (by anyone)
  - *Household Dysfunction*
    - Substance Abuse
    - Mental Illness
    - Mother treated violently
    - Imprisoned household member
    - One or no parents (separation or divorce)

www.acestudy.org

ACE Score Implications

- As the ACE score increased, the chances of being a user of street drugs, tobacco or having problems with alcohol abuse increased in stepwise fashion.
- Compared to persons with ACE score of 0, those with a score of 4 or more were:
  - 2 times as likely to be smokers,
  - 12 times more likely to have attempted suicide,
  - 7 times more likely to be alcoholic,
  - 10 times more likely to have injected street drugs.

ACE Reporter, Vol 1, No 1, April 2003

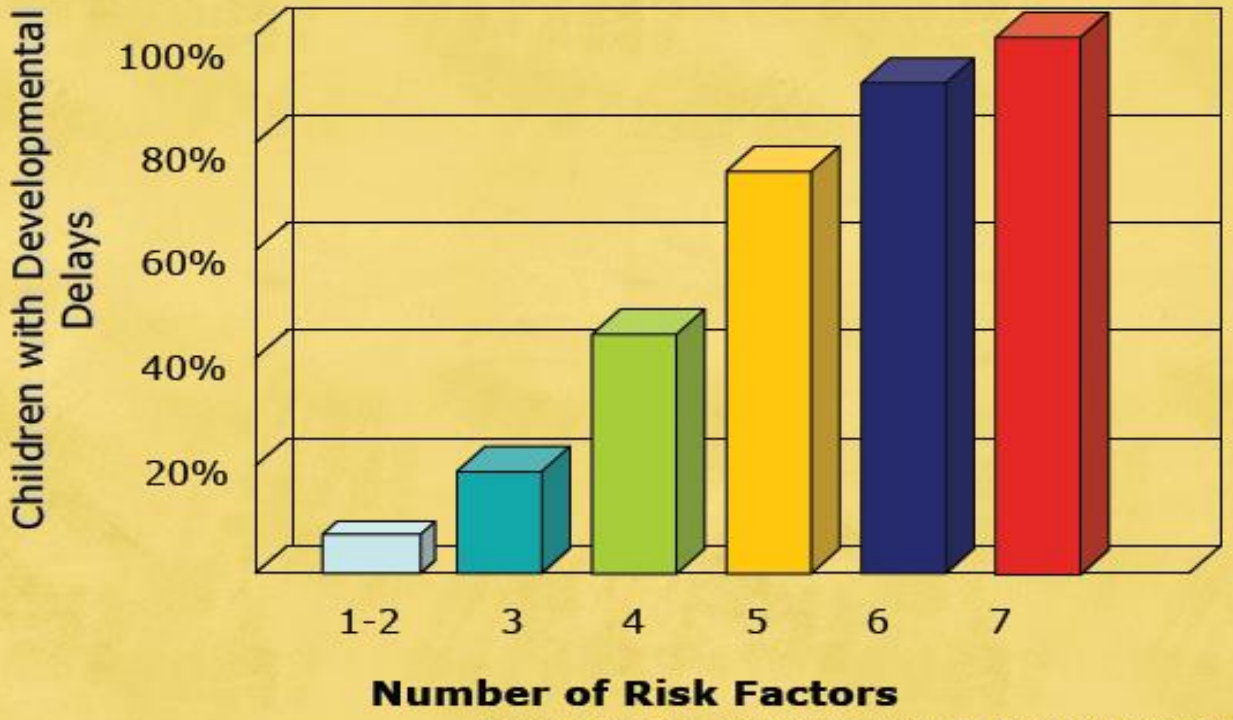
ACE Score Implications (cont.)

- ACE score of 4 or higher:
  - 7 times more likely to be alcoholic
  - 6 times more likely to have sex by age 15
  - 2 times more likely to be diagnosed with cancer
  - 4 times more likely to have emphysema

- ACE score of 6 or higher:
  - 30 times more likely to attempt suicide
  - 20 year shortening of life span

Slide courtesy of Dr. Patti van Eys, Omni Visions, Inc.

Significant Adversity Impairs Development in the First Three Years



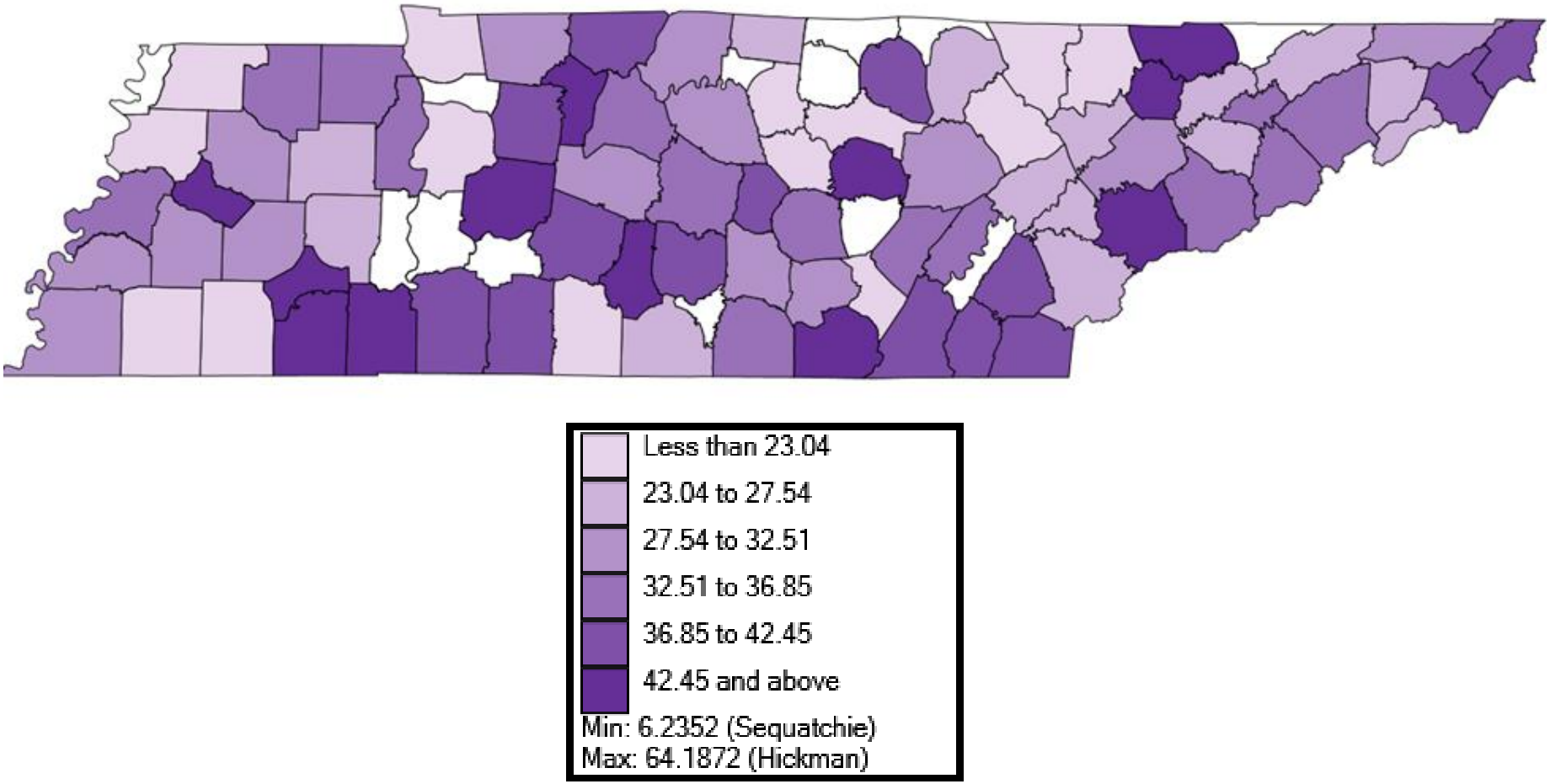
Source: Barth, et al. (2008) *via* Center on the Developing Child at Harvard University

ACEs in Tennessee

Tennessee-Specific Data

Geographic Distribution

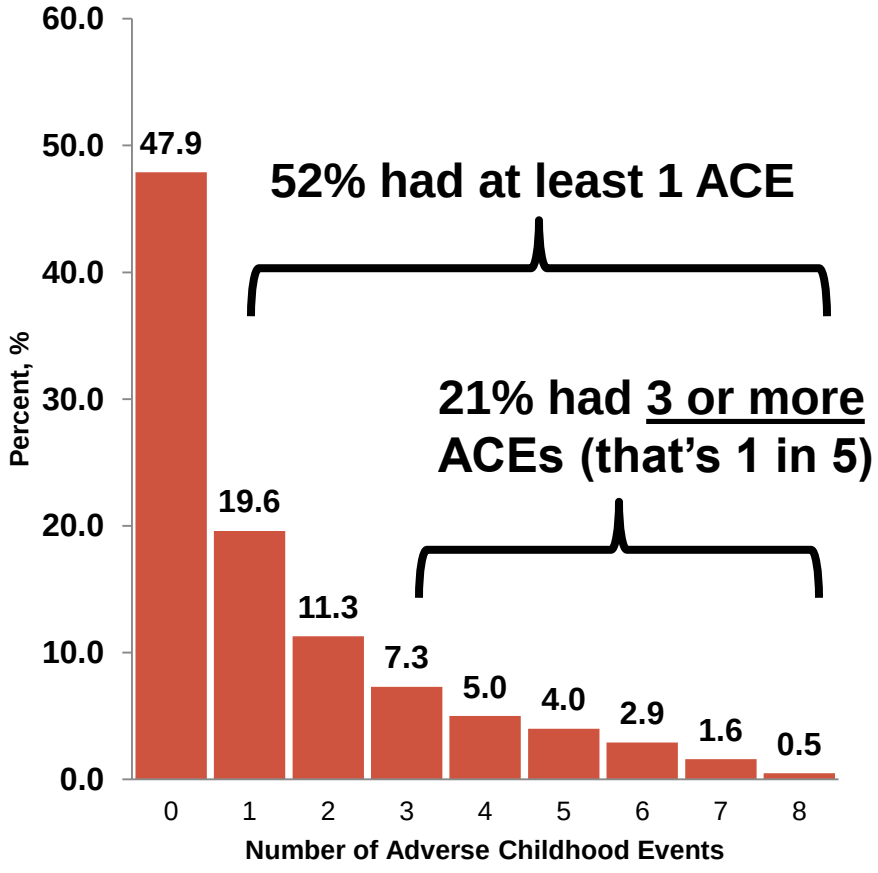
***Percentage of population that has 2 or more ACEs**



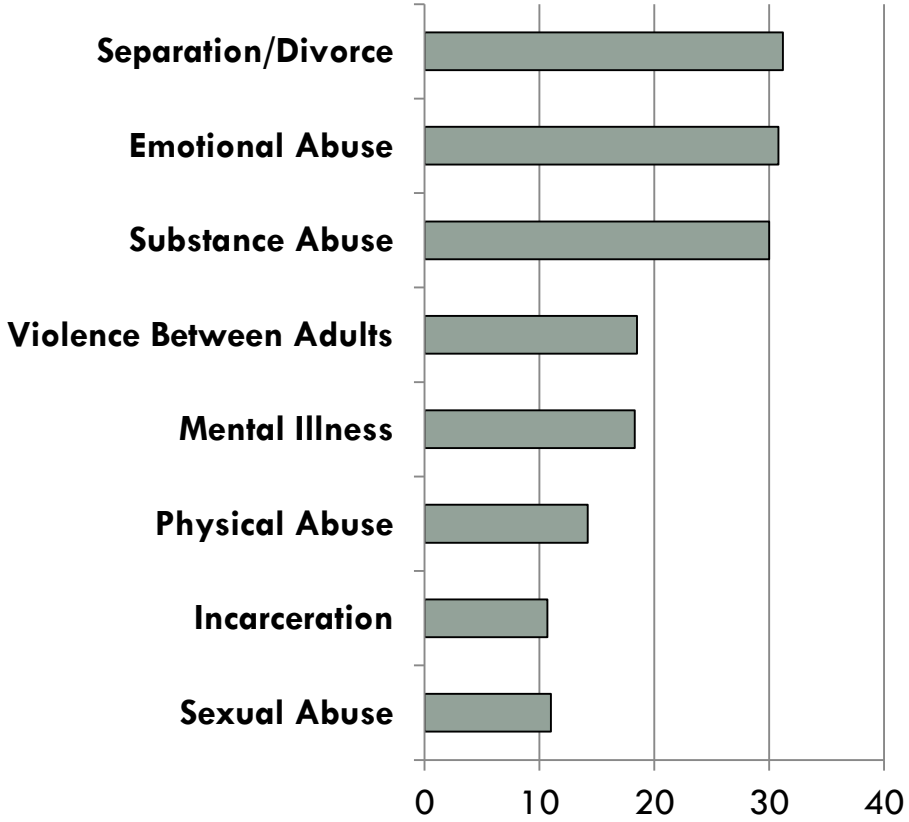
Source: Tennessee Behavioral Risk Factor Surveillance System (BRFSS), 2012.

ACEs in TN (2012)

Prevalence of Adverse Childhood Experiences in Tennessee, 2012

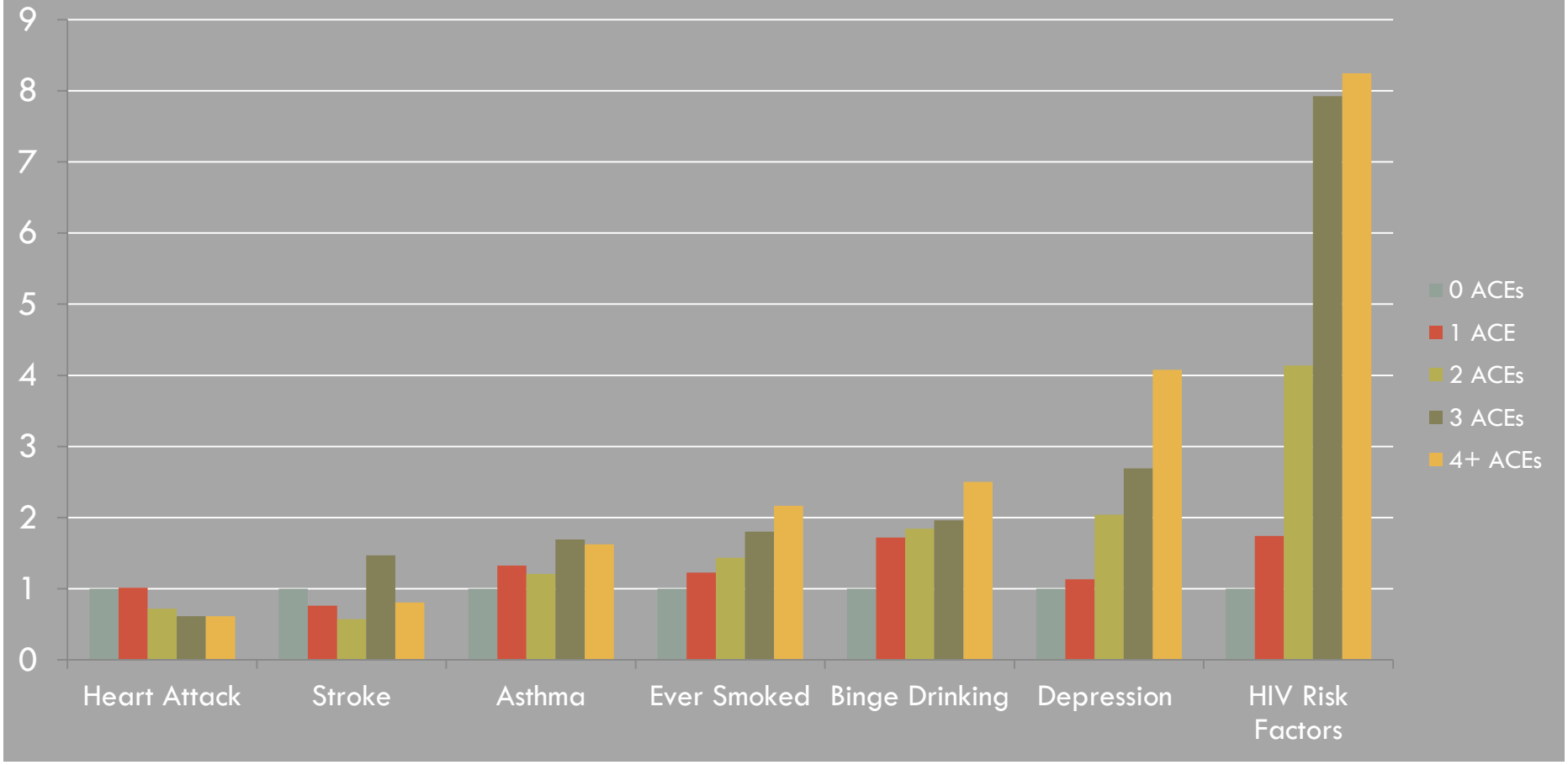


Prevalence of Adverse Childhood Experiences in Tennessee by Category, 2012

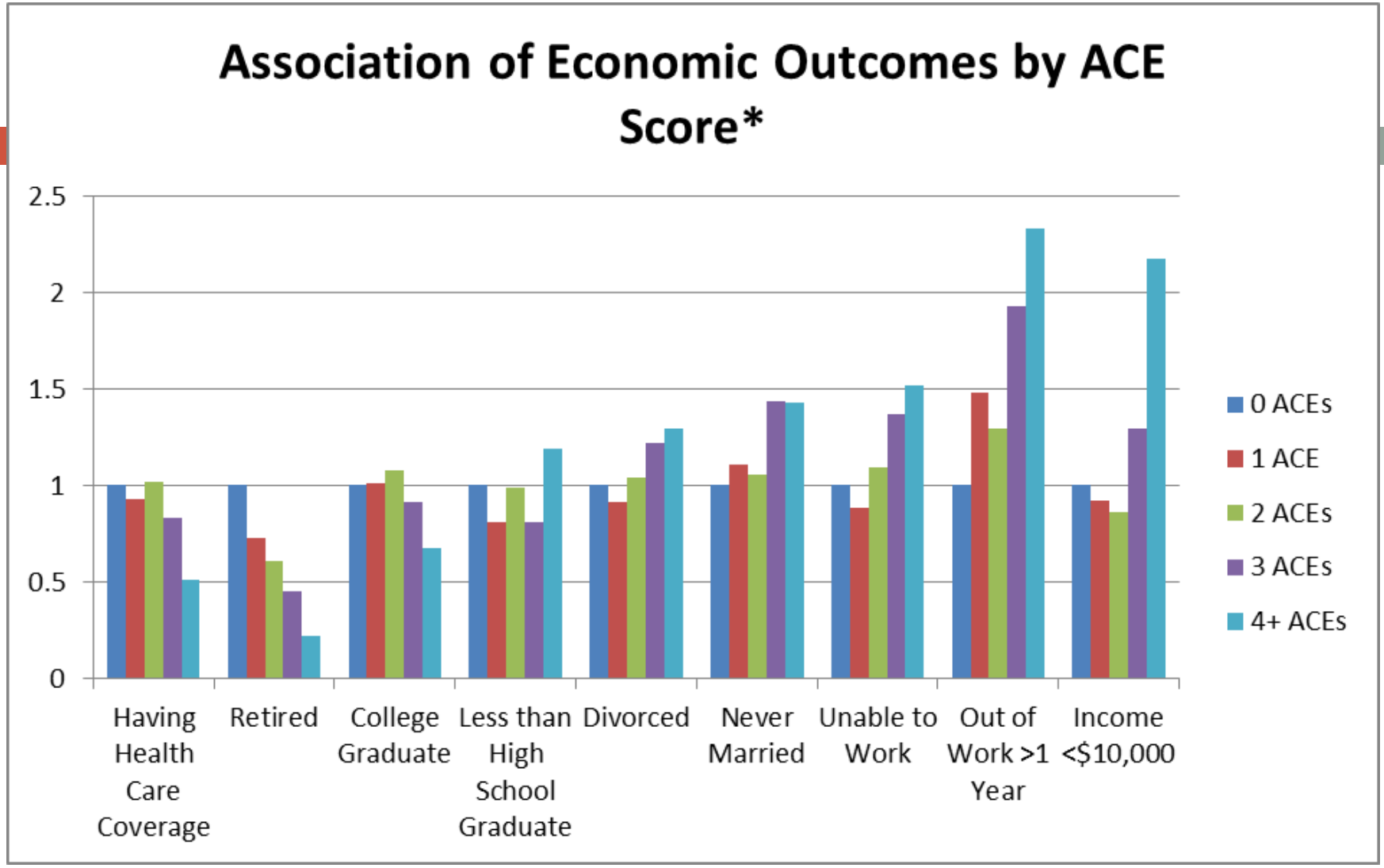


Source: Tennessee Behavioral Risk Factor Surveillance System (BRFSS), 2012.

Association of Health Outcomes and Behaviors by ACE Score*



* = All significant p>=0.05



* = All significant p>=0.05

Childhood Traumatic Stress

Child Traumatic Stress

- Occurs when children and adolescents are exposed to traumatic events or situations that overwhelm their ability to cope
- When a child is experiencing child traumatic stress, these reactions interfere with his or her daily life and ability to function and interact with others.
- May affect the way children view themselves, the world around them and their future.
- Repeated exposure to traumatic events (sometimes called "complex trauma") can affect the child's brain and nervous system and increase the risk of:
  - Low academic performance
  - Engagement in high-risk behaviors
  - Difficulties in peer and family relationships

- National Child Traumatic Stress Network (www.NCTSN.org)

Other Possible Sources of Childhood Stress

- Poverty
- Discrimination
- Separation from caregivers and family members
- Frequent placements or moving around often
- Problems at school
- Immigration issues

Remember…

- ***Traumatized children may become traumatized adults.***
  - When childhood trauma is not resolved, individuals may continue to live in a state of fear and helplessness.
  - If a child does not receive successful intervention for trauma, they are more susceptible to long-term effects.

The Good News

What Can We Do About Early Brain Neurotoxicity?

- Home visiting
- Parent coaching
- Good childcare
- High quality early education programs
- Solid pediatric care
- Income-related programs
- Mental health services

Slide courtesy of Dr. Patti van Eys, Omni Visions, Inc.

Continuing the Conversation…