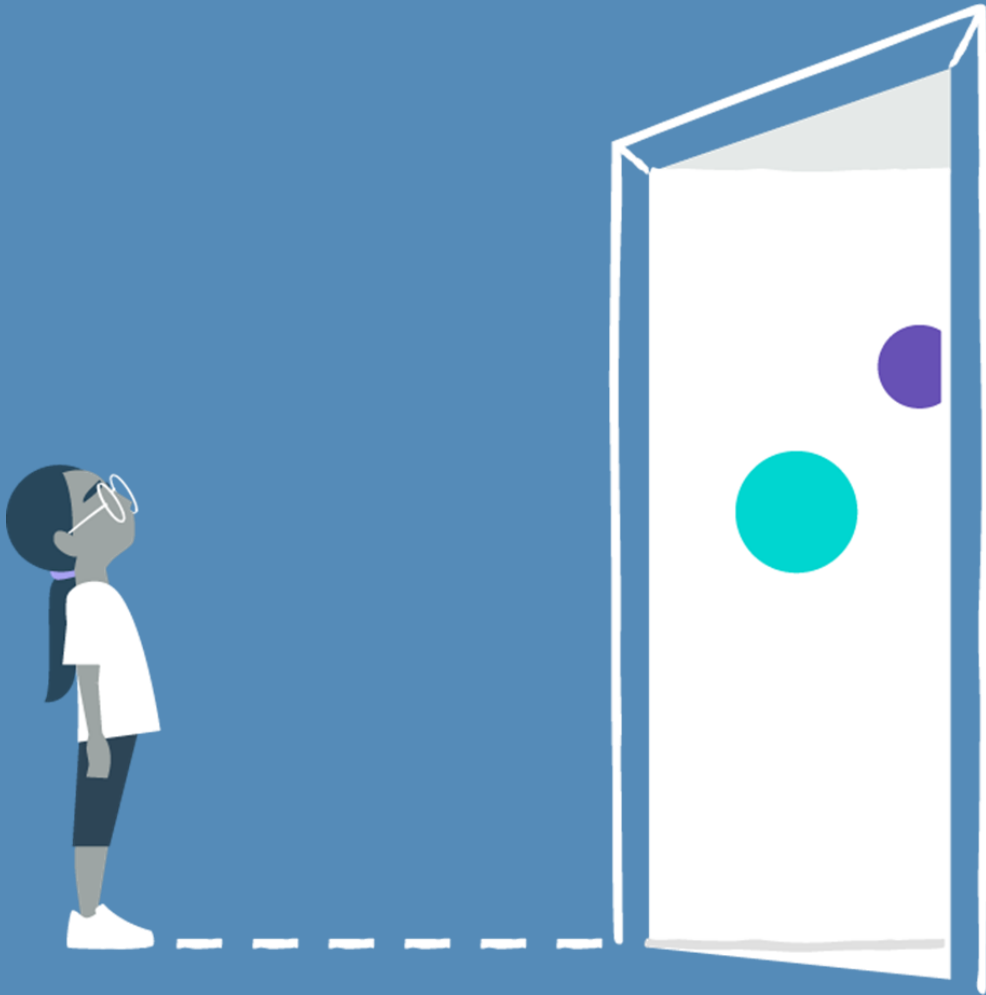


# Adverse Childhood Experiences (ACEs)



Nitchawan  
Jongrakthanakij, MD.

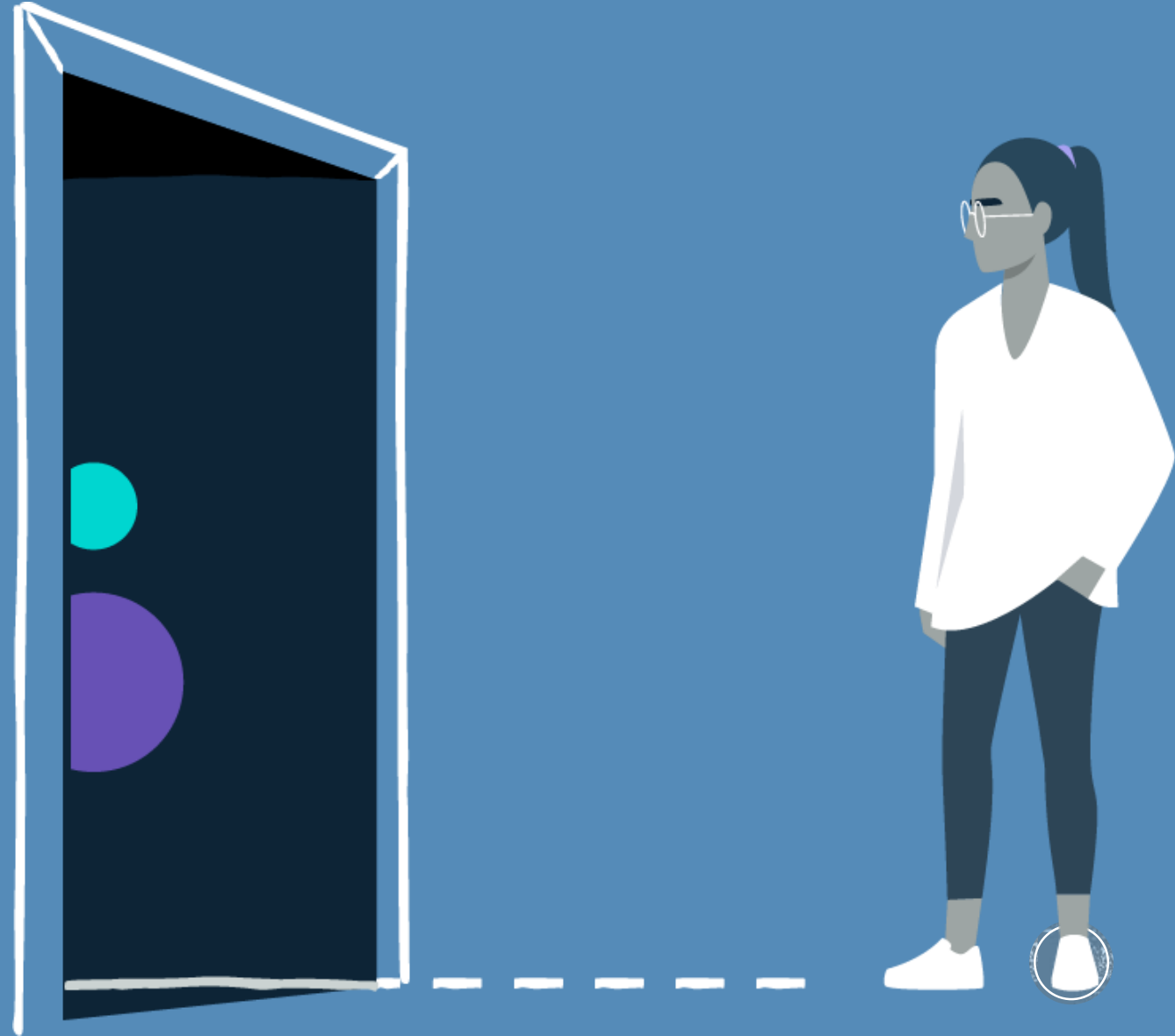
# Adverse childhood experiences [ACEs]



- are potentially traumatic events in childhood (0-17 years)
- include aspects of a child's environment that can undermine their sense of safety, stability, and bonding
  - living in a household with substance misuse or mental health problems.

# Adverse childhood experiences [ACEs]

- negatively impact physical, mental, emotional, and behavioral development.
- have lasting effects on health, well-being, and prosperity well into adulthood.





## ABUSE



Physical



Emotional



Sexual

## NEGLECT



Physical



Emotional

## HOUSEHOLD DYSFUNCTION



Mental Illness



Incarcerated Relative



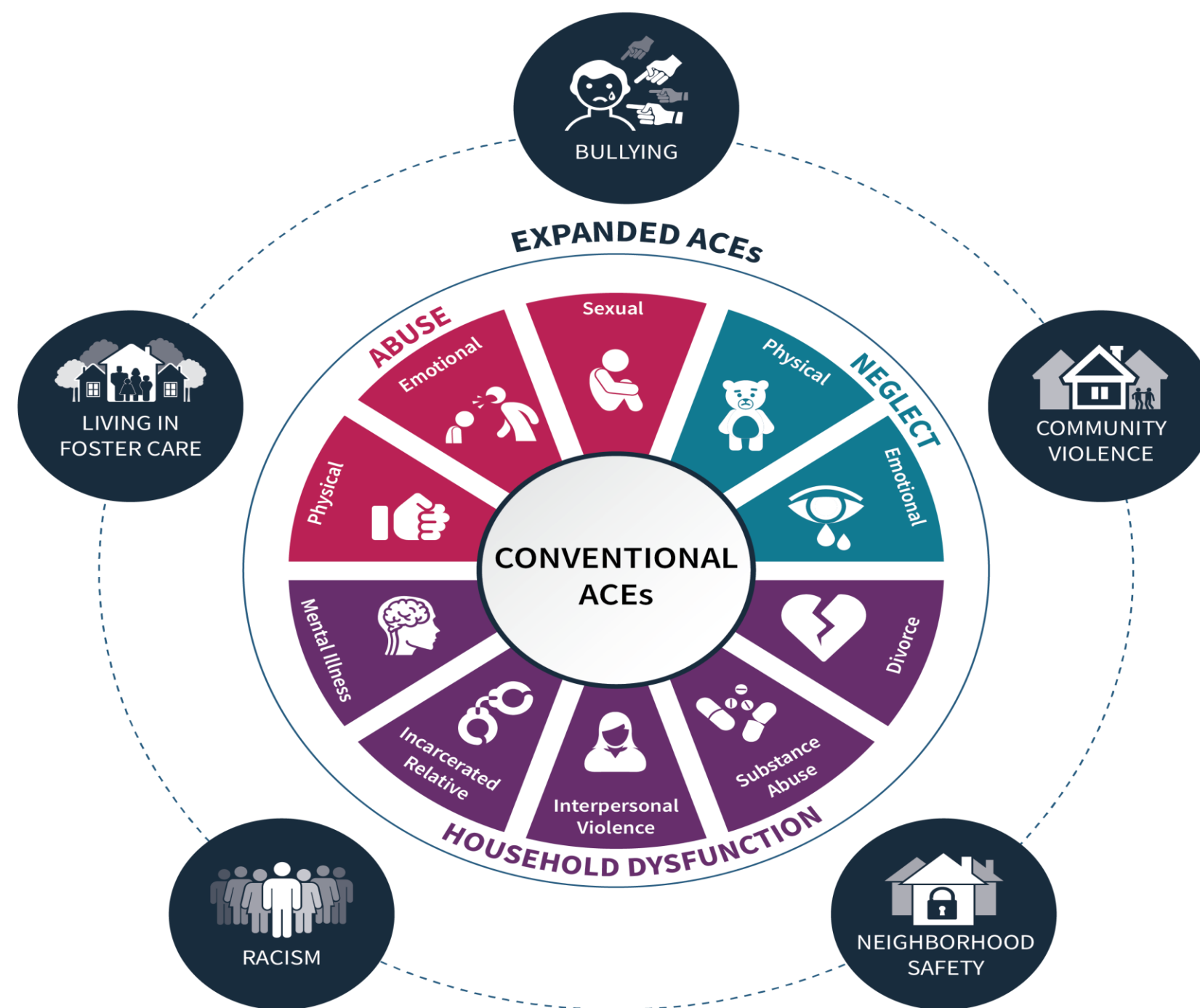
Mother treated violently



Substance Abuse



Divorce



Cronholm, P. F., Forke, C. M., Wade, R., Bair-Merritt, M. H., Davis, M., Harkins-Schwarz, M., Pachter, L. M., & Fein, J. A. (2015). Adverse Childhood Experiences: Expanding the Concept of Adversity. *American journal of preventive medicine*, 49(3), 354–361.  
<https://doi.org/10.1016/j.amepre.2015.02.001>



# 3 Realms of ACEs

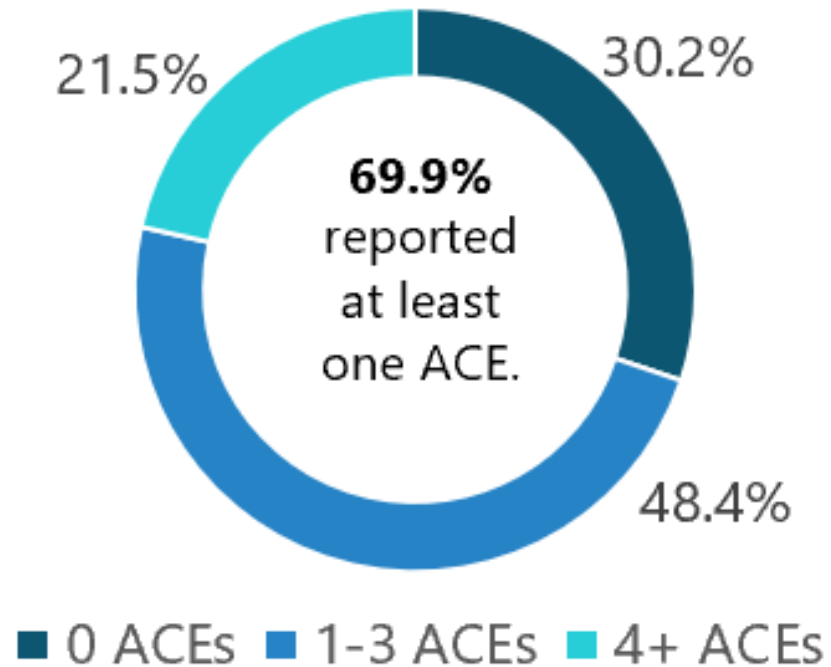
Adverse childhood and community experiences (ACEs) can occur in the household, the community, or in the environment and cause toxic stress. Left unaddressed, toxic stress from ACEs harms children and families, organizations, systems and communities, and reduces the ability of individuals and entities to respond to stressful events with resiliency. Research has shown that there are many ways to reduce and heal from toxic stress and build healthy, caring communities.



PACes Connection thanks **Building Community Resilience Collaborative and Networks** and the **International Transformational Resilience Coalition** for inspiration and guidance. Please visit [PACesConnection.com](https://acesconnection.com) to learn more about the science of ACEs and join the movement to prevent ACEs, heal trauma and build resilience.

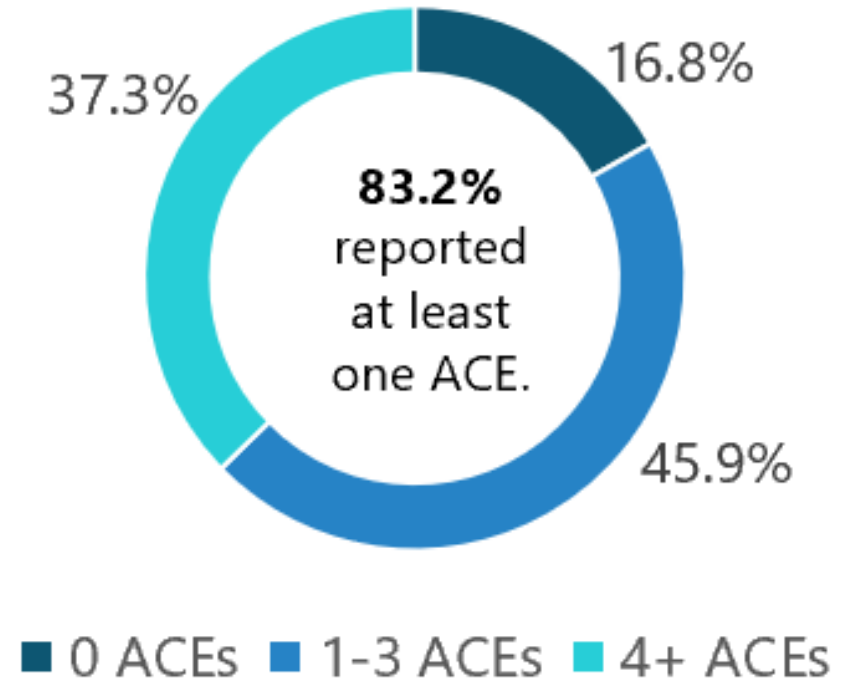


Out of **17,337**  
participants...



**Original ACE Study**

Out of **1,784**  
participants...



**Expanded ACE Study**

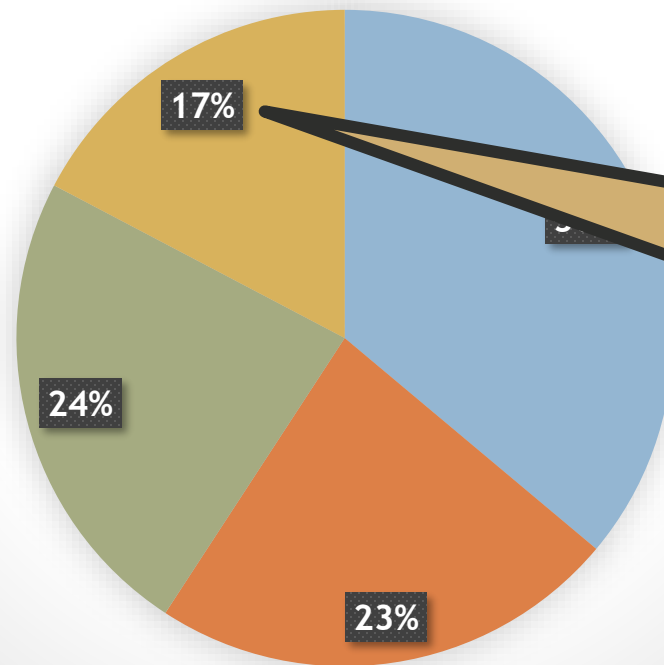
Felitti, V. J., Anda, R. F., Nordenberg, D., Williamson, D. F., Spitz, A. M., Edwards, V., Koss, M. P., & Marks, J. S. (1998). Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults. The Adverse Childhood Experiences (ACE) Study. *American journal of preventive medicine*, 14(4), 245–258. [https://doi.org/10.1016/s0749-3797\(98\)00017-8](https://doi.org/10.1016/s0749-3797(98)00017-8)

Source: The National Human Trafficking Training and Technical Assistance Center (NHTTAC). The Original ACE Study. Available at: [https://nhttac.acf.hhs.gov/soar/eguide/stop/adverse\\_childhood\\_experiences](https://nhttac.acf.hhs.gov/soar/eguide/stop/adverse_childhood_experiences)

# The prevalence estimates from 2011-2020 BRFSS [Behavioral Risk Factor Surveillance System] ACEs module (n=264,882)

Number of Adverse Childhood Experiences (ACE Score)

0 1 2 or 3 4 or more



**63.9%**

Reported  
at least 1

**17.3%**

Reported  $\geq 4$   
ACEs



An illustration of a person with red hair and a yellow face, looking distressed with their hand to their face, standing in a crowd of people. The crowd is rendered in a faded, blue-tinted style. The person in the foreground is wearing a white shirt and dark pants. The overall mood is one of stress and overwhelm.

# 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.

**Positive**  
Brief increases in heart rate,  
mild elevations in stress hormone levels.

Normal and essential part of healthy development



# 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.

## Tolerable

Serious, temporary stress responses, buffered by supportive relationships.

## “Buffered activation”

Brain and other organs recover from what could otherwise be harmful effects.



# 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.





# STRESS IN CHILDHOOD

## Three Types

Stress is a mental, physical, or biochemical response to a perceived threat or demand. Stress is a natural and inevitable part of childhood. But the *type of stress* can make a difference in the impact on a child's brain and body, as well as potential effects that can last a lifetime.

## POSITIVE STRESS

Normal, typical childhood experiences

Common Stressors

Child care drop off and pick up



Playground injuries



Losing a game

Buffering

No buffering support necessary



Brain & Body

Temporary, mild elevation in stress hormones



Brief increase in heart rate and blood pressure

Long-term

Increased resiliency and confidence  
Coping skills development



Common Stressors

Buffering

Brain & Body

Long-term

## TOLERABLE STRESS

More complicated, scary, challenging, and long-lasting



Natural or manmade tragedy

Parents' divorce

Poverty



Death of a loved one



Caring adult buffers stress

More severe, continuing cardiovascular and hormonal response



Adaption and recovery likely, but potential for lasting physical or emotional damage



U.S. Department of Health and Human Services  
DEPARTMENT OF HEALTH & HUMAN SERVICES  
OFFICE OF FAMILY ASSISTANCE



## TOXIC STRESS

Severe, long-lasting, uncontrollable, and/or frequent stress

Common Stressors



Physical, sexual, or mental abuse



Neglect

Exposure to violence



Severe economic hardship

Buffering



No adult buffers child from stress

Brain & Body



Prolonged activation of stress response system

Disrupted development of brain circuits

Immune system depression



Long-term

Possible lifelong changes, such as:



Heart disease



Alcoholism

Memory, learning, multitasking difficulties

Anxiety/depression



Cancer

Sources:

<http://www.nimh.nih.gov/health/publications/stress/index.shtml>

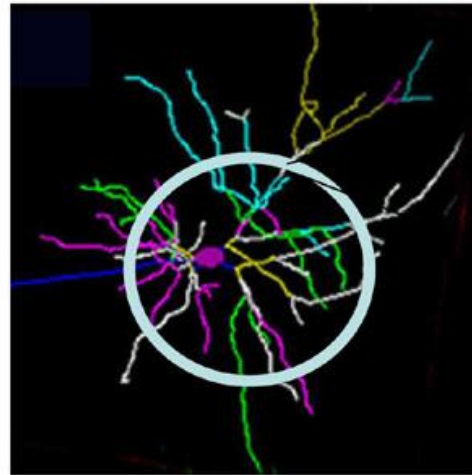
[http://developingchild.harvard.edu/topics/science\\_of\\_early\\_childhood/toxic\\_stress\\_response](http://developingchild.harvard.edu/topics/science_of_early_childhood/toxic_stress_response)

[http://www.cdc.gov/ncipc/pub-res/pdf/childhood\\_stress.pdf](http://www.cdc.gov/ncipc/pub-res/pdf/childhood_stress.pdf)

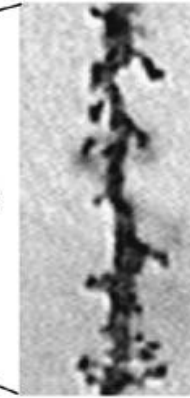
[http://developingchild.harvard.edu/resources/reports\\_and\\_working\\_papers/working\\_papers/wp3](http://developingchild.harvard.edu/resources/reports_and_working_papers/working_papers/wp3)

# Persistent Stress Changes Brain Architecture

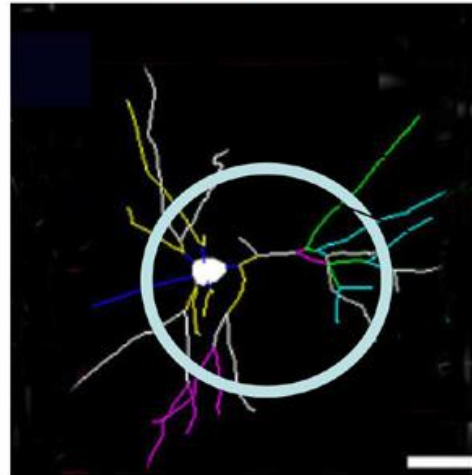
Normal



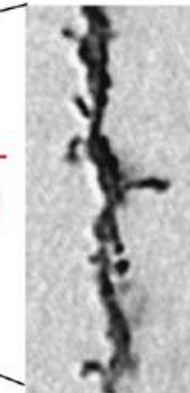
Typical neuron—  
many connections



Toxic  
stress



Damaged neuron—  
fewer connections



Prefrontal Cortex and  
Hippocampus

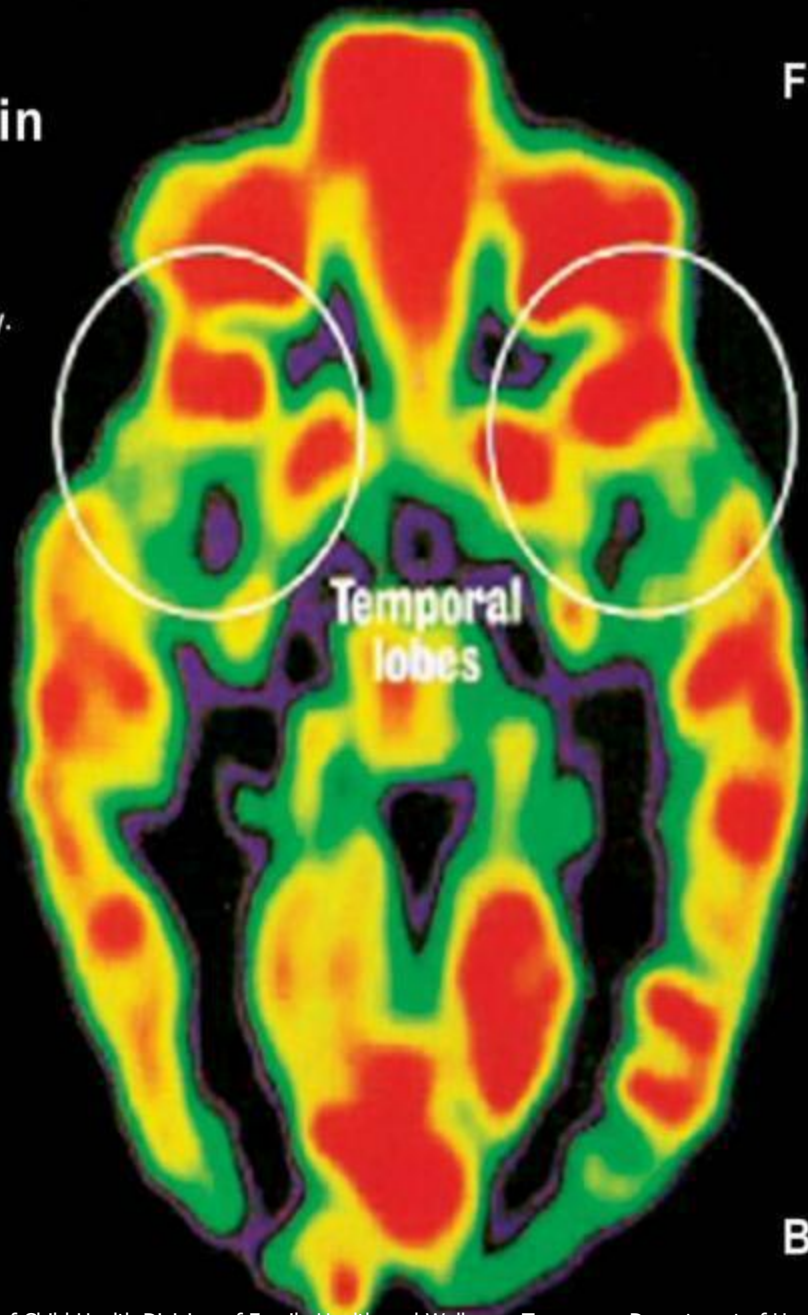
Sources: Radley et al. (2004)  
Bock et al. (2005)





## 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.

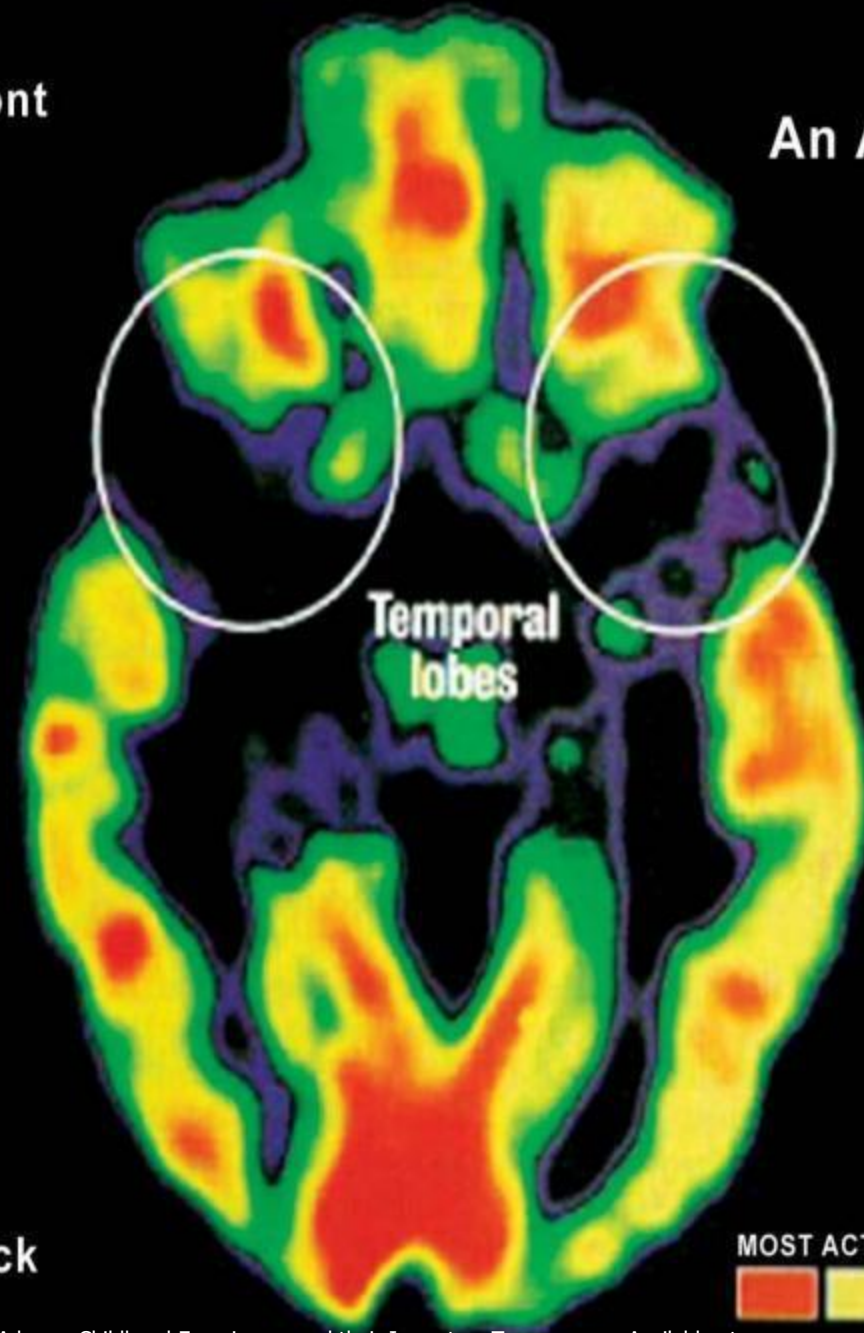


Front

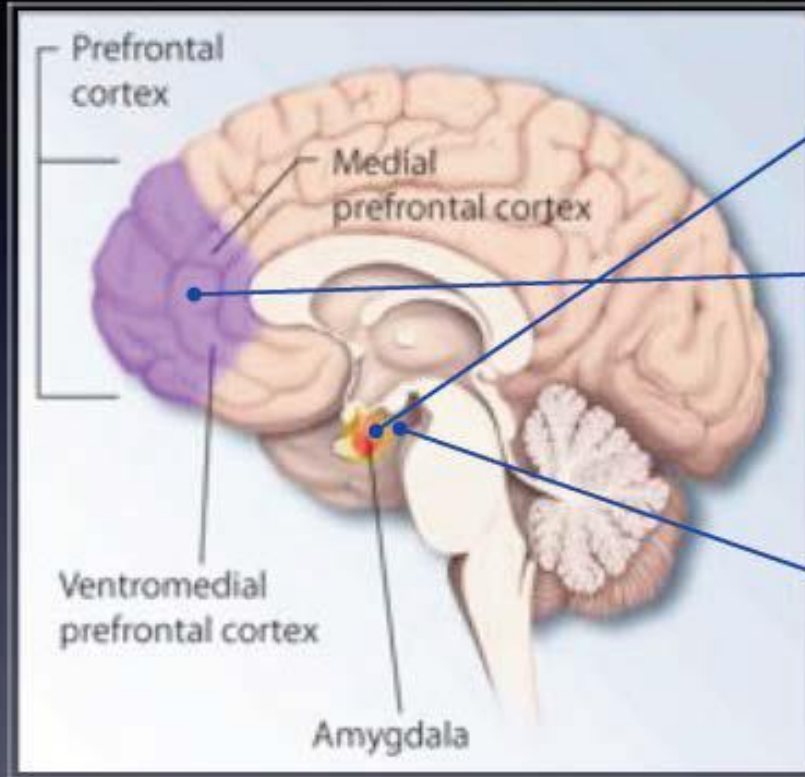
Back

## 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.



# 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:**

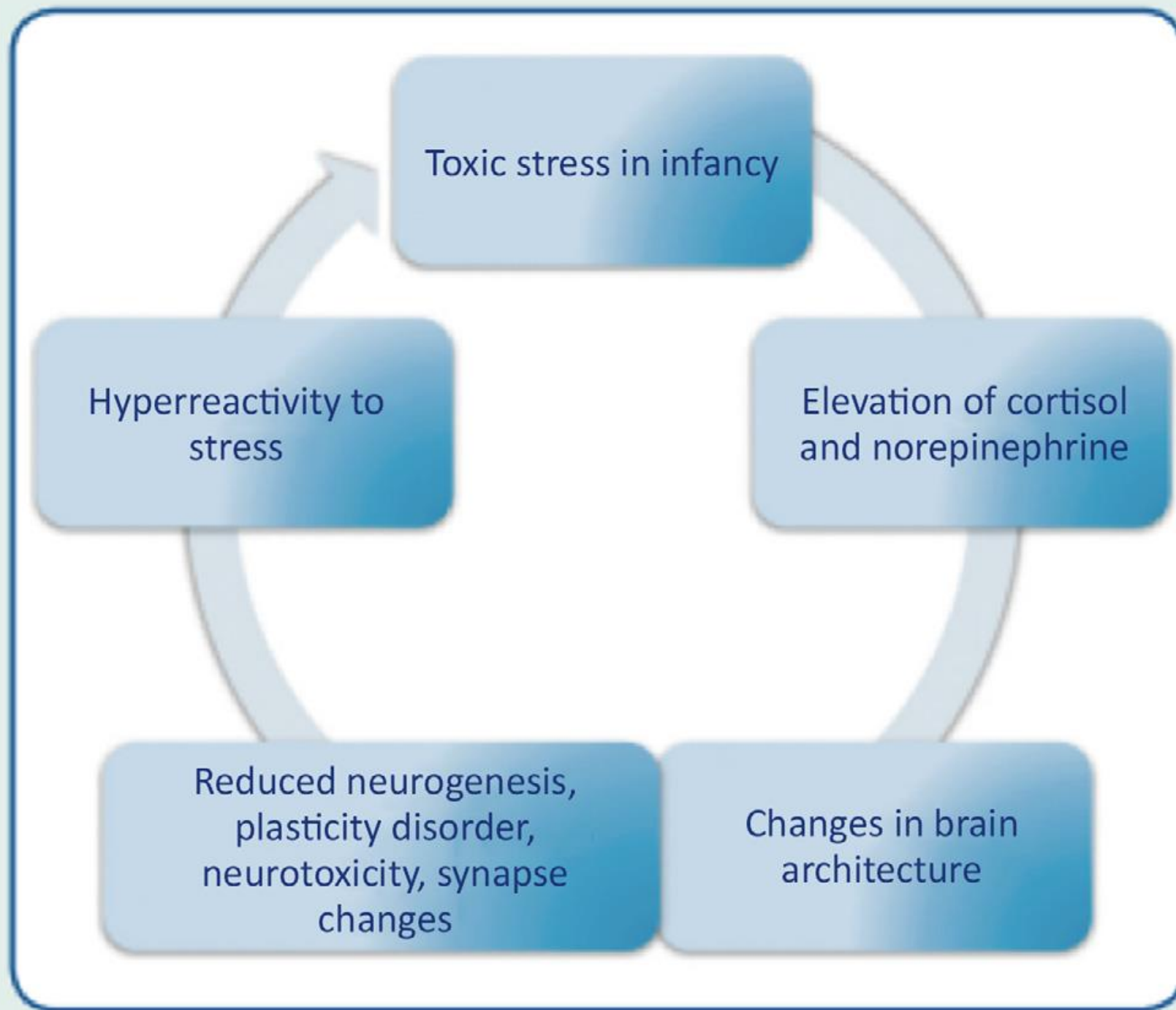
major role in memory and mood

*Toxic stress:* impairment in understanding and emotion

Freely-reproducible image from the National Institutes of Health

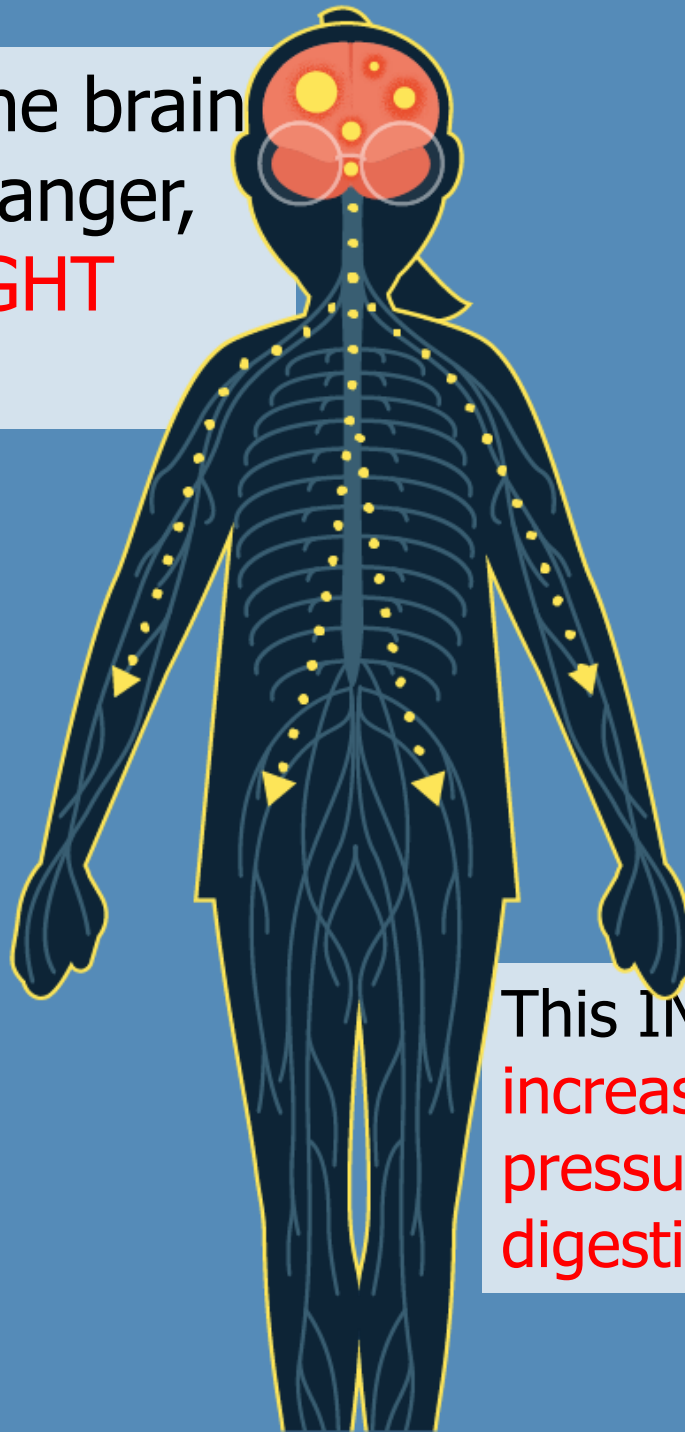






de Magalhães-Barbosa, M. C., Prata-Barbosa, A., & da Cunha, A. J. L. A. (2022). Toxic stress, epigenetics and child development. *Jornal de pediatria*, 98 Suppl 1(Suppl 1), S13–S18.  
<https://doi.org/10.1016/j.jpmed.2021.09.007>

Toxic stress happens when the brain endures repeated stress or danger, then releases **FIGHT-OR-FLIGHT HORMONES** like cortisol.



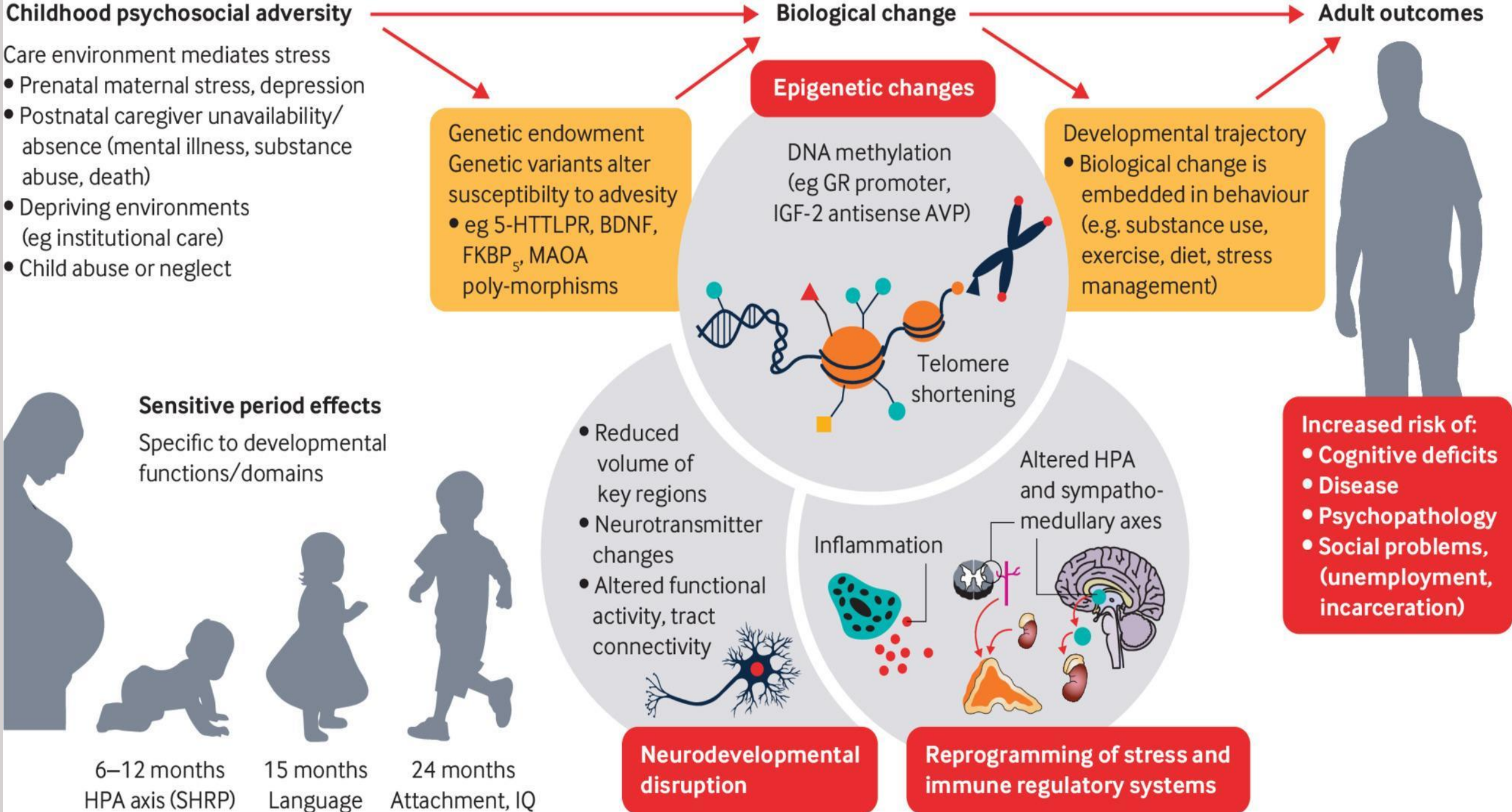
This **INTERNAL ALARM SYSTEM** increases heart rate and blood pressure and damages the digestive and immune systems.



- Toxic stress can disrupt ORGAN, TISSUE, AND BRAIN DEVELOPMENT.
- Over time this can limit a person's ability to process information, make decisions, interact with others, and regulate emotions.
- These consequences may follow a person into adulthood.

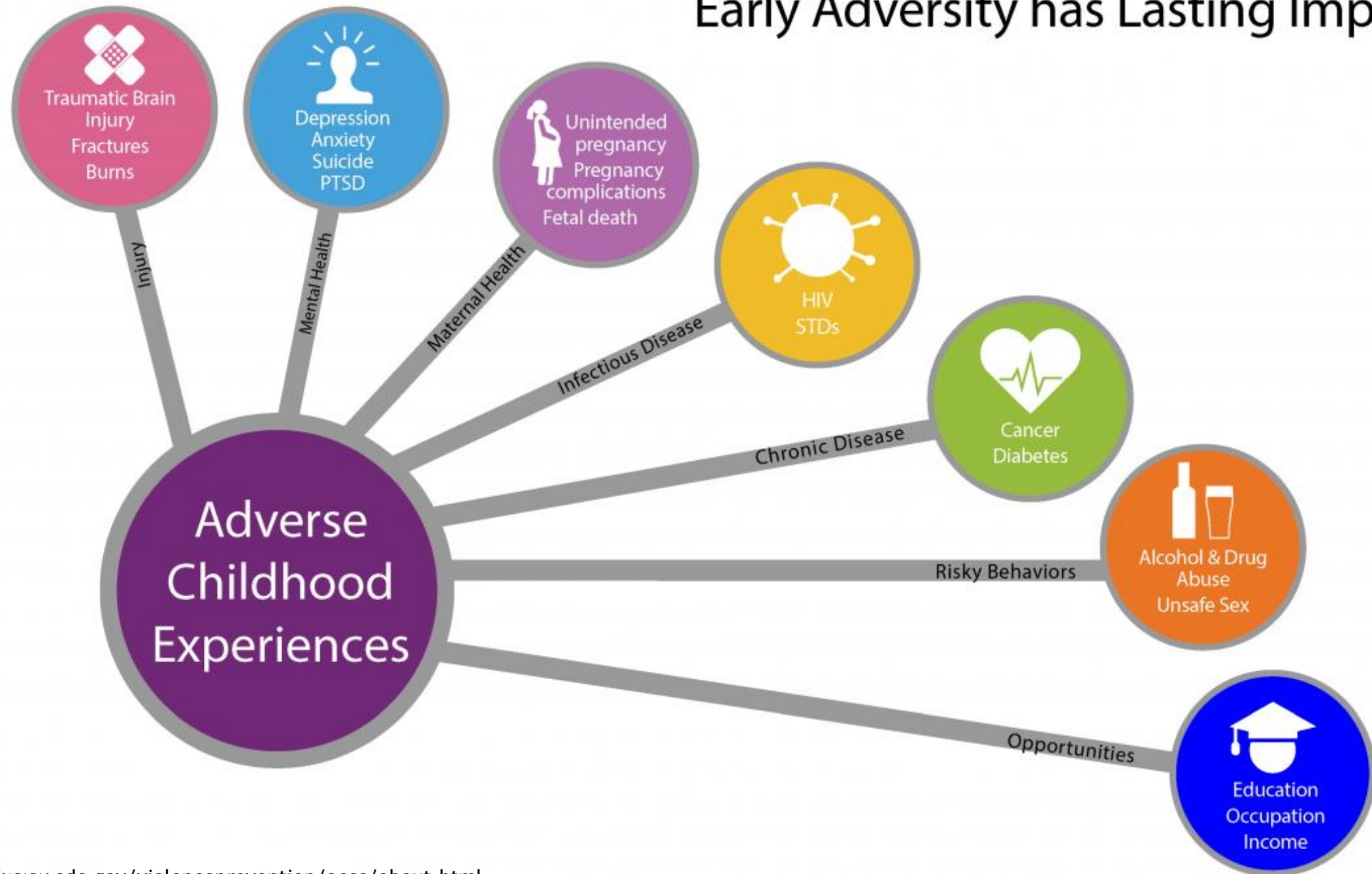








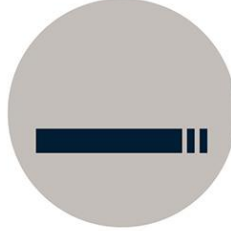
# Early Adversity has Lasting Impacts



## BEHAVIOR



Lack of physical activity



Smoking



Alcoholism



Drug use



Missed work

## PHYSICAL & MENTAL HEALTH



Severe obesity



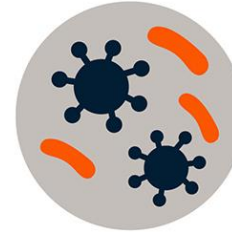
Diabetes



Depression



Suicide attempts



STDs



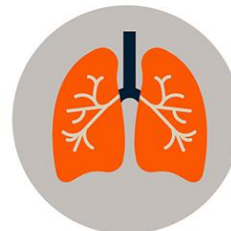
Heart disease



Cancer



Stroke



COPD



Broken bones

Source: Centers for  
Disease Control and  
Prevention  
Credit: Robert Wood  
Johnson Foundation

# Health conditions in children associated with adverse childhood experiences (ACE)

Symptom or health condition	For $\geq x$ ACEs (compared with 0)	Odds ratio
Asthma	4	17-28
Allergies	4	25
Dermatitis and eczema	3*	2.0
Urticaria	3*	22
Increased incidence of chronic disease, impaired management	3	2.3
Any unexplained somatic symptoms(eg, nausea/vomiting, dizziness, constipation, headaches)	3	9.3
Headaches	4	3.0
Enuresis, encopresis	-	-
Overweight, obesity	4	2.0
Failure to thrive, poor growth; psychosocial dwarfism	—	—
Poor dental health	4	28
Increased infections (viral, upper and lower respiratory tract infections and pneumonia, acute otitis media, urinary tract infections, conjunctivitis, intestinal	3*	14-24

# Health conditions in children associated with adverse childhood experiences (ACE)

Symptom or health condition	For $\geq x$ ACEs (compared with 0)	Odds ratio
Later menarche ( $\geq 14$ years)	2*	2.3
Sleep disturbances	5†	P† 3.1
Developmental delay	3	1.9
Learning and/or behaviour problems	4	32.6
Repeating a year at school	4	2.8
Not completing homework	4	4.0
High school absenteeism	4	7.2
Graduating from high school	4	0.4
Aggression, physical fighting	For each additional ACE	1.9
Depression	4	3.9
Attention deficit/hyperactivity disorder (ADHD)	4	5.0
Any of: ADHD, depression, anxiety, conduct/behaviour disorder	3	4.5
Suicidal ideation		1.9
Suicide attempts	For each additional ACE	1.9-2.1
Self-harm		1.8
First use of alcohol at $<14$ years	4	6.2
First use of illicit drugs at $<14$ years	5	9.1
Early sexual debut ( $<15-17$ years)	4	3.7
Teenage pregnancy	4	4.2

\* Odds ratio represents at least one ACE, but also includes other adversities

† Prevalence ratio represents at least one ACE, but also includes other adversities

Nelson C A, Bhutta Z A, Burke Harris N , Danese A, Samara M. Adversity in childhood is linked to mental and physical health throughout life *BMJ* 2020; 371 :m3048 doi:10.1136/bmj.m3048



# ACE-associated health conditions in adults associated with adverse childhood experiences (ACE)

Symptom or health condition	Odds ratio (excluding outliers)*
Cardiovascular disease (coronary artery disease, myocardial infarction, ischemic heart disease)	2.1
Tachycardia	≥1 ACE: 1.4
Stroke	2.0
Chronic obstructive pulmonary disease (emphysema, bronchitis)	3.1
Asthma	2.2
Diabetes	1.4
Obesity	2.1
Hepatitis or jaundice	2.4
Cancer, any	2.3
Arthritis, self-reported	3 ACEs, hazard ratio=1.5 ≥1 ACE, 1.3
Memory impairment (all causes, including dementias)	4.9
Kidney disease	1.7
Headaches	≥ 5 ACEs: 2.1



# ACE-associated health conditions in adults associated with adverse childhood experiences (ACE)

Symptom or health condition	Odds ratio (excluding outliers)*
Chronic pain, any (using trauma z-score)	1.2
Chronic back pain (using trauma z-score)	1.3
Fibromyalgia	≥ 1 ACE: 1.8
Unexplained somatic symptoms, including somatic pain, headaches	2.0-2.7
Skeletal fracture	1.6-2.6
Physical disability requiring assistive equipment	1.8
Depression	4.7
Suicide attempts	37.5
Suicidal ideation	10.5
Sleep disturbance	1.6
Anxiety	3.7
Panic and anxiety	—
Post-traumatic stress disorder	4.5
Illicit drug use (any)	5.2
Injected drug, crack cocaine, or heroin use	10.2
Alcohol use	6.9
Cigarette or e-cigarette use	6.1
Cannabis use	11.0
Teen pregnancy	4.2
Sexually transmitted infections, lifetime	5.9
Violence, victimization (intimate partner violence, sexual assault)	7.5
Violence perpetration	8.1

\* Odds ratios compare outcomes in individuals with >4 ACEs with those with 0 ACEs, except where specified

Nelson C A, Bhutta Z A, Burke  
Harris N , Danese A, Samara M. Adversity in  
childhood is linked to mental and physical  
health throughout  
life *BMJ* 2020; 371 :m3048 doi:10.1136/bmj.  
m3048

# Comparison of serial killers to the general population

Type of Abuse	General Population	Serial Killer Population
Physical	6%	36%
Sexual	3%	26%
Psychological	2%	50%
Neglect	18%	18%
Other	6%	N/A
No Abuse Reported	70%	32%

# ACEs Can Echo Across Generations

- The consequences of ACEs can be passed down from one generation to the next
- if children don't have protective buffers like positive childhood experiences or a caring adult in their lives.



**However,  
ACEs can be  
prevented!**

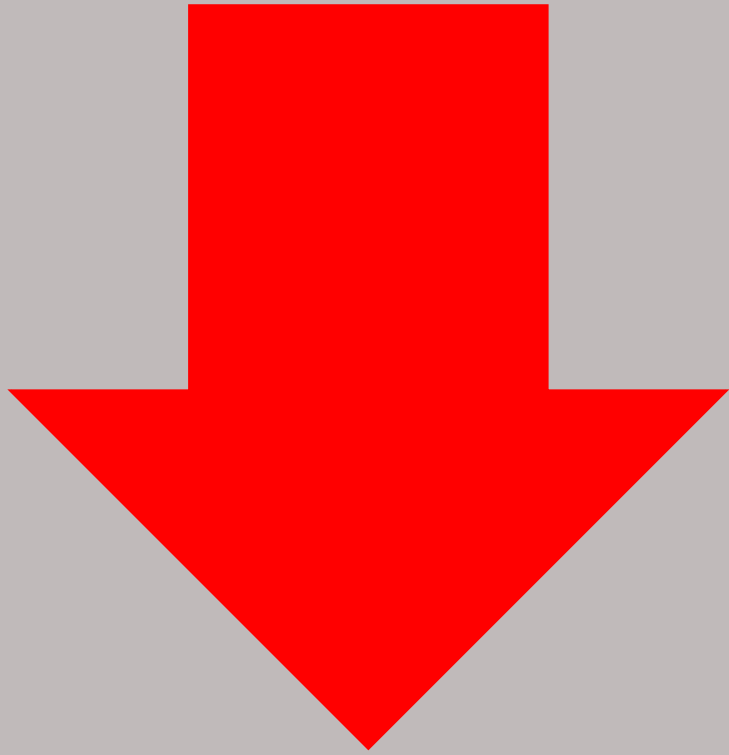


The primary prevention of ACEs  
**"stopping ACEs before they start"**

supportive and responsive relationships by caring adults as early as possible in life can prevent or reverse the harmful effects of the body's response to toxic stress.



# What could happen if we prevent ACEs?

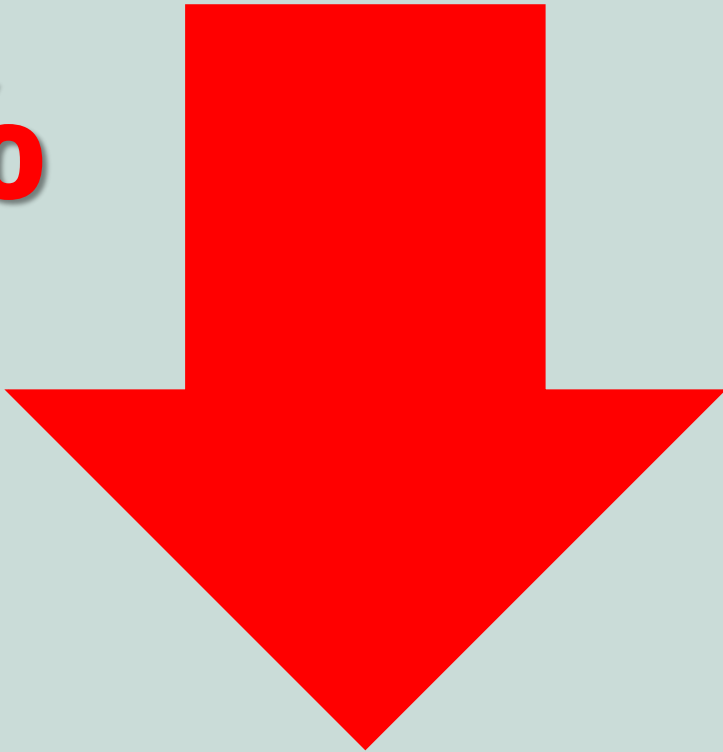


**DEPRESSION,  
HEART DISEASE,  
AND OBESITY**



# What could happen if we prevent ACEs?

**15%**

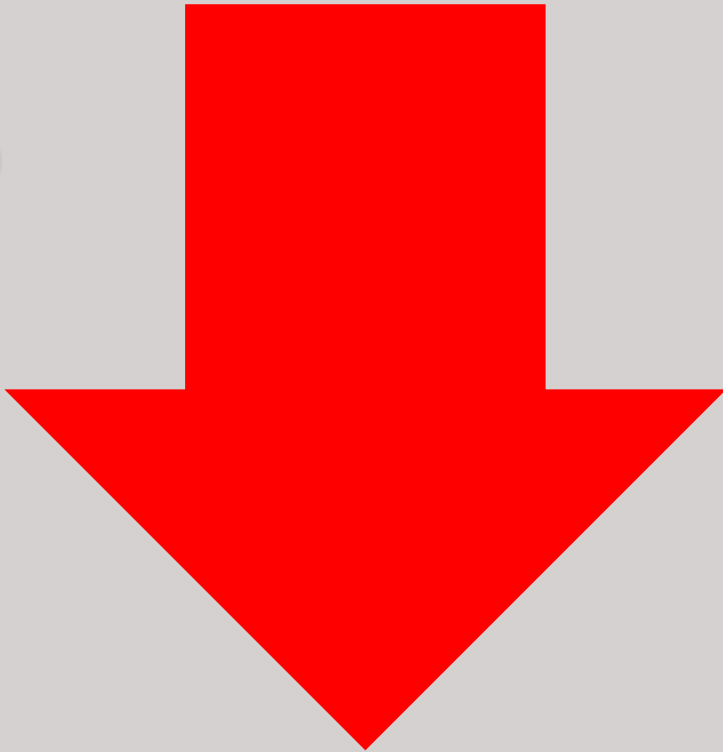


**UNEMPLOYED**



# What could happen if we prevent ACEs?

44%



**Adults with  
DEPRESSION**



# What could happen if we prevent ACEs?

**24-27%**

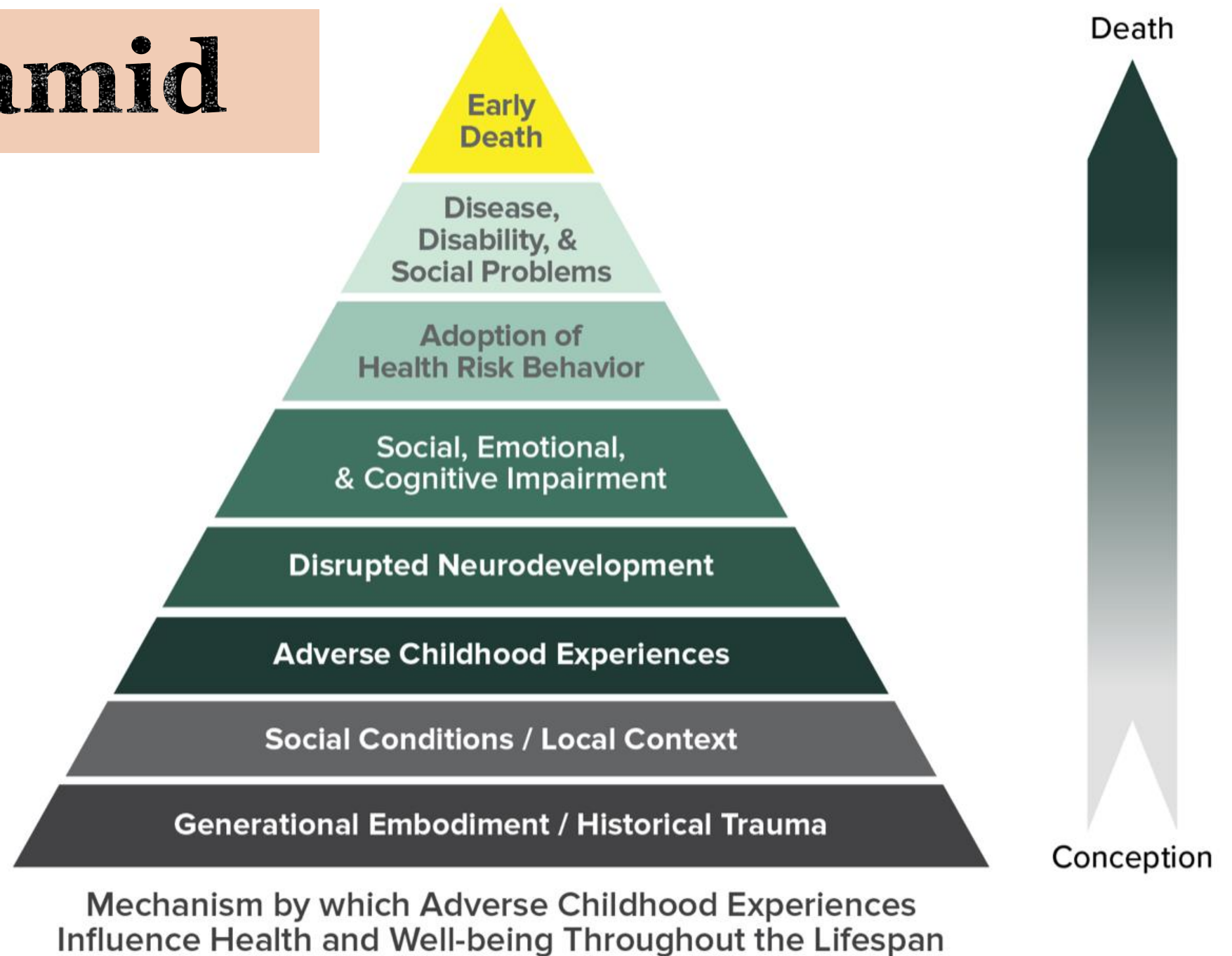


**Adults with  
respiratory  
problems**





# ACE Pyramid

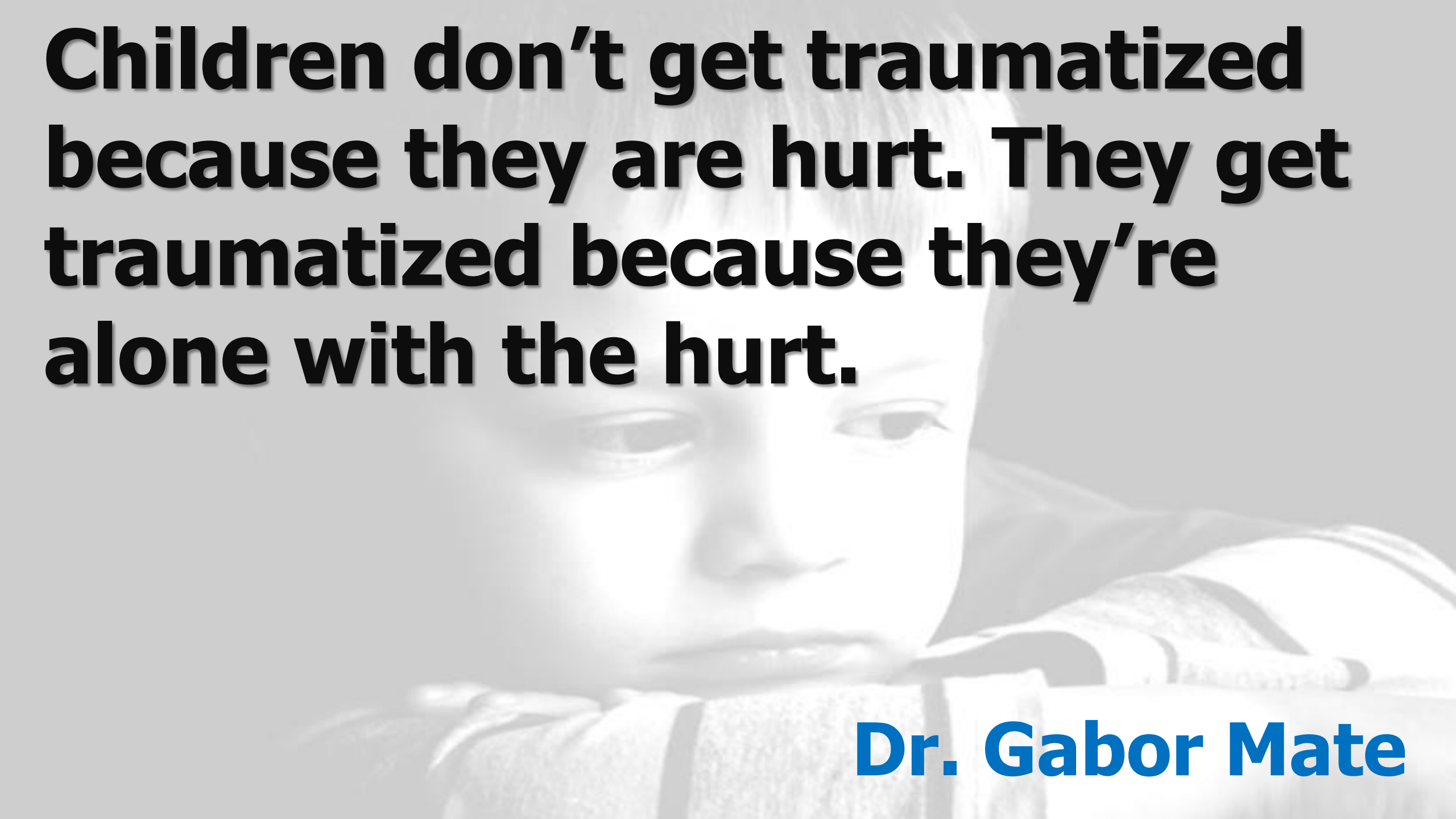




**The greater a child's terror, and the  
earlier it is experienced,  
the harder it becomes to develop a  
strong and healthy sense of self.**

**Nathaniel Branden**

**Six Pillars of Self-Esteem**



**Children don't get traumatized  
because they are hurt. They get  
traumatized because they're  
alone with the hurt.**

**Dr. Gabor Mate**