

TOXIC STRESS AND EARLY CHILDHOOD



TexProtects



**CHILD & FAMILY**  
RESEARCH PARTNERSHIP  
THE UNIVERSITY OF TEXAS AT AUSTIN  
LBJ SCHOOL OF PUBLIC AFFAIRS

★ WHAT POLICY MAKERS AND FUNDERS NEED TO KNOW ★

# **PEERING INTO THE BLACK BOX:**

**Understanding the Link Between Significant Adversity or  
Violence in **Childhood**  
and Poor **Adult Outcomes****

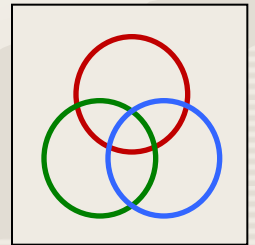


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Associate Clinical Professor of Pediatrics,  
Case Western Reserve School of Medicine, and  
Chair, AAP Leadership Workgroup on  
Early Brain and Child Development**

# My 3 Objectives For Today

- Explain how **toxic stress** mediates the relationship between childhood adversity and poor adult health
- Describe an “**ecobiodevelopmental** framework” and list its advantages
- Discuss the **public health implications** and potentially **lifelong** consequences of toxic stress



# **Critical Concept #1**

## **Life-Course Science**

**Experiences** in childhood

(both good and bad)

are **strongly** associated

with **behaviors, health** and **economic productivity ...**

**... DECADES LATER!**

# ACE Categories

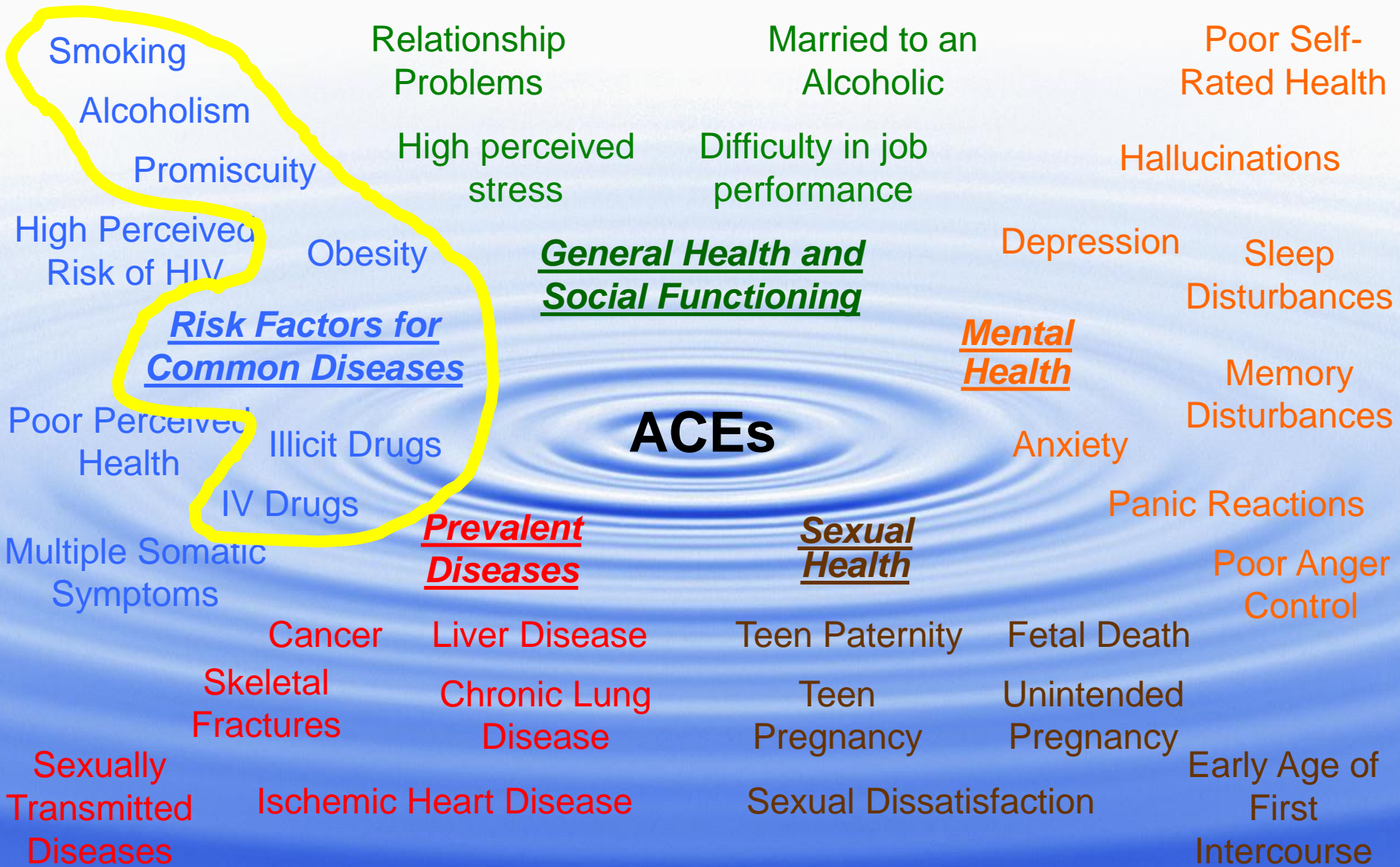


	Women (n=9,367)	Men (n=7,970)	Total (17,337)
• Abuse			
- Emotional	13.1%	7.6%	10.6%
- Physical	27.0%	29.9%	28.3% 1:4!
- Sexual	24.7%	16.0%	20.7% ←
• Household Dysfunction			
- Mother Treated Violently	13.7%	11.5%	12.7%
- Household Substance Abuse	29.5%	23.8%	26.9% 1:4!
- Household Mental Illness	23.3%	14.8%	19.4% ←
- Parental Separation or Divorce	24.5%	21.8%	23.3% ←
- Incarcerated Household Member	5.2%	4.1%	4.7%
• Neglect*			
- Emotional	16.7%	12.4%	14.8%
- Physical	9.2%	10.7%	9.9%

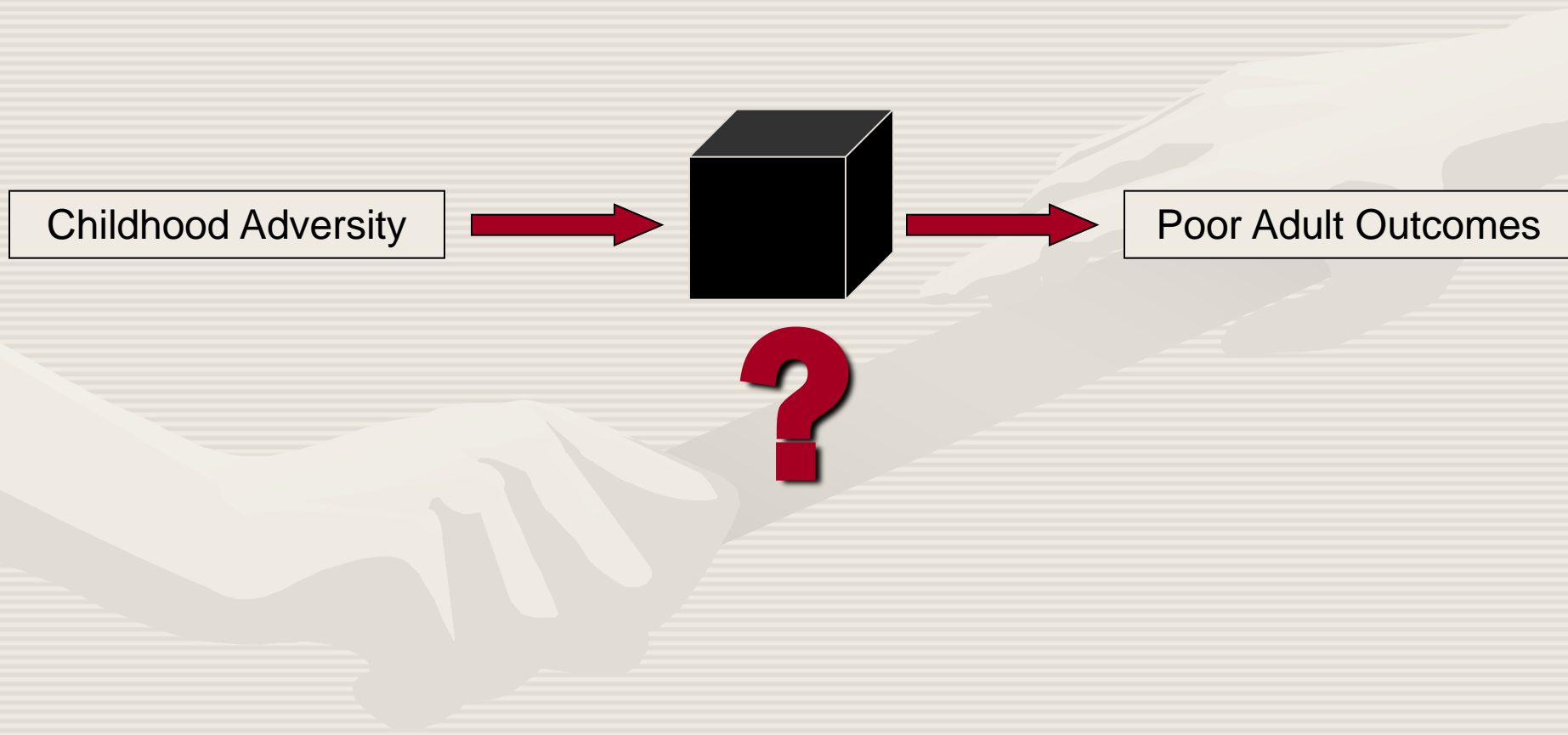
\* Wave 2 data only (n=8,667)

Data from [www.cdc.gov/nccdphp/ace/demographics](http://www.cdc.gov/nccdphp/ace/demographics)

# ACEs Impact Multiple Outcomes



# Linking Childhood Experiences and Adult Outcomes

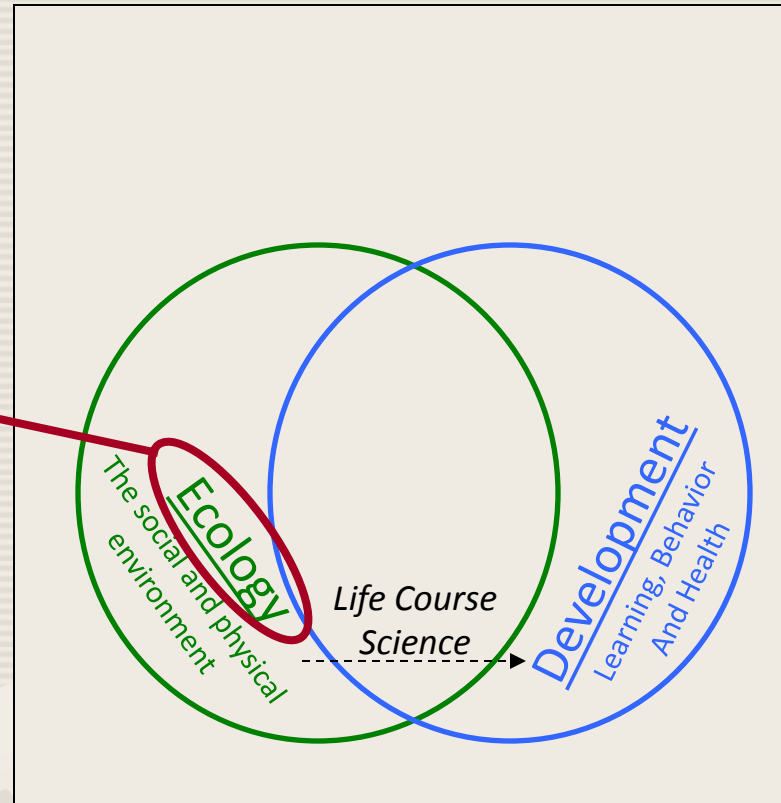


Childhood Adversity

Poor Adult Outcomes

# Developing a Model of Human Health and Disease

How do you begin to define or **measure** the ecology?



What are the **mechanisms** underlying these well-established associations?

Early childhood **ecology** strongly **associates** with lifelong **developmental** outcomes





# Defining **Adversity** or **Stress**

- How do you define/**measure** adversity?
- Huge **individual variability**
  - **Perception** of adversity or stress (subjective)
  - **Reaction** to adversity or stress (objective)
- National Scientific Council on the Developing Child (Dr. Jack Shonkoff and colleagues)
  - **Positive** Stress
  - **Tolerable** Stress
  - **Toxic** Stress

Based on the **REACTION**  
(objective physiologic responses)

# Defining **Adversity** or **Stress**



- **Positive Stress**

- Brief, infrequent, mild to moderate intensity
- Most normative childhood stress
  - Inability of the 15 month old to express their desires
  - The 2 year old who stumbles while running
  - Beginning school or daycare
  - The big project in middle school
- **Social-emotional buffers** allow a return to **baseline**  
(responding to non-verbal clues, consolation, reassurance, assistance in planning)
- **Builds motivation and resiliency**
- Positive Stress is **NOT** the **ABSENCE** of stress

# Defining **Adversity** or **Stress**



- **Toxic Stress**

- Long lasting, frequent, or strong intensity
- More extreme precipitants of childhood stress (**ACEs**)
  - Physical, sexual, emotional abuse
  - Physical, emotional neglect
  - Household dysfunction
- **Insufficient social-emotional buffering**  
(Deficient levels of emotion coaching, re-processing, reassurance and support)
- Potentially permanent changes and long-term effects
  - **Epigenetics** (there are life long / intergenerational changes in how the genetic program is turned **ON** or **OFF**)
  - **Brain architecture** (the mediators of stress impact upon the mechanisms of brain development / **connectivity**)

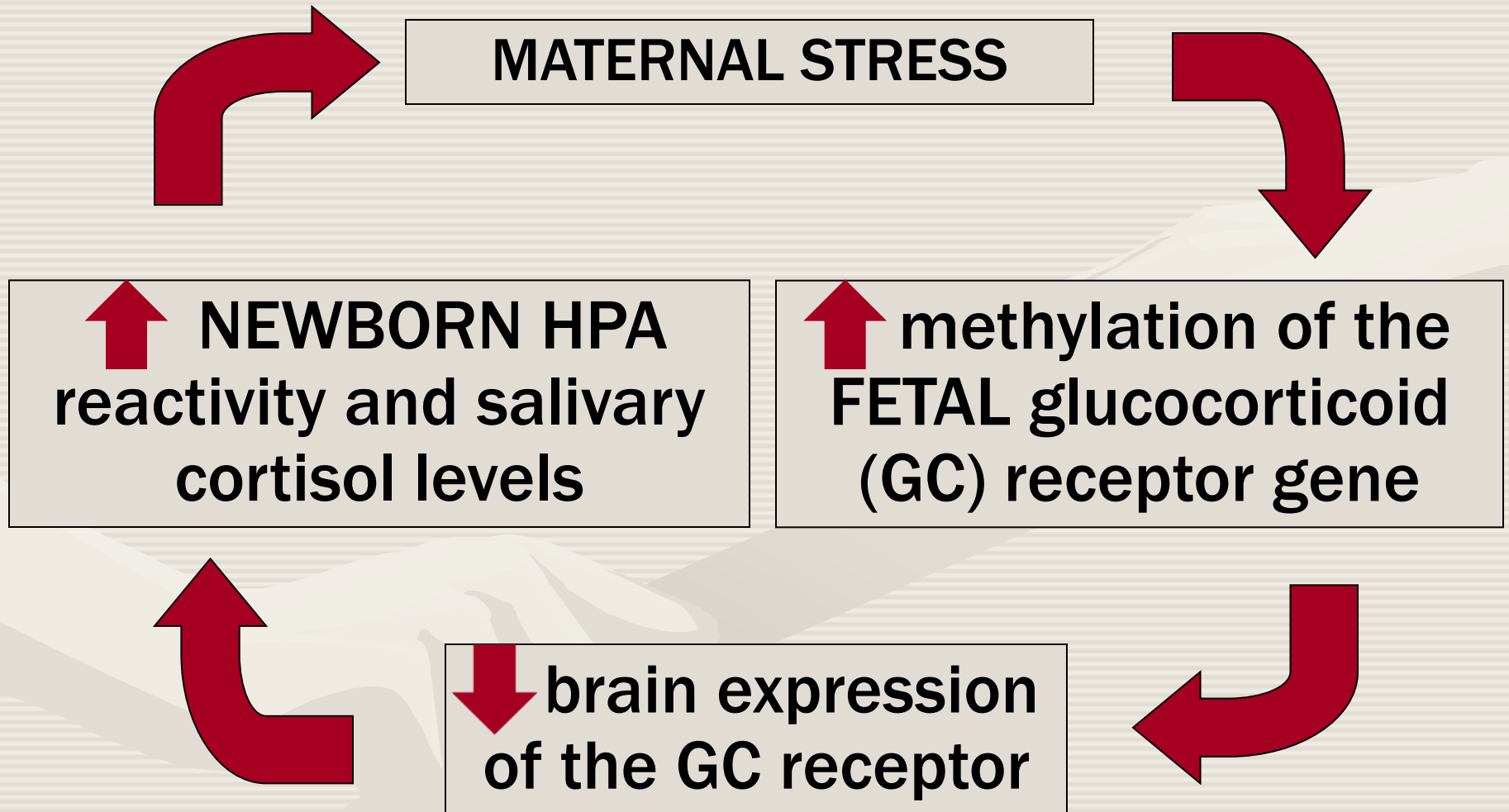
# Critical Concept #2

## EPIGENETICS

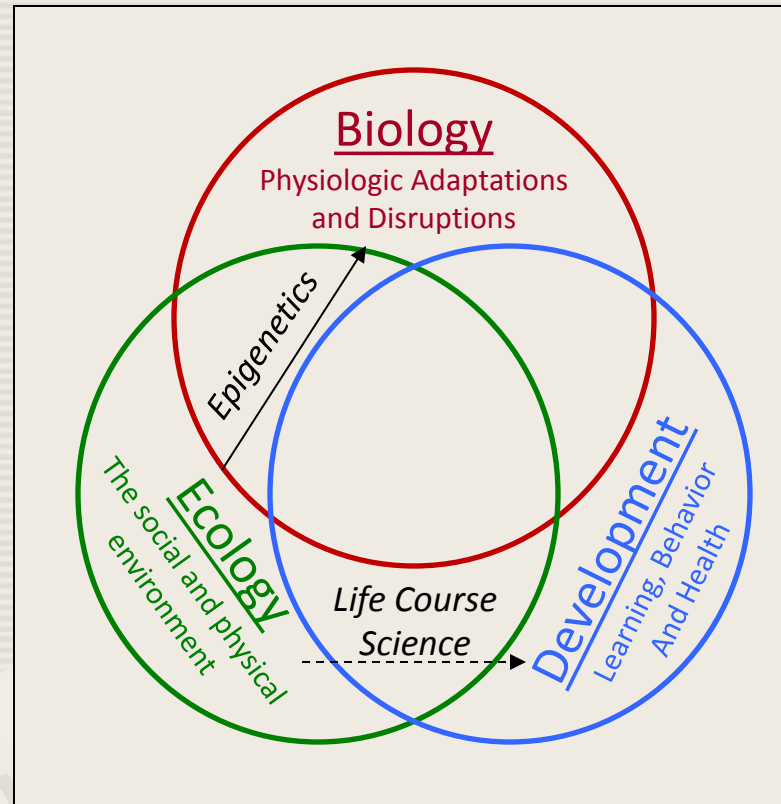
- **“Above the genome”**
  - Change in gene **expression**/no change in **DNA sequence**
  - Larger **revolution** in genomic science
    - OLD VIEW = **STATIC**; NEW VIEW = **PLASTIC** (environ. input)
  - Complex set of **SWITCHES**
    - Some are: **Master; Dynamic; Programmed Early and Stable**
- “Genes may load the gun, but the environment pulls the trigger”**

**“Epigenetics: NOT your parents’ genome!”**

# Impact of Early Stress



# Developing a Model of Human Health and Disease



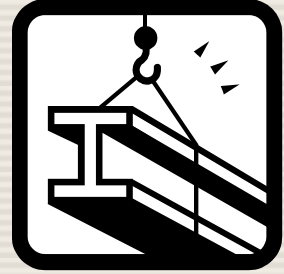
Through epigenetic mechanisms,  
the early childhood **ecology** becomes  
**biologically embedded**, influencing how/which genes are used

# Critical Concept #3

## Developmental Neuroscience:

- **Brain Architecture** is experience dependent (individual connections or “synapses” and complex circuits of connections or “pathways” are both dependent upon activity)
- **Ecology** (environment/experience) influences how brain architecture is formed and remodeled (**plasticity**)
- **Diminishing cellular plasticity** limits remediation
- Early childhood adversity -> **vicious cycle of stress** (**differential maturation**)
- Early experiences lead to **potentially permanent** alterations in brain architecture and functioning

# Two Types of Plasticity



- Synaptic Plasticity -

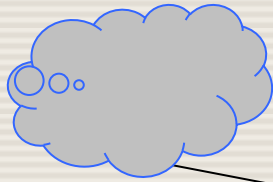
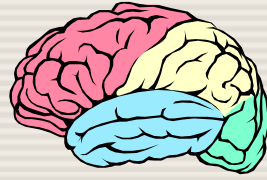
- Variation in the STRENGTH of individual connections
- “from a whisper to a shout”
- Lifelong (how old dogs learn new tricks)

- Cellular Plasticity -

- Variations in the NUMBER (or COUNT) of connections
- “ from one person shouting to a stadium shouting”
- Declines dramatically with age (**waning by age 5**)



# Asynchronous Brain Maturation



## Prefrontal Cortex

(the “OFF” switch)

**Cold** Cognition

**Judgmental**

**Reflective**

**Calculating**

**Think about it**

Biological maturity by **24**

## Amygdala

(the “ON” switch)

**Hot** Cognition

**Emotional**

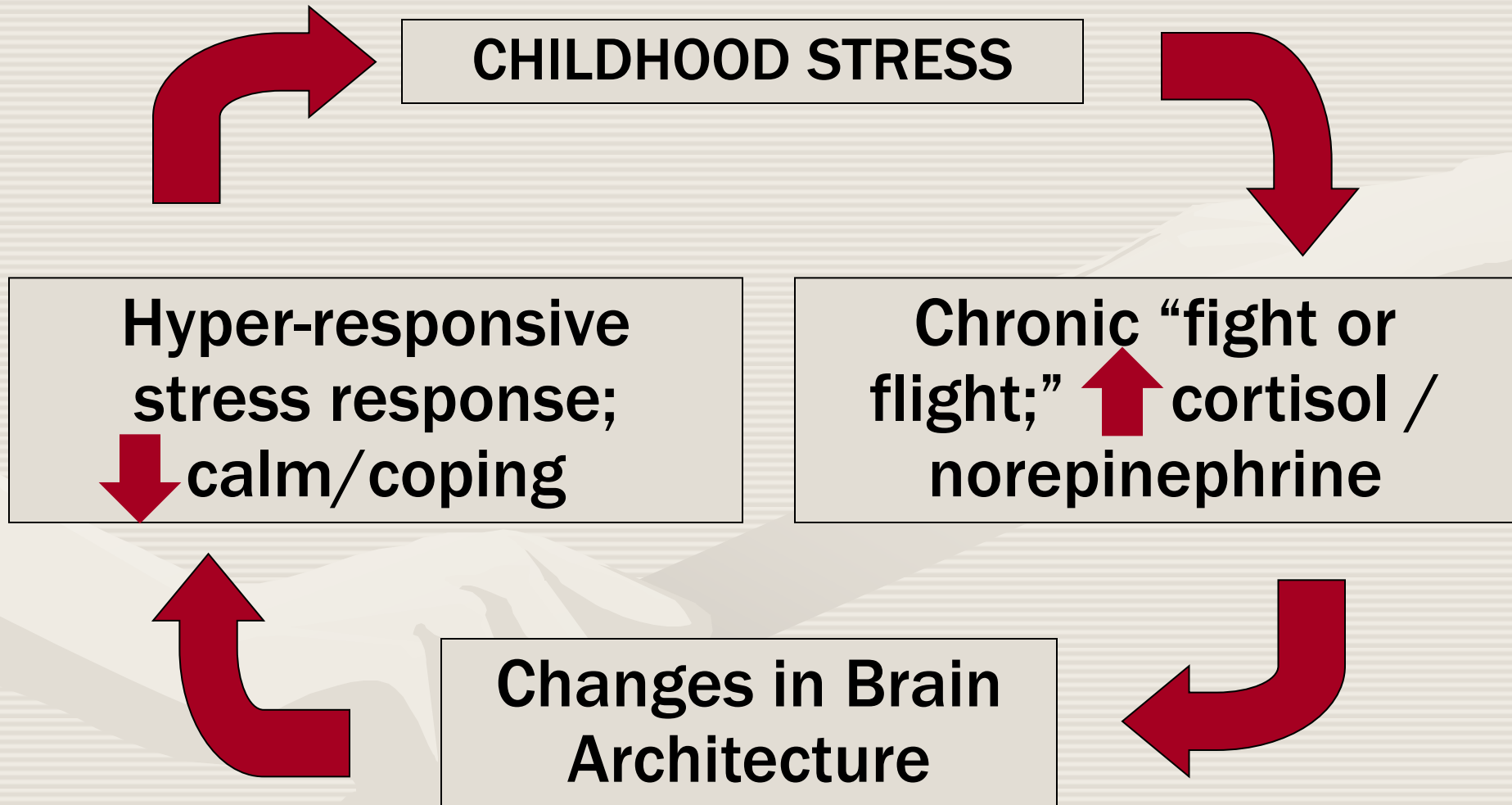
**Reactive**

**Impulsive**

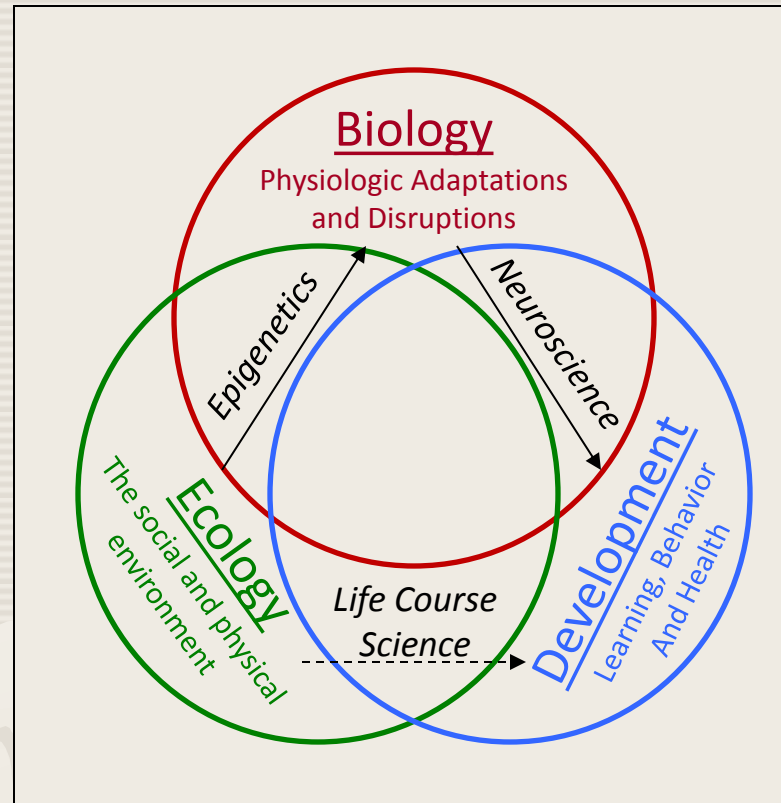
**Just do it**

Biological maturity by **18**

# Impact of Early Stress



# Developing a Model of Human Health and Disease

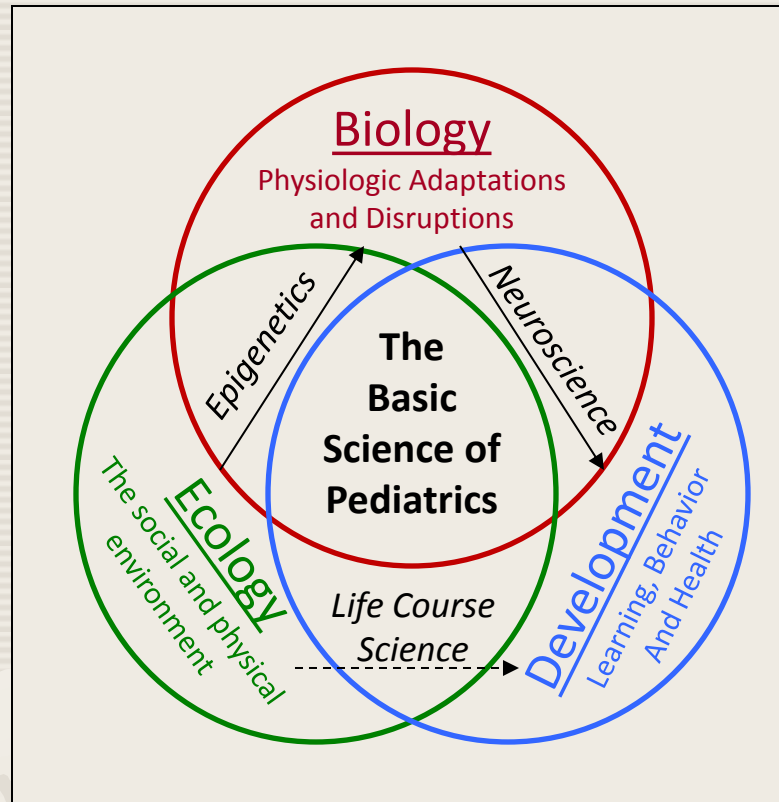


**Declining plasticity** in the developing brain results in potentially permanent alterations in brain functioning and **development**

# Eco-Bio-Developmental

## Model of Human Health and Disease

**NOT:**  
“What’s  
**WRONG**  
with you?”



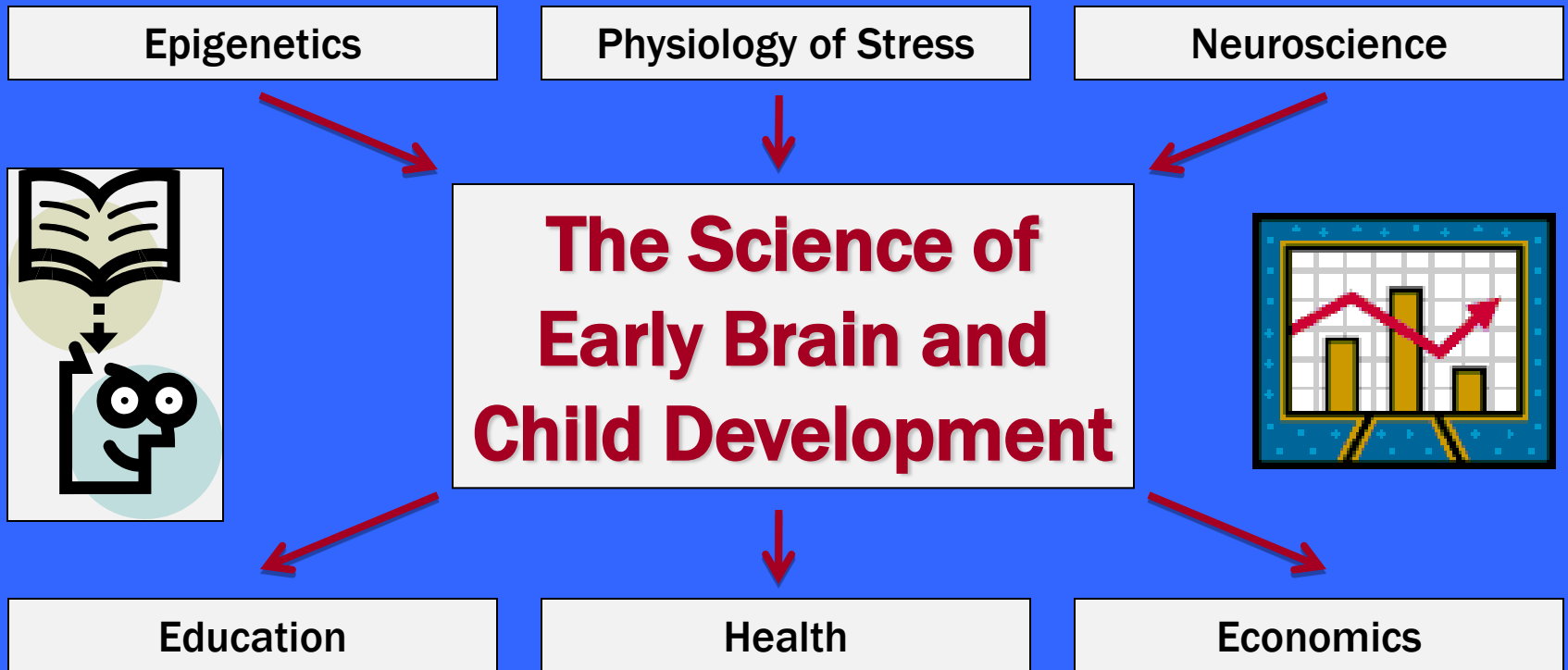
**BUT:**  
“What’s  
**HAPPENED**  
to you?”

**Ecology**

Becomes **biology**,

And together they drive **development** across the lifespan

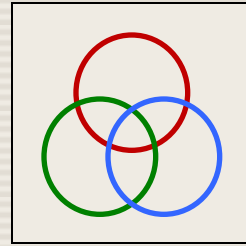
# Critical Concept #4



**One Science – Many Implications**

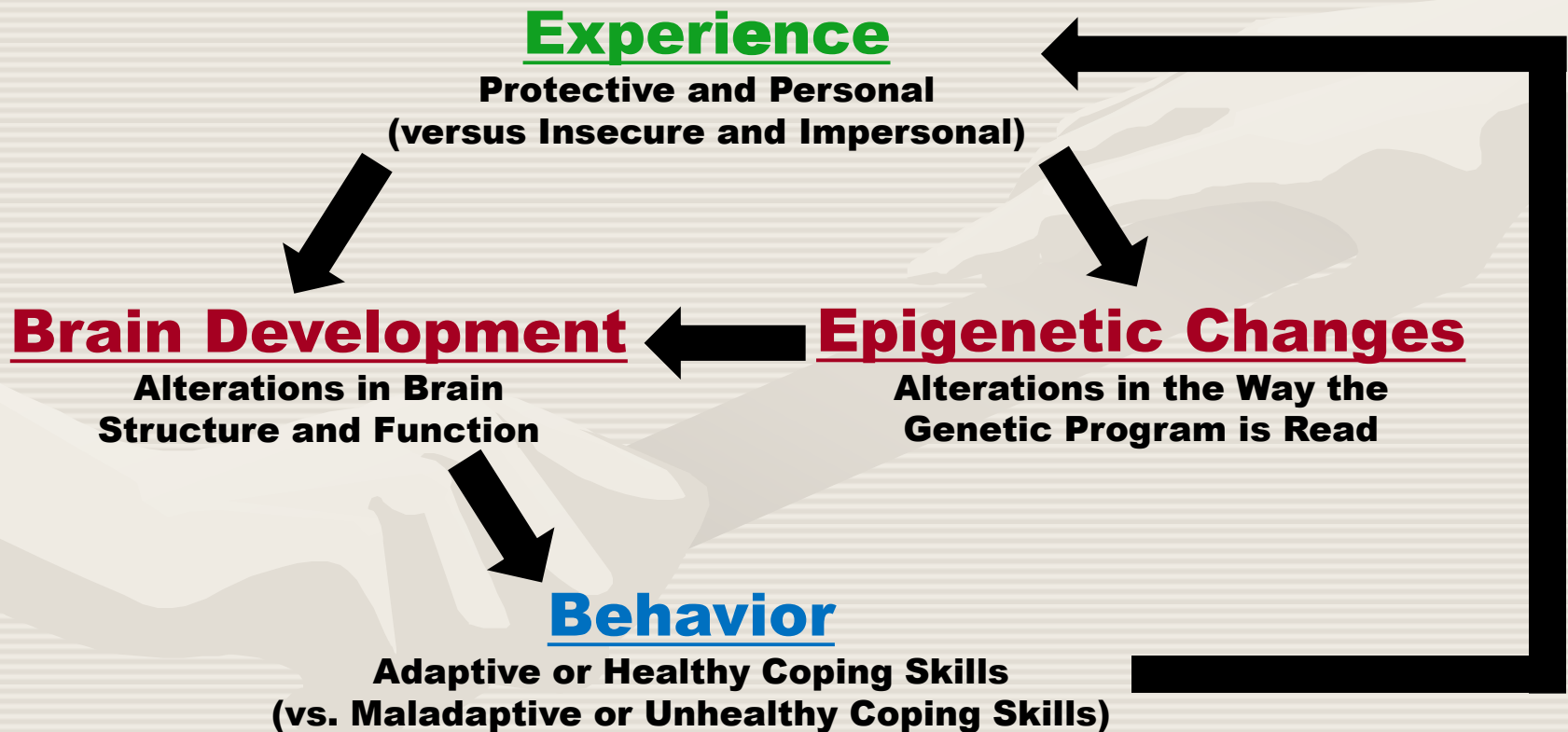
The critical challenge now is to **translate** game-changing advances in **developmental science** into effective **policies** and **practices** for families w/ children to improve **education, health** and **lifelong productivity**

# Advantages of an **EBD** Framework

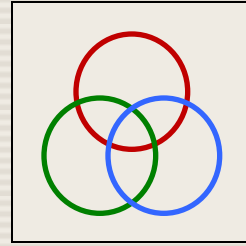


- Though grounded in **developmental science**, the **simplicity** of the EBD framework may promote understanding as well as **support for translation** (early investments are the right thing to do **biologically**)
- Psychosocial stressors and other salient features of the **ecology** are every bit as **biological** as nutrition or lead (no distinction between mental and physical health, just healthy vs. unhealthy **development**)
- Emphasizes the dimension of **time** – to reflect the **on-going, cumulative** nature of benefits and threats to health, educational success, and economic productivity

# **Development** results from an on-going, re-iterative, and cumulative dance between **nurture** and **nature**



# Advantages of an **EBD** Framework



- Underscores the need to improve the early childhood **ecology** in order to:
  - Mitigate the **biological** underpinnings for educational, health and economic **disparities**
  - Improve **developmental**/life-course trajectories
    - Changing the early childhood ecology will require a public health approach/collaboration (Rishi Manchanda)
- Highlights the pivotal role of **toxic stress**
  - Not just “**step on the gas**” or enrichment (ed model)
  - But “**take off the brake**” by treating, mitigating or immunizing against toxic stress (med model; not new!)



# Reinventing the Wheel - All over again?



## *Models*

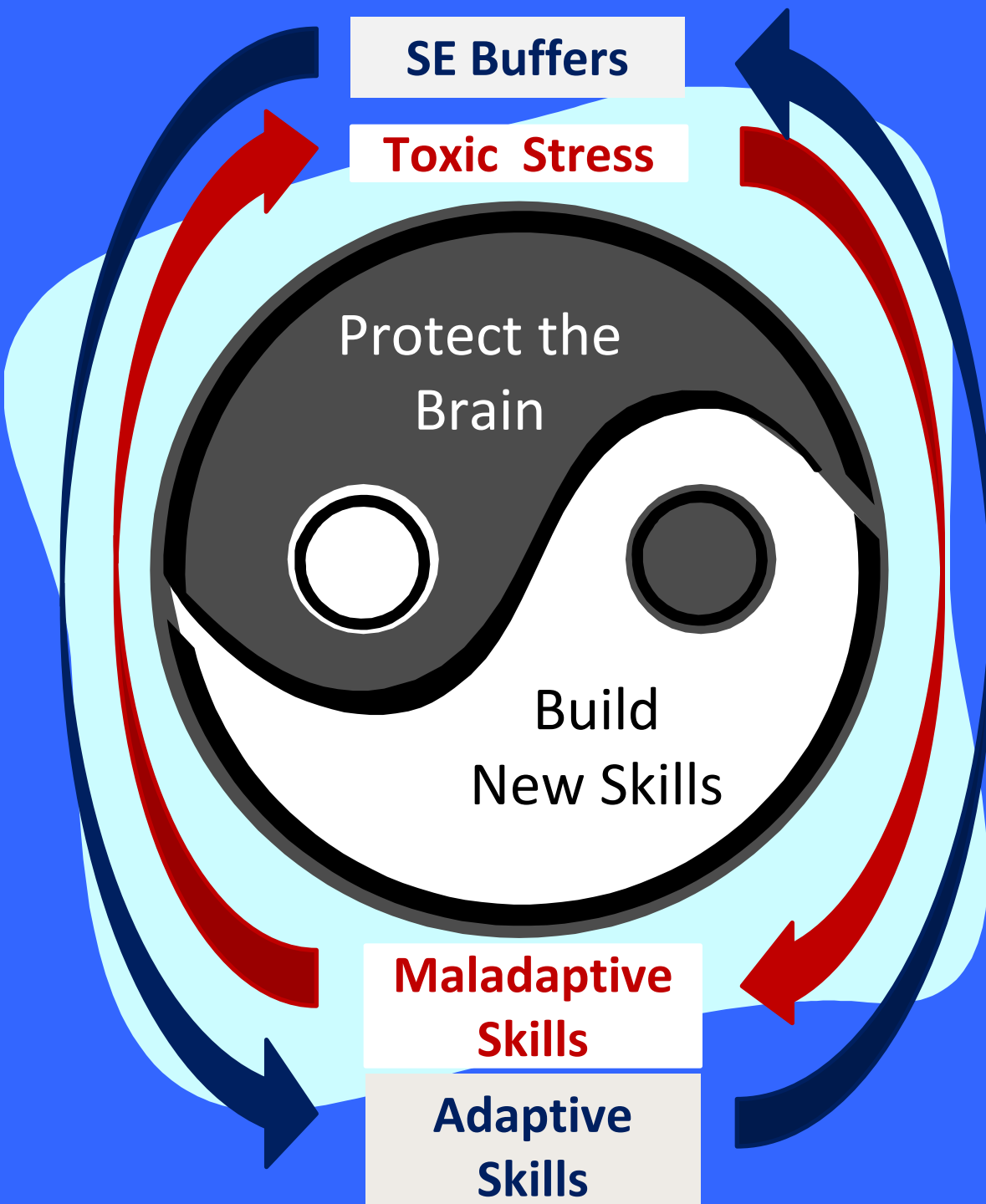
Maslow's Hierarchy of Needs  
(Theoretical - 1943)

### *Needs*

Self-Actualization

Need to know, explore  
and understand

Release the **BRAKE** ... before building **SKILLS!**

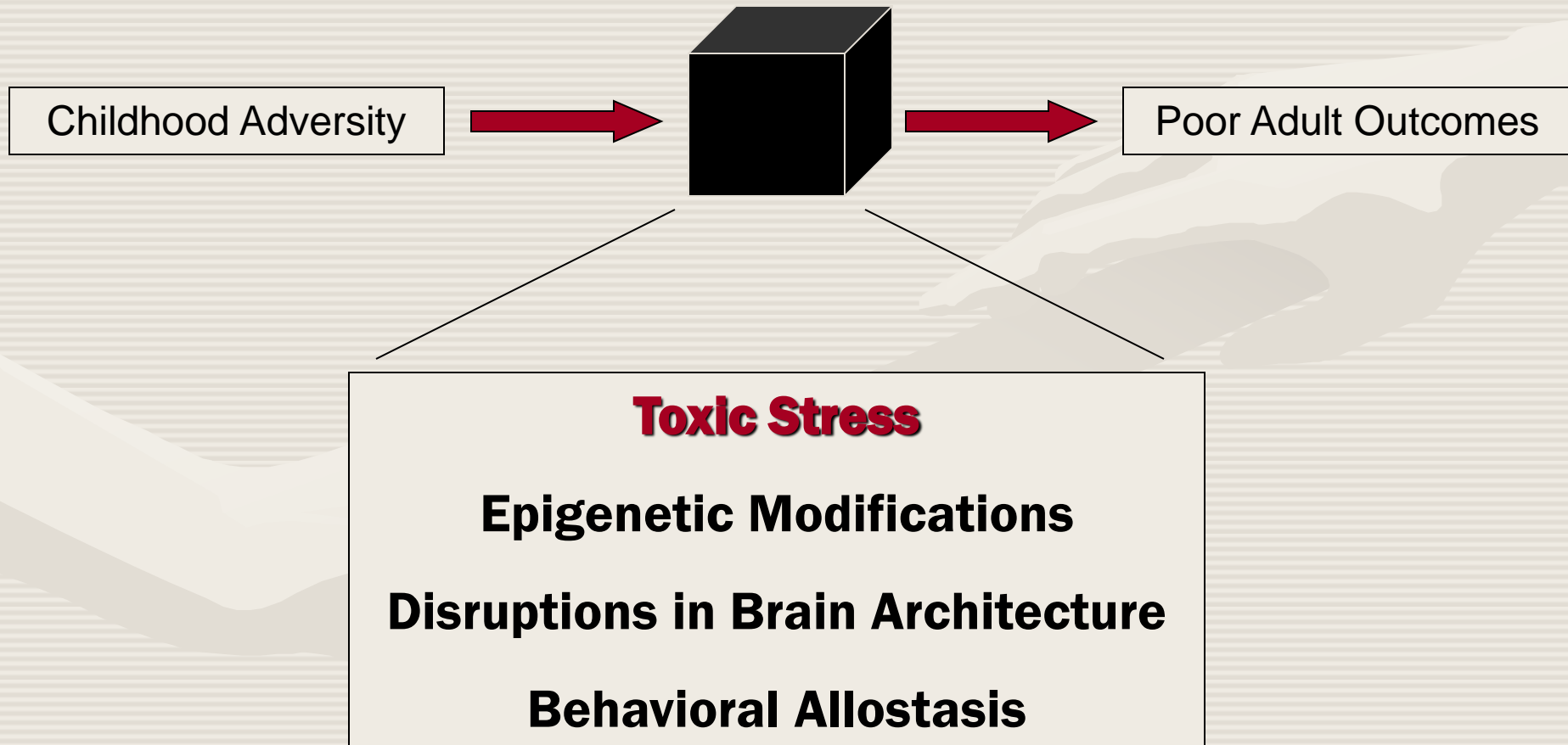


# Critical Concept #5

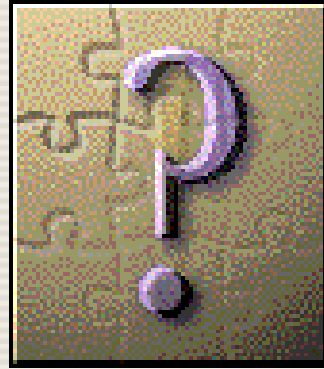
Yin/Yang of  
Early  
Childhood:

- Protect the Brain (Med)
- Build New Skills (Ed)

# Linking **Childhood Experiences** and **Adult Outcomes**



# The **BIG** Questions are...



Since **TOXIC STRESS** mediates the association between **ACE exposure** and **poor adult outcomes**, it raises the following BIG questions:

- Are there ways to:
  - **treat**,
  - **mitigate**, and/or
  - **prevent** (immunize against?) **toxic stress**?
- If so, is there a mismatch between:
  - what we **KNOW** ... and ...
  - what we actually **DO**?

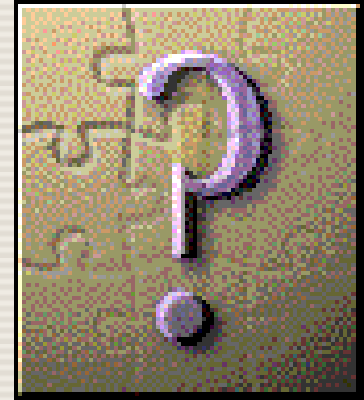
# Addressing **Toxic** Stress



- **Indicated treatments**

- Consequences are **Biological Mal-adaptations** (“what’s wrong with you,” vs “what’s happened to you”)
- **PCIT, CPP, and TF-CBT** are evidence-based
- Efficacy linked to age / chronicity (**brain plasticity**)
- **REACTIVE** – mal-adaptations are happening!
- **ACCESS** – interventions must be local
  - More **providers / better reimbursement / advocacy**
  - Need a **universal but local platform** (Medical homes? Schools?)
    - **Better coordination / communication between silos**

# Addressing **Toxic** Stress



- **Secondary / Targeted Preventions**

- Focused, targeted interventions for those deemed to be **“at high”** or the **“highest risk”**
- Home Visiting Programs (NFP, PAT, Child First, etc.)
- Parenting Programs (PPP, Nurturing Parenting, Legacy)
- More likely to minimize **“biological disruptions”** and yield a positive ROI
- Still issues with **stigma**; **numbers** of/**access** to providers/programs
- Who is **“at high risk?”** Requires **screening**  
(Not perfect! No ‘OMNI-screen! Child vs Family? Dysfunction vs Risk?)

# Addressing **Toxic** Stress



- **Primary / Universal Prevention**
  - Proactive, universal interventions to make stress **positive**, or tolerable instead of toxic
  - Acknowledges that preventing all childhood adversity is **impossible** and even **undesirable**
  - **Actively building resiliency** (“immunizing” through positive parenting, 7Cs, promoting optimism, formalized social-emotional learning)
  - **SE Buffers** allow the physiologic stress response to return to baseline
    - **Parenting/Caregiving** skills for younger children
    - **SEL** skills for older children ([www.casel.org](http://www.casel.org))

# Critical Concept #6

## SOCIAL-EMOTIONAL SKILLS...

(a.k.a – Affect Regulation, Non-Cognitive Skills, Mindfulness)

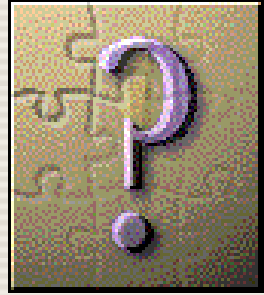
...Are **learned** (they can be **modeled, nurtured, taught, practiced, and reinforced**)

...Effectively **buffer** against **toxic stress**  
(by helping to turn **off** the physiologic stress response)

...Increase **test scores**  
(an average of **11 points** by meta-analysis!)



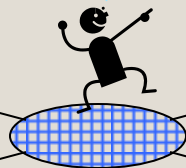
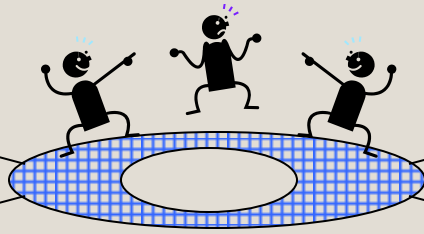
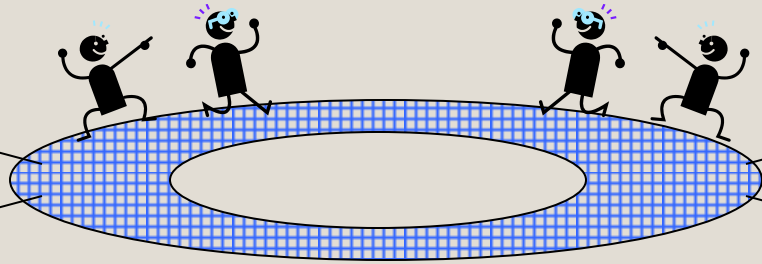
# Parenting as **Primary** Prevention



- Promoting **PARENTING SKILLS** in the first 1000 days
  - Parenting is personal – makes pediatricians NERVOUS!
  - “Positive/Nurturing/Supportive” Parenting
  - A Poor investment?
    - Are parenting skills “**TEACHABLE?**” **YES!!**
    - Is there a “**CEILING EFFECT**” on returns? **What is “OK?”**
  - Or the “**GOLD STANDARD?**”
    - Shouldn’t **SAFE, STABLE,** and **NURTURING RELATIONSHIPS** be THE reference point (NOT routine, general, or control populations)
- Significant Challenges:
  - Define what the basic, **BIOLOGICAL NEEDS** of children are
  - Utilize a **TWO GENERATION APPROACH** to meet those needs
  - Utilize a **PUBLIC HEALTH APPROACH** to match the **FAMILY’S NEEDS** with the indicated, local services

# Social-Emotional Safety Nets

A Public Health Approach to “**Toxic Stress**”



**ALL are necessary – NONE are sufficient!**

## Universal Primary Preventions

AG “Plus” (ROR / PFR / BF Grid)  
Consistent messaging (CTC)

**No identification**

**No stigma**

**Ceiling effects =  
Limited evidence base**

## Targeted Interventions

(for those “at risk”)

Home visiting (NFP/PAT)

Parenting programs (Legacy/PPP)

Early Intervention (Ideally!)

**Less ceiling=More evidence**

**Requires screening**

**Issues with stigma**

## Evidence-Based Treatments

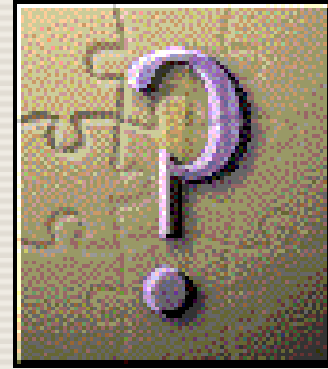
(for the symptomatic)

PCIT; TB-CBT; Pharmacotx

**Treatment works!**

**Screening / stigma / access**

# The **BIG** Questions are...



Since **TOXIC STRESS** mediates the association between **ACE exposure** and **poor adult outcomes**, it raises the following BIG questions:

- Are there ways to:
  - **treat**,
  - **mitigate**, and/or
  - **prevent** toxic stress?
- If so, is there a mismatch between:
  - what we **KNOW** ... and ...
  - what we actually **DO**?

**YES!**

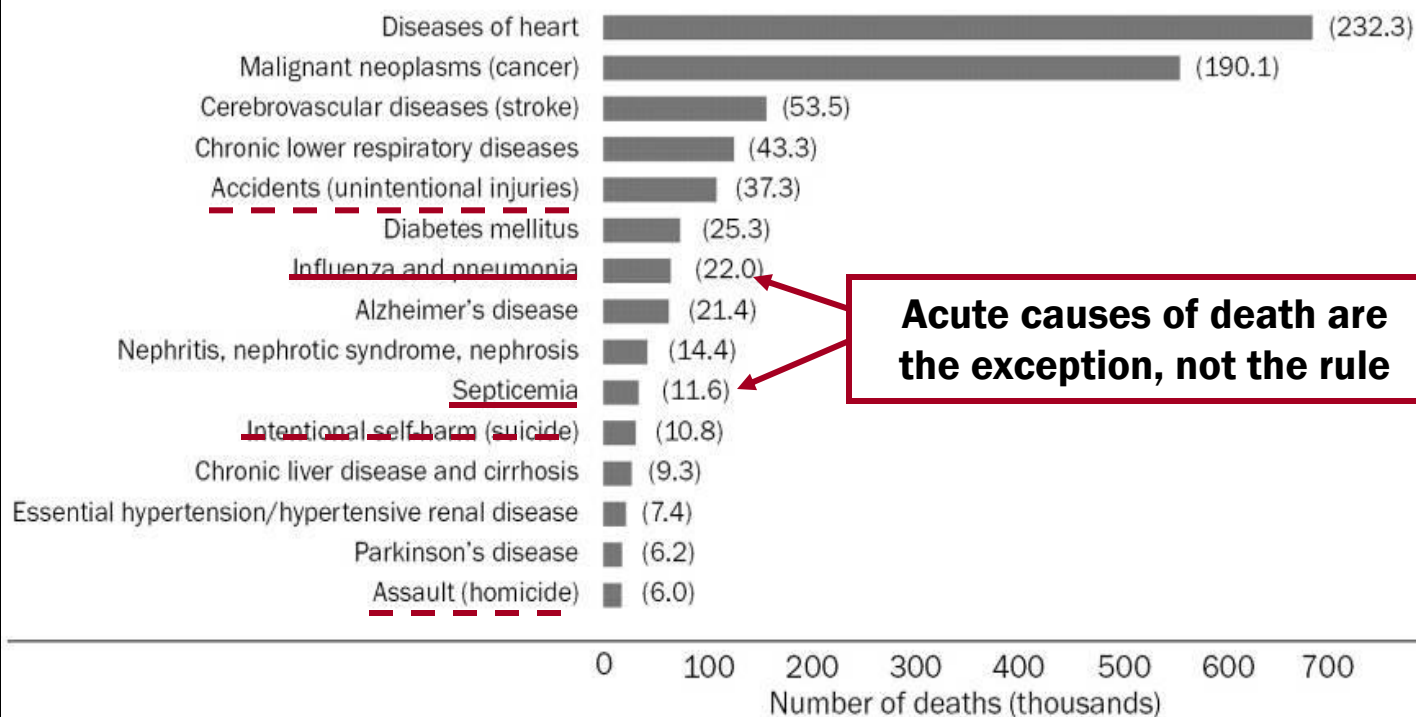
# Public Health Implications

- What we **DO**:
  - 95% of the trillions of dollars that we spend on health is on **treatment** and **NOT prevention**
- What we **KNOW**:
  - That **70% of early deaths** are **preventable**, with...
  - The **majority (40% overall)** due to **behavioral patterns** that lead to **chronic disease**.
  - Is this **Behavioral Allostasis** due to toxic stress?

# Proximal Causes of Death: Chronic Disease

## EXHIBIT 2

**Total Deaths And Age-Adjusted Death Rates (Per 100,000 Population) For The Fifteen Leading Causes Of Death In The Total U.S. Population, 2003**



**SOURCE:** D.L. Hoyert et al., "Deaths: Final Data for 2003," *National Vital Statistics Report* 54, no. 13 (2006): 1-120.

**NOTE:** Numbers in parentheses are age-adjusted death rates per 100,000 population.

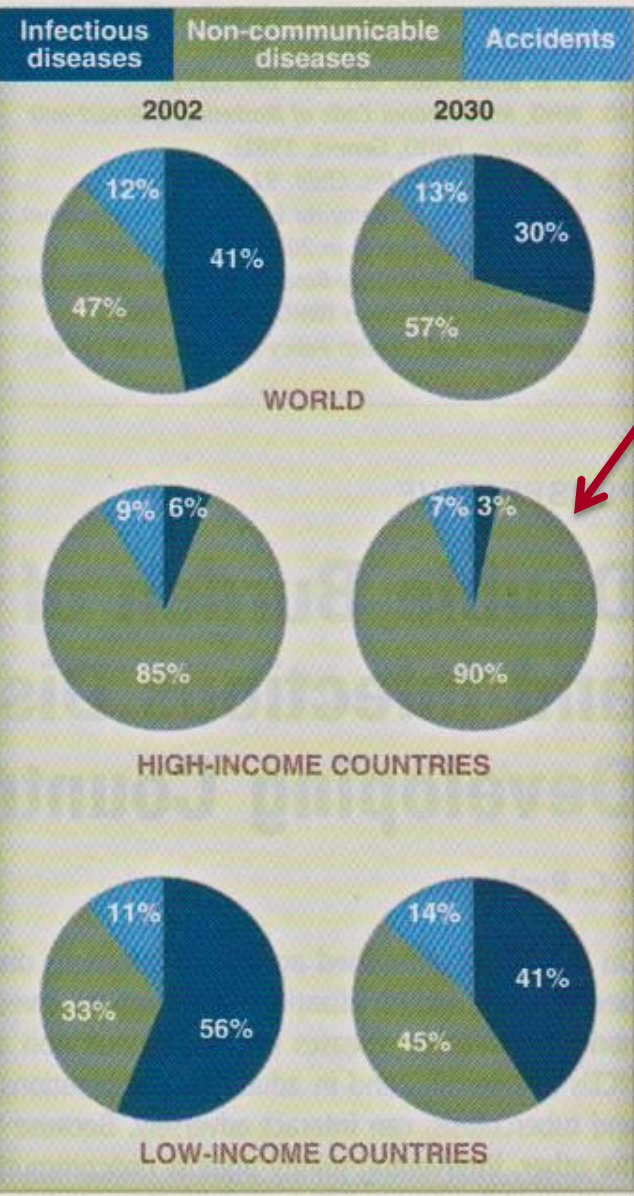
# Distal Causes of Death: Unhealthy Lifestyles

**Table 2.** Actual Causes of Death in the United States in 1990 and 2000

Actual Cause	No. (%) in 1990*	No. (%) in 2000
<u>Tobacco</u>	400 000 (19)	435 000 (18.1)
<u>Poor diet and physical inactivity</u>	300 000 (14)	400 000 (16.6)
<u>Alcohol consumption</u>	100 000 (5)	85 000 (3.5)
Microbial agents	90 000 (4)	75 000 (3.1)
Toxic agents	60 000 (3)	55 000 (2.3)
Motor vehicle	25 000 (1)	43 000 (1.8)
Firearms	35 000 (2)	29 000 (1.2)
<u>Sexual behavior</u>	30 000 (1)	20 000 (0.8)
<u>Illicit drug use</u>	20 000 (<1)	17 000 (0.7)
<b>Total</b>	<b>1 060 000 (50)</b>	<b>1 159 000 (48.2)</b>

\*Data are from McGinnis and Foege.<sup>1</sup> The percentages are for all deaths.

If these unhealthy lifestyles are manifestations of behavioral allostasis, a **FUNDAMENTAL** cause of death is **TOXIC STRESS!**



- By 2030, **90%** of the morbidity in high income countries will be due to **NCDs (Non-Communicable Diseases)**
- NCDs are related to **unhealthy behaviors** (overeating/inactivity, smoking, alcohol, and substance abuse)

**Fig. 1.** The proportional distribution of disability-adjusted life years, contributable to infectious diseases and NCDs for (top) the world, (middle) high-income countries, and (bottom) low-income countries for 2002 and 2030 (3).

PERSPECTIVE

# Changing Human Behavior to Prevent Disease: The Importance of Targeting Automatic Processes

Theresa M. Marteau,<sup>1\*</sup> Gareth J. Hollands,<sup>1</sup> Paul C. Fletcher<sup>2</sup>

Much of the global burden of disease is associated with behaviors—overeating, smoking, excessive alcohol consumption, and physical inactivity—that people recognize as health-harming and yet continue to engage in, even when undesired consequences emerge. To date, interventions aimed at changing such behaviors have largely encouraged people to reflect on their behaviors. These approaches are often ineffectual, which is in keeping with the observation that much human behavior is automatic, cued by environmental stimuli, resulting in actions that are largely unaccompanied by conscious reflection. We propose that interventions targeting these automatic bases of behaviors may be more effective. We discuss specific interventions and suggest ways to determine whether and how interventions that target automatic processes can enhance global efforts to prevent disease.

**How/When do those automatic processes form in the first place!?**



# Critical Concept #7

Do we continue to treat **disease**,

the **unhealthy lifestyles** that lead to  
disease,

or the **TOXIC STRESS** that leads to  
the adoption of unhealthy  
lifestyles??

# Developing a Shared “VISION”



# SUMMARY



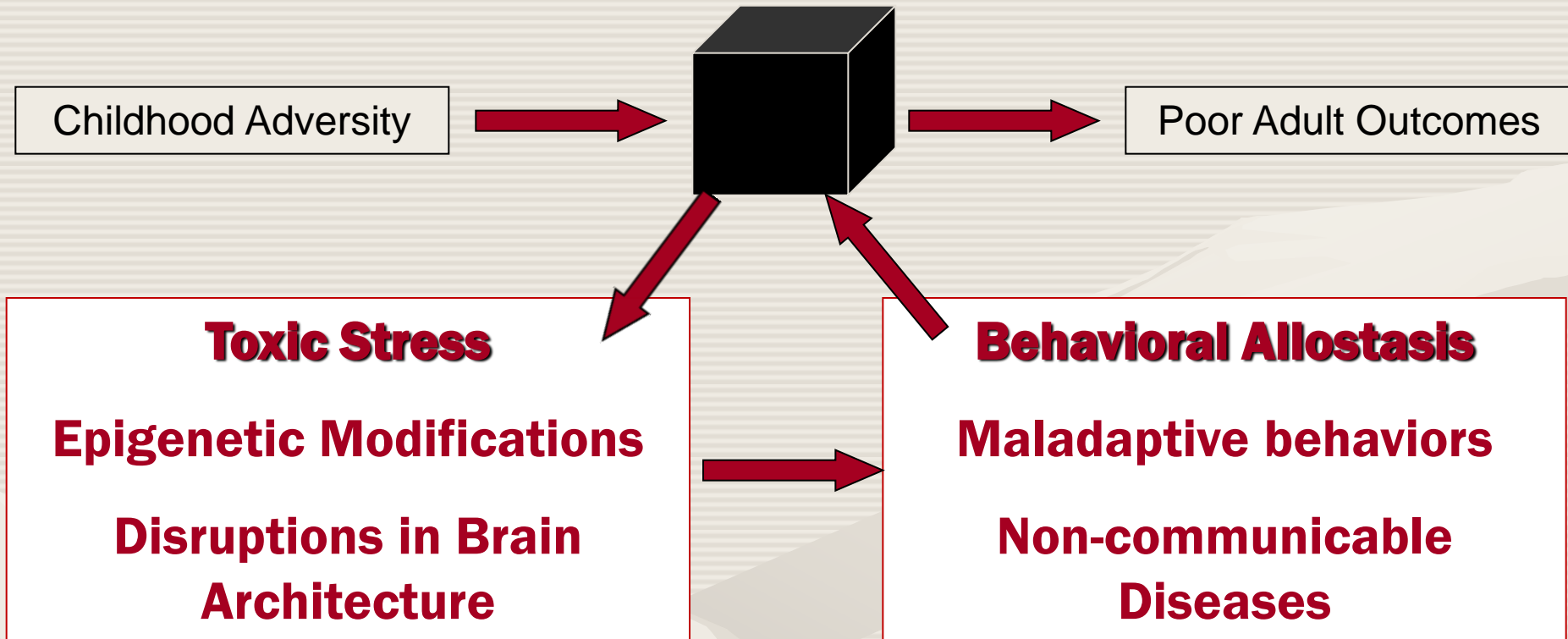
- **What is Toxic Stress?**
  - **A physiologic stress response that is excessive or prolonged** (reflects an inability to “turn it off”)
  - **Results in potentially permanent changes in:**
    - **Gene expression** (epigenetics)
    - **Brain development** (neuroscience)
    - **Behavior** (allostasis)

# SUMMARY



- Why should we care?
  - **Toxic stress** is a **MEDIATOR** between early childhood **adversity** and less than optimal outcomes in **learning, behavior** and **health**
  - Understanding the **BIOLOGY** underlying these well established associations opens up new opportunities for **primary prevention** and **early intervention**

# Linking Childhood Experiences and Adult Outcomes



Improve caregiver/community capacity to prevent or minimize toxic stress (e.g. – efforts to promote the safe, stable and nurturing relationships that turn off the physiologic stress response)

Improve caregiver/community capacity to promote healthy, adaptive coping skills (e.g. - efforts to encourage rudimentary but foundational SE, language, and cognitive skills )

# SUMMARY



- **What can we do about it?**
  - **EDUCATION** – for providers, trainees, families, the general public and business/philanthropic communities (re: science, TS, and EBD frame)
  - **MESSAGING** – be a “convener” (ala CTC); develop a shared “vision” locally to support a public health approach towards toxic stress
  - **ADVOCACY** – partner with like-minded stakeholders to “incentivize” wellness/relational health, population health, and long-term outcomes
  - **RESEARCH** – **basic** (non-invasive biomarkers, personalized med), **clinical** (standardized screens – not just for the child, but the family; not just for dysfunction, but those at risk), and **translational** (medical homes, schools, communities are integrated vertically and horizontally)
  - **PRACTICE TRANSFORMATION** – promoting wellness (over chronic/acute care) and supporting families (PPP, Family Safe Zones)

Since there are known, established ways to **treat**,  
**mitigate** and even **prevent** toxic stress,

## **WHY ARE WE NOT DOING THEM?!**

- “They cost too much” or “TS is not my concern”

**When kids don't fulfill their potential, we ALL lose**

- “Defensiveness” (“It's not MY fault” or “It's THEM!”)

**Toxic stress is not restricted by race, wealth, zip code**

- “Too complicated”

**The biology suggests that it is all about relationships**

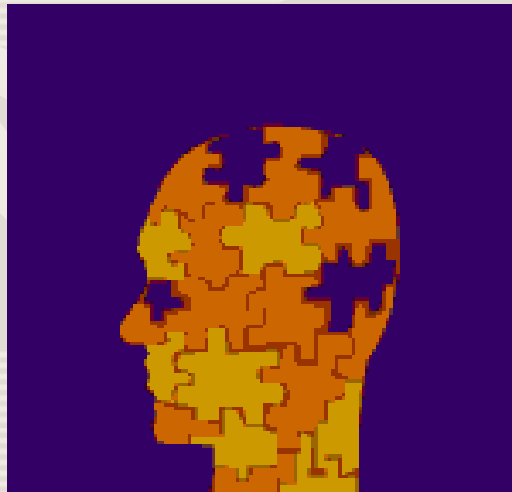
- “Too hard”

**1) understand the science, 2) advocate for a public health approach, 3) develop a shared language/vision**

# CONCLUSION:

It is easier to **build strong children**  
than to **repair broken men.**

Frederick Douglass





# Q & A

*Following Q&A, please transition to the  
**Legislative Conference Center (E2.002)** for  
lunch and afternoon presentations.*

Please visit <http://texprotects.org/conference/toxicstress> for presentation slides