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To learn more about Dr Navsaria or to enquire about speaking opportunities, please visit the links below. Thank you for your interest and use this information to do good work for children!



Dipesh Navsaria,
MPH, MSLIS, MD

www.navsaria.com
facebook.com/DrLibrarian
[@navsaria](https://twitter.com/navsaria)

TOXIC STRESS AND THE FIRST THOUSAND DAYS

**P O L I C I E S
P R O G R A M S
P R A C T I T I O N E R S &
P A T I E N T S**

DIPESH NAVSARIA, MPH, MSLIS, MD

DEPARTMENT OF PEDIATRICS
UW SCHOOL OF MEDICINE & PUBLIC HEALTH

SCHOOL OF LIBRARY AND INFORMATION STUDIES
UNIVERSITY OF WISCONSIN-MADISON

EARLY BRAIN & CHILD DEVELOPMENT LEADERSHIP WORKGROUP
AMERICAN ACADEMY OF PEDIATRICS



Disclosure

I have no relevant financial relationships to disclose.

I will not discuss off-label use or investigational use in my presentation.

Although...

You can see what being around me can result in...



Images courtesy of Dipesh Navsaria

“Oh, that’s so nice...”
CRITICAL

First, a story...

EARLY BRAIN AND CHILD DEVELOPMENT

The Science

The Result

The Solution?

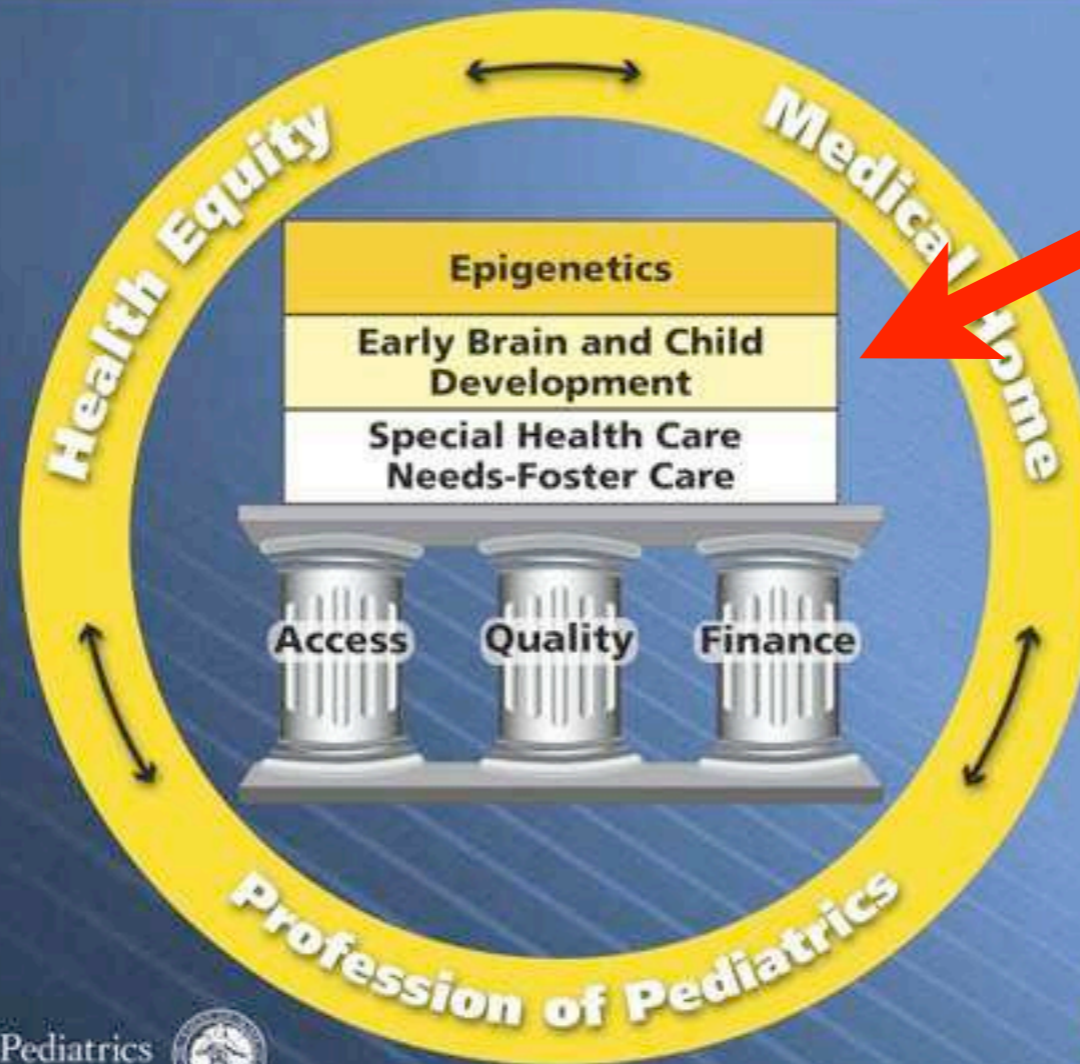
The Call

EARLY BRAIN AND CHILD DEVELOPMENT

The Science

AAP Agenda for Children 2011-2012

DEDICATED TO THE HEALTH OF ALL CHILDREN™



American Academy of Pediatrics
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© 2011 American Academy of Pediatrics

- Planning
- Implementing
- Integrating

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- Implementing
- Integrating
- Planning

The AAP's EBCD Initiative

“Building Brains, Forging Futures”
“It’s all about Nurturing Relationships”

Urgency

The Essential Role of Health

Early Brain and Child Development (EBCD) Leadership Workgroup

Andy Garner, MD, Chair

Pam High, MD

Colleen Kraft, MD

Mary Margaret Gleason, MD

Dipesh Navsaria, MPH, MSLIS, MD

David Willis, MD, Past Chair

Staff:

Mary Crane, PhD

Karen Smith, MPH



EARLY BRAIN AND CHILD DEVELOPMENT

from *The Science of Early Childhood Development*
National Scientific Council on the Developing Child, 2007

...the mind is its own place
...like a man in Hell; a f
- John Milton: "Para

EARLY BRAIN AND CHILD DEVELOPMENT

1

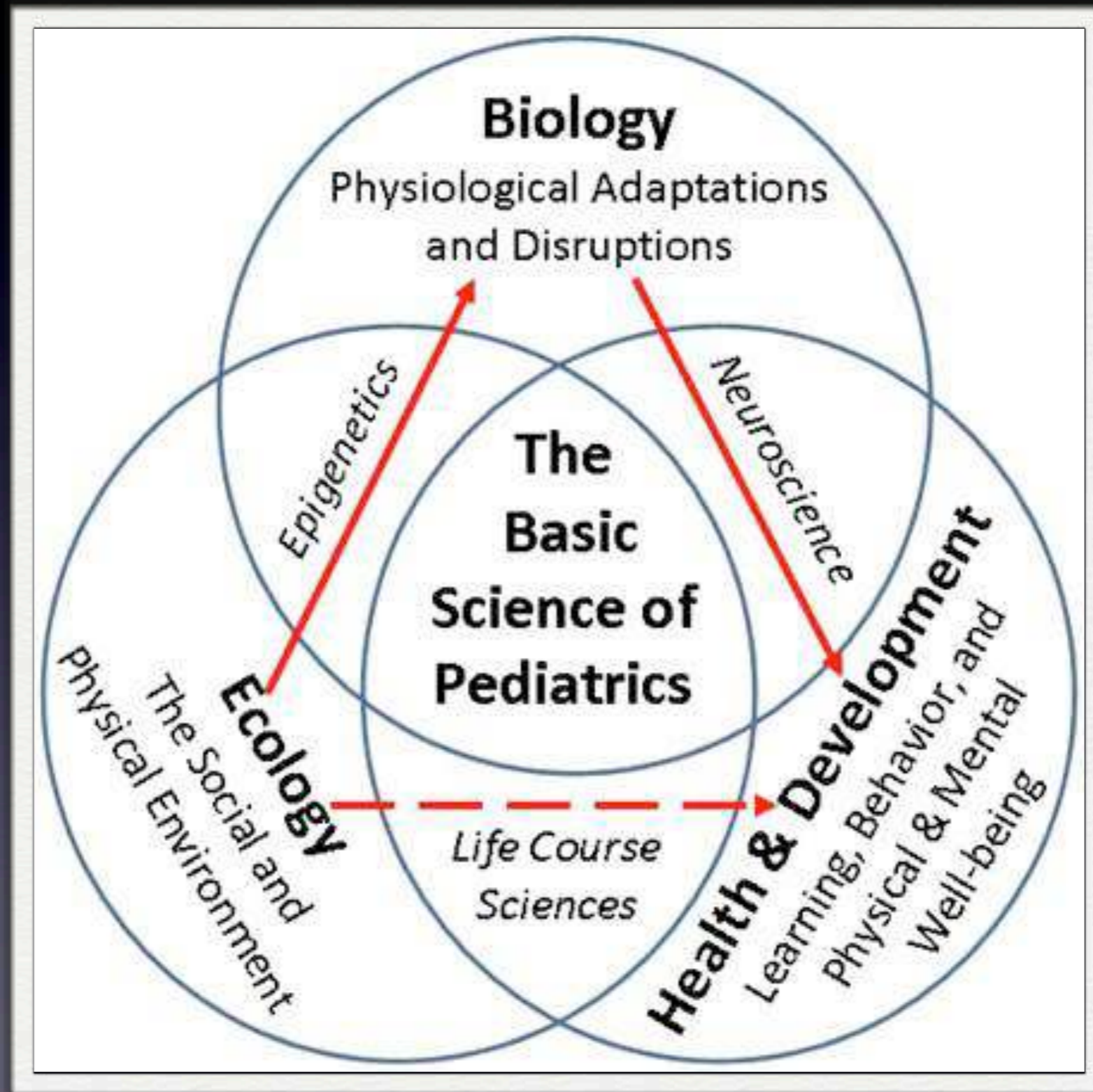
Child development is a foundation for **community** development and **economic** development, as capable children become the foundation of a prosperous and sustainable society.

2

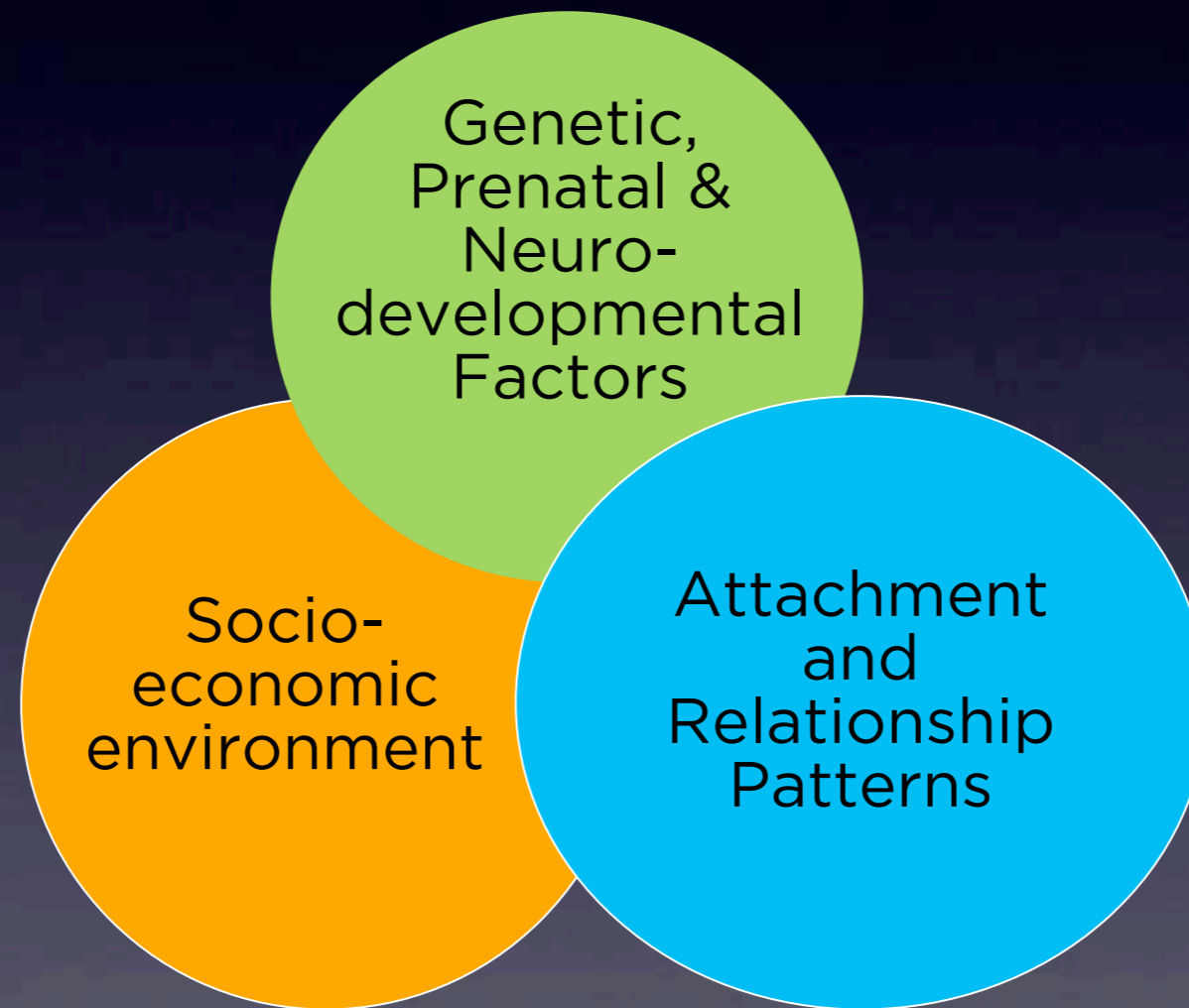
Brains are built **over time**.

Creative Commons-licensed work by flickr user *Andrew Mace*—

Eco-biodevelopmental Model



The **3-legged stool** for developmental and health trajectories



EARLY BRAIN AND CHILD DEVELOPMENT

3

The interactive influences of genes and experience literally **shape** the architecture of the developing brain and the active ingredient is the “**serve and return**” nature of children’s engagement in relationships with their parents and other caregivers in their family or community.

Humans do not develop in
isolation; there is a need for
affiliation.

Development proceeds
through and **by** *relationships.*

The Face to Face Paradigm Edward Z Tronick



Video from Zero to Three / UMass Boston. Accessible at <http://youtu.be/apzXGEbZht0>

EARLY BRAIN AND CHILD DEVELOPMENT

4

Both brain architecture and developing abilities are built “from the bottom up” with simple circuits and skills providing the **scaffolding** for more advanced circuits and skills over time.

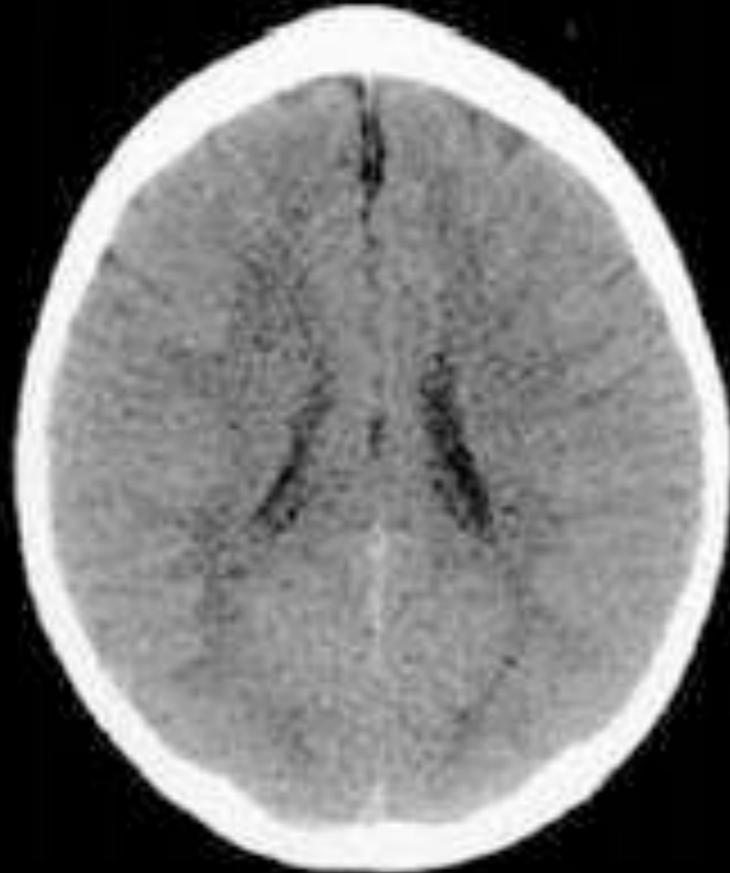
EARLY BRAIN AND CHILD DEVELOPMENT

5

Toxic stress in early childhood is associated with **persistent** effects on the nervous system and stress hormone systems that can **damage developing brain architecture** and lead to lifelong problems in learning, behavior and both physical and mental health.

Creative Commons-licensed work by flickr user *Pedro Klien*

3 Year Old Children



Normal



Extreme Neglect

Normal

Extreme Neglect

THE STRESS RESPONSE:

increases in cortisol and epinephrine

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

Social-emotional buffering
is the **primary factor**
distinguishing level of stress.

Andy Garner, MD

Adversity & Toxic Stress

Toxic stress is the
key intergenerational transmitter
of social and health disparities

POSITIVE STRESS

Child sees someone approaching
with their immunization syringe

Parent leaving on the first day of preschool

TOLERABLE STRESS

Death of a family member

Serious illness

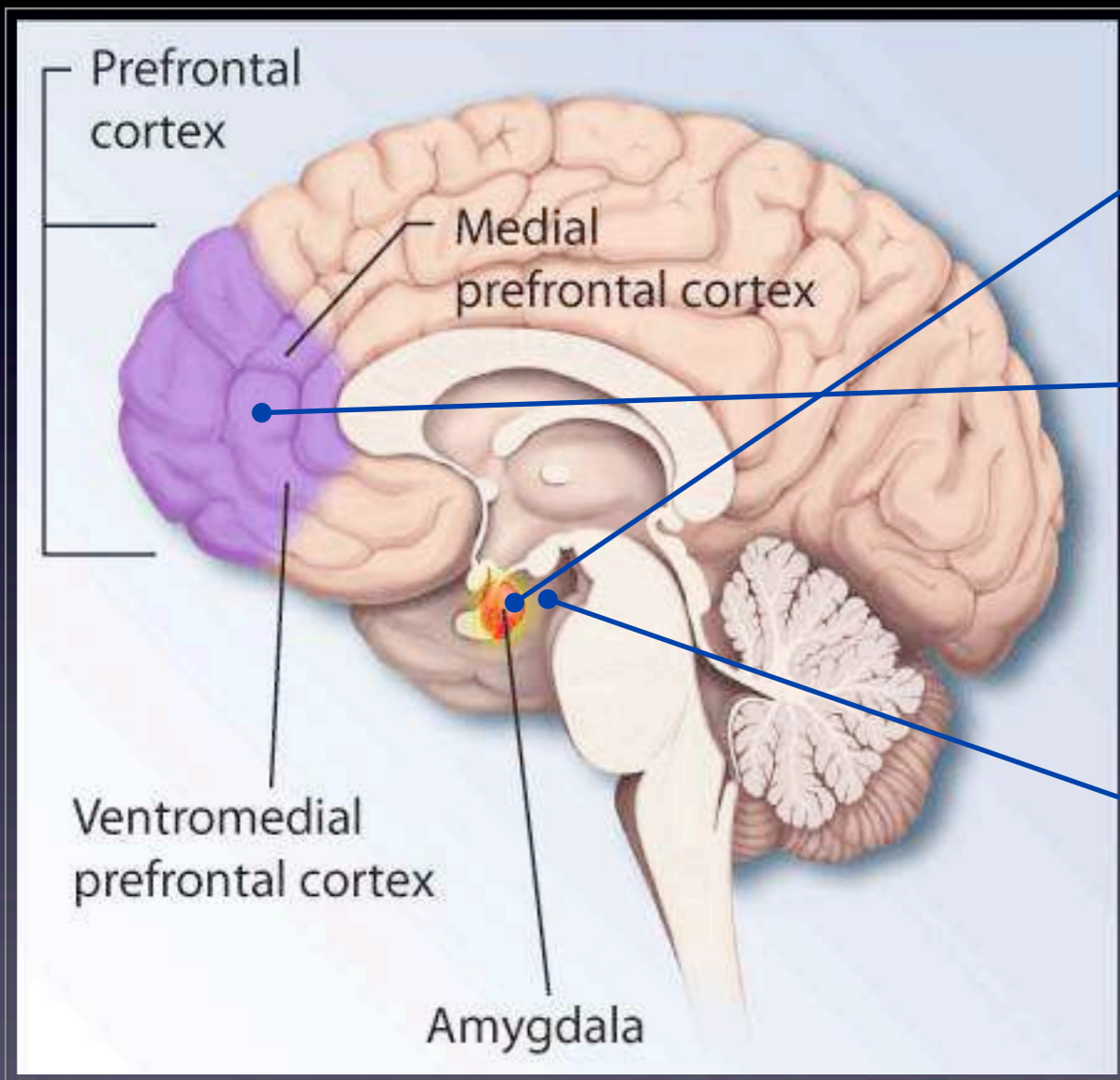
Natural disaster

What if it's worse?
What if there's no supportive relationships?

Child abuse
Parental substance abuse
Homelessness

TOXIC STRESS

What happens?



Amygdala:

activates the stress response

Toxic stress: enlargement

Prefrontal cortex:

usually a check to the amygdala

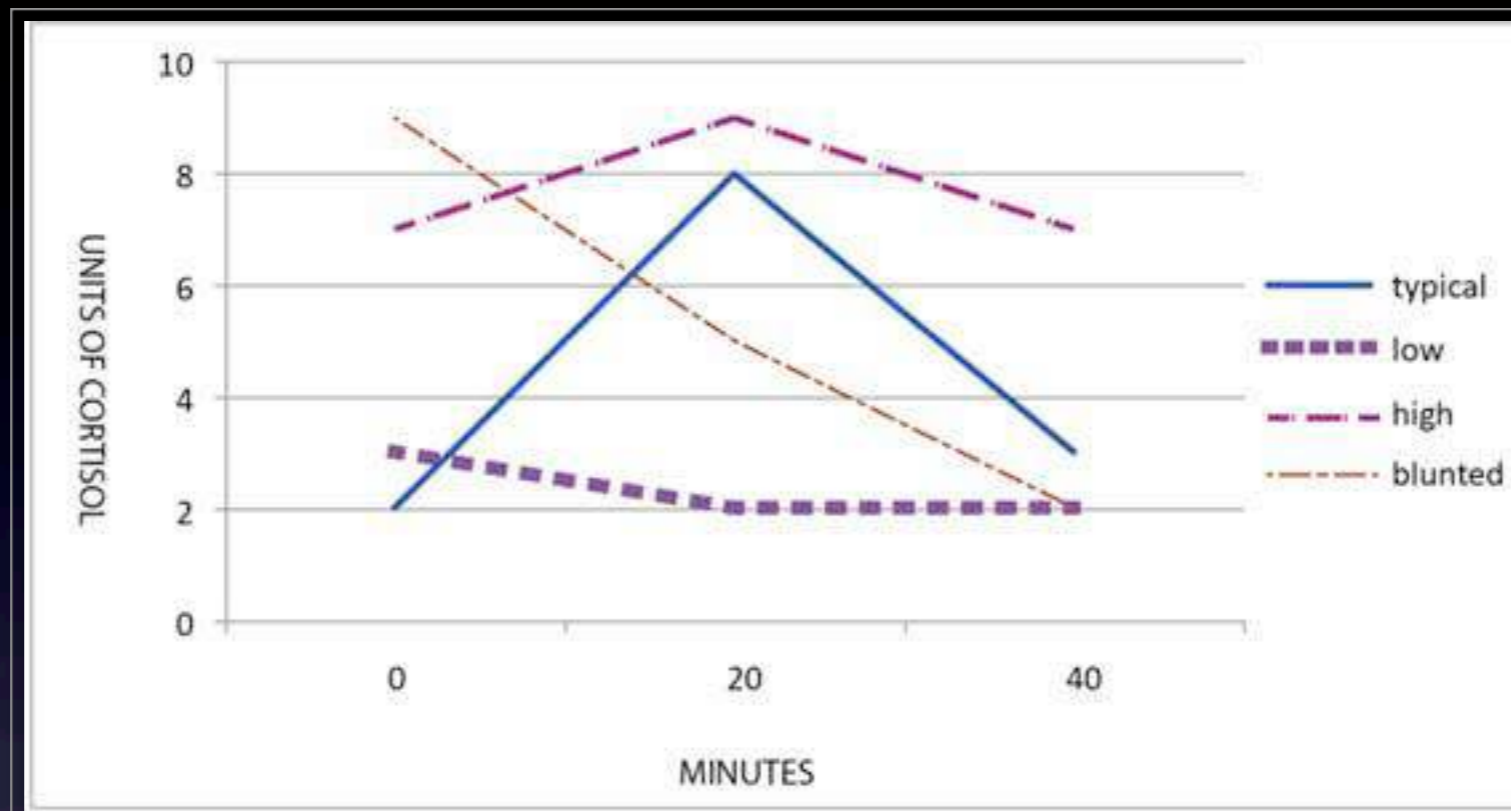
Toxic stress: loss of neurons, less able to function

Hippocampus:

major role in memory and mood

Toxic stress: impairment in understanding and emotion

POVERTY IS NEUROTOXIC



Children with “typical” cortisol response had **higher** executive function, and were rated as having **more** self-control in the classroom.

Those with a flat (high or low) or blunted response had **low** levels of executive function and were rated as having **poor** self-regulation.

POVERTY IS NEUROTOXIC

Next, children in a large (1200) study whose mothers engaged in “scaffolding” during play had lower cortisol levels and were more attentive.

Those who were more authoritarian had higher cortisol levels and were found to be less attentive.

This was found at 7 months of age and again at 15 months.

They also found that the more impoverished the family, the less likely they were to engage in scaffolding.



THE ADVERSE CHILDHOOD EXPERIENCES STUDY

**The Most Important Study
You've (Probably) Never Heard Of.**

In 1985, Dr Vincent Felitti noticed many patients in his obesity treatment programs had prior history of abuse or trauma

The CDC worked with Kaiser Permanente and looked retrospectively at over 17,000 patients.

This was the first study to simultaneously assess childhood exposure to multiple types of abuse, neglect, domestic violence and serious household dysfunction.

THE ADVERSE CHILDHOOD EXPERIENCES STUDY

Study participants were middle-class Americans from San Diego, 80% white, 74% attended college, average age of 57, split evenly between men and women.

Not exactly an impoverished, “at-risk” population.

THE ADVERSE CHILDHOOD EXPERIENCES STUDY

Emotional Abuse (10%)

Physical Abuse (26%)

Sexual Abuse (21%)

Emotional Neglect (15%)

Physical Neglect (10%)

Mother treated violently (13%)

Household substance abuse (28%)

Household mental illness (20%)

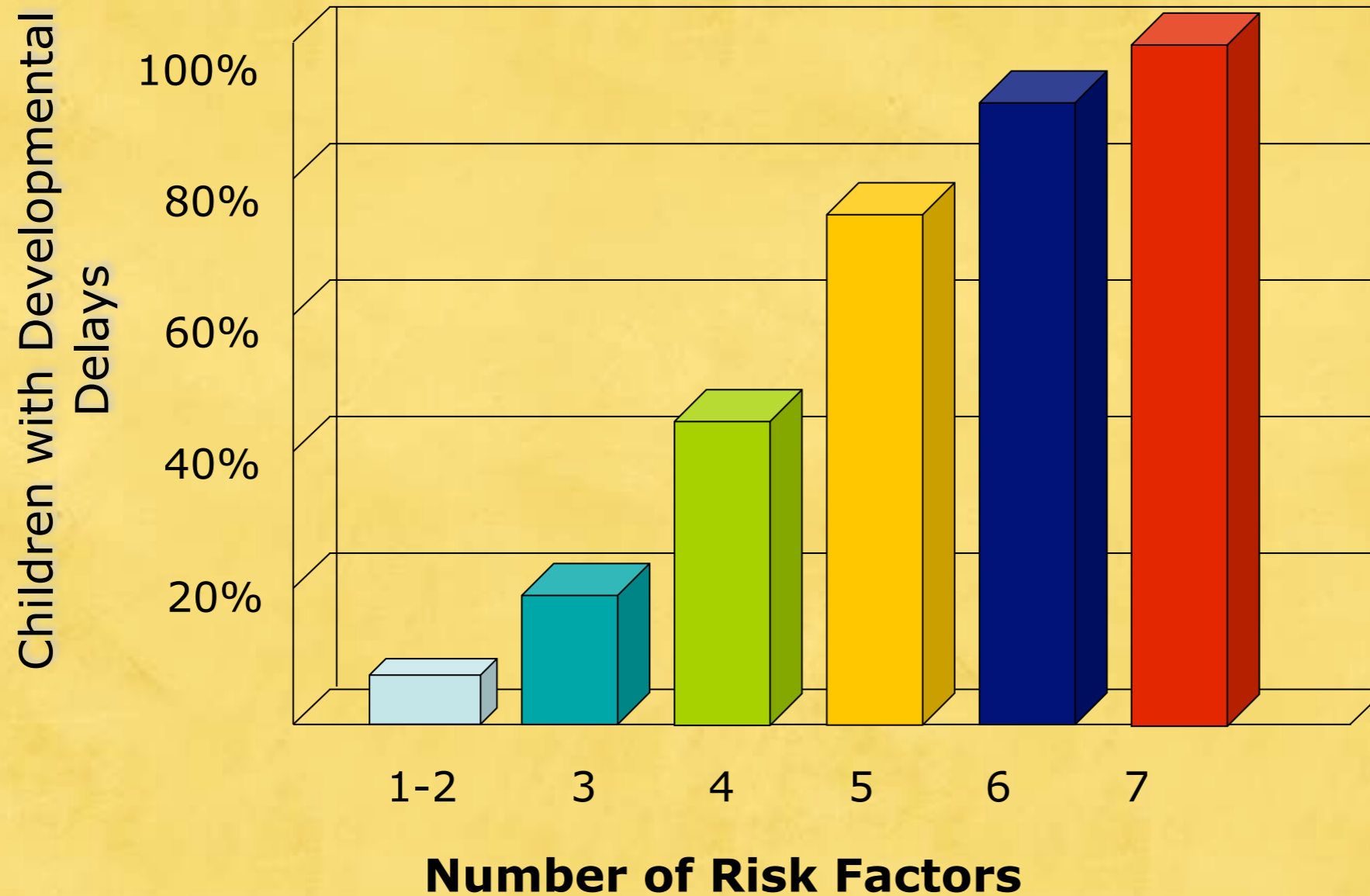
Parental separation or divorce (24%)

Incarcerated household member (6%)

ACE Score (one point for each category listed)	Prevalence in study
0	33%
1	26%
2	16%
3	10%
4	6%
5	5%
6	6%

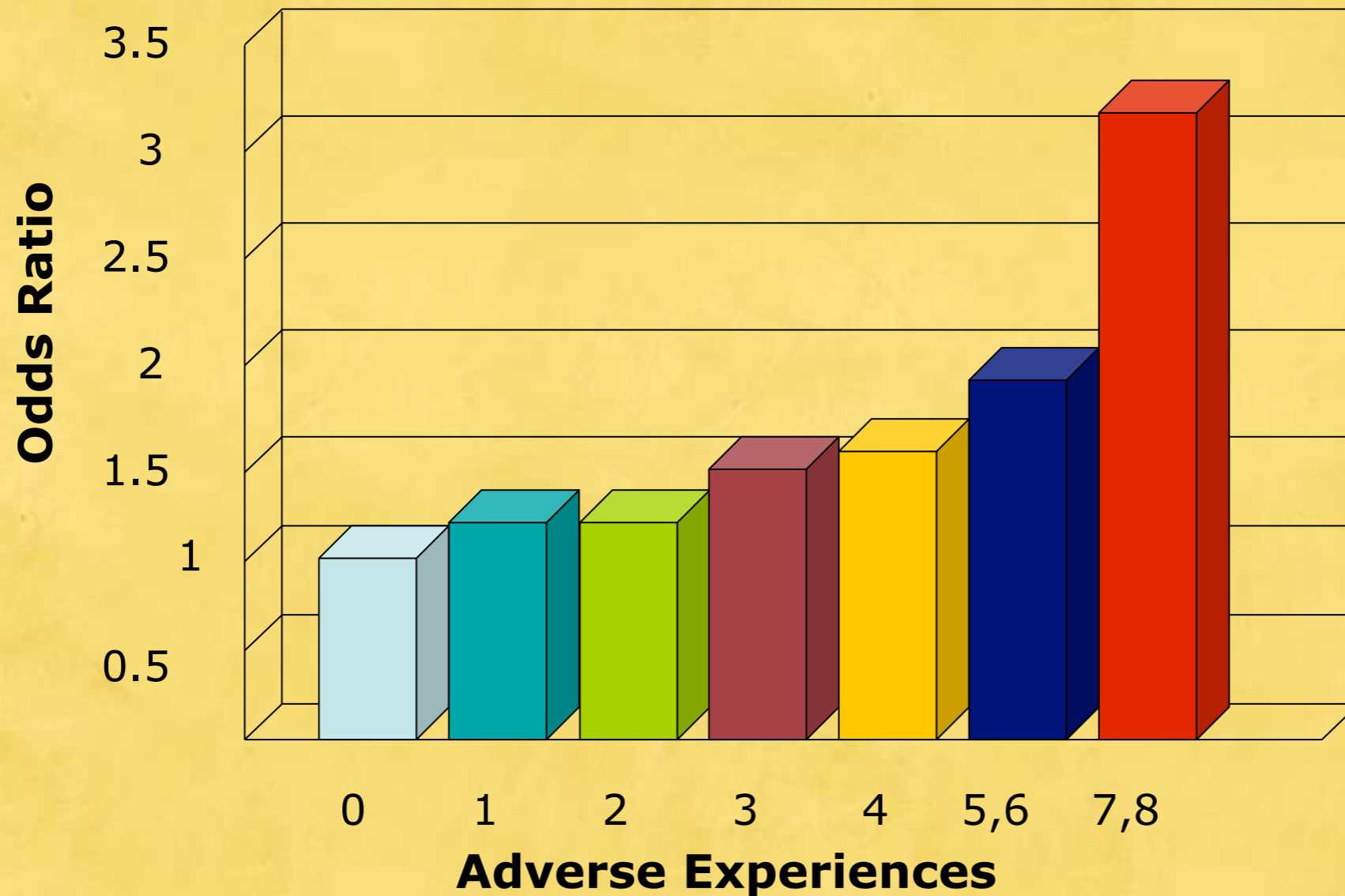
Not only are they unexpectedly common...
...their effects are **cumulative**.

Significant Adversity Impairs Development in the First Three Years



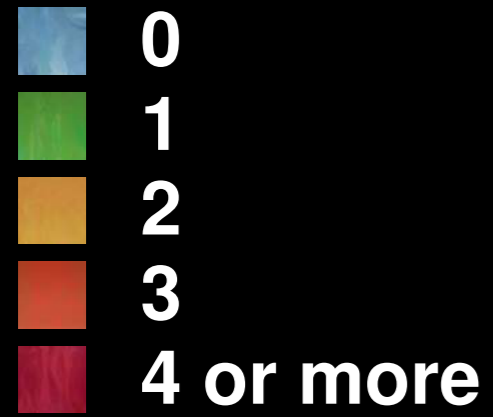
Source: Barth, et al. (2008) *via* Center on the Developing Child at Harvard University

Risk Factors for Adult Heart Disease are Embedded in Adverse Childhood Experiences



Source: Dong, et al. (2004) via Center on the Developing Child at Harvard University

SMOKING & COPD



Regular Smoking by Age 14

COPD

20.00

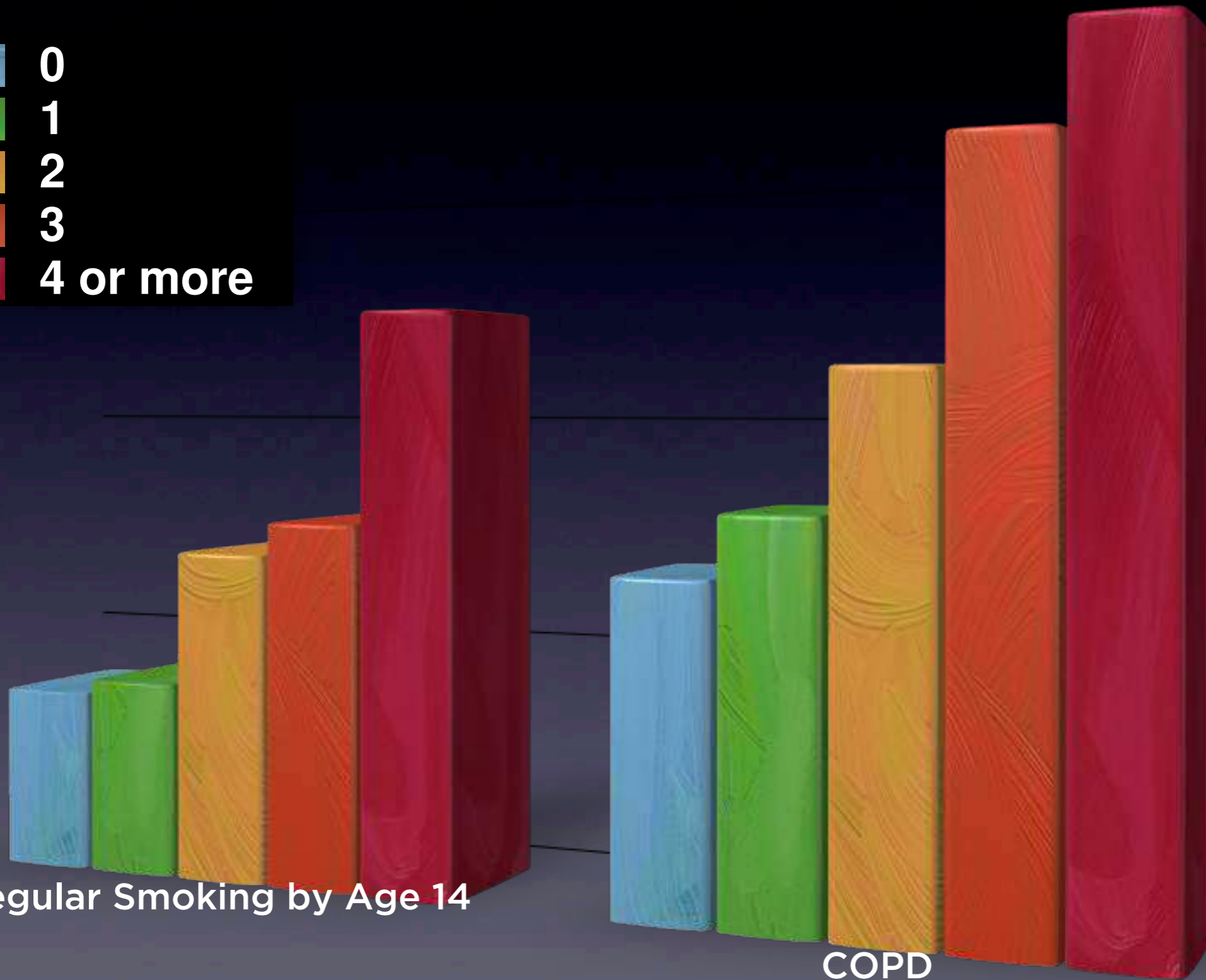
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10.00

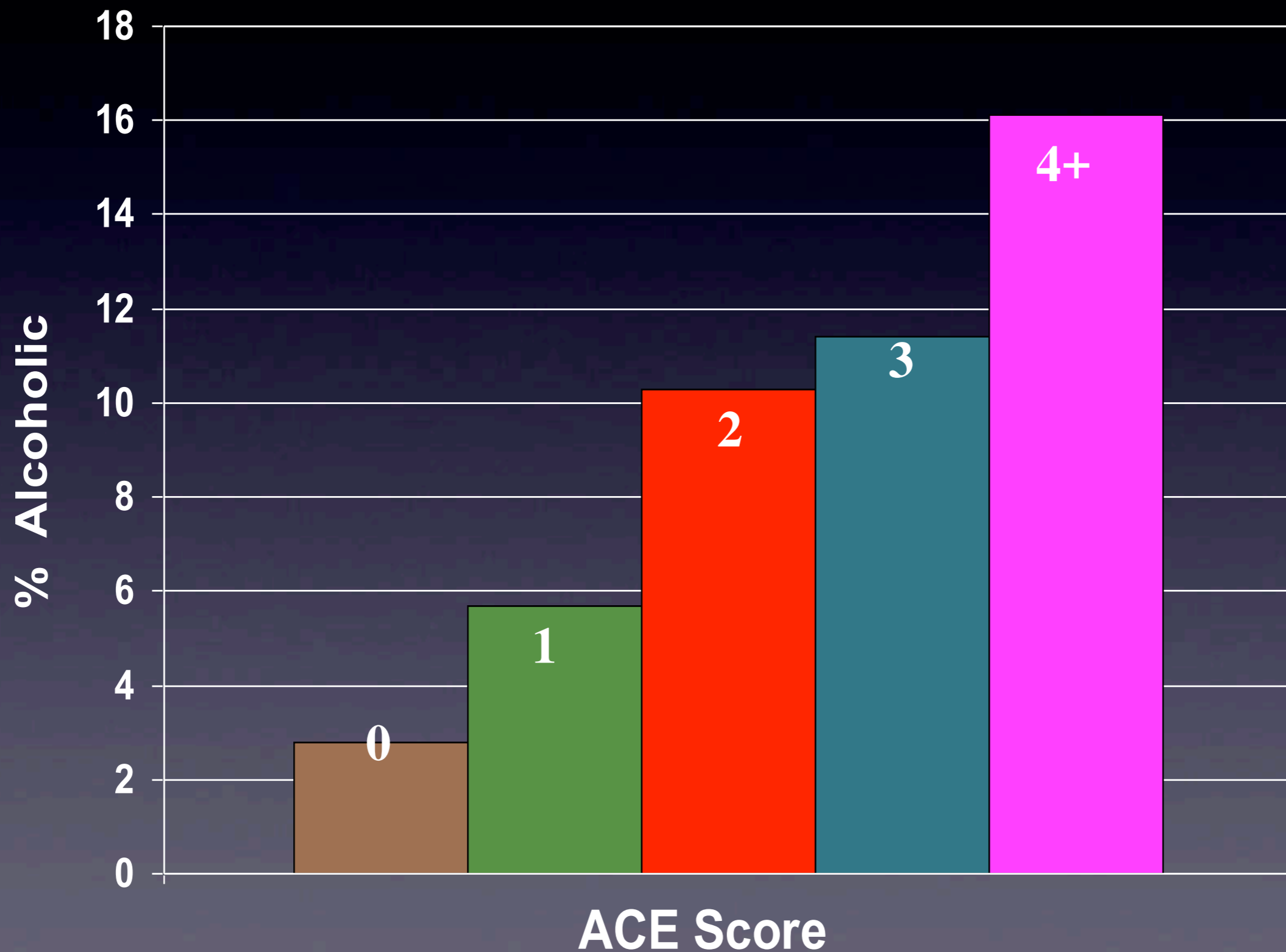
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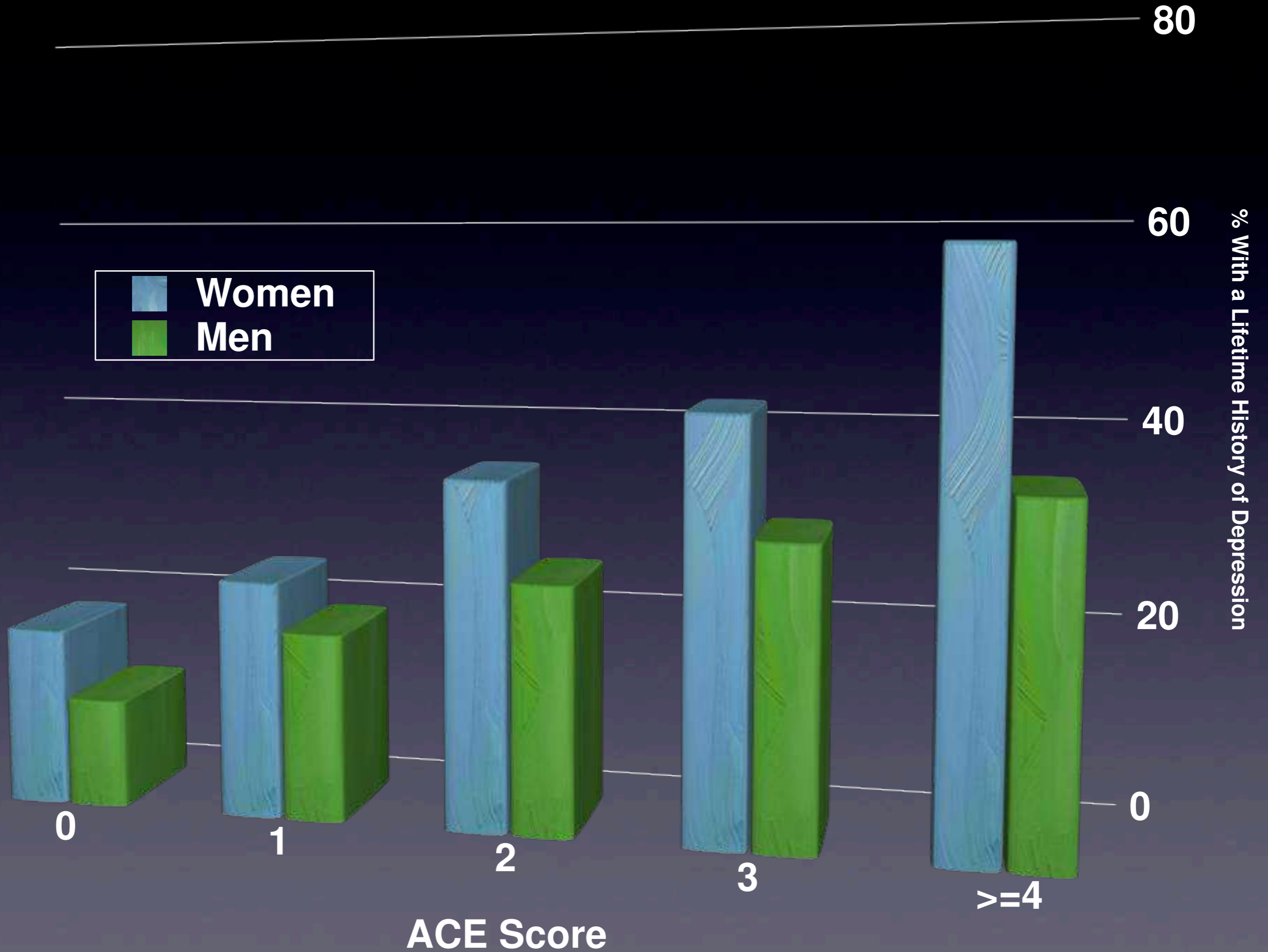
Adverse Childhood Experiences Score



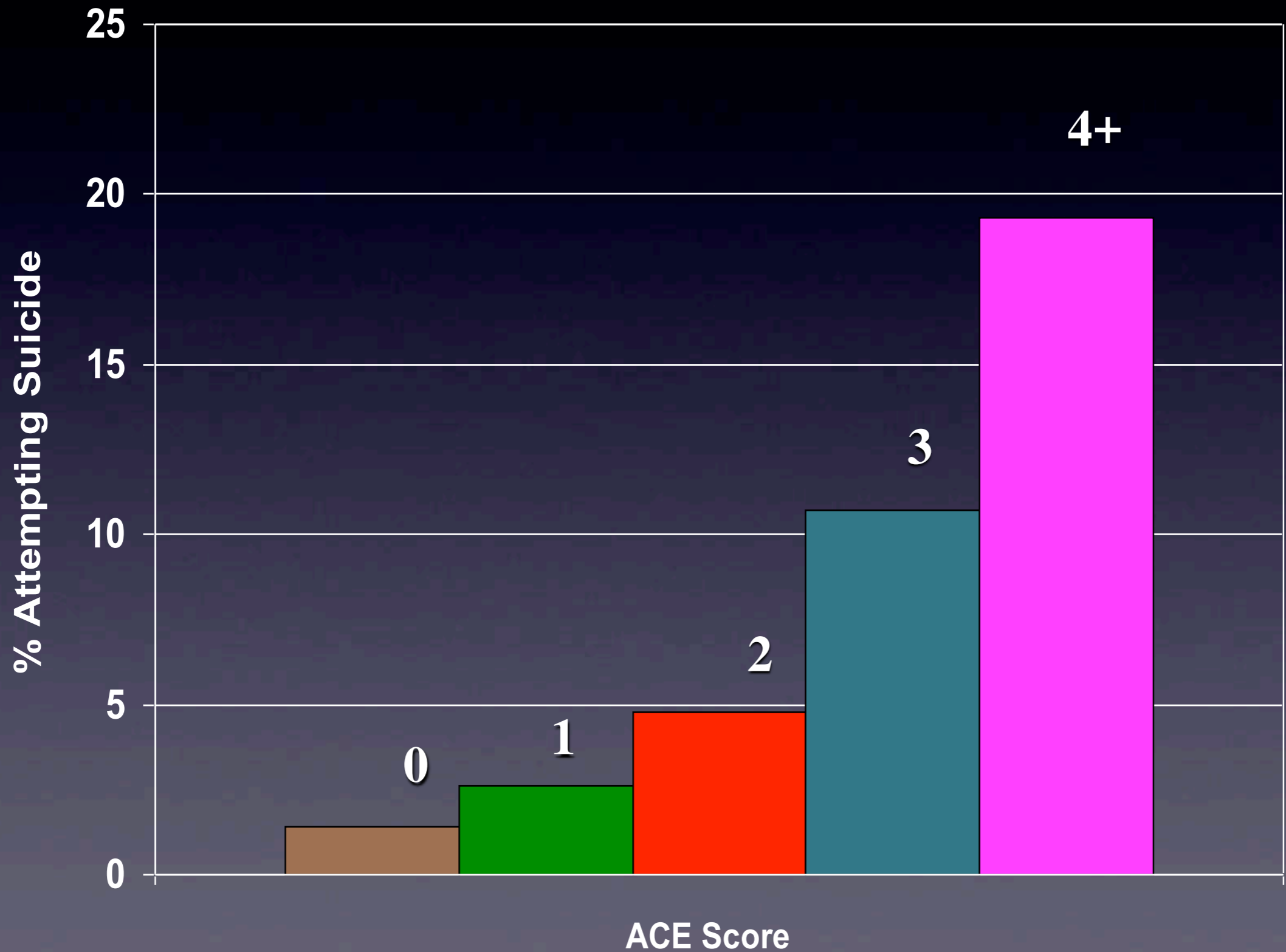
Childhood Experiences vs. Adult Alcoholism



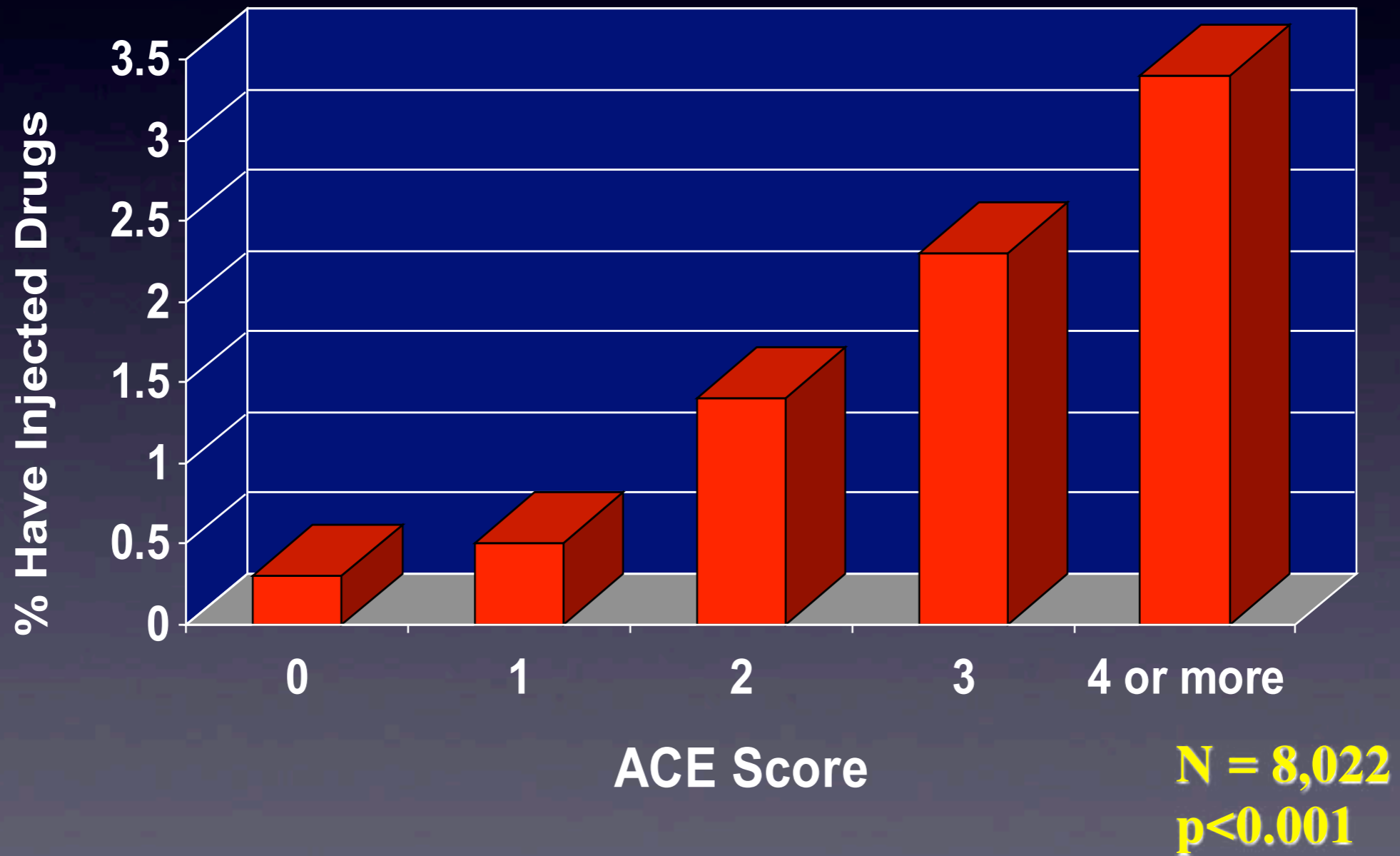
DEPRESSION



SUICIDE



IV DRUG USE



EPIGENETICS

It's **really cool** stuff,
but I don't completely
understand it either.

EPIGENETICS



Maybe Lamarck was right.

Creative Commons-licensed work by Wikimedia Commons user *Luca Galuzzi*

EPIGENETICS

Structural Genome = ~23,000 inherited genes

Epigenome = built over time, determines what genes are expressed

**Structural Genome : Epigenome
Hardware : Operating System**

Twins have same genome; different epigenomes

EPIGENETICS

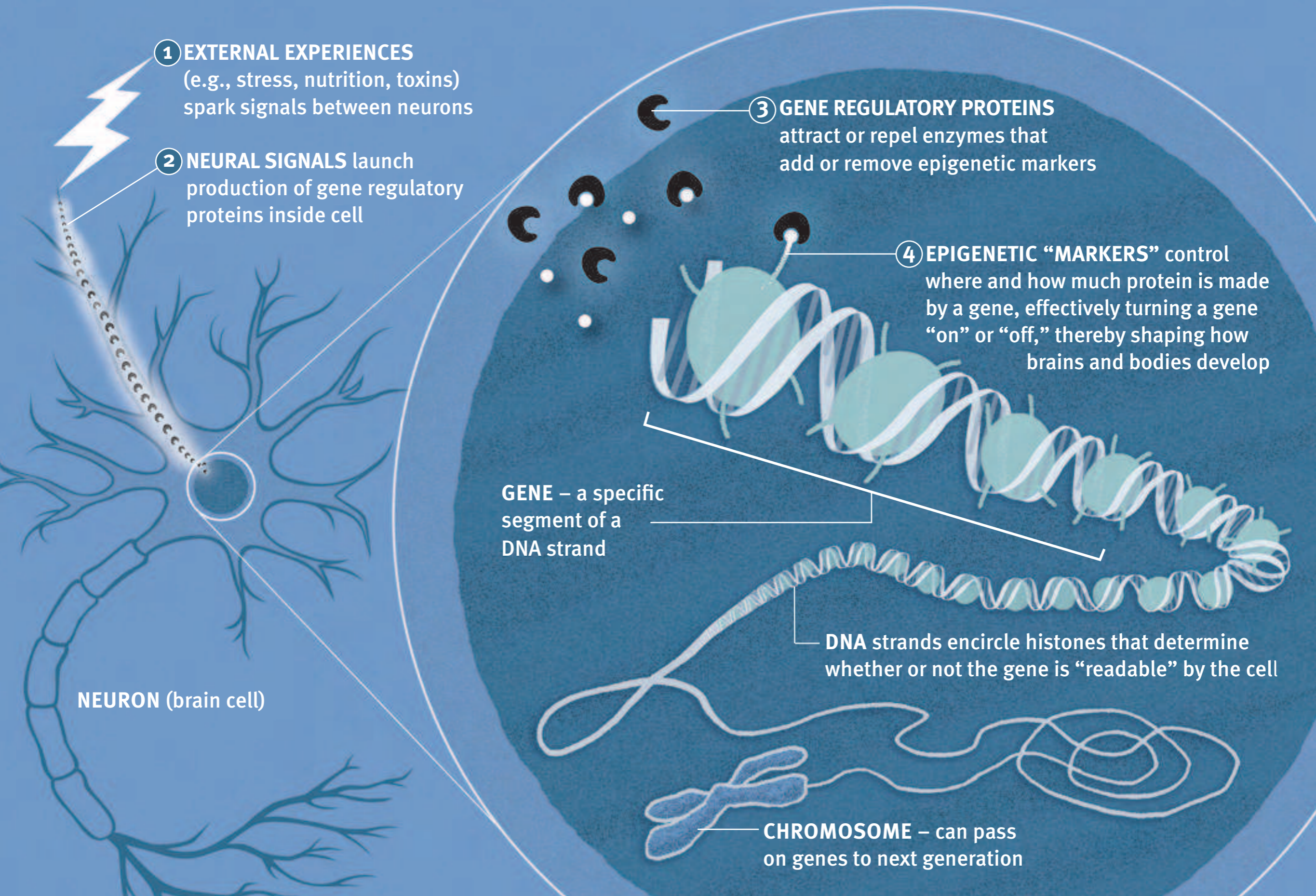
Switches: nutritional status, toxin exposure, environmental interactions.

Fetal exposures can lead to epigenetic changes that can be **passed on** to future generations.

Repetitive, highly stressful experiences damage creation of **adversity response** systems.

Positive experiences, rich learning and supportive relationships **activate genetic potential** for countering adversity.

How Early Experiences Alter Gene Expression and Shape Development



EPIGENETICS

So...

Early prenatal or postnatal experiences and exposures influence long-term outcomes by chemically altering the structure of genes.

The brain is particularly responsive to experiences and environments during early development, which influences how well or poorly its architecture matures and functions.

Recent research demonstrates that even after the epigenome has been modified, there may be ways to alter it again that actually can **reverse negative changes and restore functioning.**

EPIGENETICS

So...

The documented effects of toxic stress on negative epigenetic adaptations demonstrate the **urgent need** to alleviate sources of significant adversity as early as possible in the lives of children who live in threatening environments.

Certain epigenetic changes in humans can be transferred across generations, thereby underscoring important, long-term implications for **policies** that affect the circumstances in which young children are raised.

EPIGENETICS

Where may we have science-policy gaps?

Child Welfare

**Mandated maternal employment & public
assistance**

Prenatal & newborn care

Support for new parents

EARLY BRAIN AND CHILD DEVELOPMENT

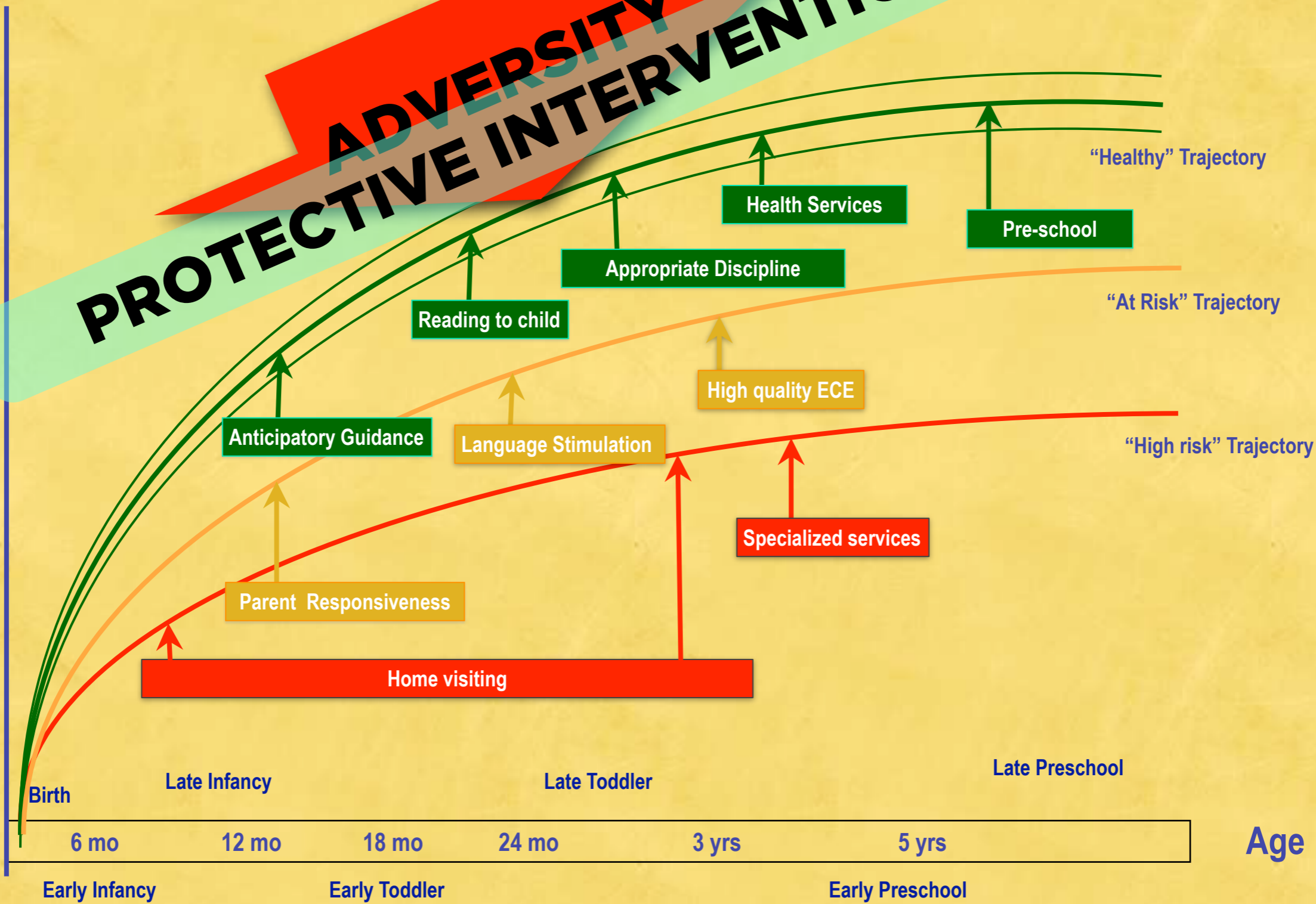
6

Creating the right conditions for early childhood development is likely to be **more effective and less costly** than addressing problems at a later age.

Creative Commons-licensed work by flickr user *River Beach*

Developmental Progress

ADVERSITY PROTECTIVE INTERVENTIONS



Three Promising Domains for EBCD Innovation

Jack Shonkoff, MD

Reduce emotional and behavioral barriers to learning.

Enhance the healthy development of children by transforming the lives of their parents.

Reconceptualize the health dimension of early childhood policy and practice.

The Brave New World of Pediatrics:

DEVELOPMENTAL ASSURANCE

**Building a healthy mind, brain and body
for social purpose.**

NONE OF THIS IS TO SAY...

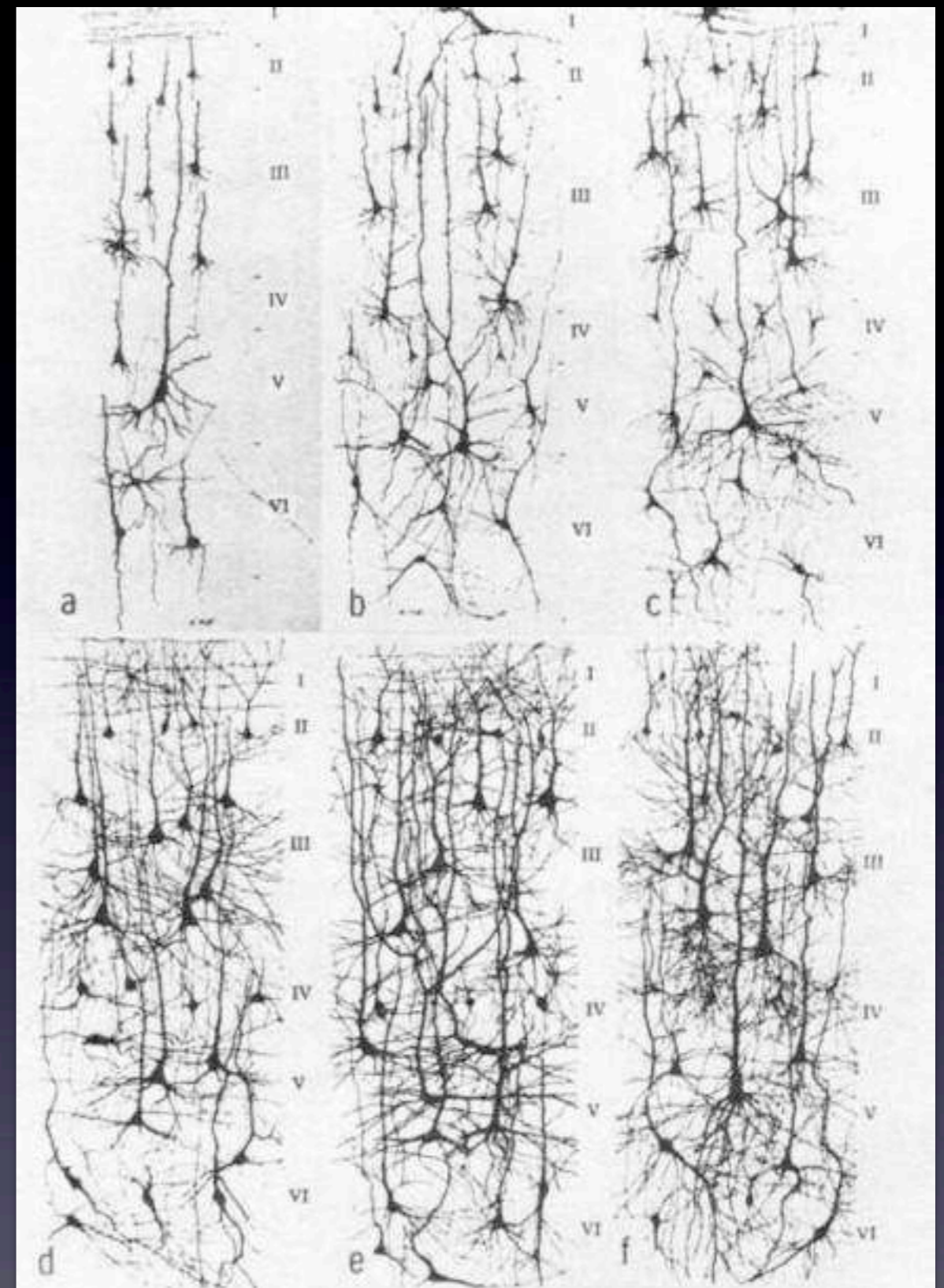
...that children should be engaged constantly

...that “bad things” are necessarily a long-term negative

...that children should not be appropriately disciplined

FIVE NUMBERS TO REMEMBER

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)

(FROM CONEL, 1939-1959)

18 Months:

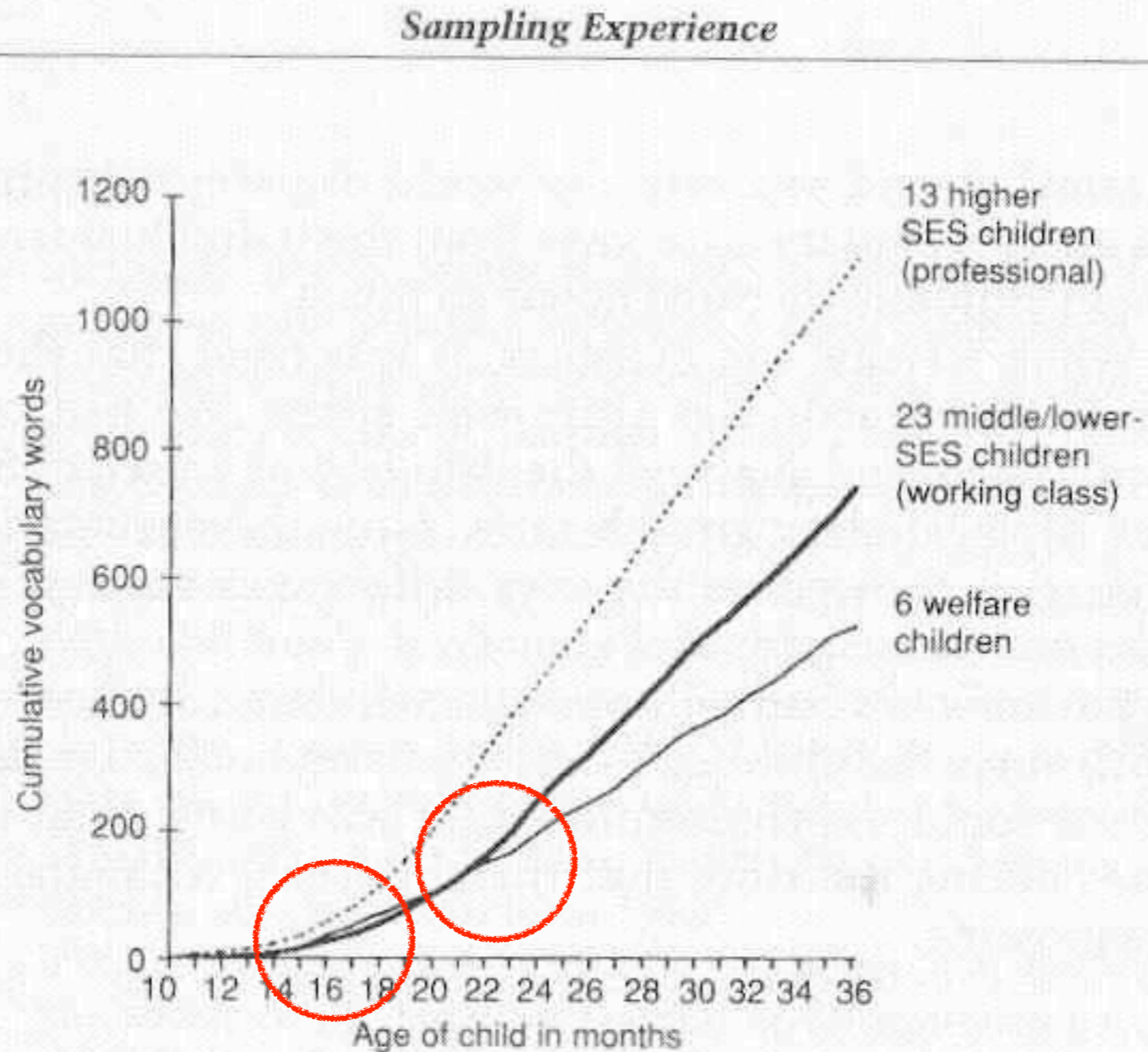


Figure 2. The widening gap we saw in the vocabulary growth of children from professional, working-class, and welfare families across their first 3 years of life. (See Appendix B for a detailed explanation of this figure.)

90-100%

Chance of
Developmental Delays
when Children Experience
6-7 Risk Factors

3:1 Odds

**of Adult Heart Disease
after 7-8 Adverse
Childhood Experiences**

The background of the slide is a dense, overlapping pattern of US dollar bills of various denominations, including \$100, \$50, and \$20 bills. The bills are slightly faded and have a dark overlay, creating a textured, monochromatic effect.

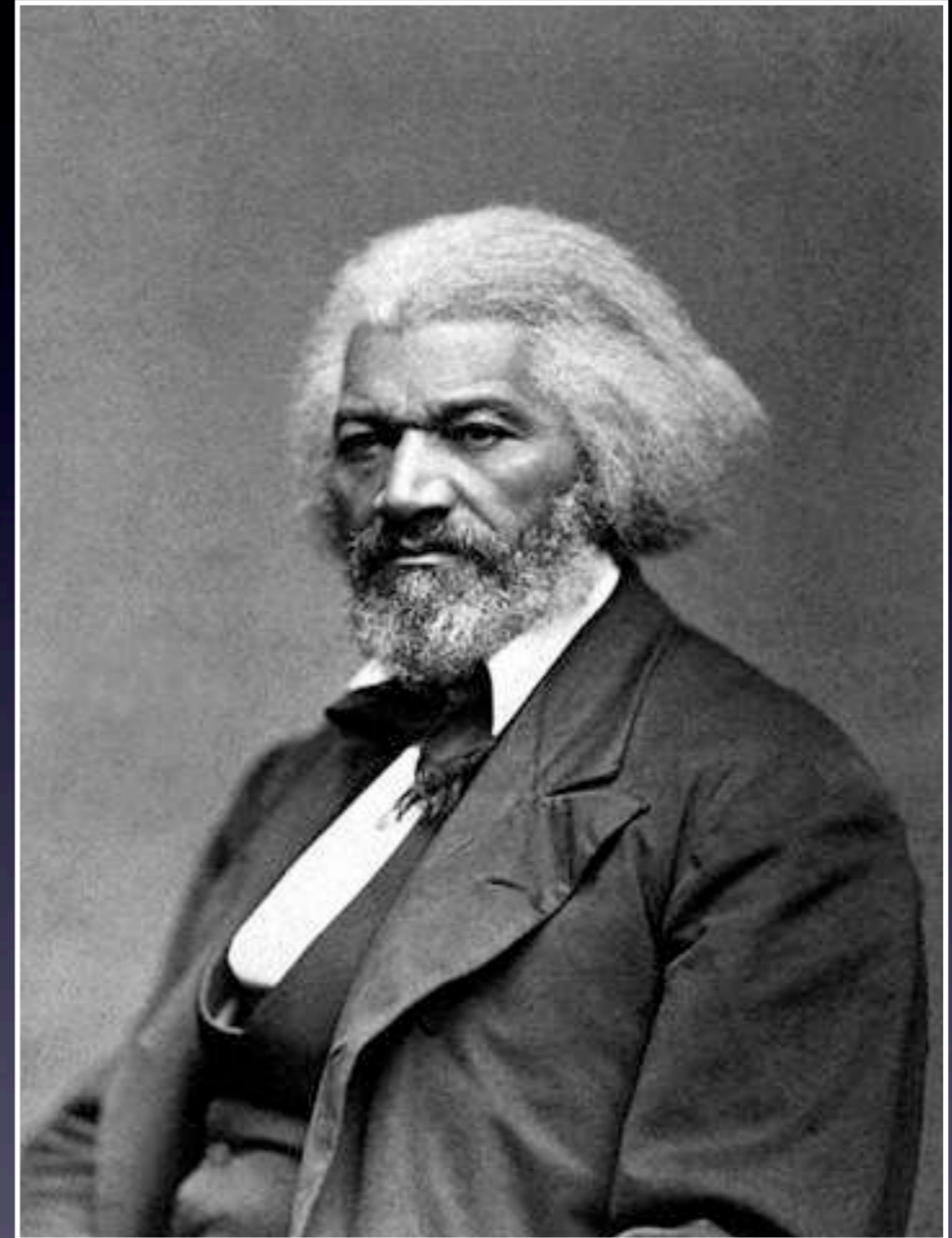
\$4-\$9

**in Returns for
Every Dollar Invested
in Early Childhood Programs**

Creative Commons-licensed work by flickr user *Tracy O*

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

**— Frederick Douglass
(1817–1895)**

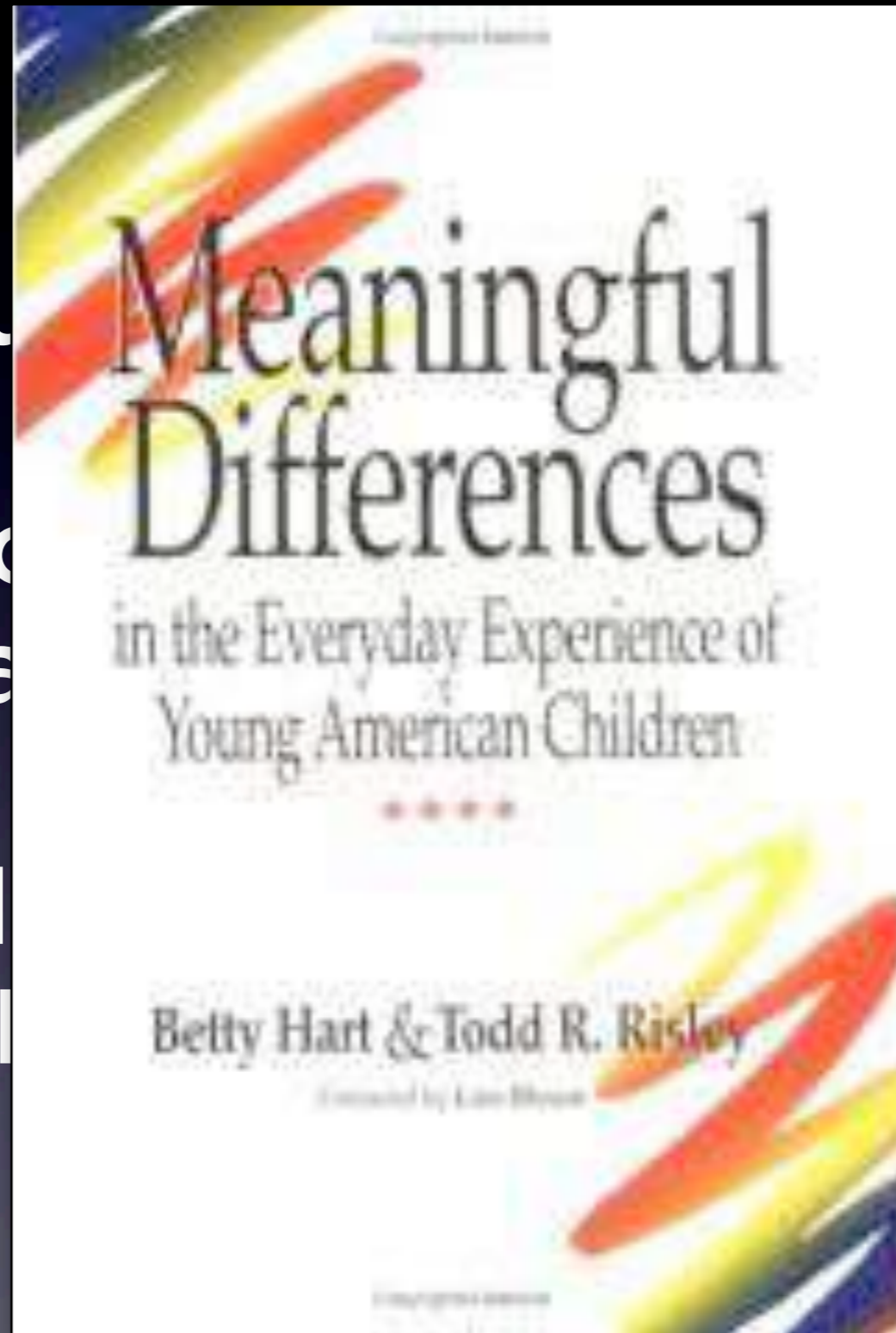


EARLY BRAIN AND CHILD DEVELOPMENT

The Result


Meaningful
in the
Experience
America

Todd
Betty



By Age 3...	Welfare	Professionals
Vocabulary Size	525 words	1100 words
IQ	79	117
Utterances	178/hour	487/hour
Encouragements	75,000	500,000
Discouragements	200,000	80,000

Children from low-income families hear as many as **30 million fewer** words than their more affluent peers before the age of 4.

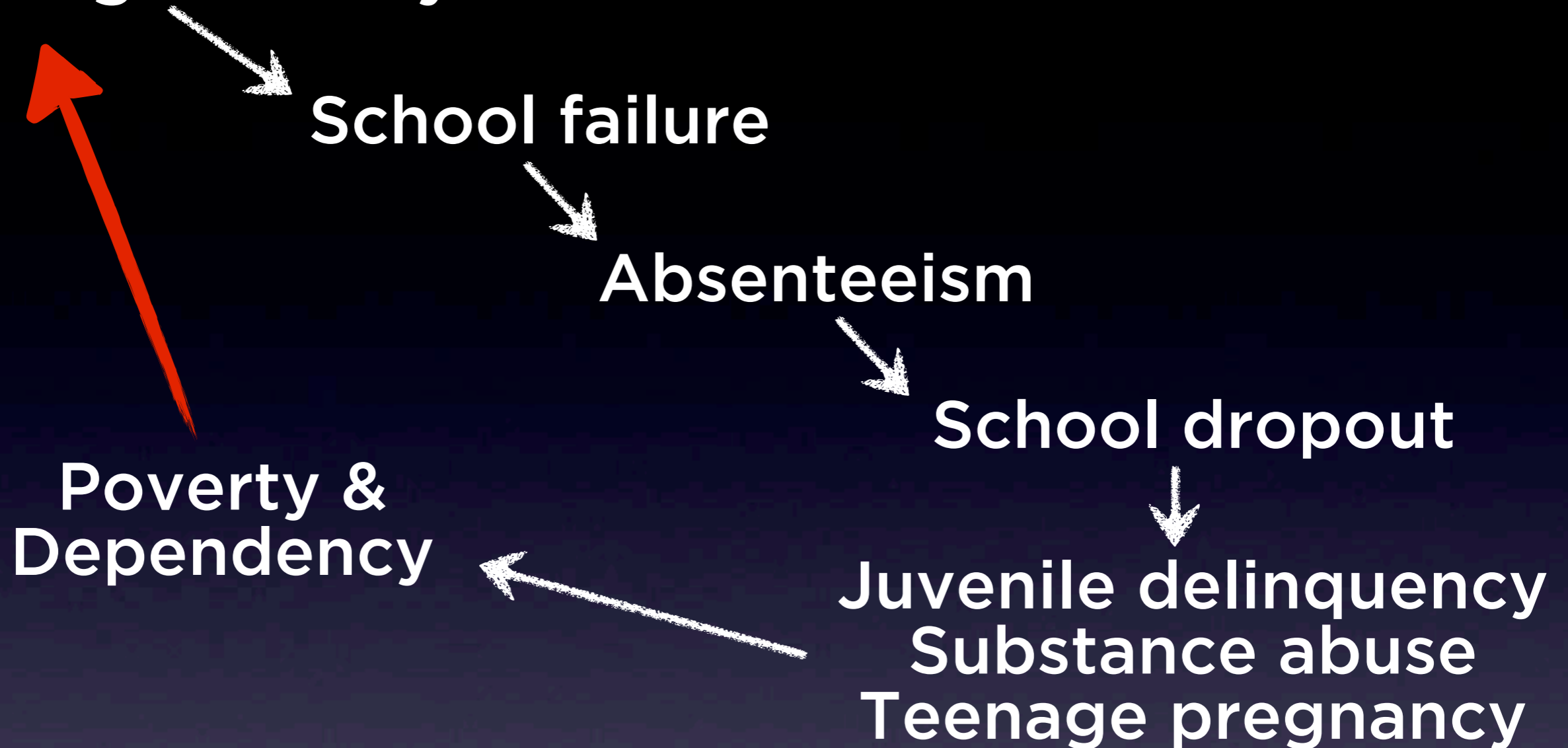


One-third
of children
enter school
unprepared
to learn.

Most ^(88%)
will **never**
catch up.

Creative Commons-licensed work by flickr user *horizontal.integration*

Reading difficulty



School intervention is too late. Innate interest in learning and curiosity can be irreparably damaged if reading is not enjoyable at an early age.

A black and white photograph showing a police officer in uniform on the left, looking down at a young boy on the right. The officer is wearing a uniform with a badge and an American flag patch. The boy is wearing a light-colored sweater. They are in a classroom, with papers and a window visible in the background.

America's Cradle-
to-Prison
Pipeline:
A Report of the
Children's
Defense Fund,
October 2007

Mississippi State Senator Willie Smith [d.] said that the state of Mississippi once used elementary schooling laws; achievement scores to project future prison population. In 1992 [he] was the deputy commissioner of Mississippi's Department of Corrections [which] commissioned a study to project what the state's prison population would be in 10 years.

What can we do about it?

EARLY BRAIN AND
CHILD DEVELOPMENT

A Partial

The Solution

Clinic / Hospital / Home Visiting

Broaden support for parents in community settings

School-based Health Centers

Home Visiting Programs

Resilience Training (7 Cs)

Optimism

Emotional coaching

Positive Parenting

Outside the Clinical Realm

EBCD education

Investment in new strategies

Invest in community-based mentoring activities

after-school programs

Big Brother/Big Sister

Little League / gymnastics / martial arts

Intentional Skill Building

Invest in EI programs

Education for those in judicial/foster care systems

Collaborate with social workers, mental health, etc.

Treatment

Traumatic Stress networks

Appropriately trained professionals

Insurance coverage for services



Access

COMMUNITY HEALTH CENTERS™

Improving health. Improving lives.

Improving health. Improving lives.

Primary Care Behavioural Health Model

Currently involved with
20% of all medical patients

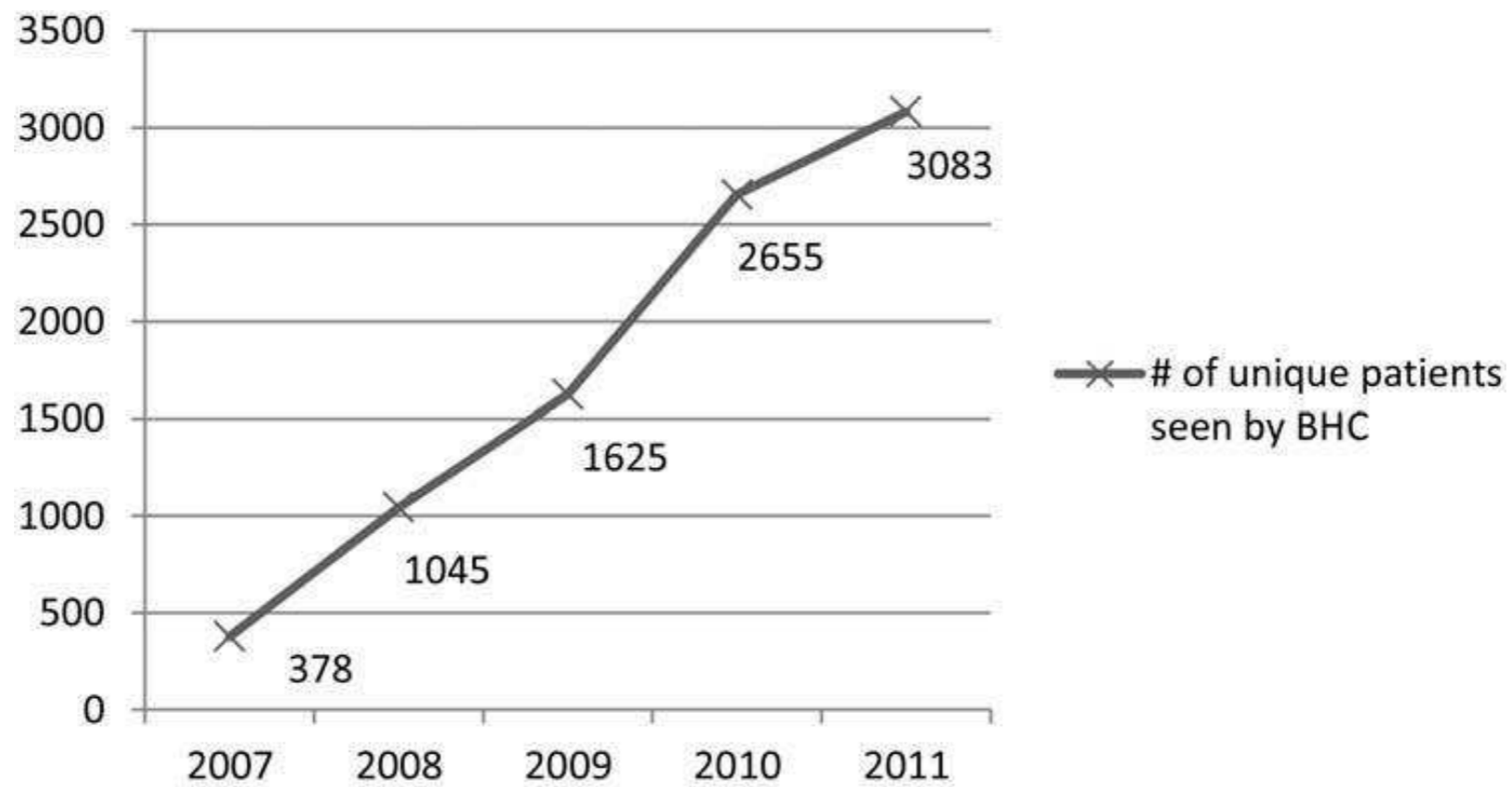


Figure 1. Number of unique patients seen by BHC
 BHC= Behavioral Health Consultant

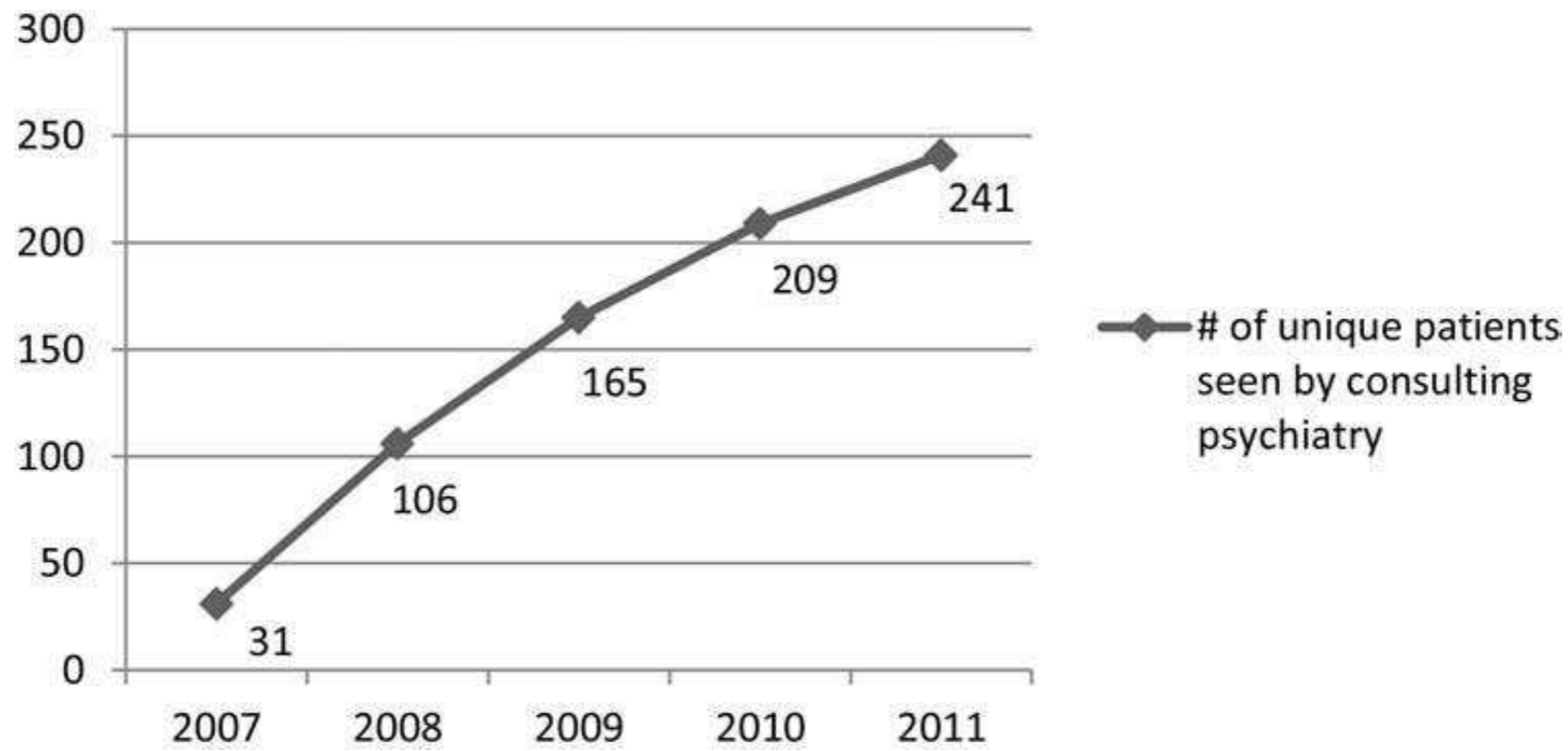


Figure 2. Number of unique patients seen by consulting psychiatry



Prescription for Reading



Name: _____

Date: _____ Age: _____

Rx *Read Books*

- Every night at bedtime
- For _____ minutes every day
- As needed

Refills: as requested at local public library

Signature: _____

Dipesh Navsaria, MPH, MSLIS, MD
Pediatrician & Occasional Children's Librarian

Families: Please visit reading.pediatrics.wisc.edu for more information on the joy of sharing books together and how it can make a huge difference in your child's life.

of sharing books together and how it can make a huge difference in your child's life.
Families: Please visit reading.pediatrics.wisc.edu for more information on the joy

Home Visiting

BUILDING ADULT CAPACITIES



EARLY BRAIN AND CHILD DEVELOPMENT

The Call

EBCD Focus

Promoting the healthy early childhood foundations of **life-span health**.

Promoting **kindergarten readiness**.

Promoting **preventative mental health**.

Mitigating toxic stress effects on health and developmental trajectories.
Strengthening the systems to address the **social determinants of health**.

Using A Public Health Approach to Building Healthy Brains

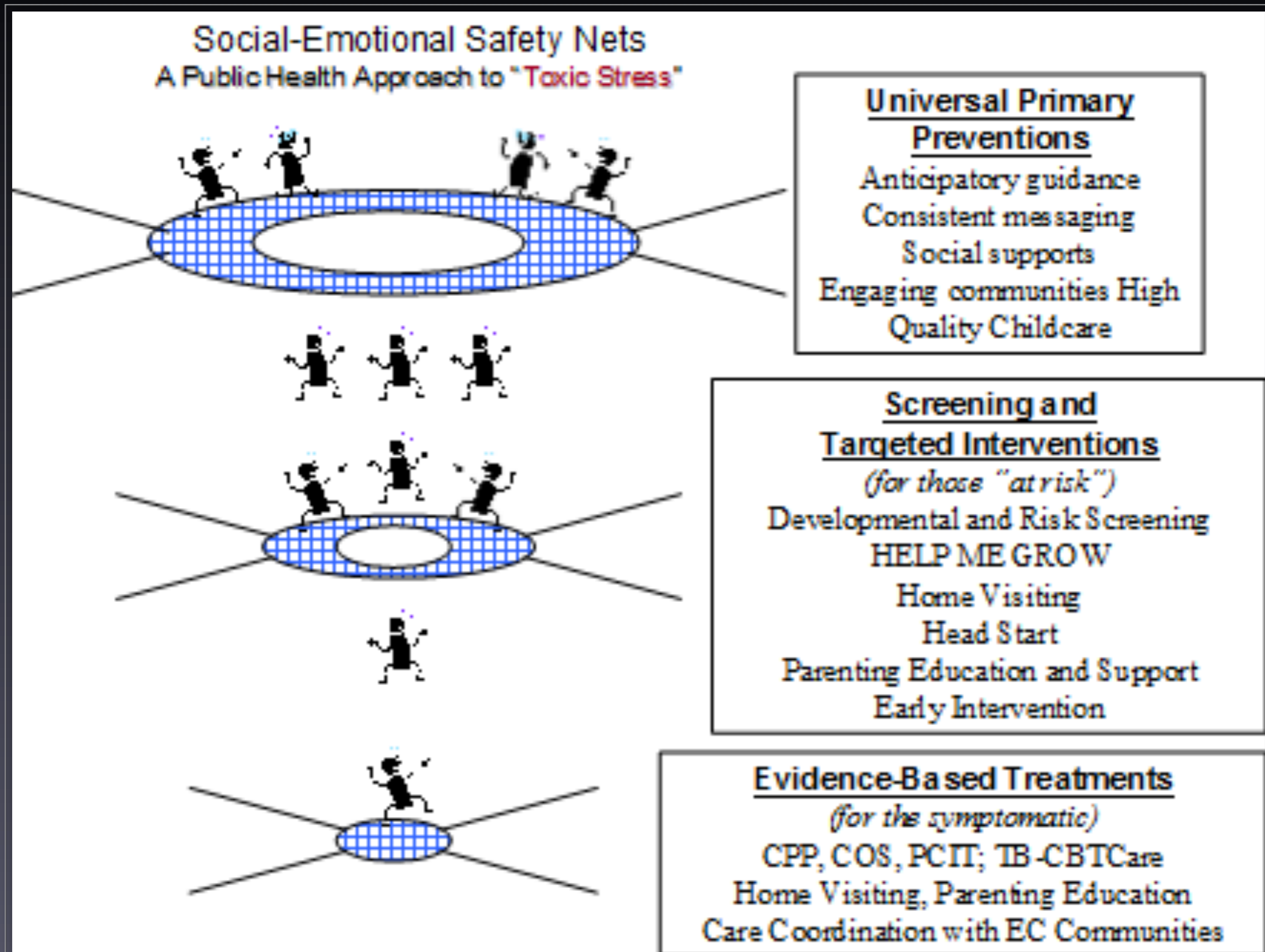


Image from Andy Garner, MD

Practice level steps for EBCD promotion?

Minimize toxic stress

(socioeconomic distress, substance abuse, maltreatment, maternal depression, ACE score)

Promote positive parenting and supportive relationships for families (social capital, home visitors, relational monitoring)

Provide an environment for healthy development (avoidance of environmental toxins, optimal nutrition, early literacy promotion, media impacts, prevent catastrophic disease)

Development enhancing activities (ROR, face time, + interpersonal relationships, quality preschool programs, positive parenting)

EC coordination with medical homes (medical homes, ECCS grants, home visiting, etc.)

Screen for families at risk and refer to other community-based services (dev. delay, substance abuse, social capital)

COMPETENCIES

	Know the Condition	Assess for the condition	Manage, Rx & Refer
Basic Competencies	Understand life course health and toxic stress	Standardized developmental and risk screening	Refer to community resources e.g. EI, MH, home visiting
Mid-level Competencies	EBP of community EC RX and programs	Assess developmentally, ie. Neurodev, Behaviourally.	Referral and co-management for developmental / Beh interventions
Advanced Competencies	MH interventions, attachment	Relational monitoring and team interventions	Advocacy, coordinate, consult for EC population management

5 Rs of Early Childhood Education

ROUTINES

help children know what to expect of us & what is expected of them

READING

together daily

RHYMING

playing and cuddling

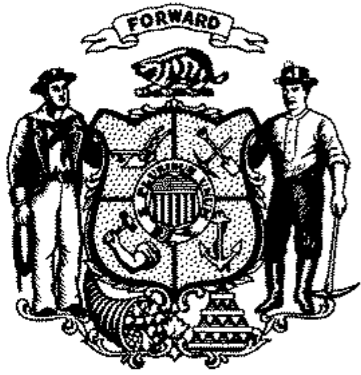
REWARDS

for everyday successes; praise is a powerful reward

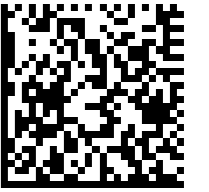
RELATIONSHIPS

reciprocal and nurturing: the foundation of healthy child development

AAP School Readiness Technical Report, 2008



sin
RE



LRB-3486/1
SRM:eev:ev

2013 SENATE RESOLUTION 59

Resolved by the senate, the assembly concurring, That policy decisions enacted by the Wisconsin state legislature will acknowledge and take into account the principles of early childhood brain development and will, whenever possible,

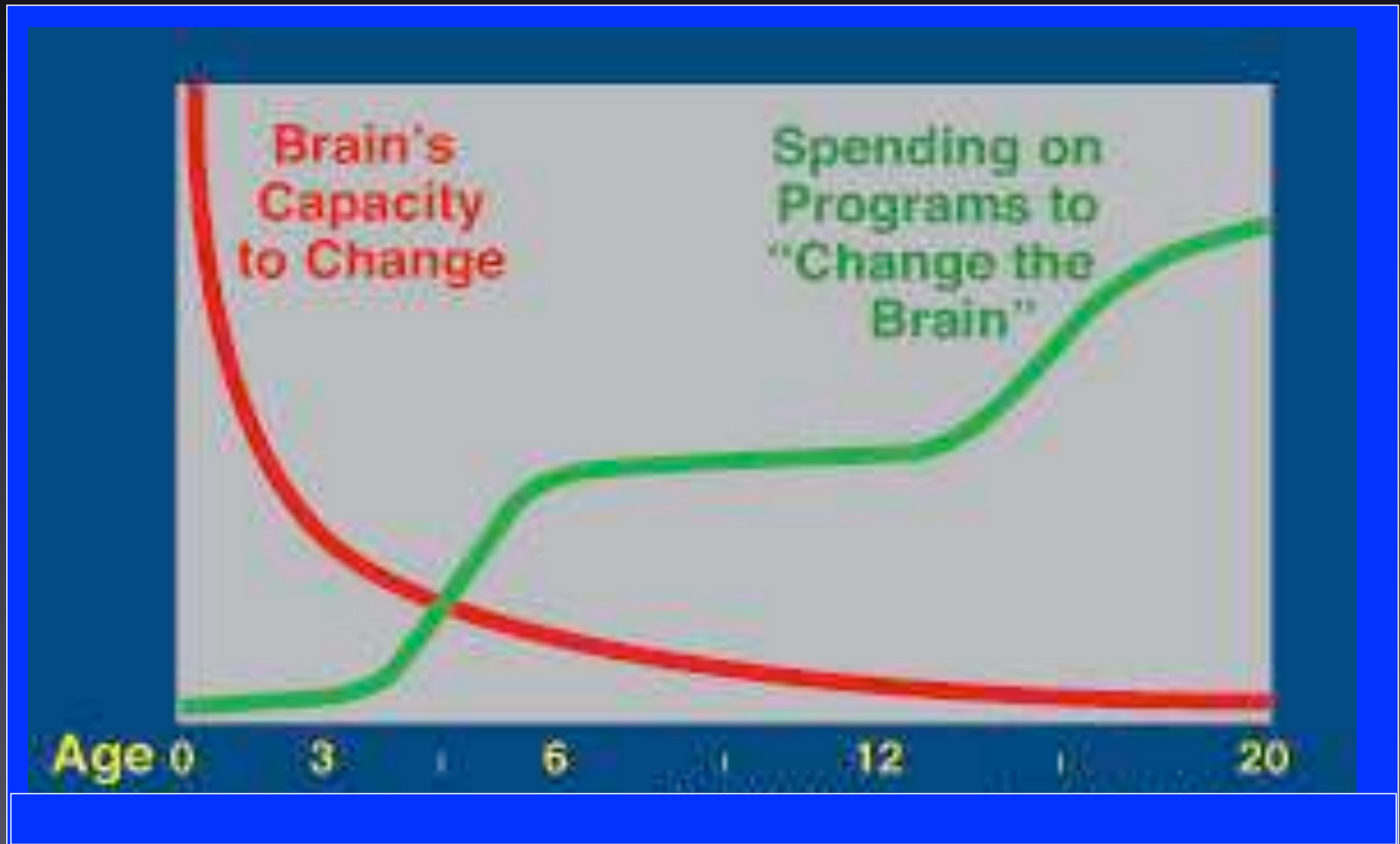
November 4, 2013 of toxic stress, by Senators, L. LEHMAN, L. TAYLOR, RISSER and C. LARSON, cosponsored by Representatives BALEWEG, PASCH, KESTELL, SARGENT, MASON, JOHNSON, BARNES, WRIGHT, OHNSTAD, GOYKE, WACHS, SPIROS, KRUG and HULSEY. Referred to Committee on Senate Organization.

sustainable state through investing in human capital.

(END)

1 **Relating to:** early childhood brain development.

Public Investment in Children by Age



ReadyNation



A business partnership for
early childhood and economic success

formerly the Partnership for America's Economic Success

State Network

Business leader organizations in many states have started supporting proven investments in early childhood. ReadyNation has sponsored business leader summits and provided other types of assistance to support business leader engagement in over half the states. There are also many other business groups in the states working in early childhood.

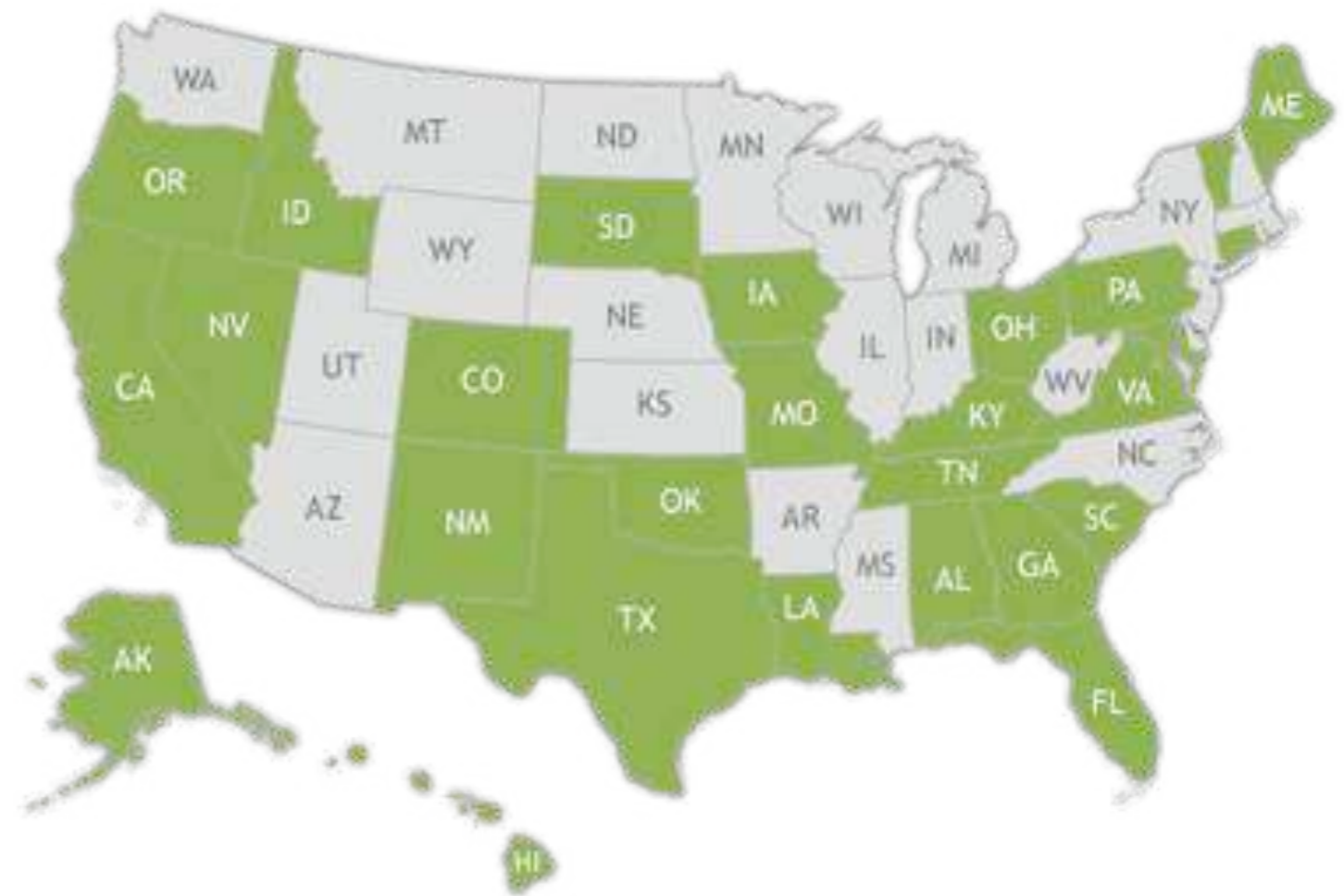
Click on the map to find out more about business organizations promoting early childhood policy in that state.

Learn more about our [National Network](#) of business organizations.

The States at a Glance

Looking for data on your state that illustrates both the status of children and the power of early investment? We recommend the following:

<http://www.readynation.org/state-network/>



AAP's EBBCD Initiative

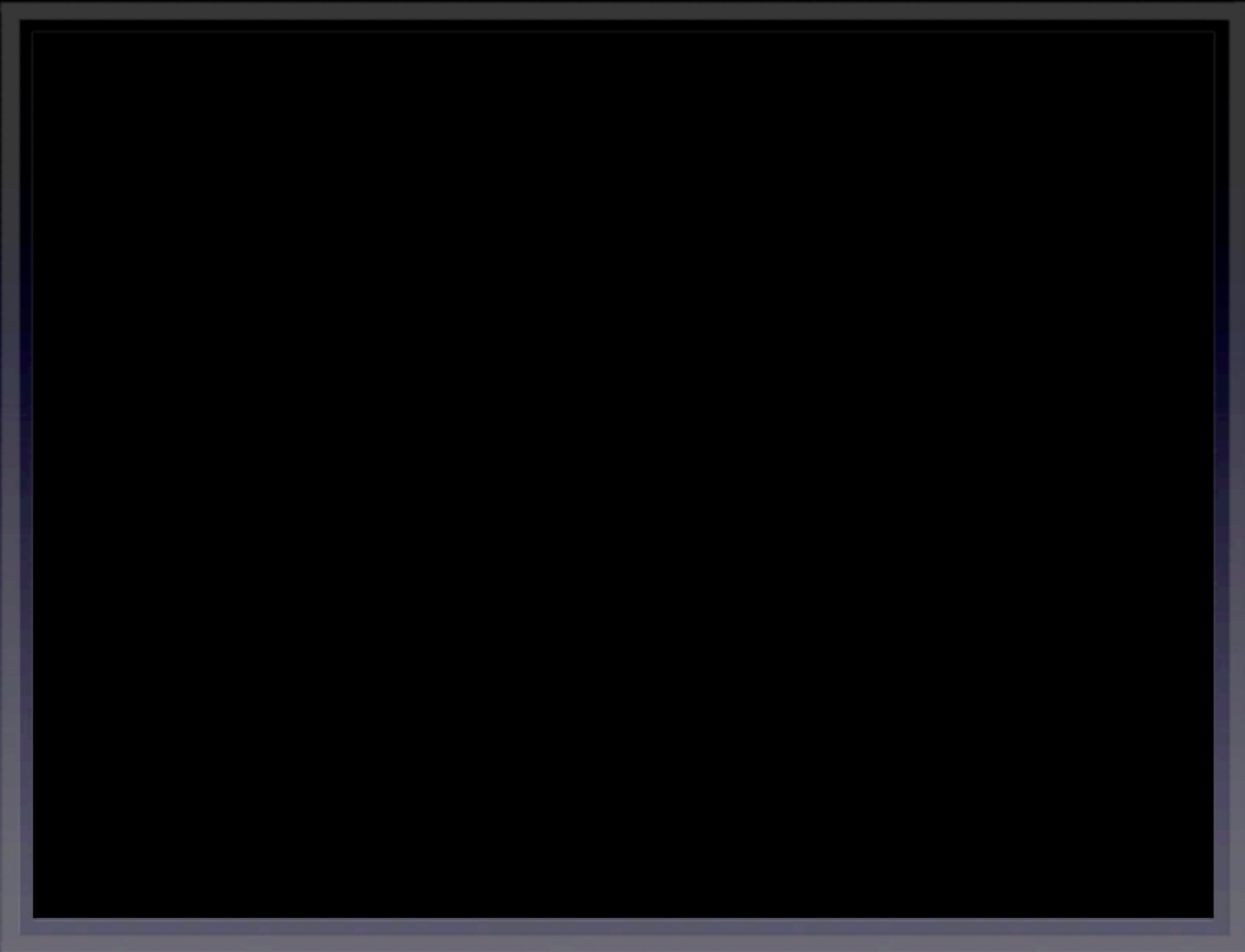


“Building Brains,
Forging Futures”

It's all about Nurturing Relationships:
Early relationships build their brains and our future.

But the story's end?

Change the First Five Years and You Change Everything



Ounce of Prevention Fund

Accessible at <http://youtu.be/GbSp88PBe9E>

“While schools can do much to raise achievement among children who initially lag behind their peers, all too often pre-school gaps set in train a pattern of **ever increasing inequality** during school years and beyond.

Any drive to improve social mobility must begin with an effective strategy to **nurture the fledgling talent in young children** so often lost before it has had a chance to flourish.”

The Sutton Trust

facebook.com/DrLibrarian
twitter.com/navsaria
dnavsaria@pediatrics.wisc.edu

**THE
END**



Image courtesy of Dipesh Navsaria

Friday, January 17, 14

