

Adverse Childhood Experiences:

*Connecting a Developmental Lens
to the Health of Society*

Robert Anda, MD, MS
ACE Study Concepts

www.RobertAndaMD.com

www.cestudy.org

www.cdc.gov/ace



The Walk to
Paradise Garden
W. Eugene Smith

Stress

(adrenaline, cortisol)

Unpredictable

Severe

Predictable

Moderate



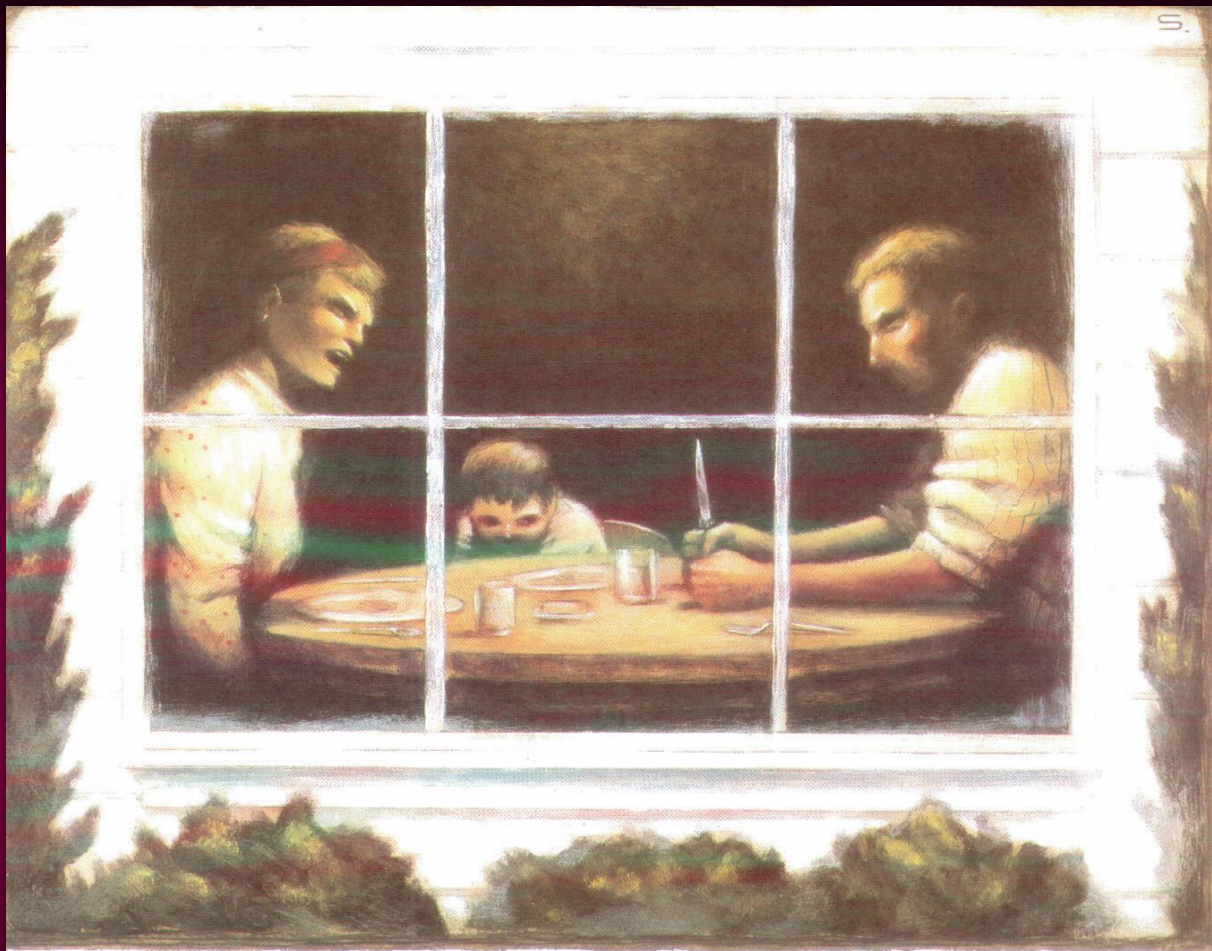
*Number of Episodes
Chronicity**



*(Poly)genetics
Epigenetics
Intrauterine
exposures**

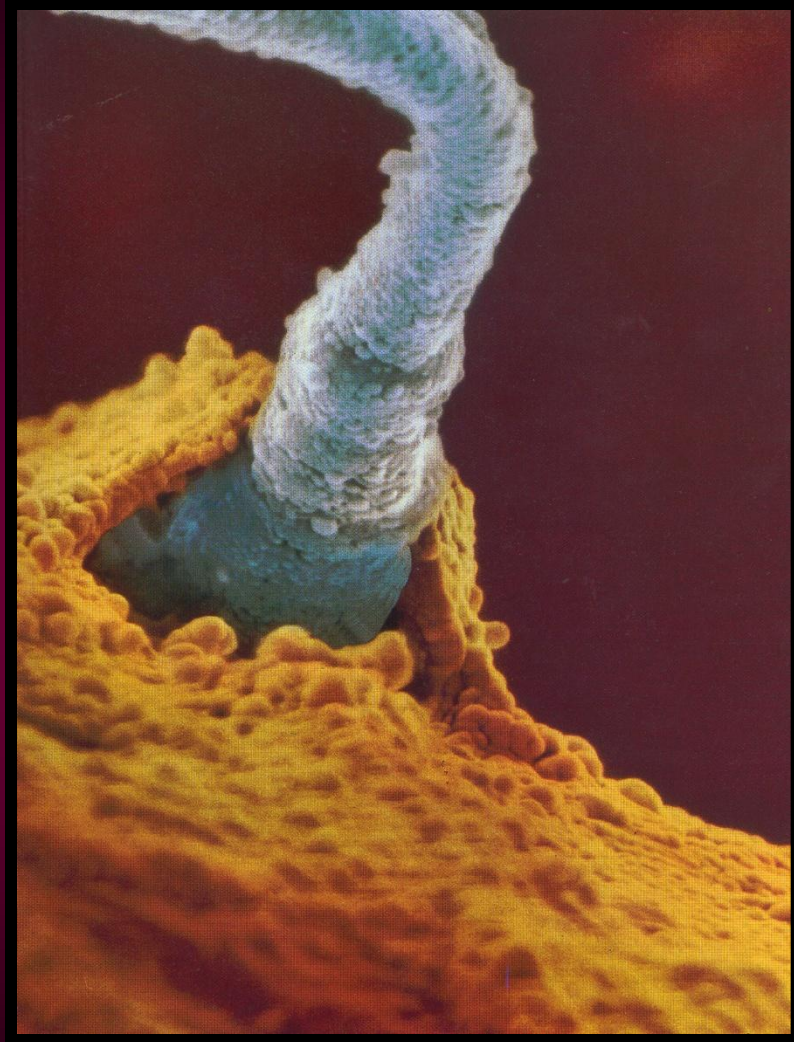
Vulnerability

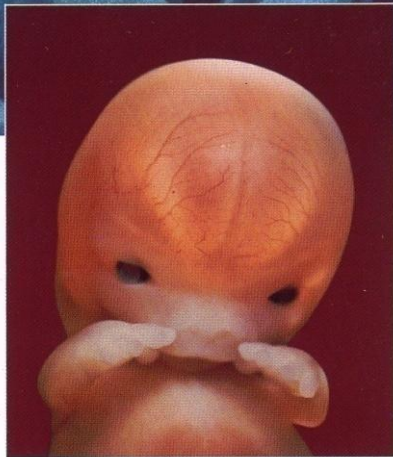
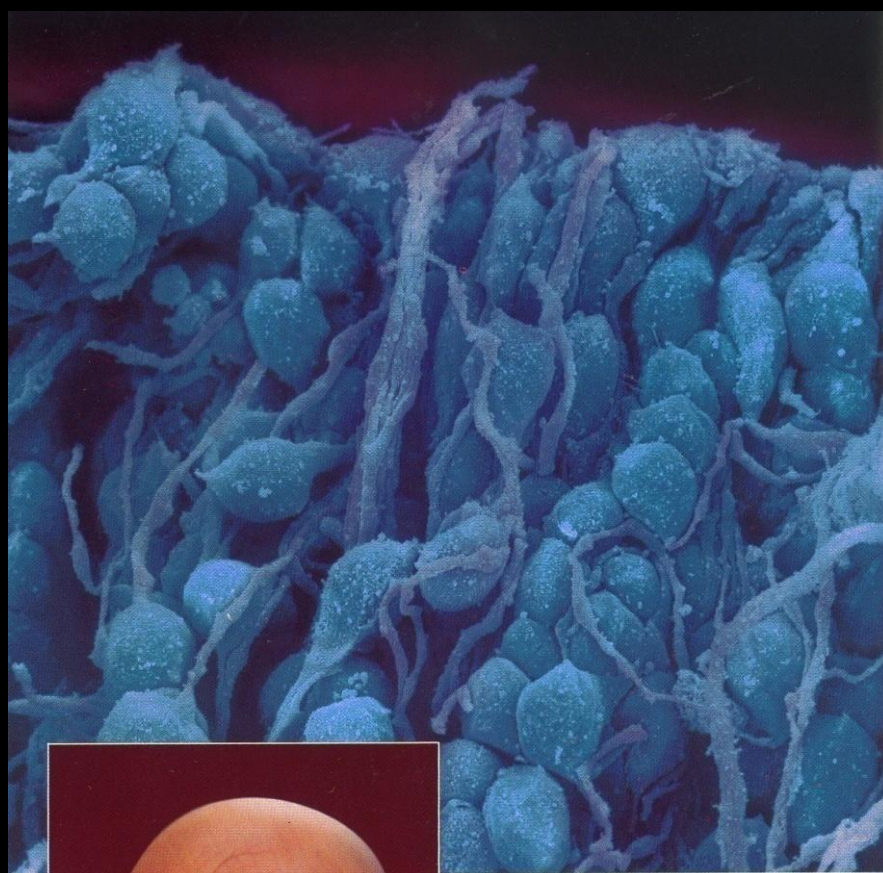
Resilience



Seeing the Pain

America's physicians confront family violence





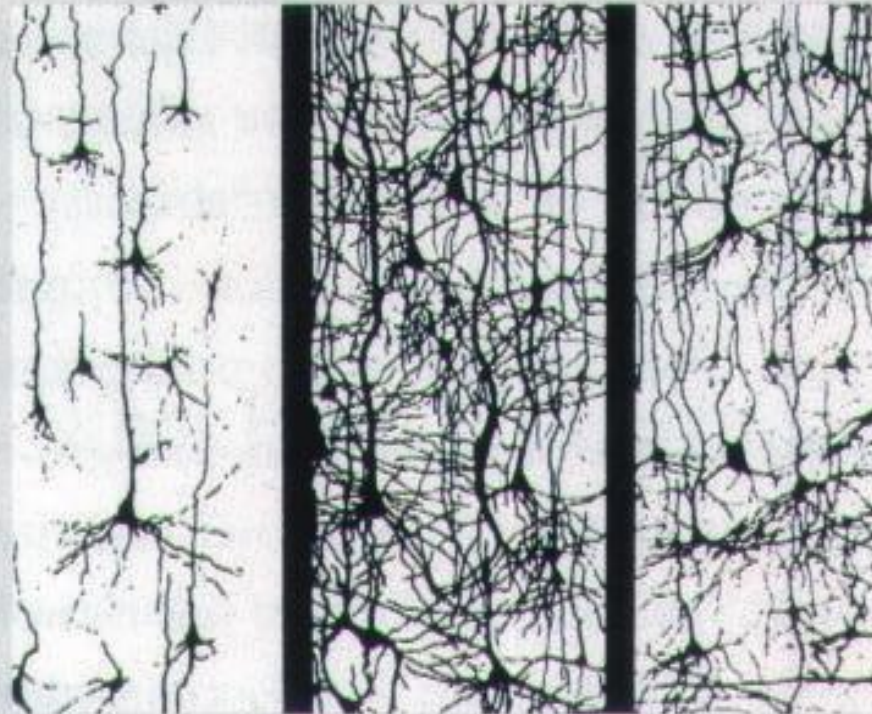
Early connections in the brain

The brain is undoubtedly one of nature's most remarkable creations: cells that can react to impulses, analyze and control behavior. As early as in the seventh week, nerve cells in the brain have begun to touch one another by means of projections, and some have even become connected in primitive nerve paths. The picture *above* shows nerve cells at this time, greatly enlarged. The rate of production is tremendous: 100,000 new nerve cells are created every minute, and by the time the baby is born, there will be some 100 billion. *Left*, the posterior lobes of the cerebrum shimmer through the skin of the forehead.

At Birth

6 Years Old

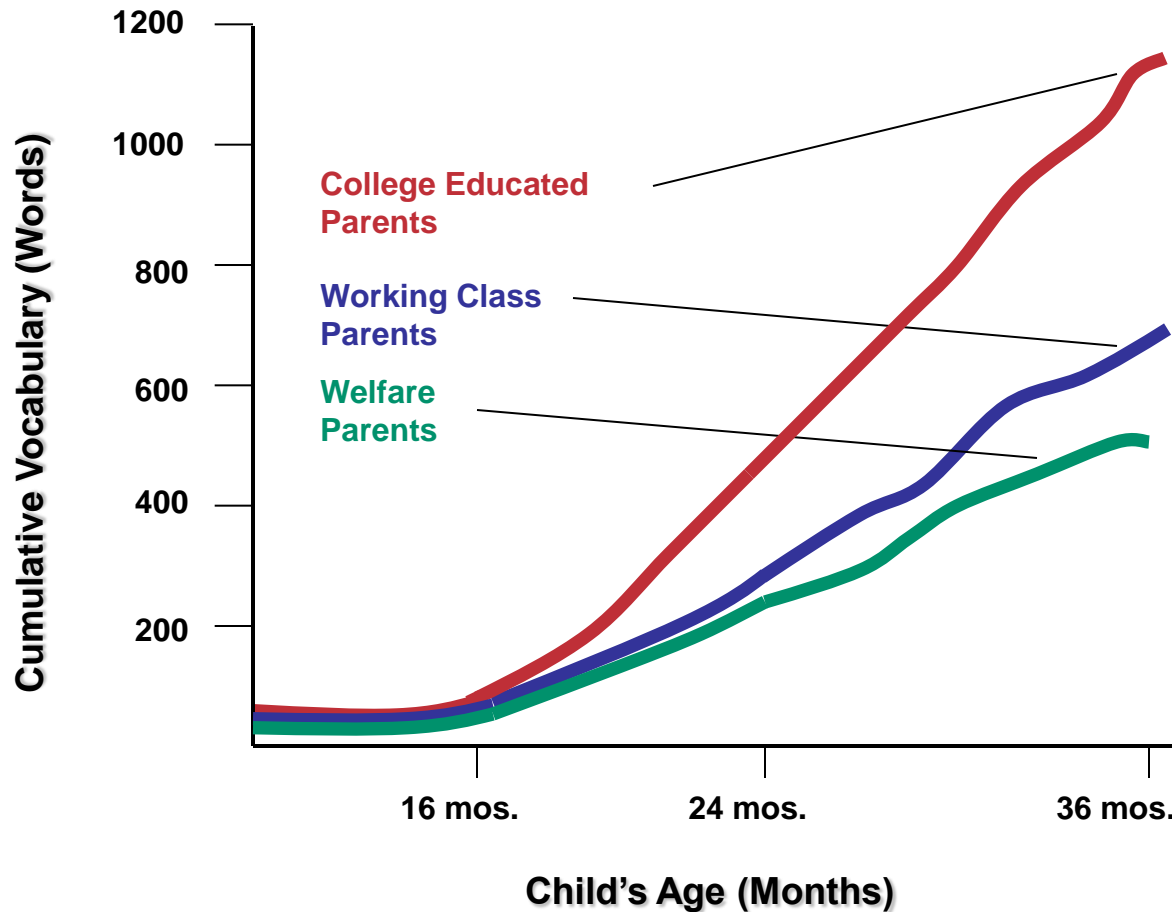
14 Years Old



SYNAPTIC DENSITY: Synapses are created with astonishing speed in the first three years of life. For the rest of the first decade, children's brains have twice as many synapses as adults' brains.

Drawings supplied by H.T. Chugani.

Barriers to Educational Achievement Emerge at a Very Young Age



5 Days



2 Months



1 Year



28 Years



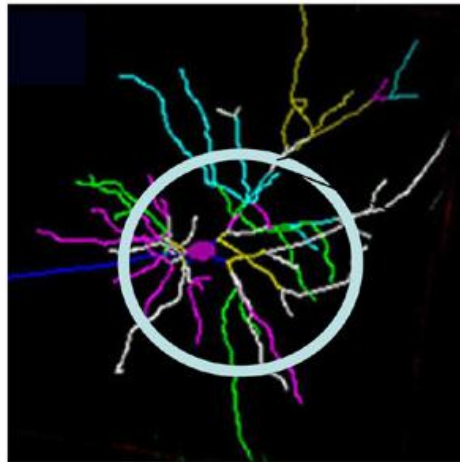
RAPID EARLY DEVELOPMENT: These PET scans suggest that the brain of a one year old more closely resembles an adult's brain than a newborn's.

Source: H.T. Chugani

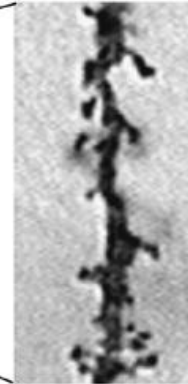


Persistent Stress Changes Brain Architecture

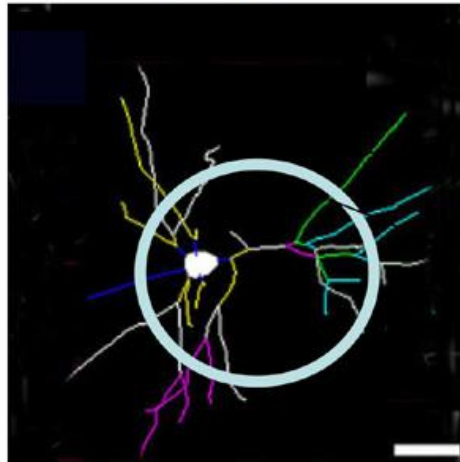
Normal



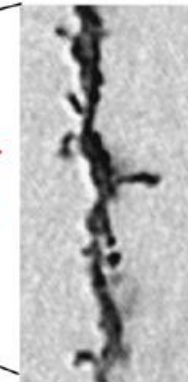
Typical neuron—
many connections



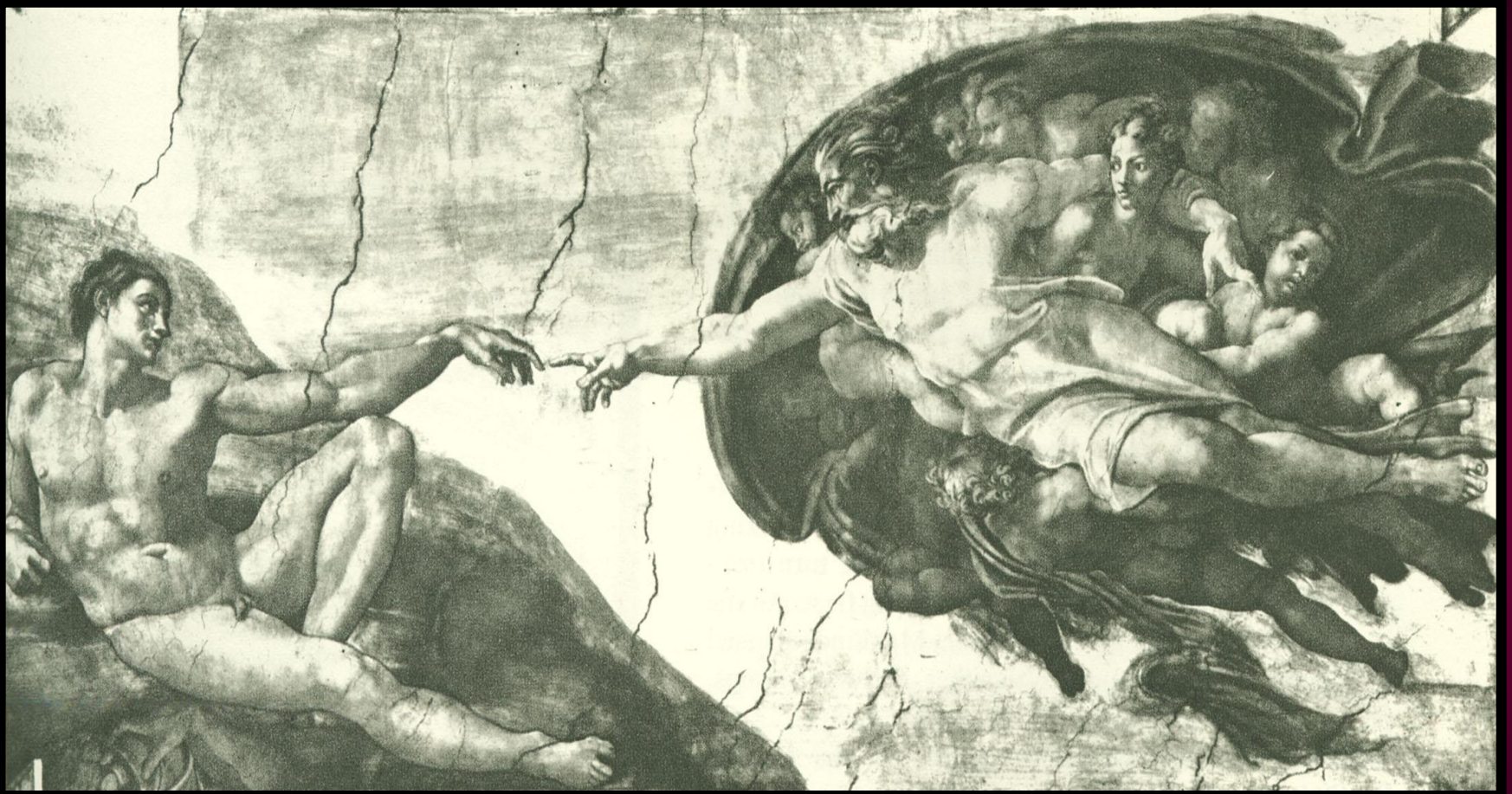
Toxic
stress



Damaged neuron—
fewer connections



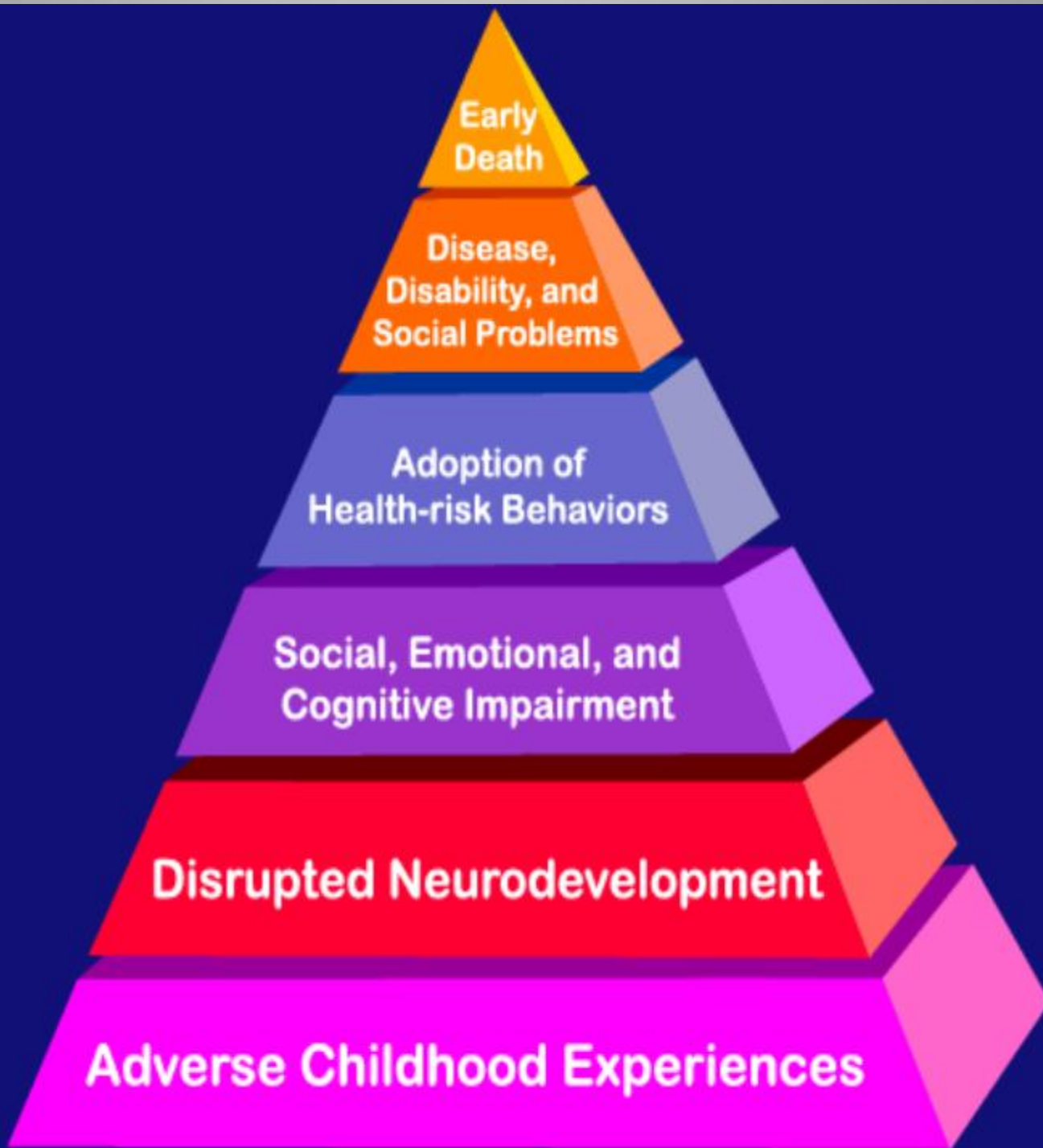
Prefrontal Cortex and
Hippocampus



“The Creation of Adam”

Michelangelo 1508–1512

Death



**Early
Death**

**Disease,
Disability, and
Social Problems**

**Adoption of
Health-risk Behaviors**

**Social, Emotional, and
Cognitive Impairment**

Disrupted Neurodevelopment

Adverse Childhood Experiences

Conception

The Adverse Childhood Experiences (ACE) Study

Examines the health and social effects of ACEs throughout the lifespan among 17,421 members of the Kaiser Health Plan in San Diego County

A Primary Care Setting...

Educated...

Middle Class..

Predominantly White...

ACE Study Design

**Survey Wave I
(N=9,508)**

Follow-up

N = 17,421

Mortality

National Death Index

Morbidity

Hospital Discharge

Outpatient Visits

**Survey Wave II
(N=8,667)**

**Emergency room
visits**

Pharmacy Utilization

***Comprehensive medical
Evaluations abstracted***

Adverse Childhood Experiences Are Common

Household dysfunction:

Substance abuse	27%
Parental sep/divorce	23%
Mental illness	17%
Battered mother	13%
Criminal behavior	6%

Abuse:

Psychological	11%
Physical	28%
Sexual	21%

Neglect:

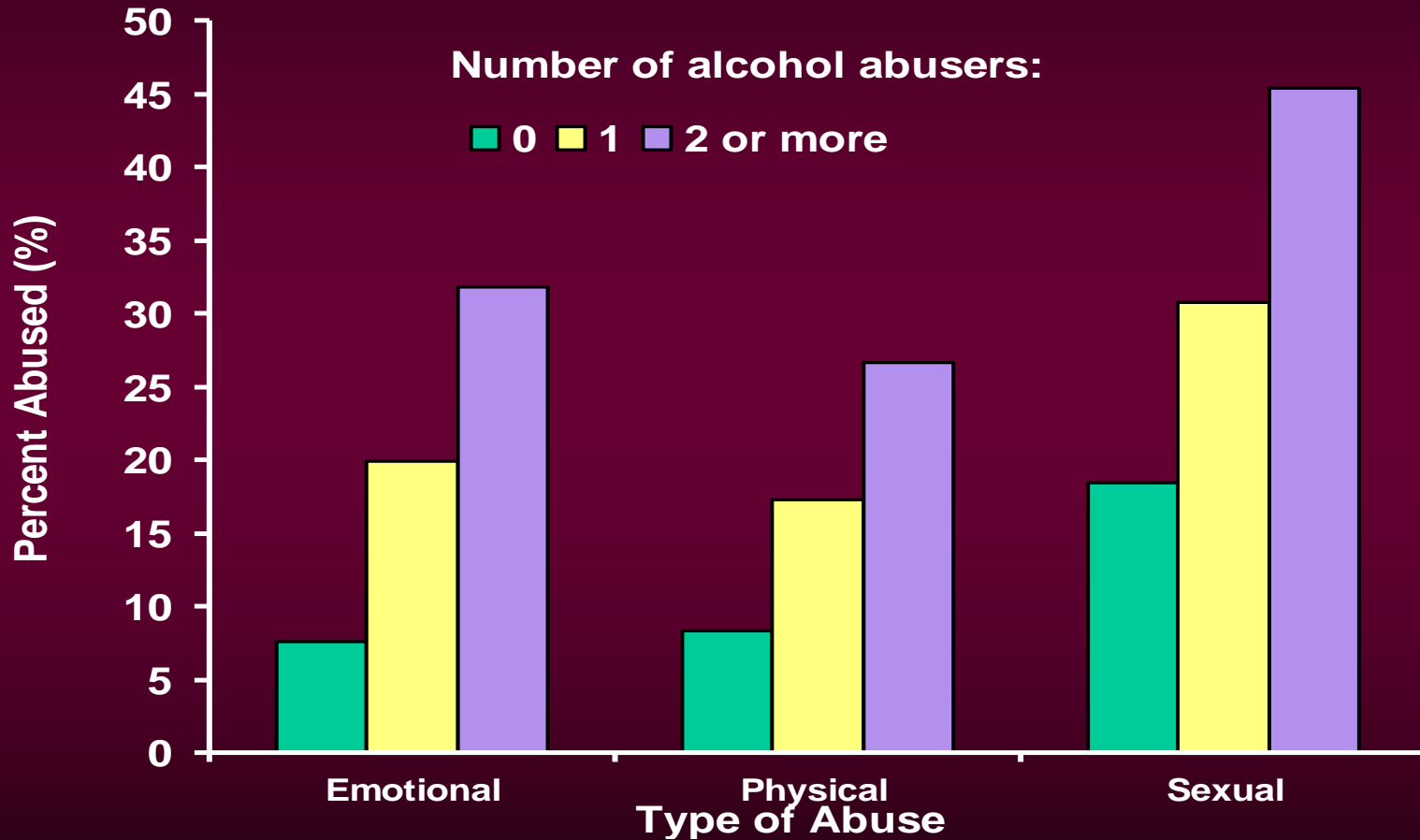
Emotional	15%
Physical	10%

**Adverse Childhood Experiences Rarely
Occur in Isolation...**

They come in **groups.**

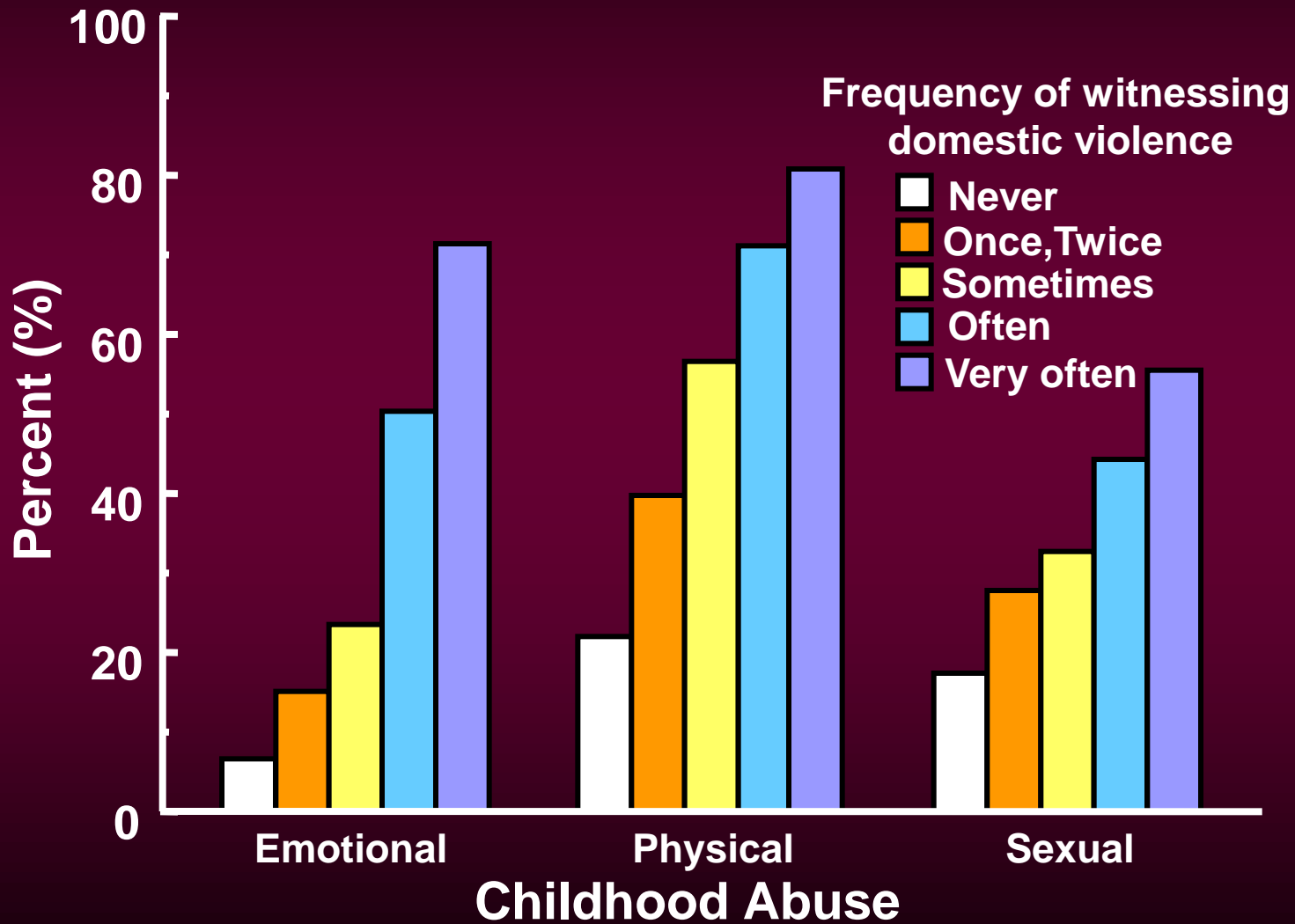
Alcohol Abuse in the Home and the Risk of Other ACEs...

Alcohol Abuse in the Home and the Risk of Childhood Abuse



Domestic Violence in the Home and the Risk of Other ACEs...

Prevalence of Childhood Abuse by Frequency of Witnessing Domestic Violence



ACEs tend to come in groups...

Additional ACEs (%)

1 2 3 4 ≥5

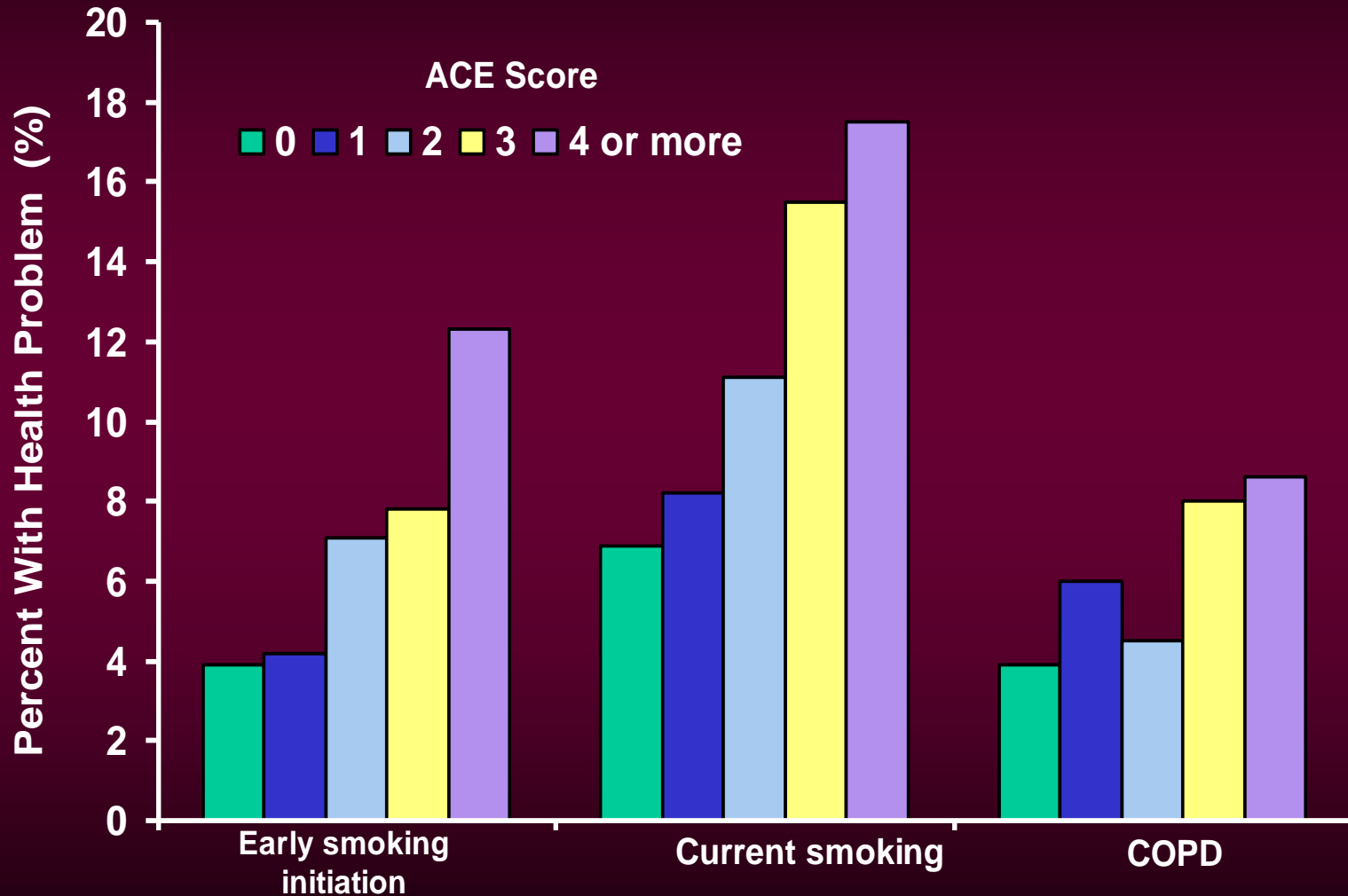
If you had:

A battered mother 95 82 64 48 52

Adverse Childhood Experiences Score Biologic Stress “Dose”

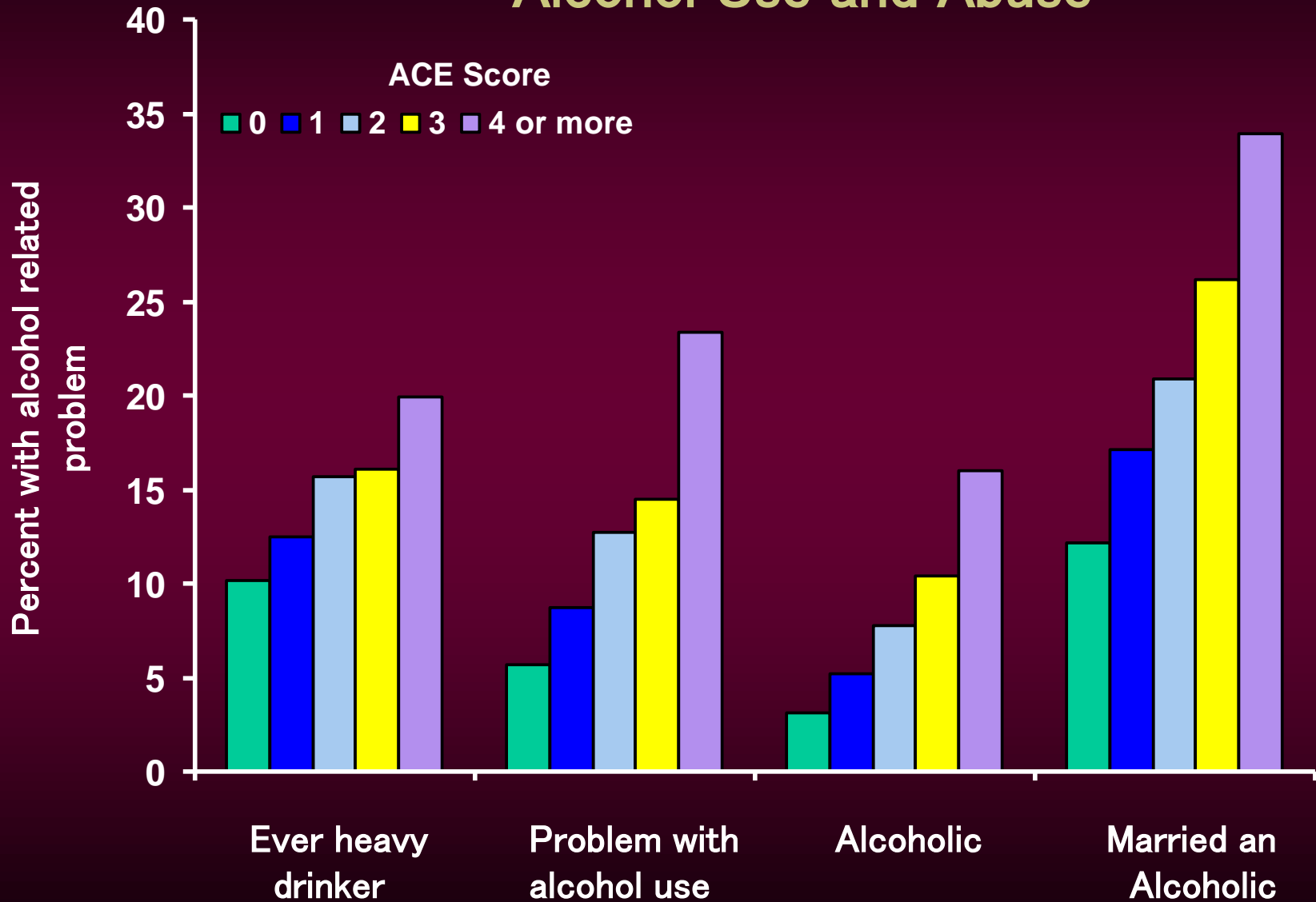
<u>ACE Score</u>	<u>Prevalence</u>
0	33%
1	26%
2	16%
3	10%
4 or more	16%

ACEs, Smoking, and Lung Disease

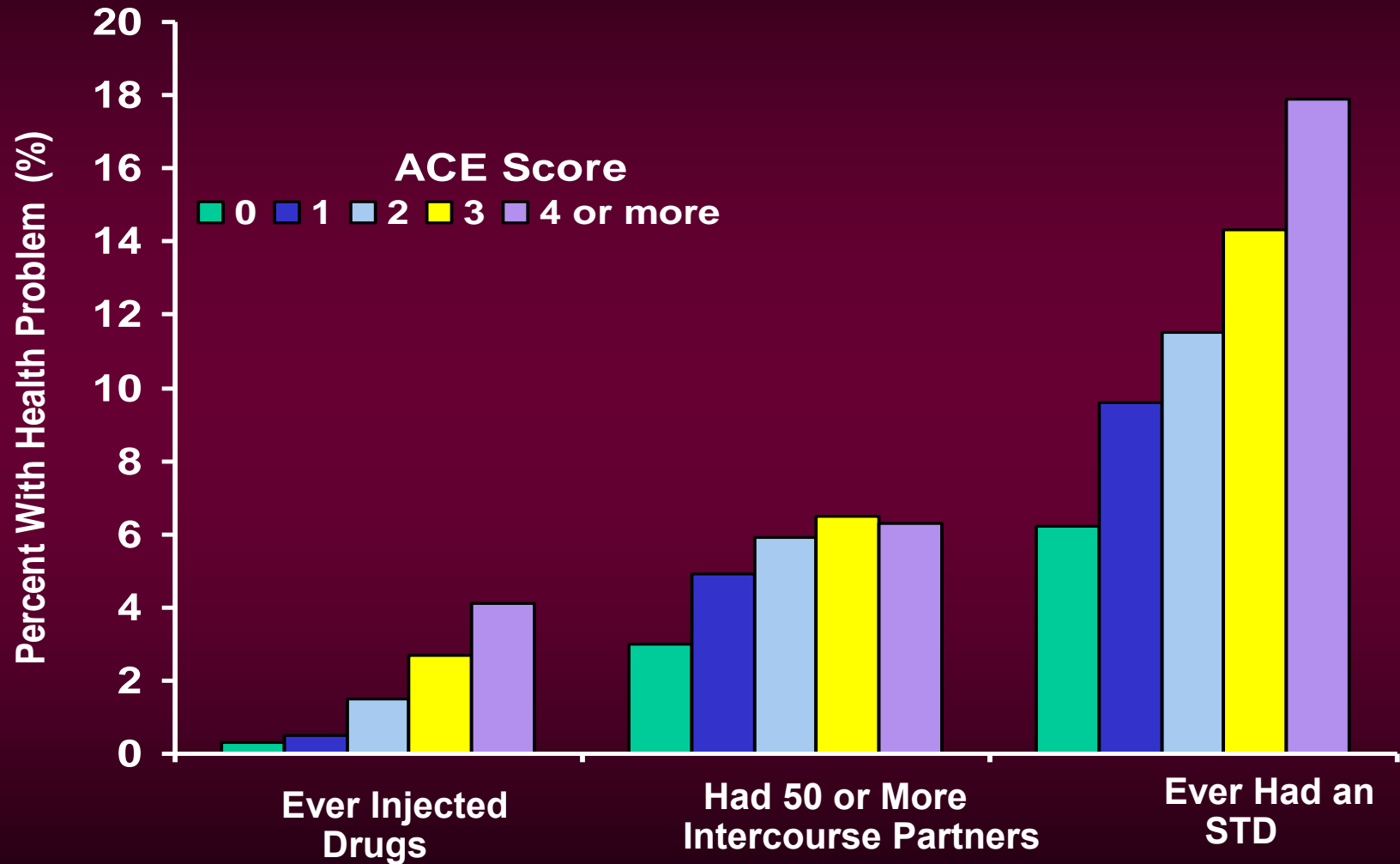


The ACE Score...

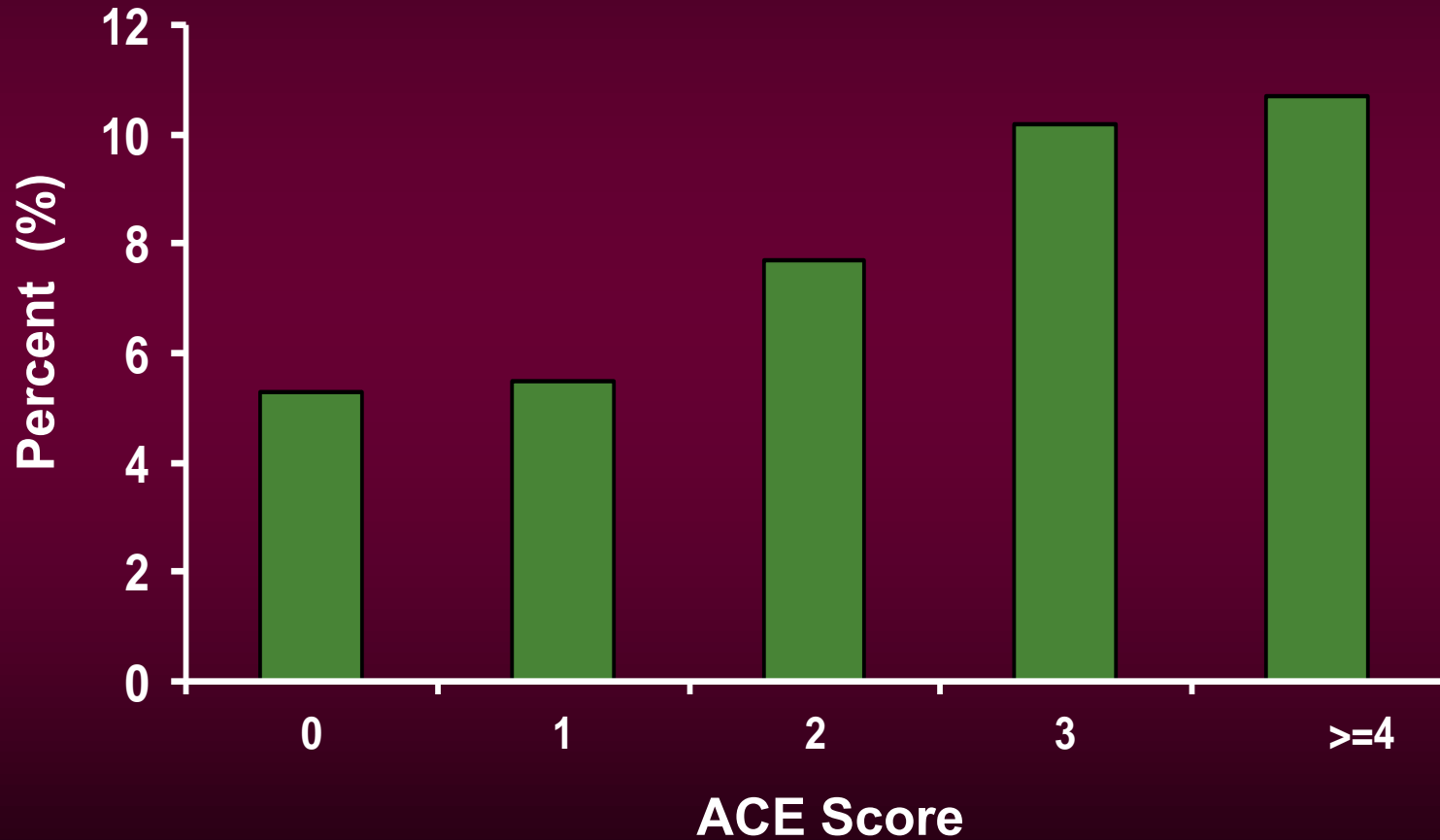
Alcohol Use and Abuse



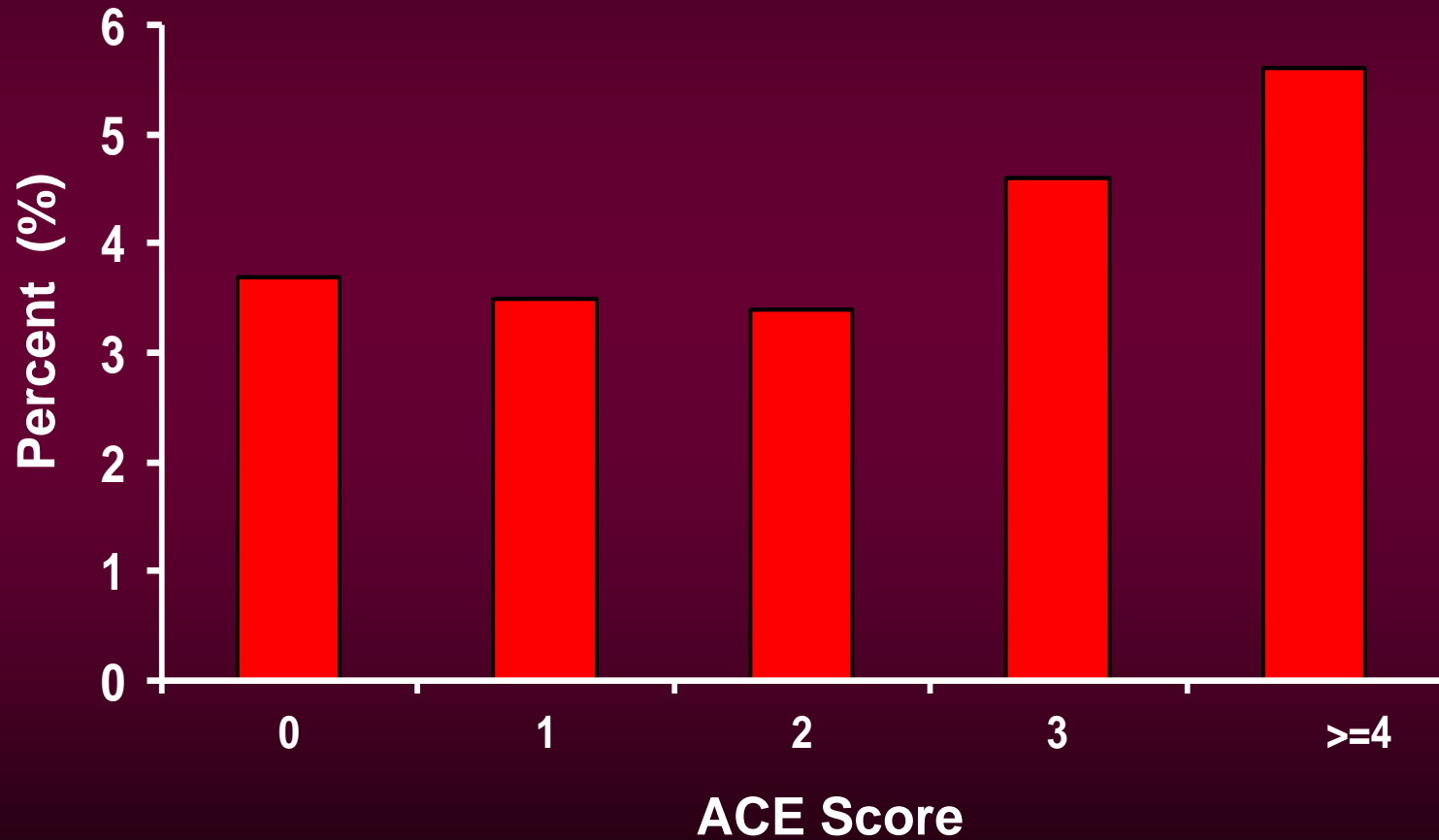
ACE Score and HIV Risks



The ACE Score and the Prevalence of Liver Disease (Hepatitis/Jaundice)

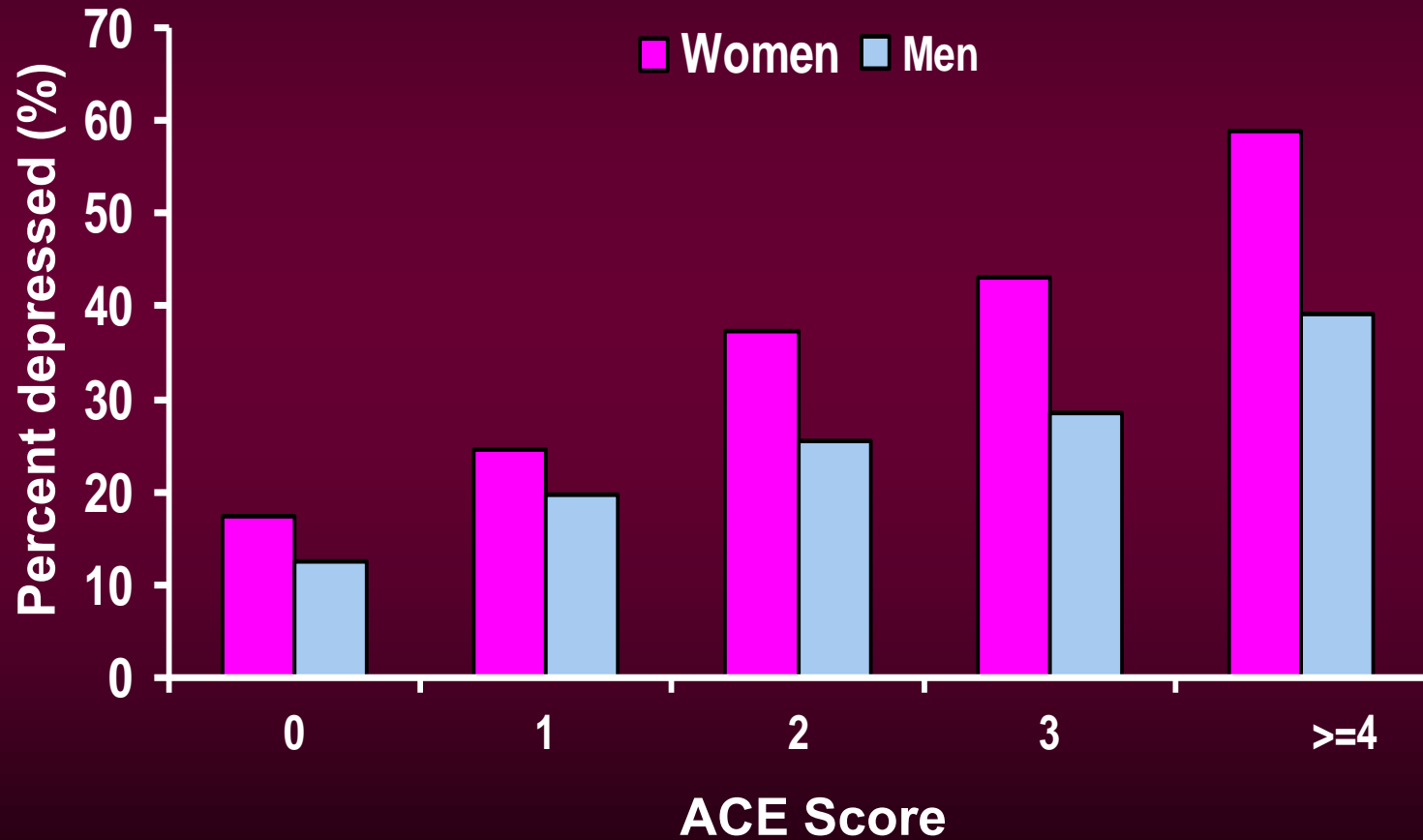


The ACE Score and the Prevalence of Coronary Heart Disease

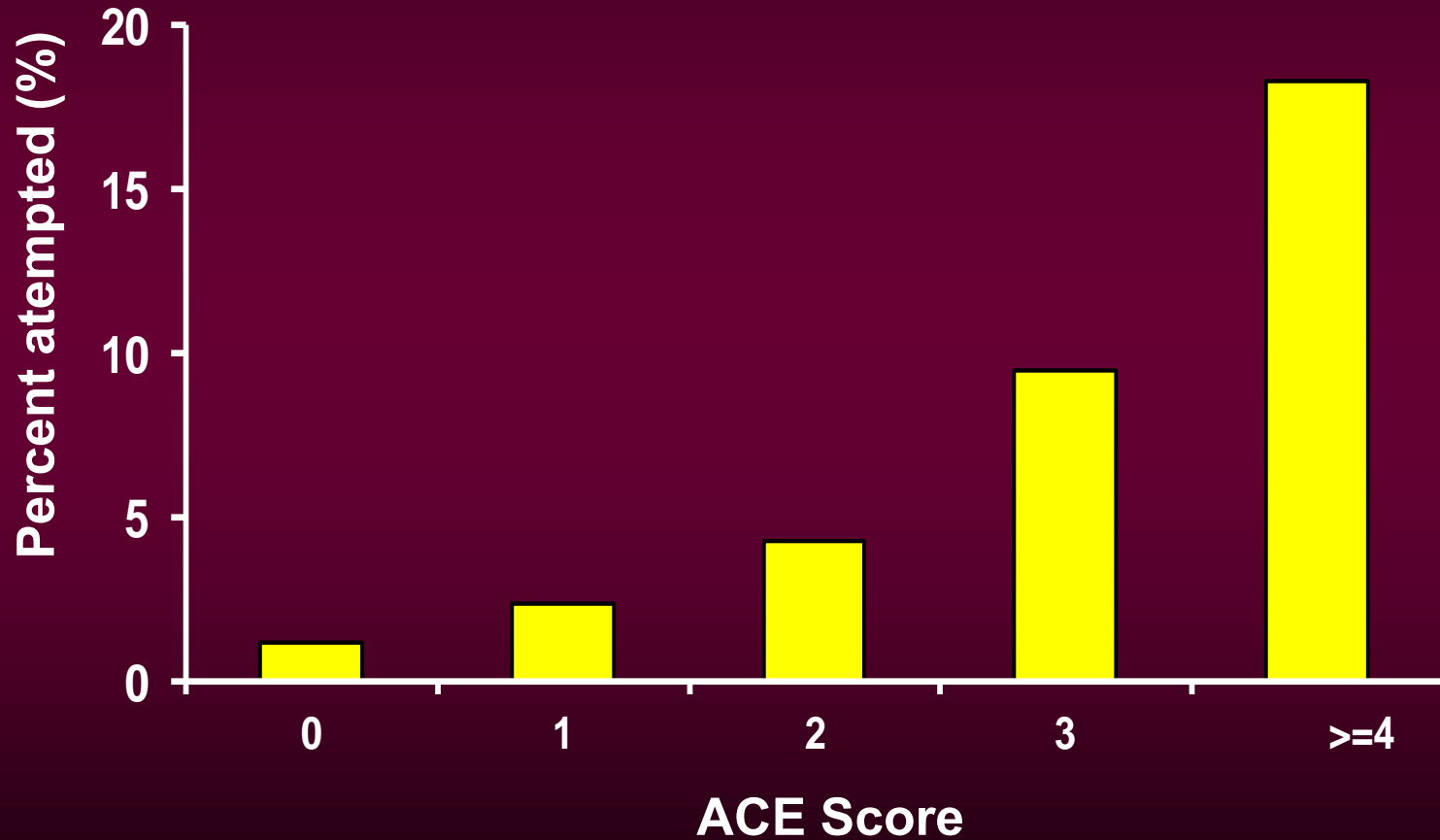


A Focus on Mental Health...

The ACE Score and a Lifetime History of Depression

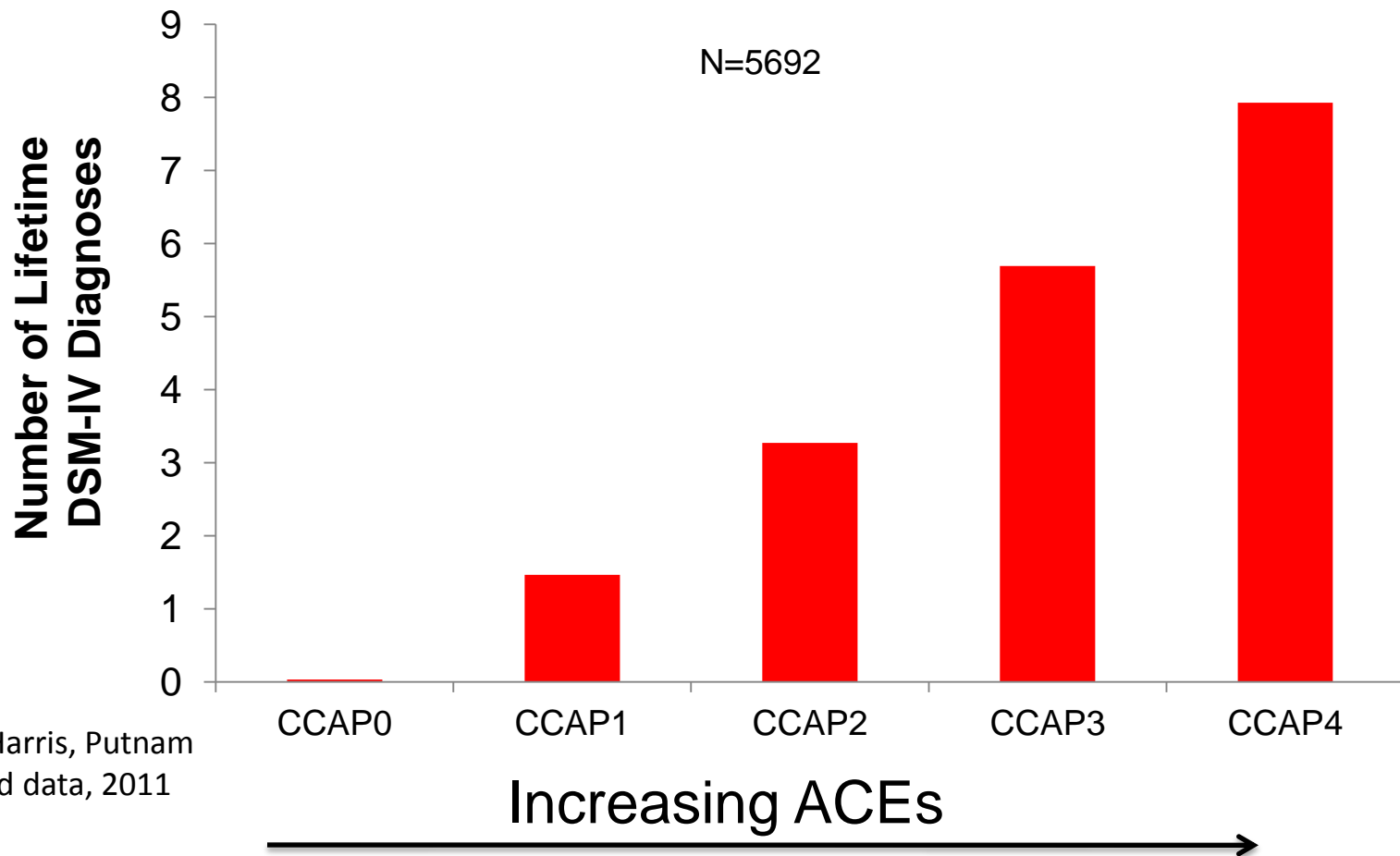


The ACE Score and the Prevalence of Attempted Suicide



Cumulative ACEs Increase the Number of Lifetime DSM-IV Diagnoses*

National Comorbidity Survey – Replication Sample



*Putnam, Harris, Putnam
unpublished data, 2011



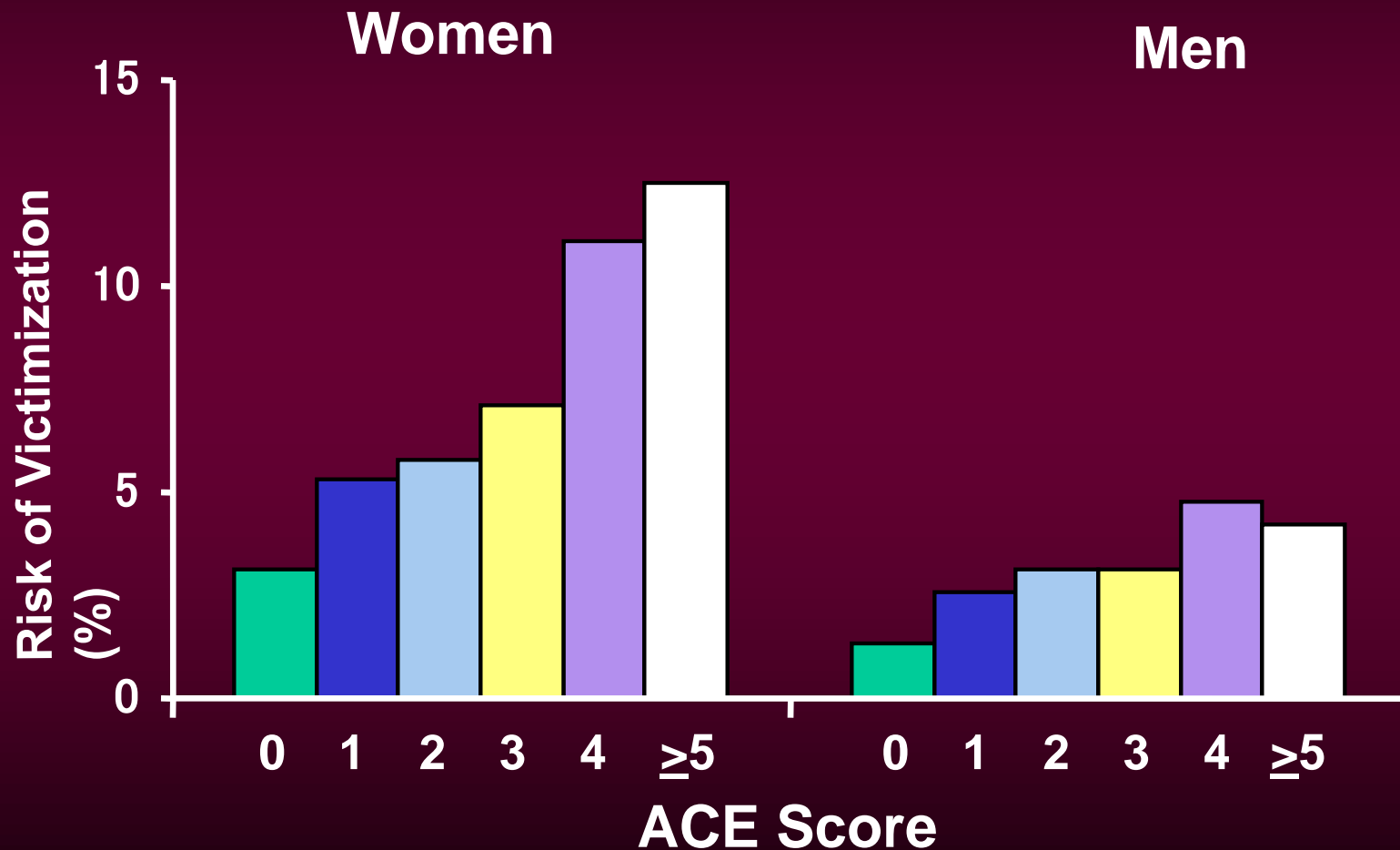
Art of: Hieronymus Bosch

“The Kiss”

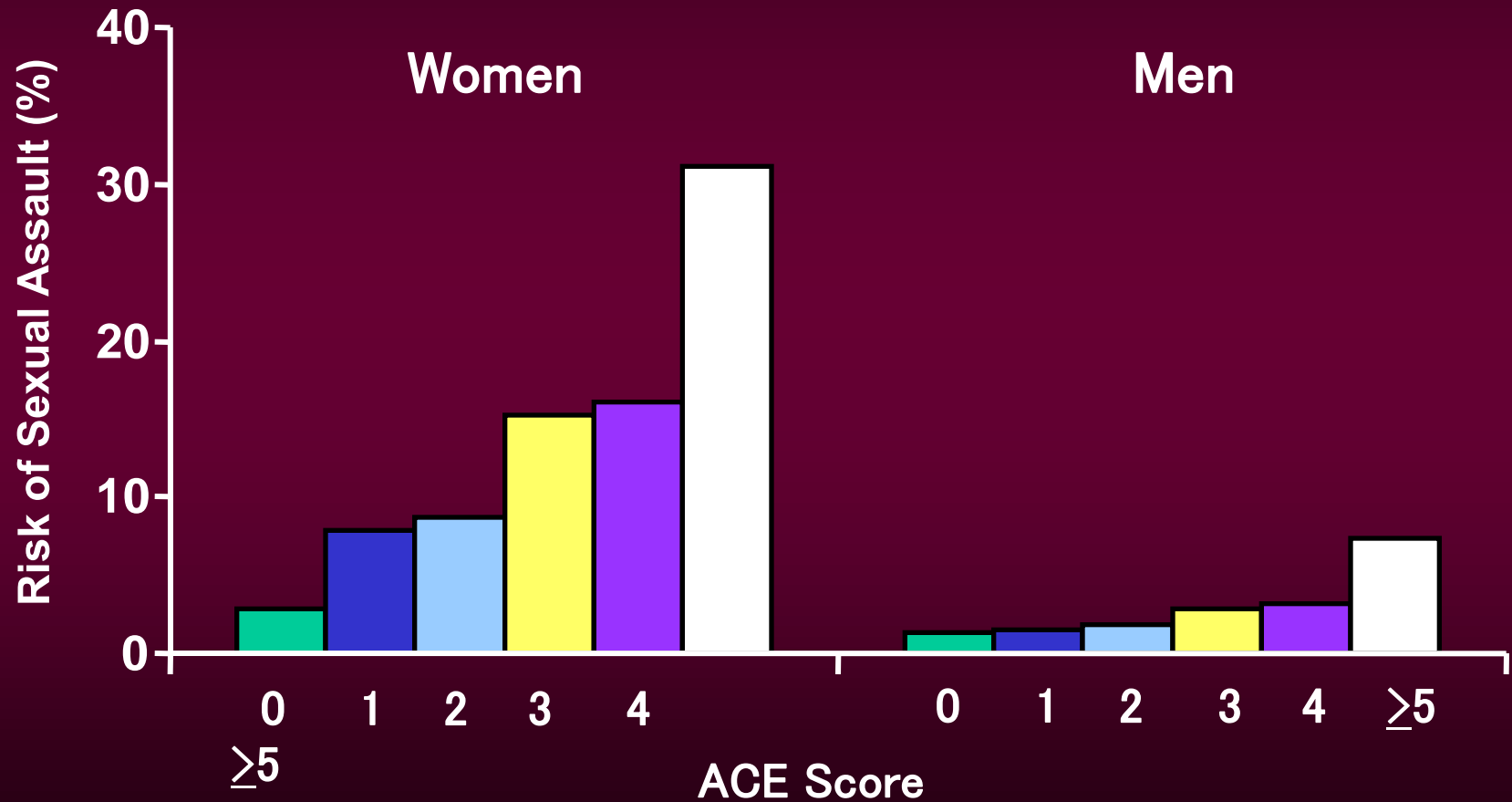
**Constantin Brancusi
1909**



ACE Score and the Risk of Being a Victim of Domestic Violence



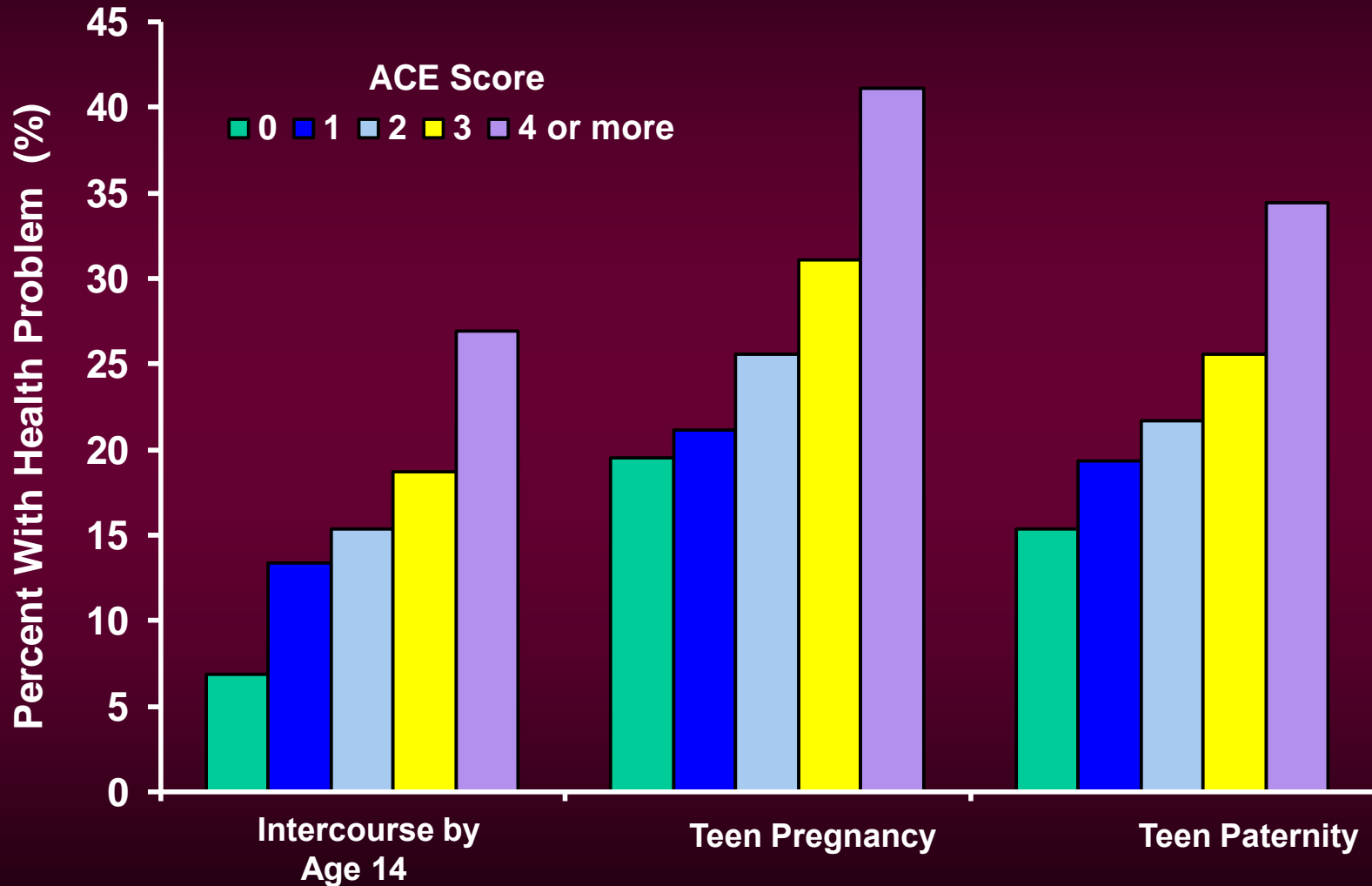
ACE Score and the Risk of Being Sexually Assaulted as an Adult



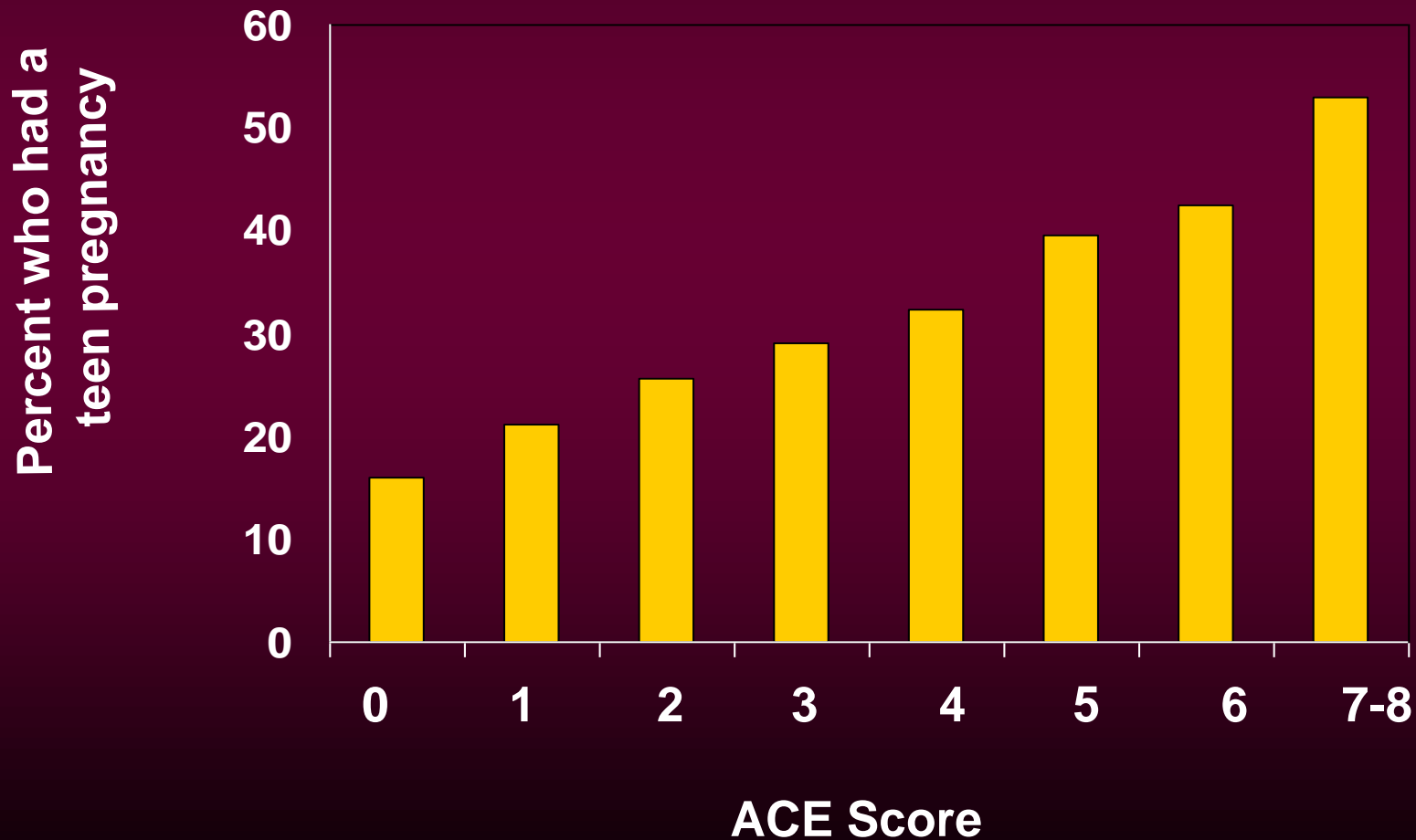
ACEs and Reproductive Behavior

.... Are they self replicating??

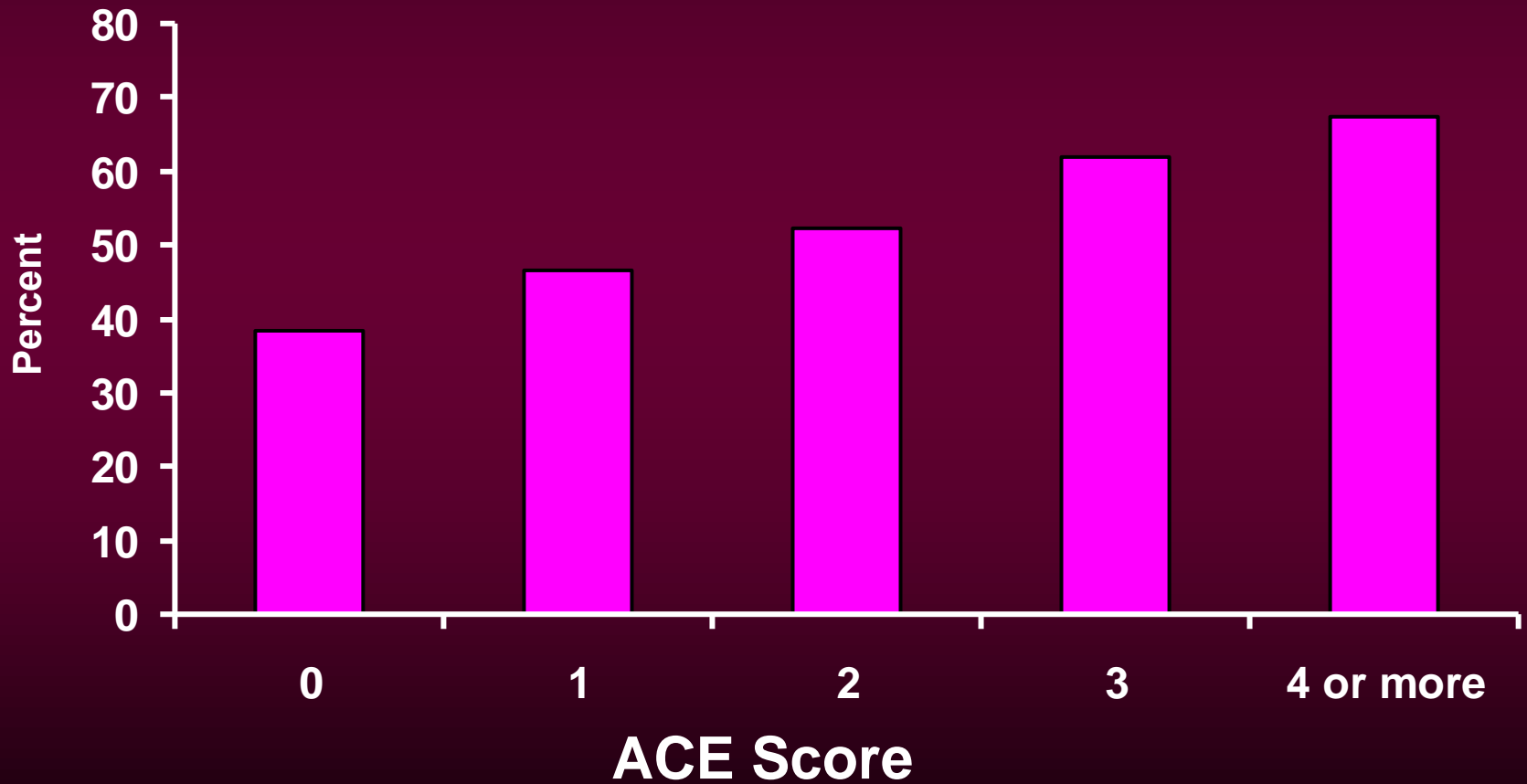
ACE Score and Teen Sexual Behaviors

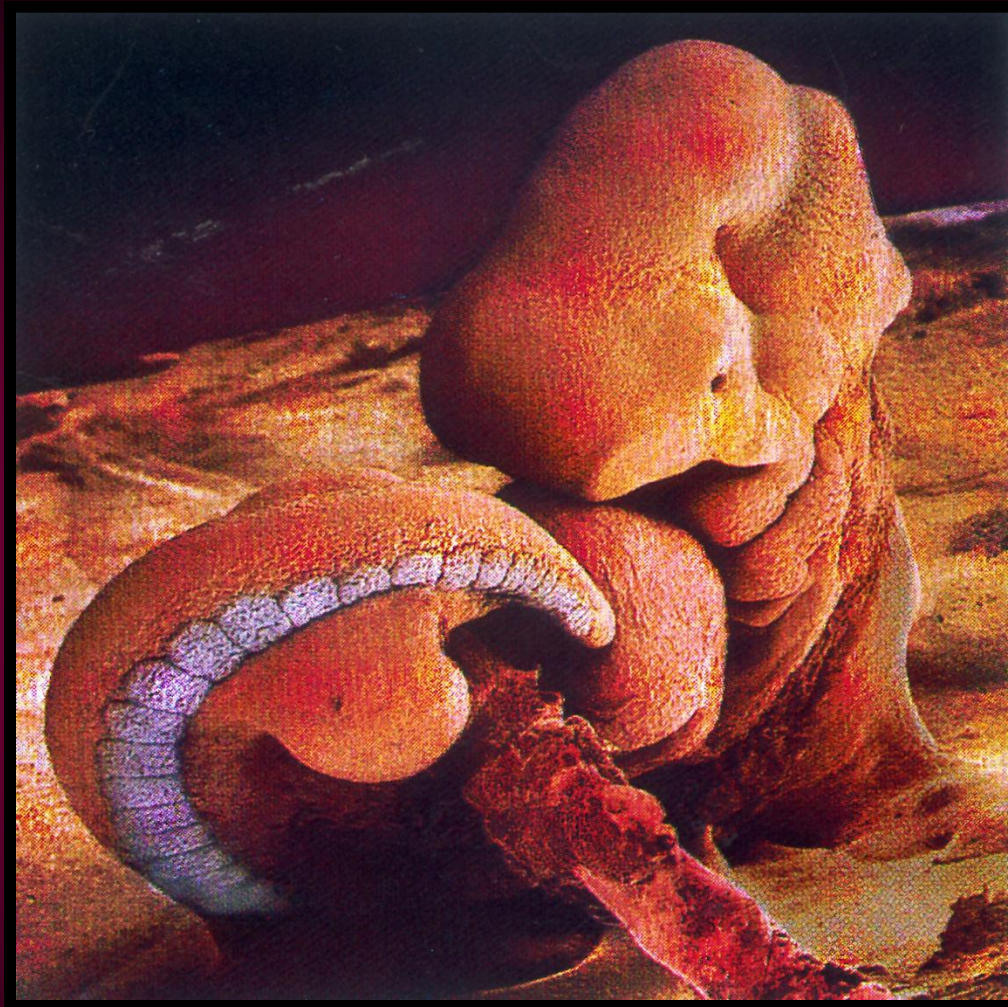


Relationship Between Number of Adverse Childhood Experiences and Adolescent Pregnancy

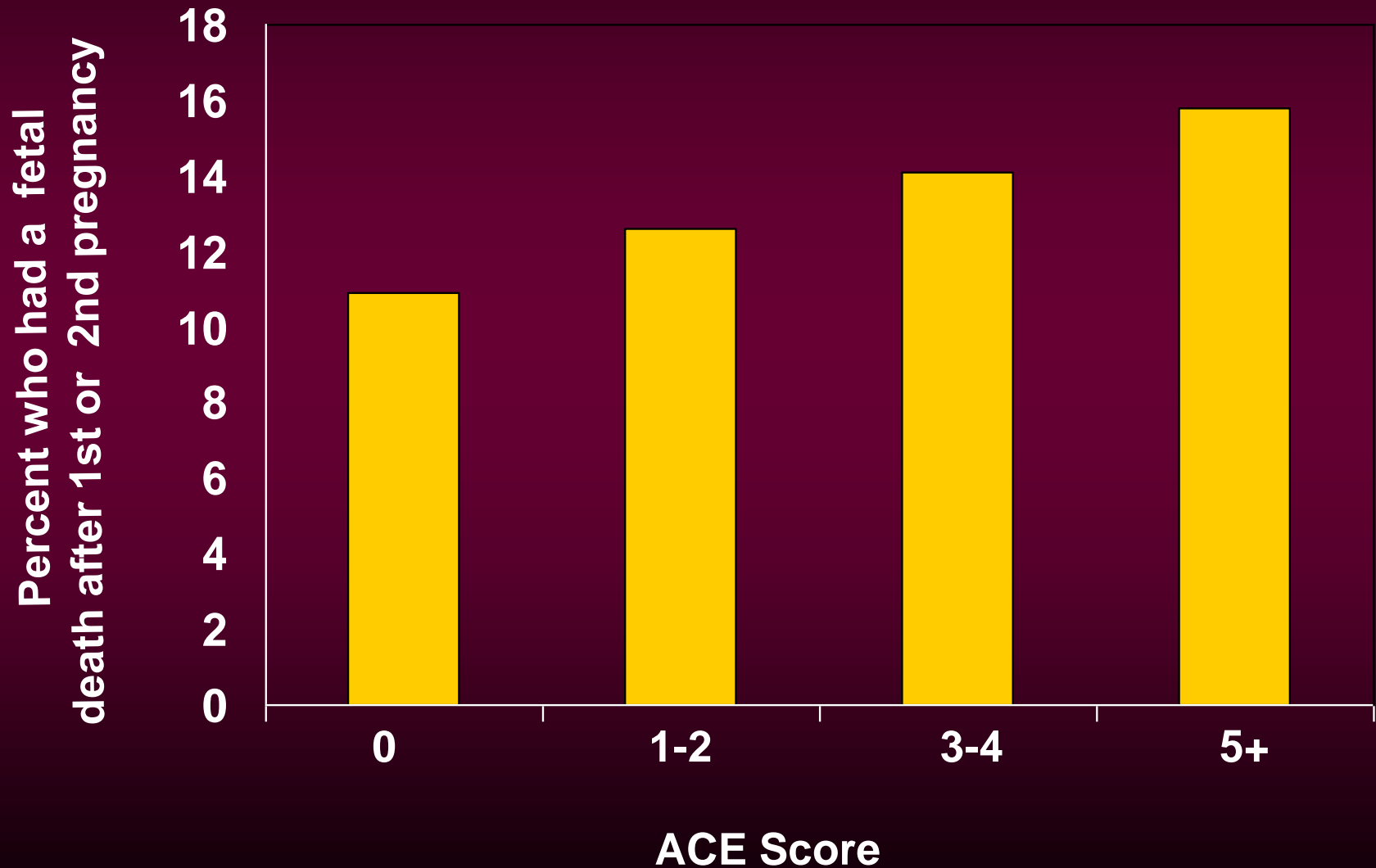


Percent of Women Who Ever Had an Unintended Pregnancy by ACE Score





Relationship Between Number of Adverse Childhood Experiences and Fetal Death—First or Second Pregnancy





Watercolor
By Tennessee Dixon
@ 1978

Estimates of the Population Attributable Risk* (PAR) of ACEs for Selected Outcomes in Women

<u>Mental Health:</u>	<u>PAR</u>
Current depression	54%
Depressed affect	41%
Suicide attempt	58%
<u>Drug Abuse:</u>	
Alcoholism	65%
Drug abuse	50%
IV drug abuse	78%
<u>Promiscuity</u>	48%
<u>Crime Victim:</u>	
Sexual assault	62%
Domestic violence	52%

*Based upon the prevalence of one or more ACEs (62%) and the adjusted odds ratio ≥ 1 ACE.

ACEs Changed the Landscape

- Provided a compelling tabulation of childhood adversity that directly related to easily understood costly outcomes
- Largely responsible for increased awareness of policy makers of the role of childhood trauma in costly medical, psychiatric and social problems
- Legitimized and stimulated interest in childhood adversities for researchers in a range of fields

ACEs Changed the Landscape

- **Pervasiveness of ACEs**
 - Huge number of major public health problems that were ACE-related (e.g., Depression, Substance Abuse, STDs, Cancer, Heart Disease, Chronic Lung Disease, Diabetes)
 - Significant number of middle-class Americans had ACEs
- **Perniciousness of ACEs**
 - Major contributors to the leading causes of death and disability
 - Life-shortening (~20 years for people with 6+ ACEs)
- **Persistence of ACEs**
 - Life-time effects
 - Likelihood of intergenerational transmission

Beyond ACEs

- Link ACEs to existing and future programs seeking to prevent mental illness, medical diseases, substance abuse, health risk behaviors, and social dysfunction
- Prevent ACEs
 - Zero ACEs is protective
 - Prevent further ACEs in maltreatment victims
- Identify and treat ACEs early in life
- Identify mechanisms (behavioral and biological) through which ACEs negatively impact life trajectories



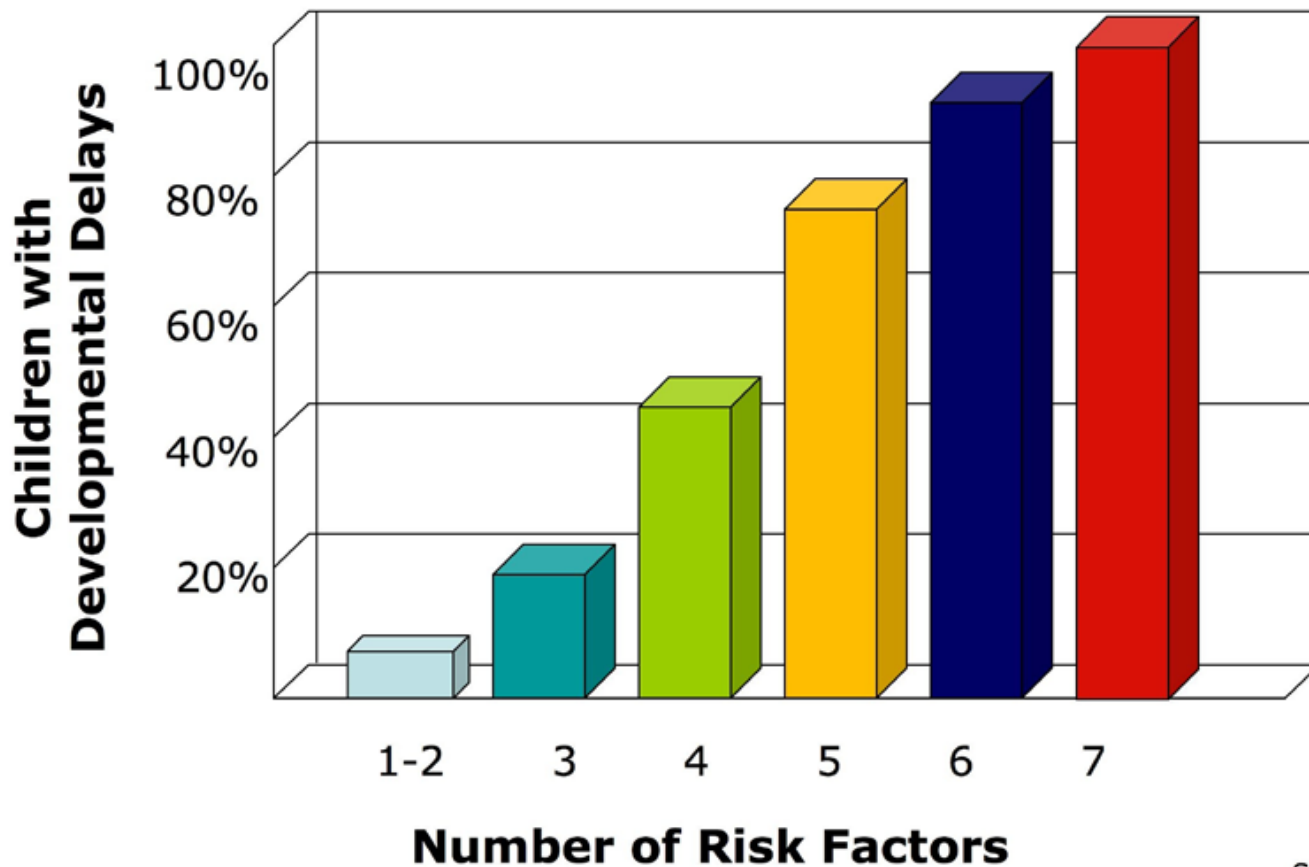
The Walk to
Paradise Garden
W. Eugene Smith

The Costs of the Status Quo..

Reflect the Costs of
Ignoring and Impairing
Early Childhood Development



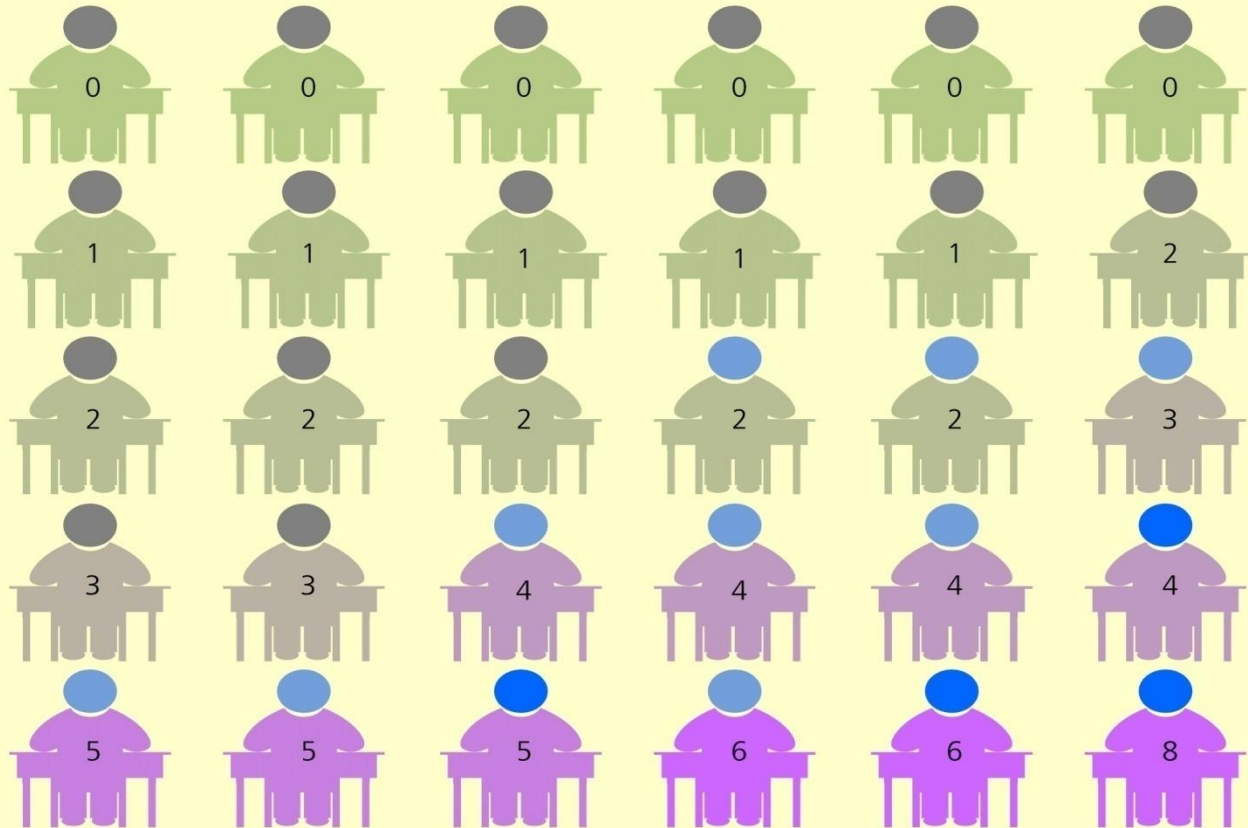
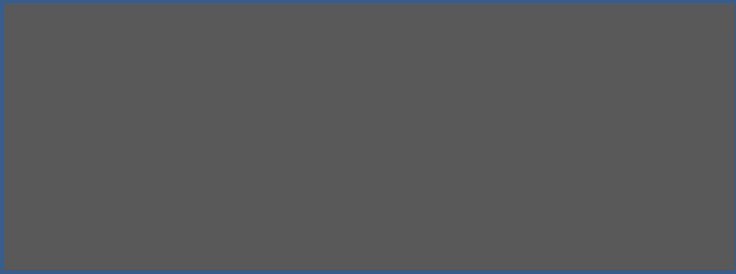
Significant Adversity Impairs Development in the First Three Years



ACEs and High School Sophomores and Seniors

Washington School Classroom (30 Students) Adverse Childhood Experiences (ACEs)

- 6 students with no ACE
- 5 students with 1 ACE
- 6 students with 2 ACEs
- 3 students with 3 ACEs
- 7 students with 4 or 5 ACEs
- 3 students with 6 or more ACEs



Population
 Average

Spokane Washington

Students with 3 or more ACEs:

- Are 2 ½ times more likely to fail a grade
 - Score lower on standardized tests
 - Have language difficulties
 - Are suspended or expelled more
- Are designated to special education more frequently
 - Have poorer health

Courtesy of Chris Blodgett, PhD
Washington State University

Costs of the Status Quo

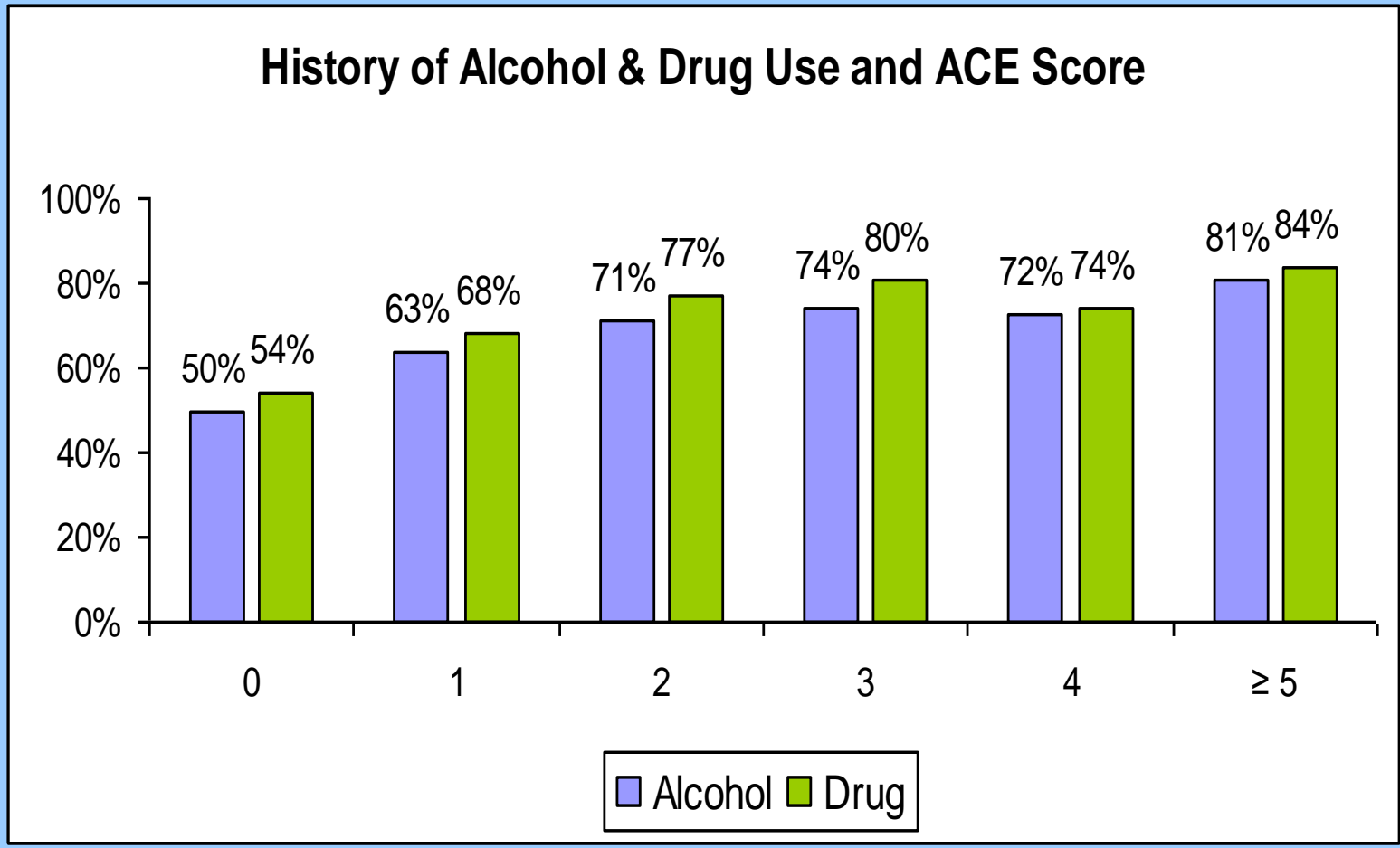
Criminal Justice

..the prison pipeline

ACEs Among **Youth on Probation**
Pierce County, Washington

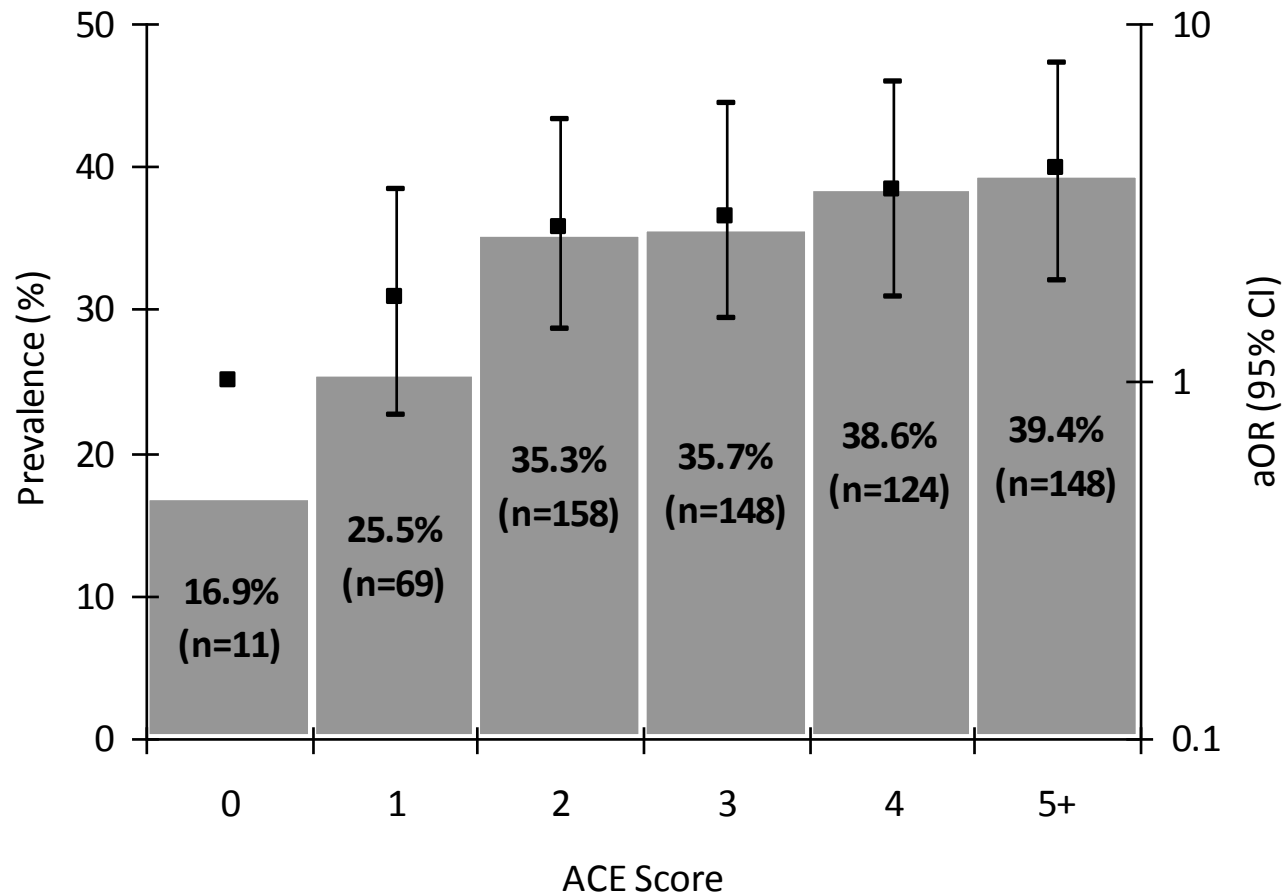


ACE Exposure and Youth Outcomes



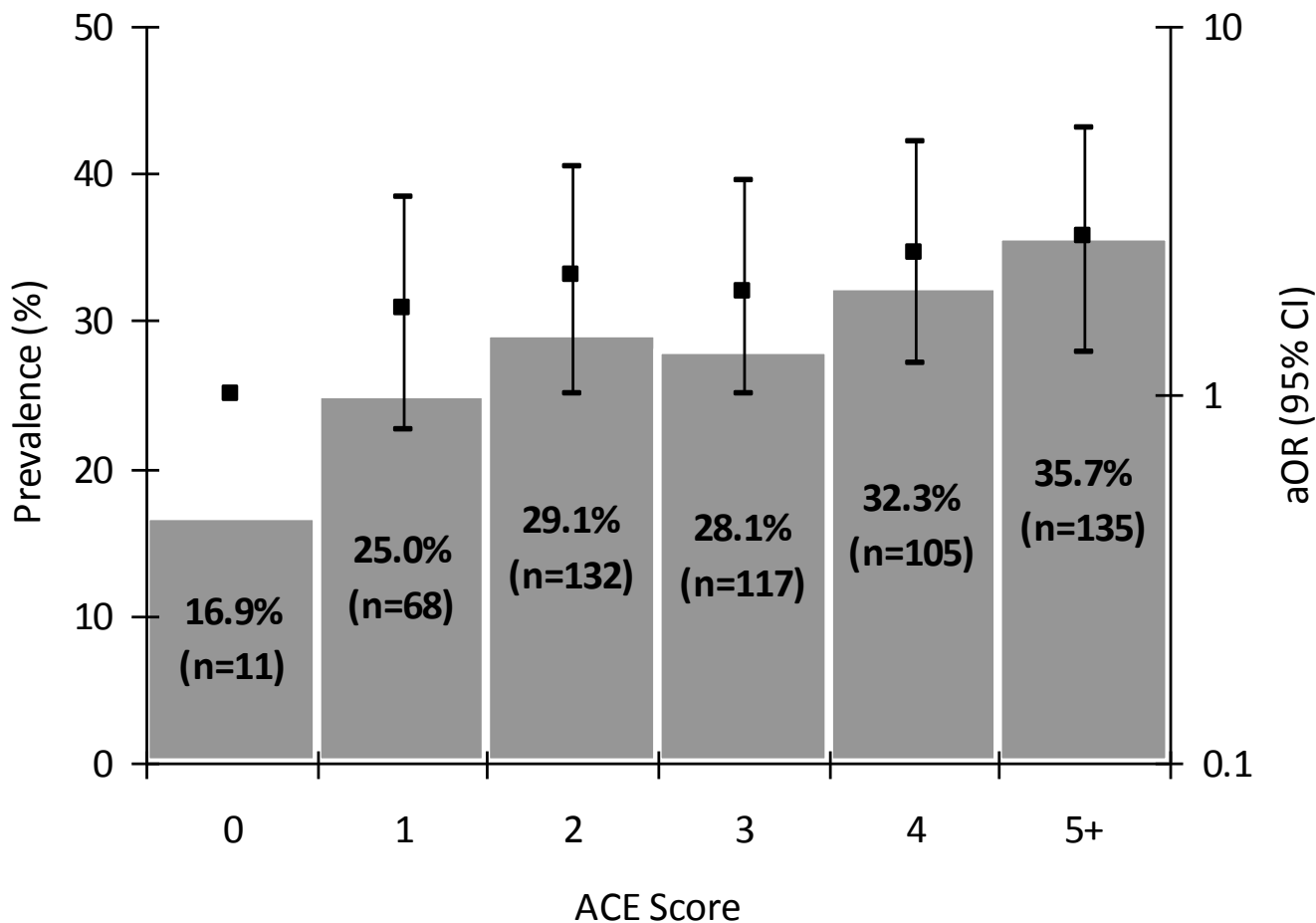
ACE Score and Repeated Suspension/Expulsion Youth on Probation, Pierce County, WA

History of ≥ 7 expulsions or suspensions since the first grade



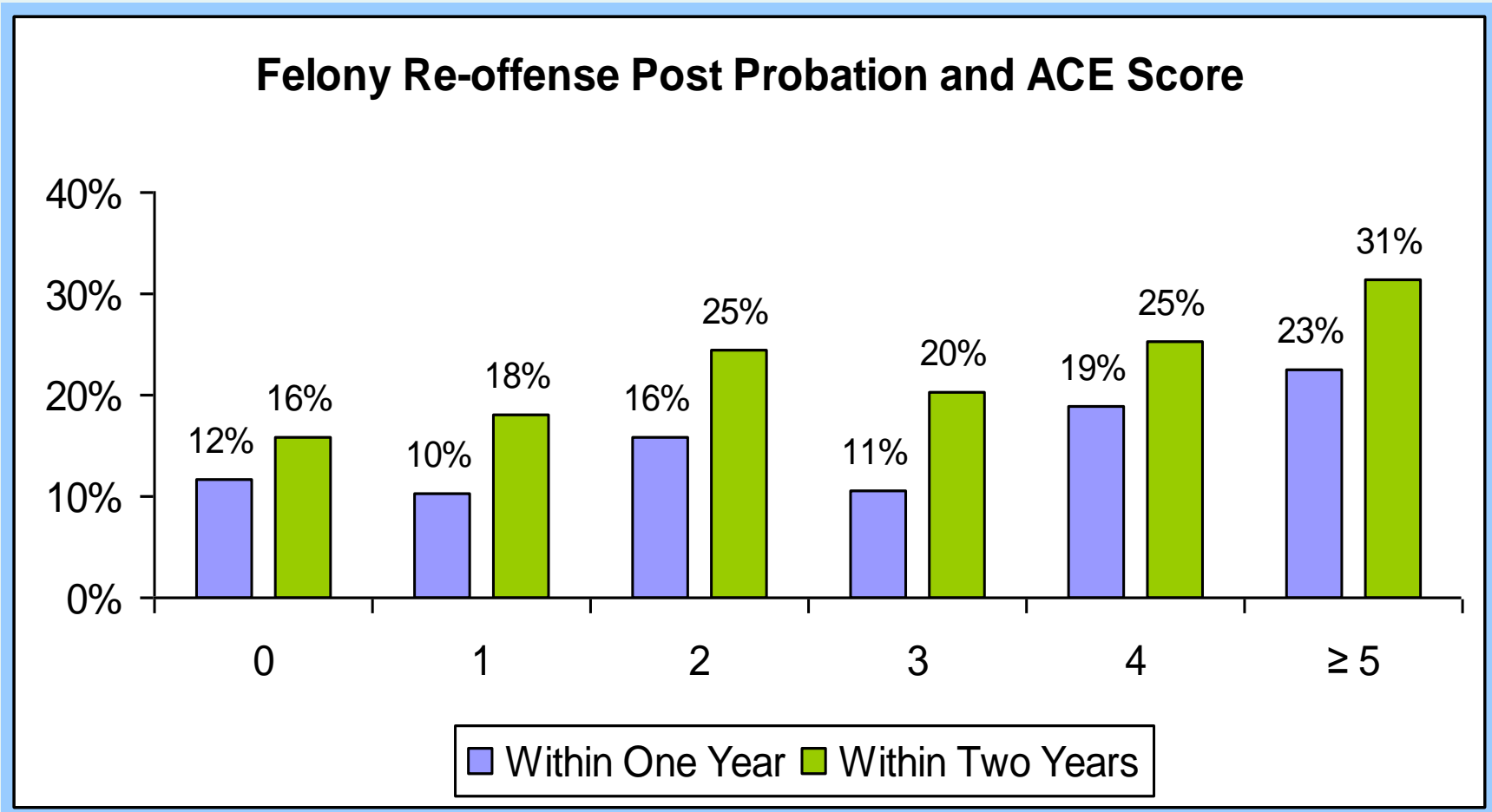
ACE Score and Poor Academic Performance Youth on Probation, Pierce County, WA

Poor academic performance during most recent school term





ACE Score and Felony Re-offense



Costs of the Status Quo

Health Care

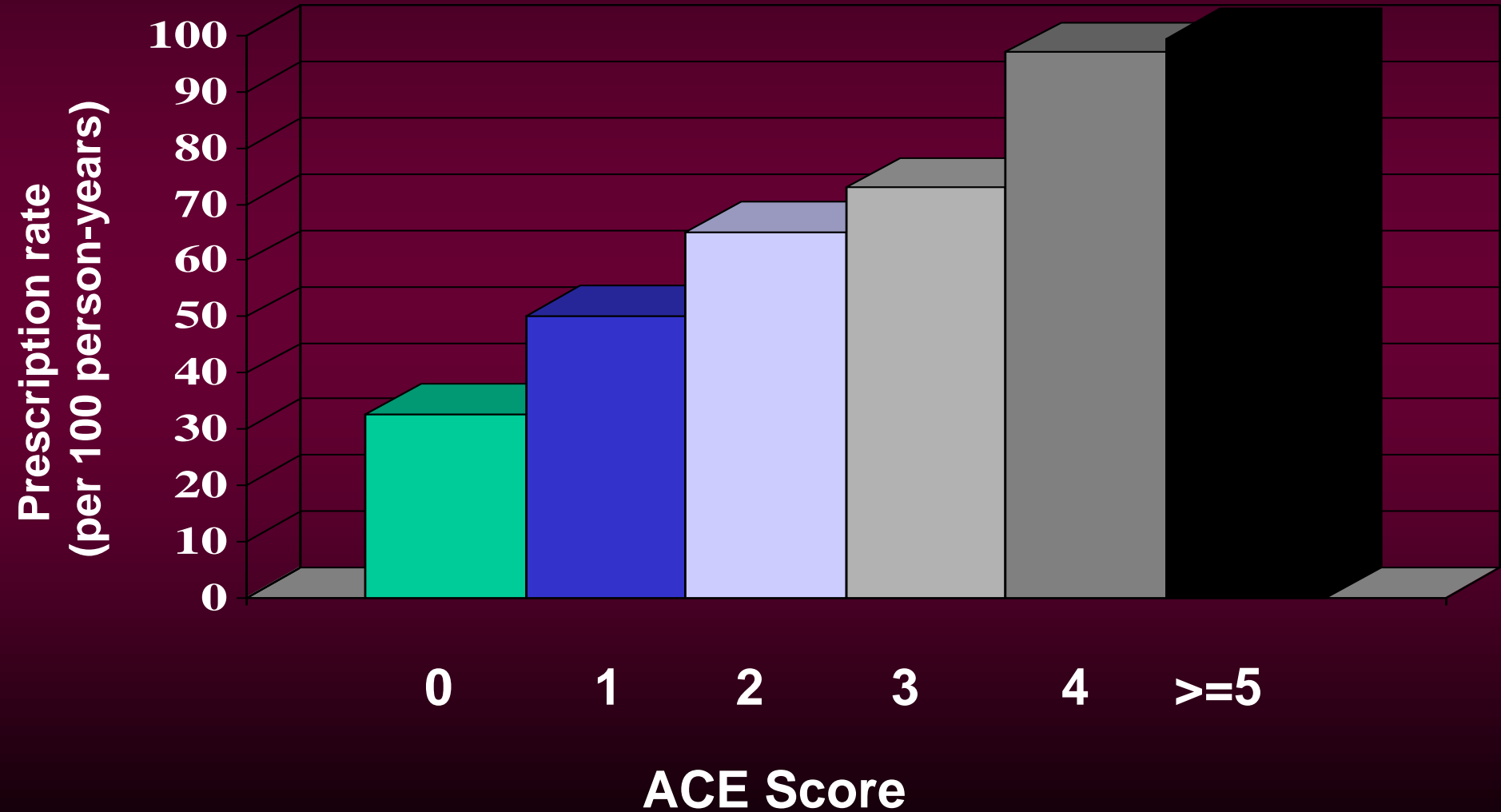
Prescription Drugs in the United States (2003)

-nearly \$180 billion spent

-11% of total national health expenditures

-more than four times the amount spent in 1990

ACE Score and Rates of Antidepressant Prescriptions



Costs of the Status Quo

Corporations and the Workforce

Drains on Profitability..

Depression and its work related outcomes, absenteeism, reduced productivity, and medical expenses: \$44 billion per year

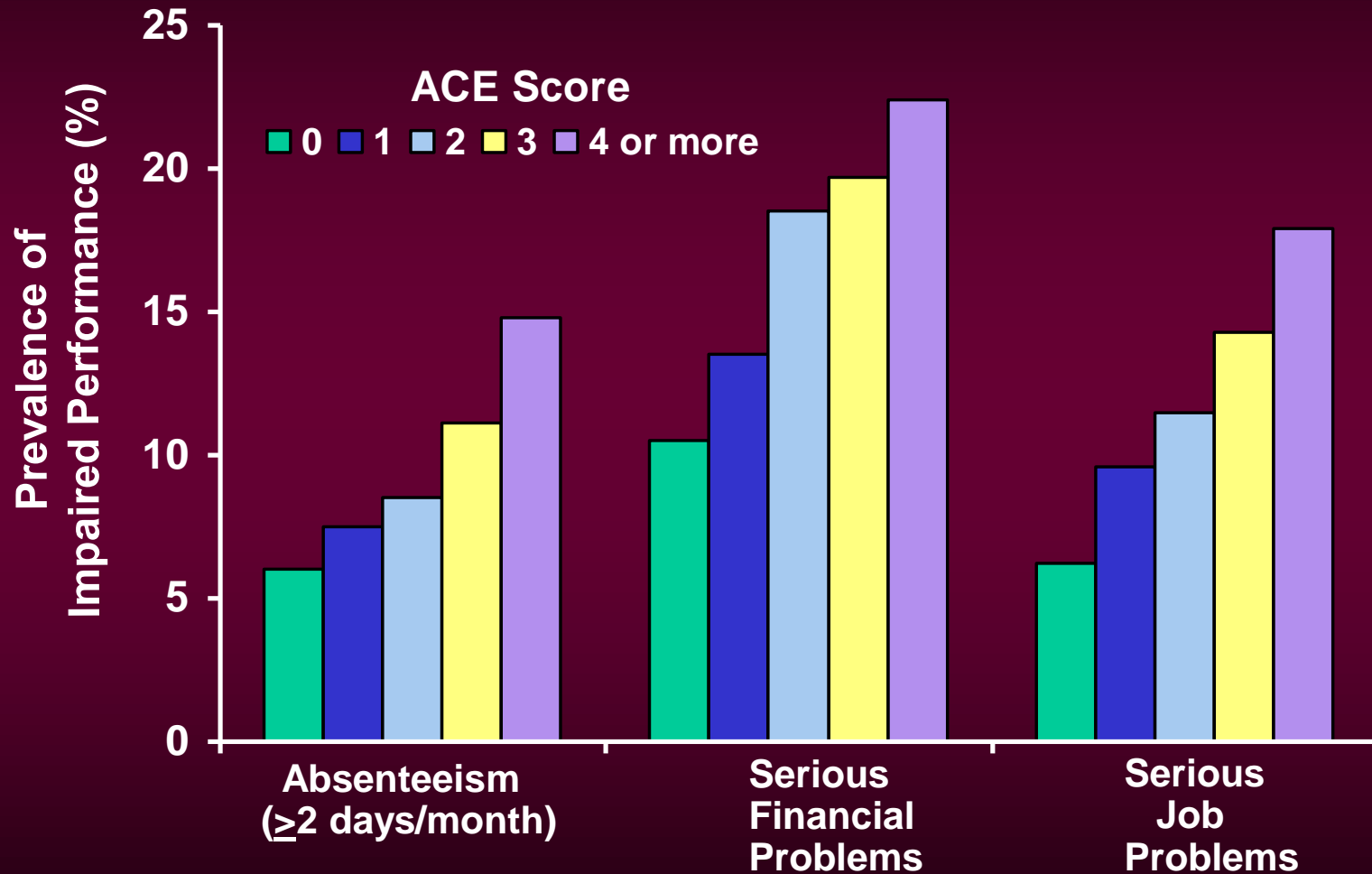
Back pain in the workforce: \$28 billion per year

Chemical dependency: \$246 billion per year

These massive losses occur despite the existence of workplace safety programs and the most expensive system of medical care in the world.

[

ACE Score and Indicators of Impaired Worker Performance



4 Areas of Health and Well-Being as Mediators

**Adverse
Childhood
Experiences**



Relationship Problems

- marital
- family
- sexual

Emotional Distress

- depressed mood
- panic reactions
- difficulty with anger

Somatic Symptoms

- back pain
- headaches
- joint problems

Substance Abuse

- alcoholism
- smoking
- illicit drug use

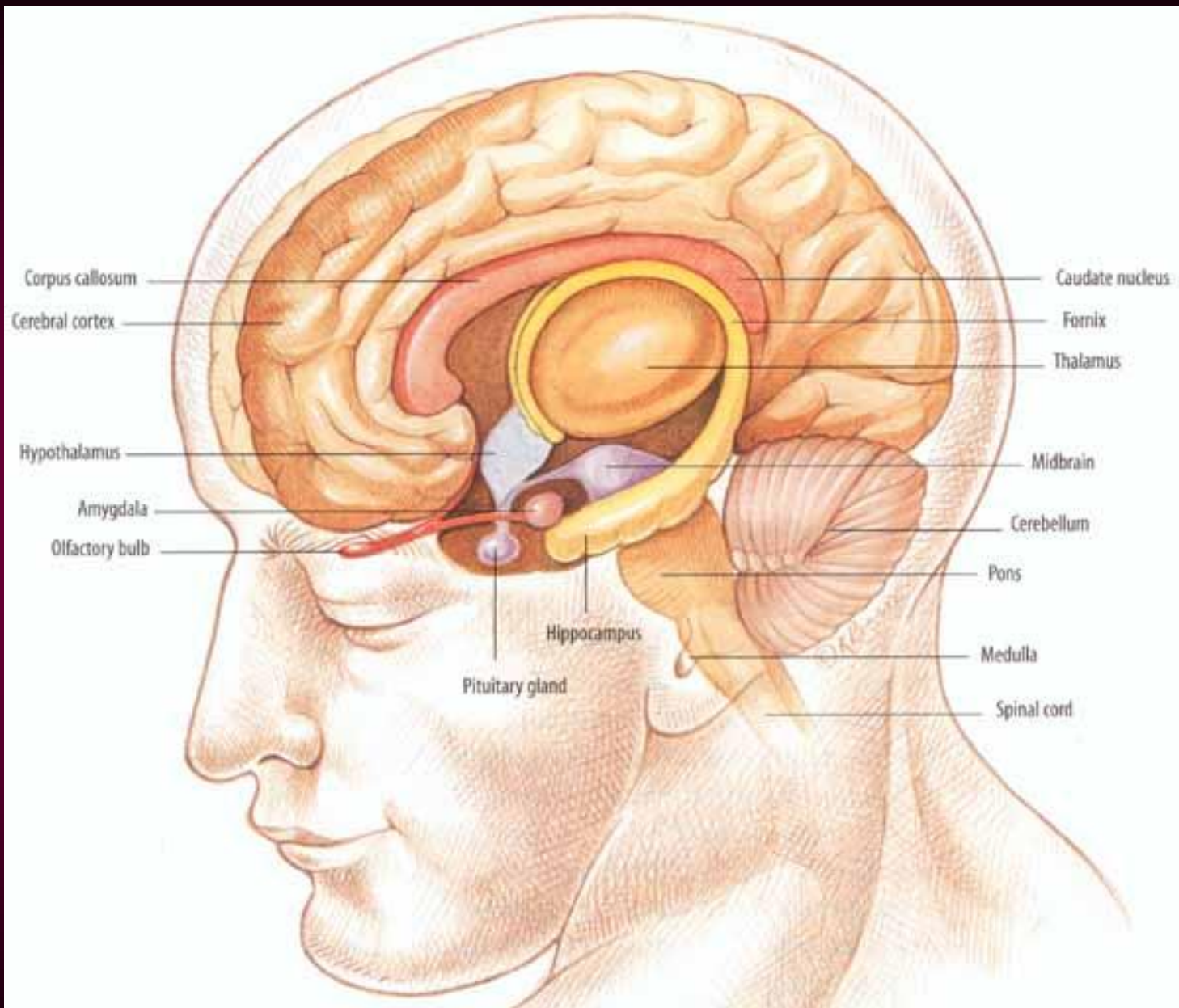


**Poor
Worker
Performance**

“In the brain, as in the economy, getting it right the first time is ultimately more effective and less costly than trying to fix it later. “

James Heckman
Nobel Laureate Economist

National Scientific Council
on the Developing Child, Perspectives:
The Cradle of Prosperity. (2006).
<http://www.developingchild.net>



ACEs Effect An Array of Brain Functions

Affect Regulation

Panic reactions, depression, anxiety, hallucinations

Somatic Issues

Sleep disturbances, severe obesity, pain

Substance Use

Smoking, alcoholism, illicit drug use, IV drug use

Sexuality

Early intercourse, promiscuity, sexual dissatisfaction

Memory

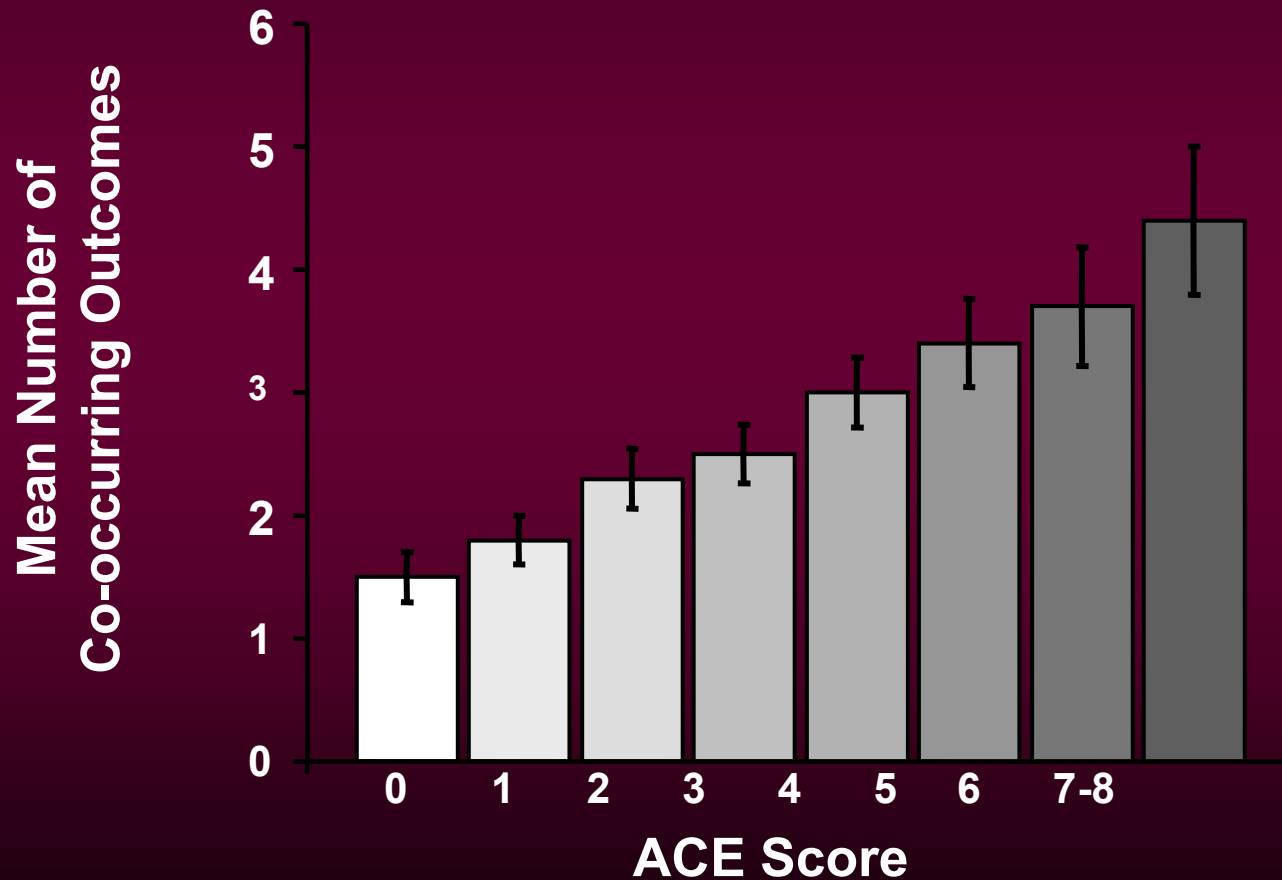
Amnesia (childhood)

Arousal

**High stress, problems with anger, perpetrating
domestic violence**

Neurobiology and Epidemiology Converge

*Complex Trauma—Trauma Spectrum Disorders
and the mean number of a **variety of problems***



ACEs appear to affect multiple brain systems and functions. This leads to multiple problems in different health and social domains.

Developmental Trauma Disorder

Adverse Childhood Experiences As a National Health Issue

ACEs have a strong influence on:

- adolescent health**
- reproductive health**
- smoking**
- obesity**
- alcohol abuse**
- illicit drug abuse**
- sexual behavior**
- mental health**
- risk of violence and revictimization**
- stability of relationships**
- performance in the workforce**

Adverse Childhood Experiences As a National Health Issue

ACEs increase the risk of:

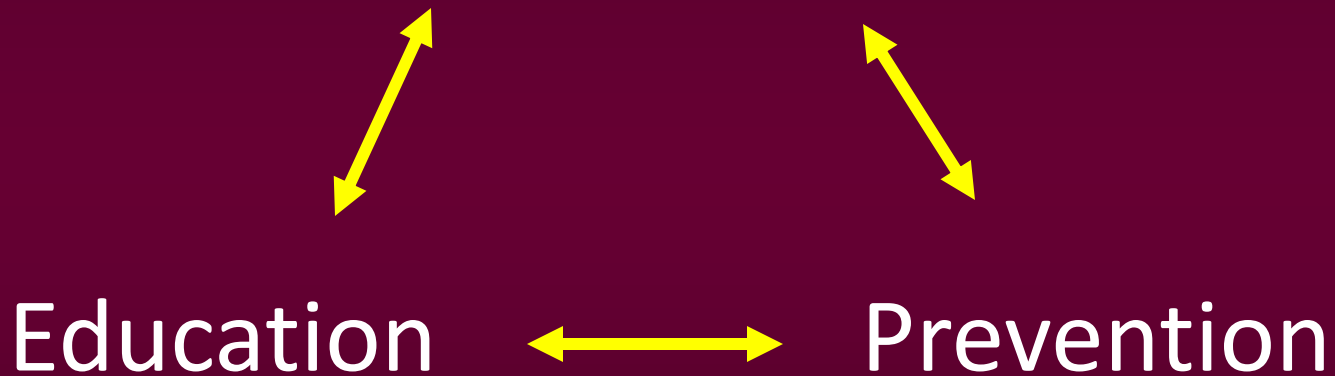
- Early death**
- Heart disease**
- Chronic Lung disease**
 - Lung cancer**
 - Liver disease**
- Autoimmune disease**
 - Suicide**
 - Injuries**
- HIV and STDs**
- other risks for leading causes of death**



Beham, (Hans) Sebald (1500-1550): Hercules slaying the Hydra, 1545 from The Labours of Hercules (1542-1548).

A Public Health Framework For Change

Treatment



*All must consider
Intergenerational transmission*

Bridging The Chasm



**Child
health
as it
stands
today**

**Intergenerational
Care**

**Consolidation and
Coordination**

**Child
and
adult
health
as it
could
be**

Bridging The Chasm



**Child
health
as it
stands
today**

**Breakthroughs
in molecular genetics
and neurobiology:
Mental illness
Substance abuse
Violence**

**Improved recognition
and treatment of:
Mental illness
Substance abuse
Domestic violence
Child abuse**

**Child
health
as it
could
be**

Bridging The Chasm

**Child
health
as it
stands
today**

**Mass education
about child
development &
parenting:**

**Media
Schools**

**Promoting Healthy
Neurodevelopment
through better early
childhood development
(Promoting Resilience)**

**Child
health
as it
could
be**

Bridging The Chasm



**Harnessing Brain Plasticity
To Overcome the Effects
of Adversity
(Resilience or Recovery)**

**Child
health
as it
stands
today**

**Child
health
as it
could
be**

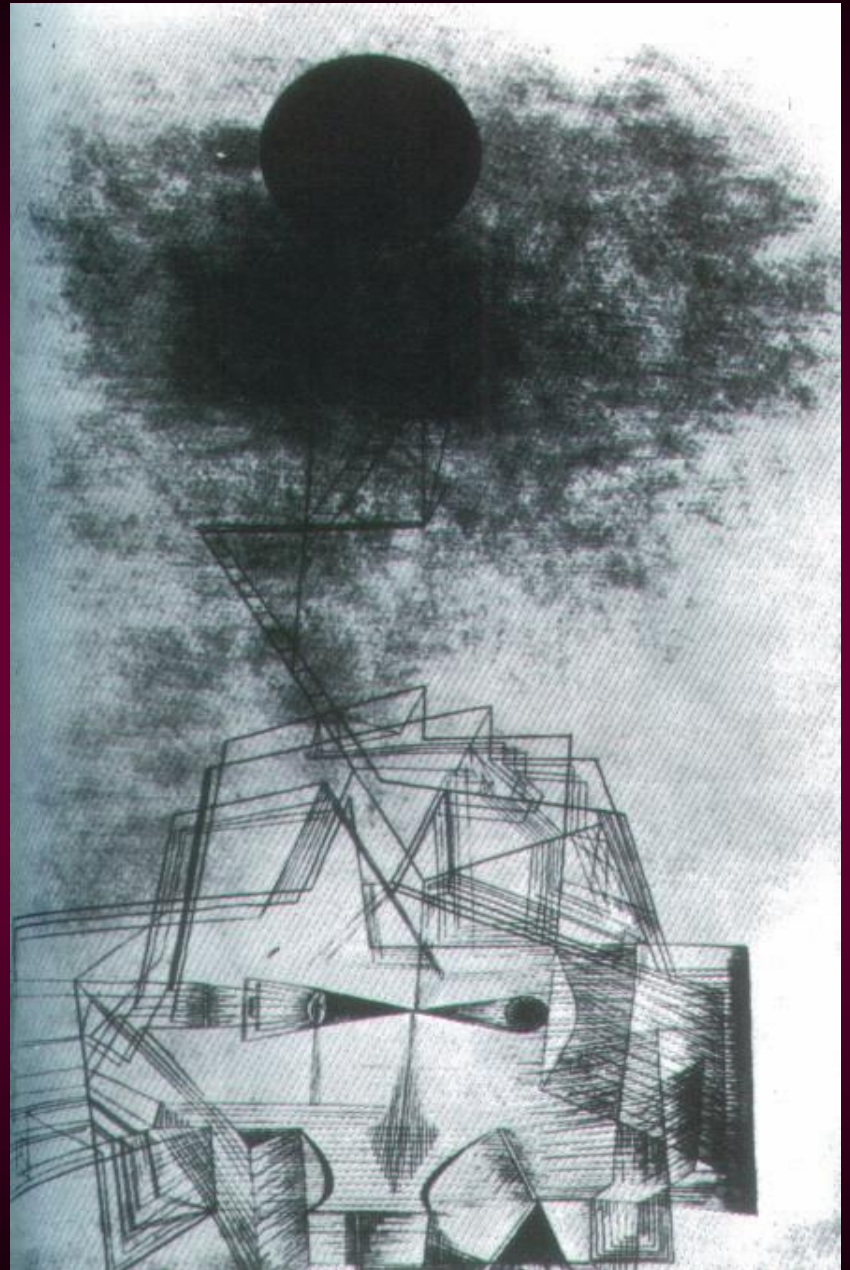
**Documenting the
societal burden of
child health as it
stands today**



**New directions
in prevention,
treatment, and
policy**

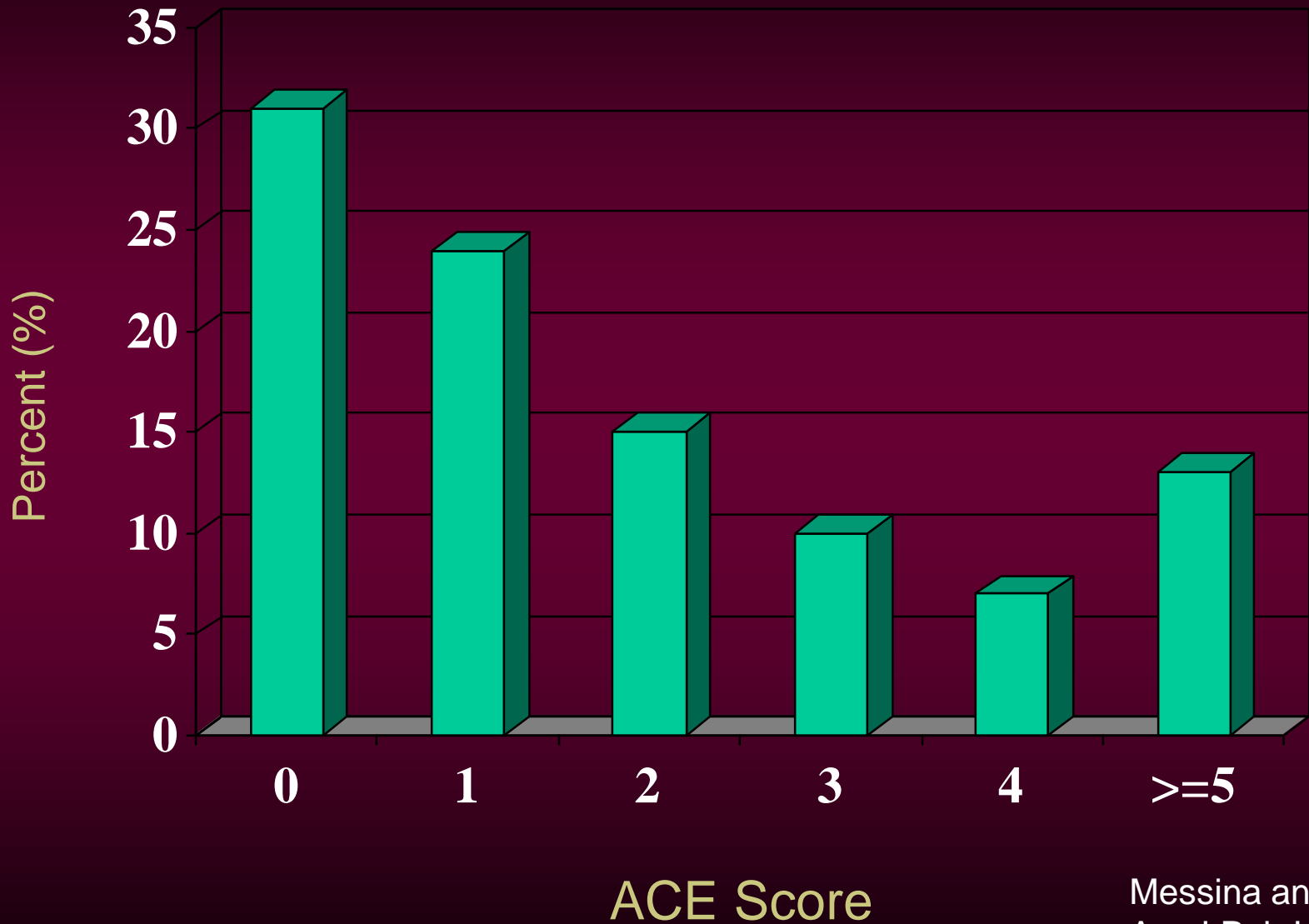
*Limits of
Understanding*

by Paul Klee
(1879-1940)



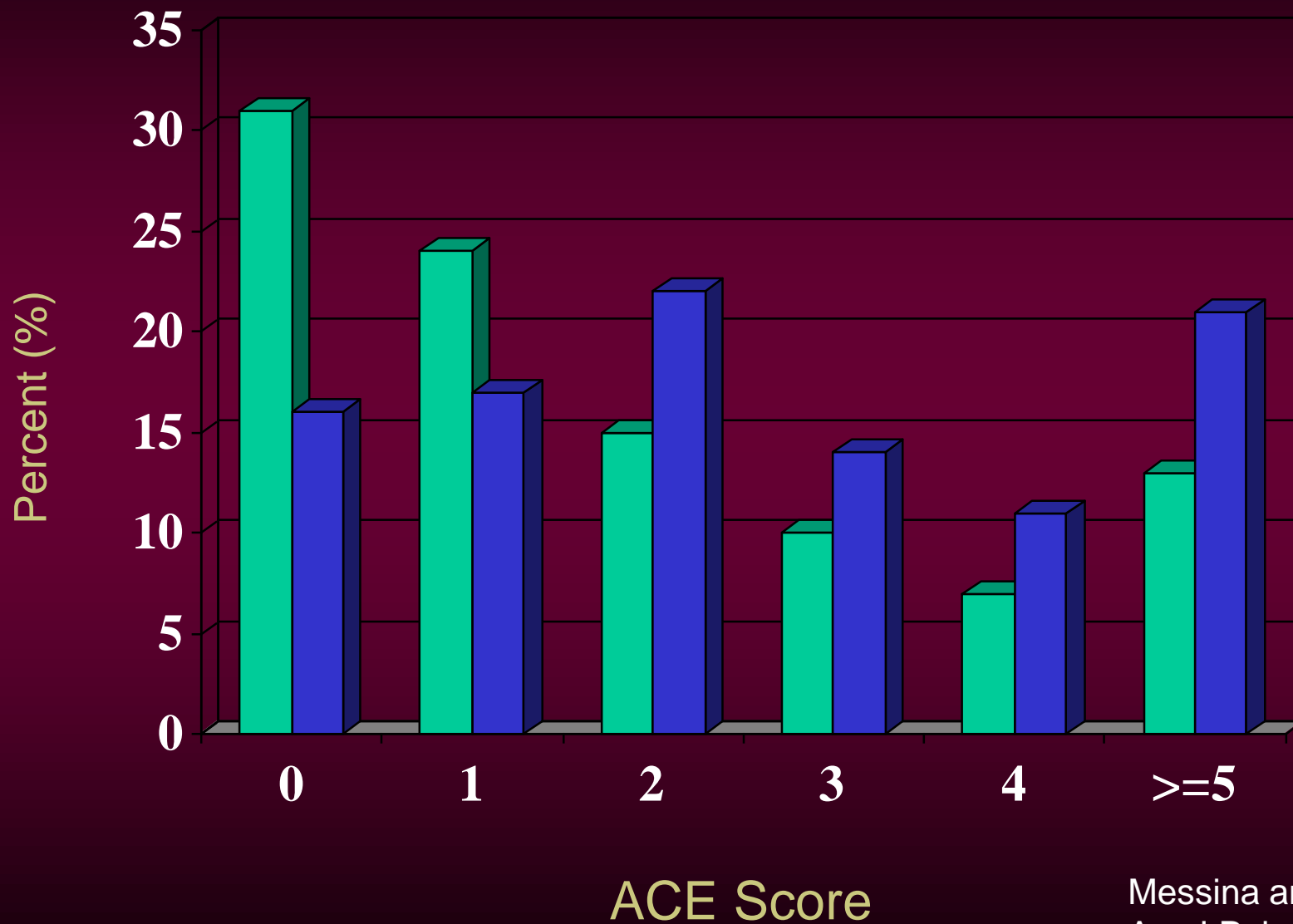
**..the prison pipeline
extends into adulthood**

ACE Scores Kaiser Health Plan



Messina and Greila
Am J Pub Health
October, 2006

ACE Scores Kaiser vs Adult Women In Prison



These Mediators Account for Most of the Effect of ACEs on Worker Performance

**Indicators of
Worker Performance**

**% Mediation by 4 Areas
of Health and Well-Being**

Absenteeism

50-67%

Serious Financial Problems

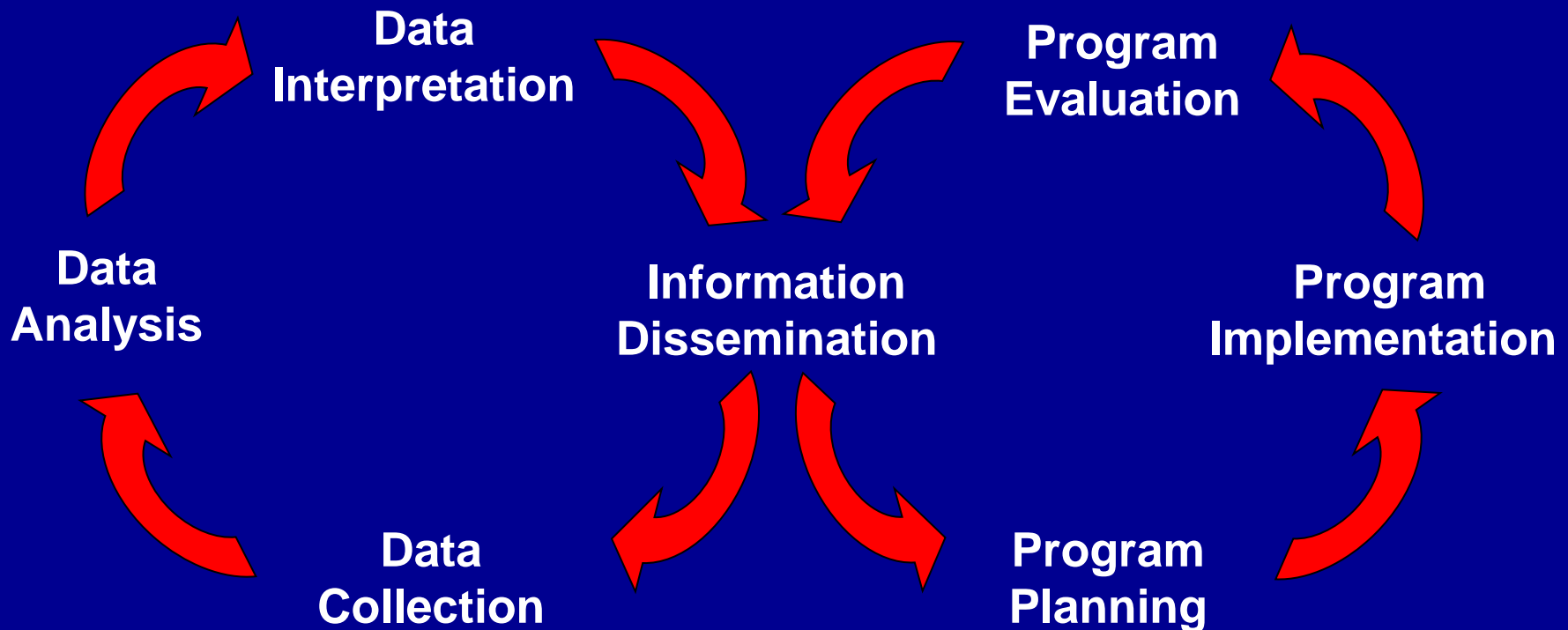
50-83%

Serious Job Problems

79-100%

Public Health Surveillance

Information for Program Applications



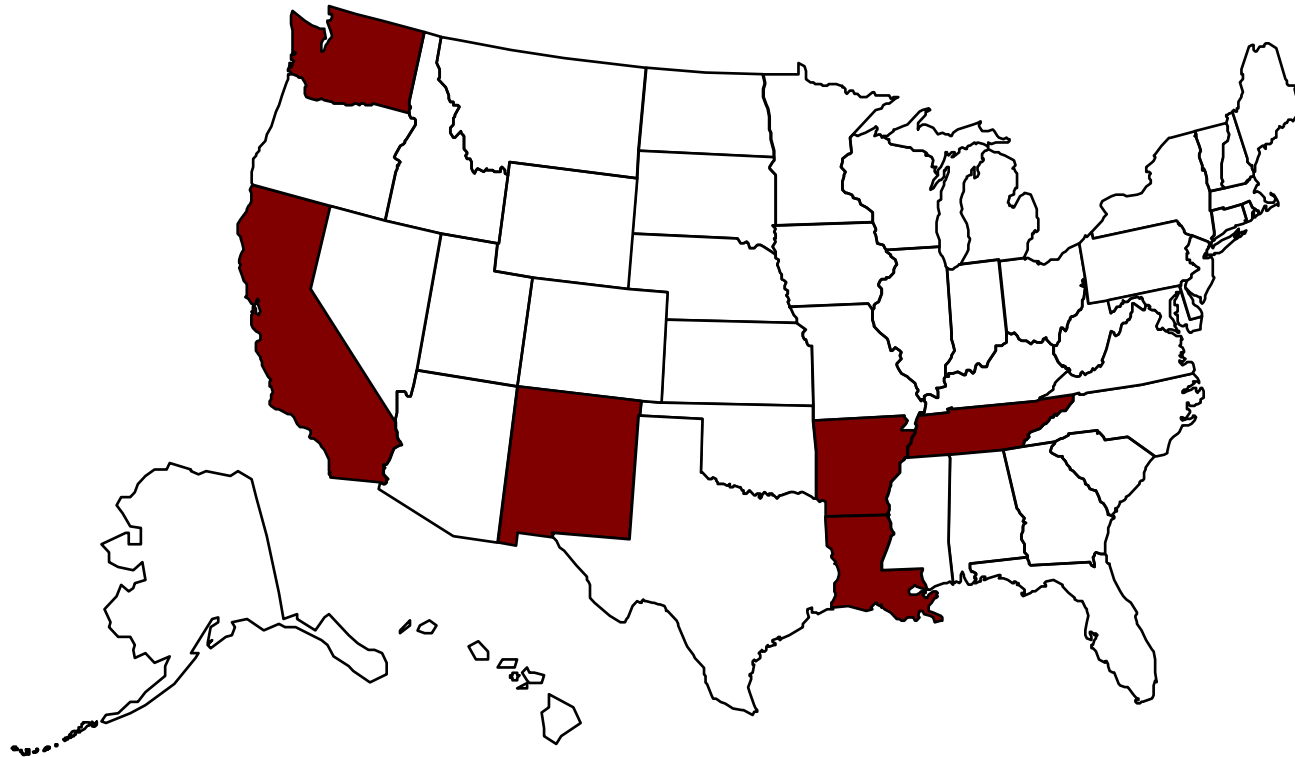
States With ACE Studies in 2008



No data

Source: Behavioral Risk Factor Surveillance System, CDC.

States With ACE Studies in 2009

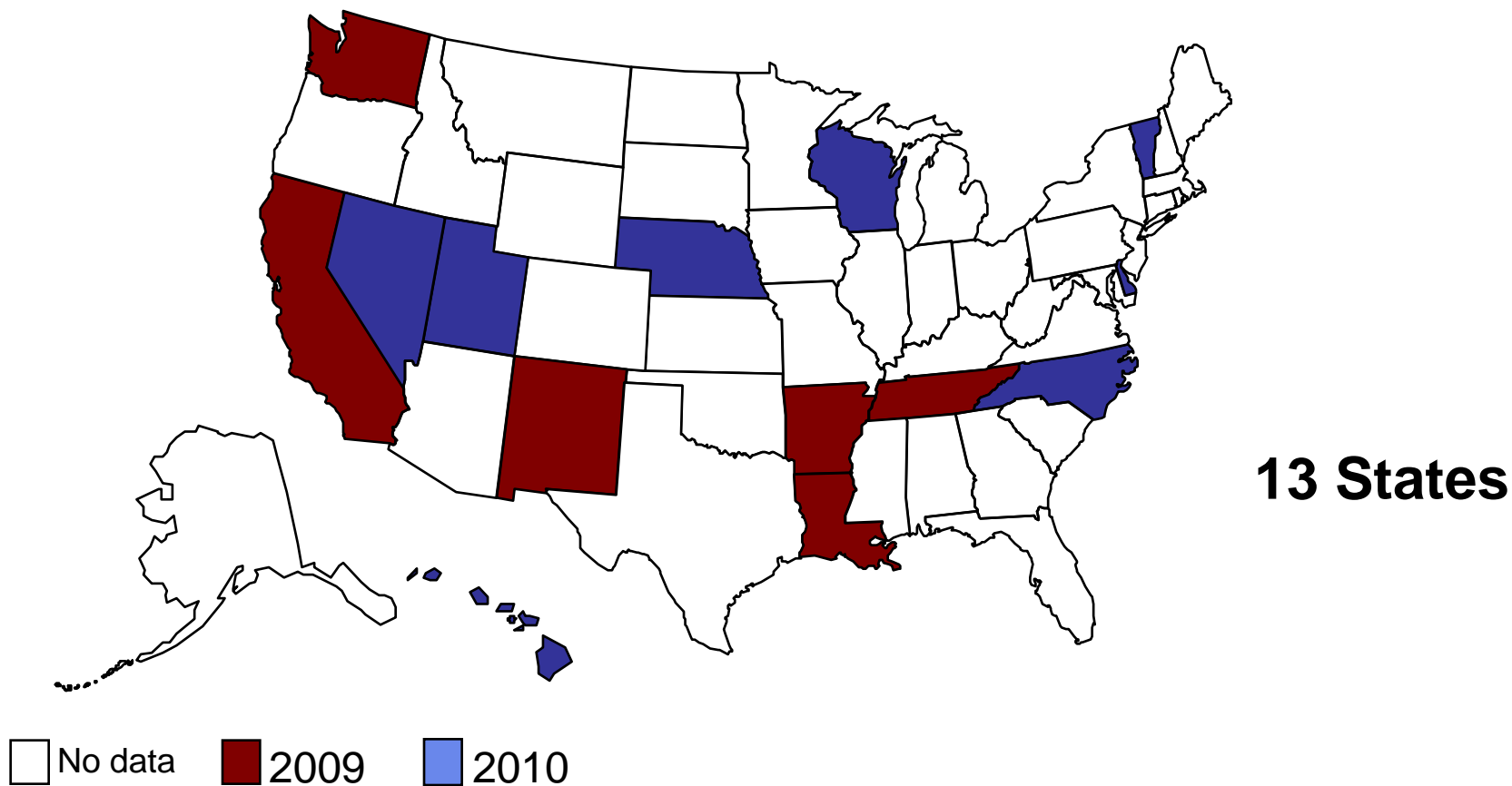


6 States

□ No data ■ 2009

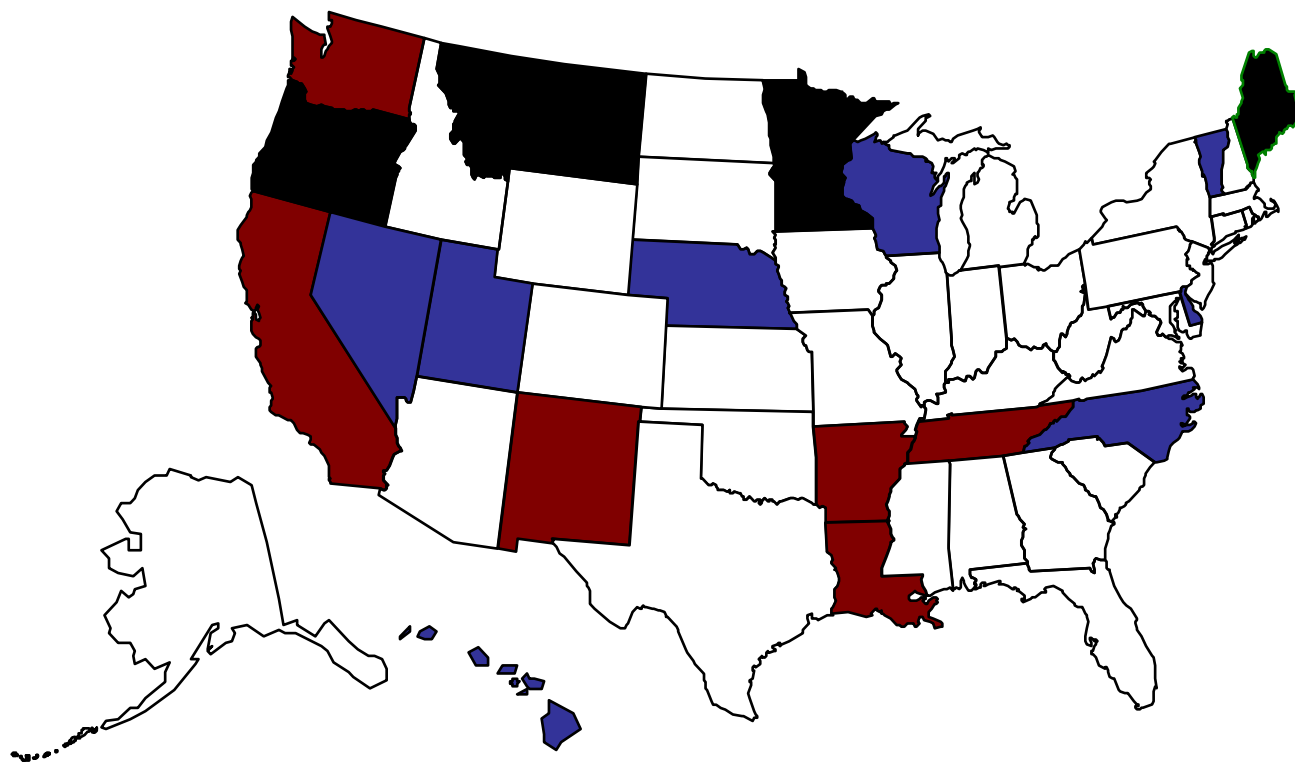
Source: Behavioral Risk Factor Surveillance System, CDC.

States With ACE Studies in 2009-2010



Source: Behavioral Risk Factor Surveillance System, CDC.

States With ACE Studies in 2009-2011



18 States

□ No data ■ 2009 ■ 2010 ■ 2011

Source: Behavioral Risk Factor Surveillance System, CDC.

ACEs: A Global Challenge



附录 1

童年期负性经历研究问卷¹

家庭健康史：女性

这些问卷引自应用于美国加利福尼亚州童年期负性经历研究的版本。其中一些条目（如社会人口学问题 1b, 3a, 3b, 教育问题 4, 11a, 11b）要根据当地情况进行调整。

- | | |
|-------------------------|--|
| 1. 你的出生日期？
_____年__月 | 5. 你目前的婚姻状况？
你现在…
<input type="checkbox"/> 已婚
<input type="checkbox"/> 没有结婚但与伴侣住在一起 |
| 1b. 你出生在哪个州？
_____州 | |

Adverse Childhood Experiences (ACE) and Health-Risk Behaviors among Adults in a Developing Country Setting

Bernadette J. Madrid and Laurie S. Ramiro

University of the Philippines Manila and Child Protection Unit Network Inc.

This study aimed to determine the relationship between adverse childhood experiences, health-risk behaviors and the occurrence of certain diseases, in a developing country setting. One thousand and sixty-eight (1,068) males and females aged 35 years and above, and residing in the selected urban communities in Quezon City, Philippines participated in the study. Using the Adverse Childhood Experiences (ACE) Questionnaires developed by the US Center for Disease Control and Kaiser Permanente, the results revealed that sexual abuse and having a smoker and an alcoholic in the home were the most common adverse experiences in childhood. The probability of being exposed to more than one category ranged from 7 percent to as high as 86 percent. Significantly more categories of exposure were found among males, those belonging to the middle socio-economic class and those who had lower levels of education. This present study revealed that certain health-risk behaviors occur even with only a single exposure or two. The results also show that just about two types of exposures can result in various diseased conditions.

Key words: adverse childhood experiences, health-risk behaviors, developing country, Philippines

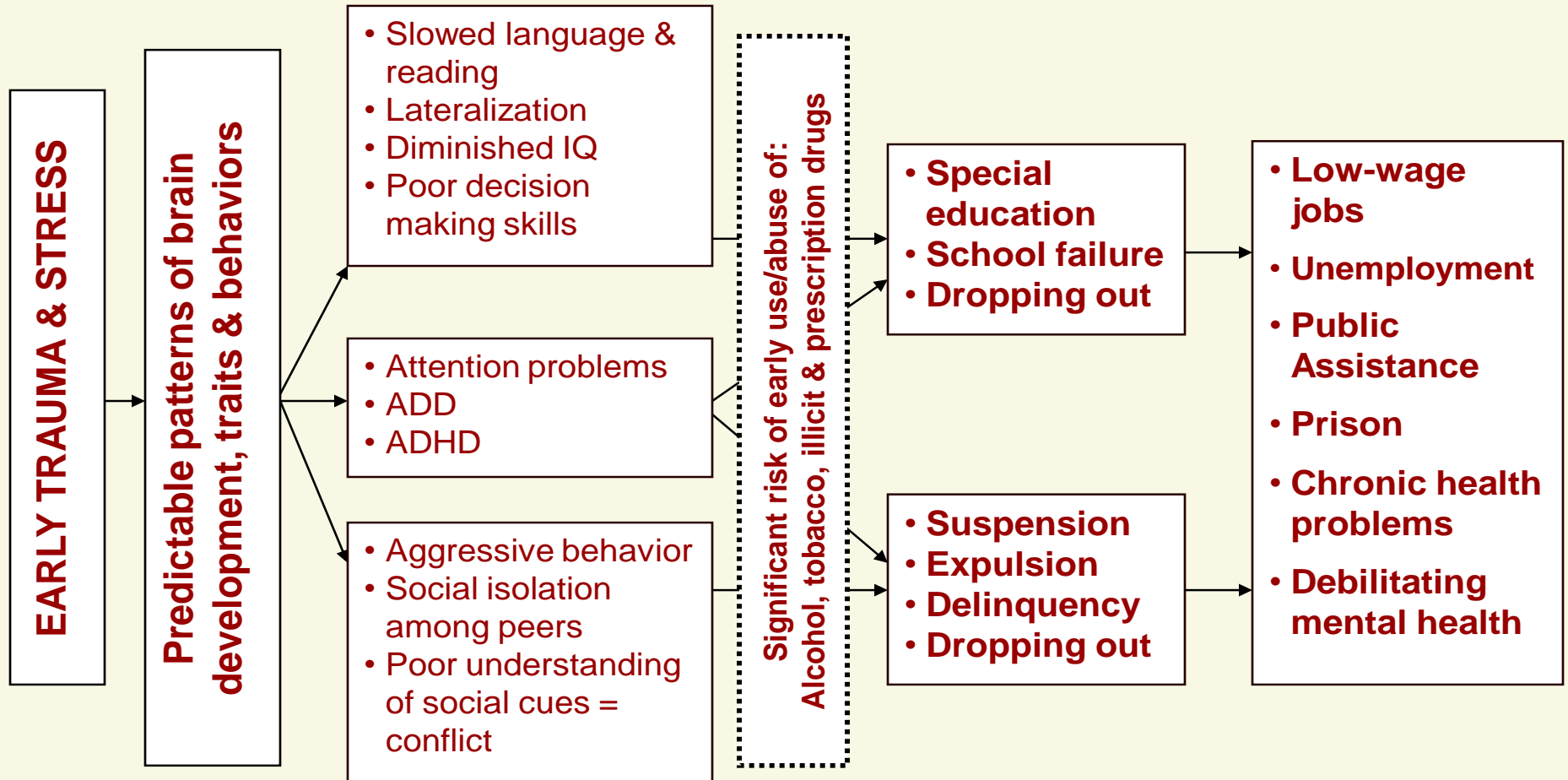
Costs of the Status Quo

Health Care

Corporations and the Workforce

Criminal Justice

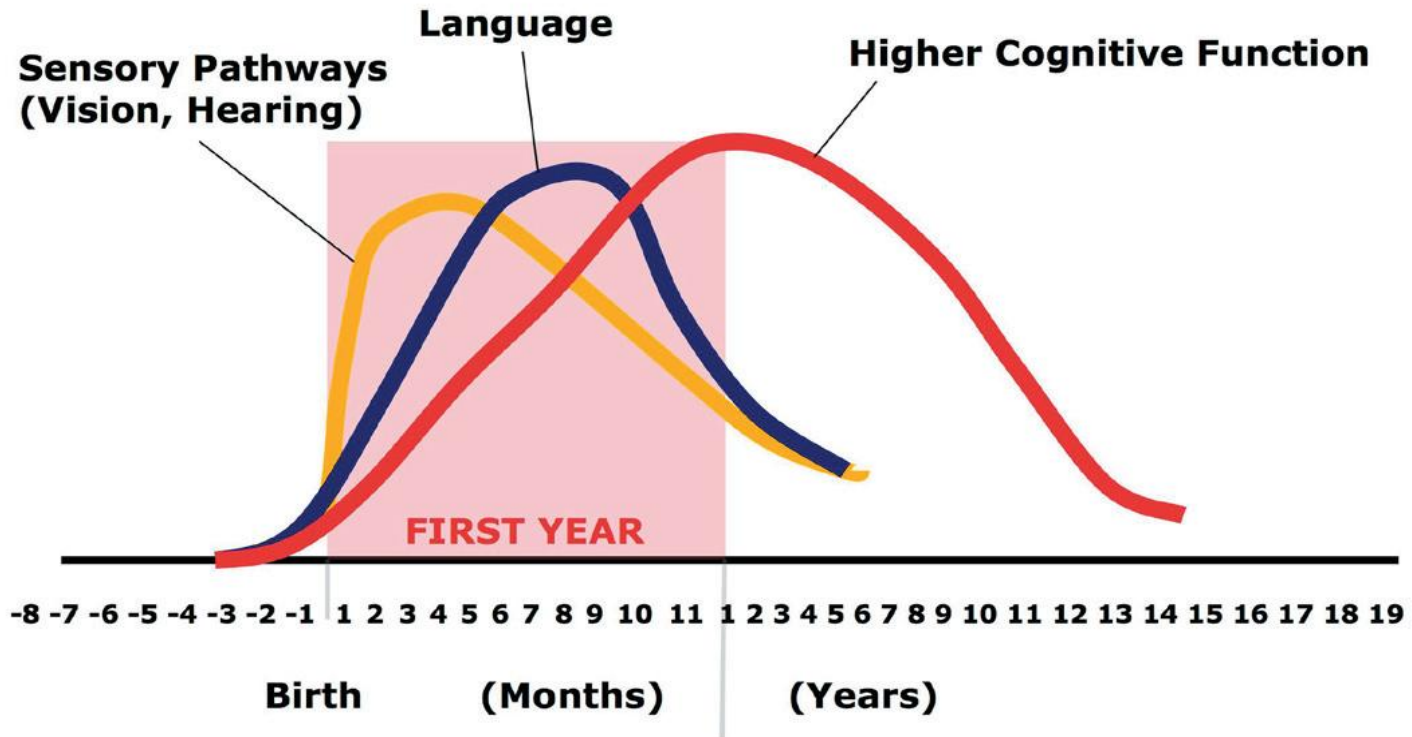
THE FAST TRACK TO POVERTY



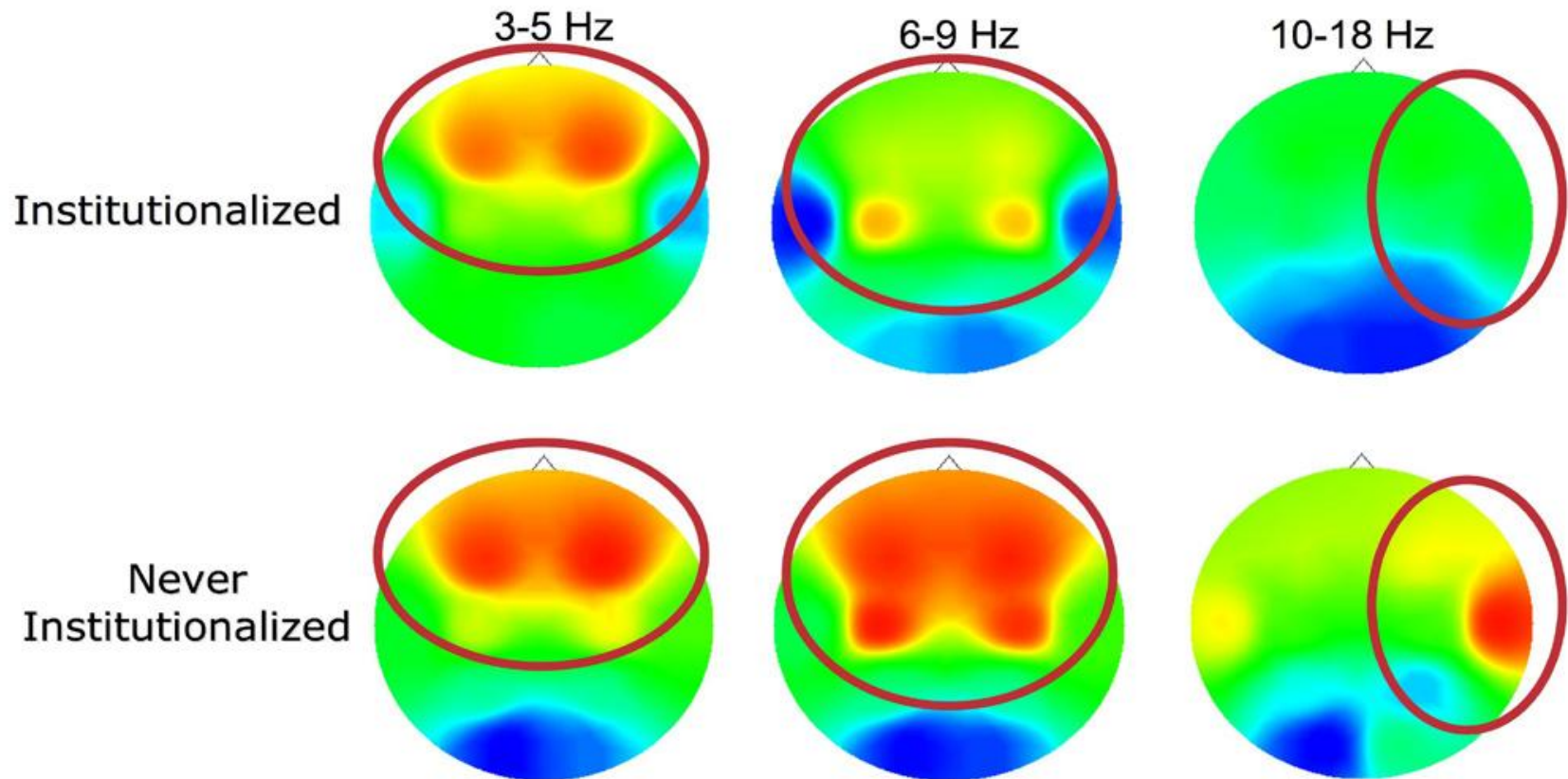


Human Brain Development

Neural Connections for Different Functions Develop Sequentially



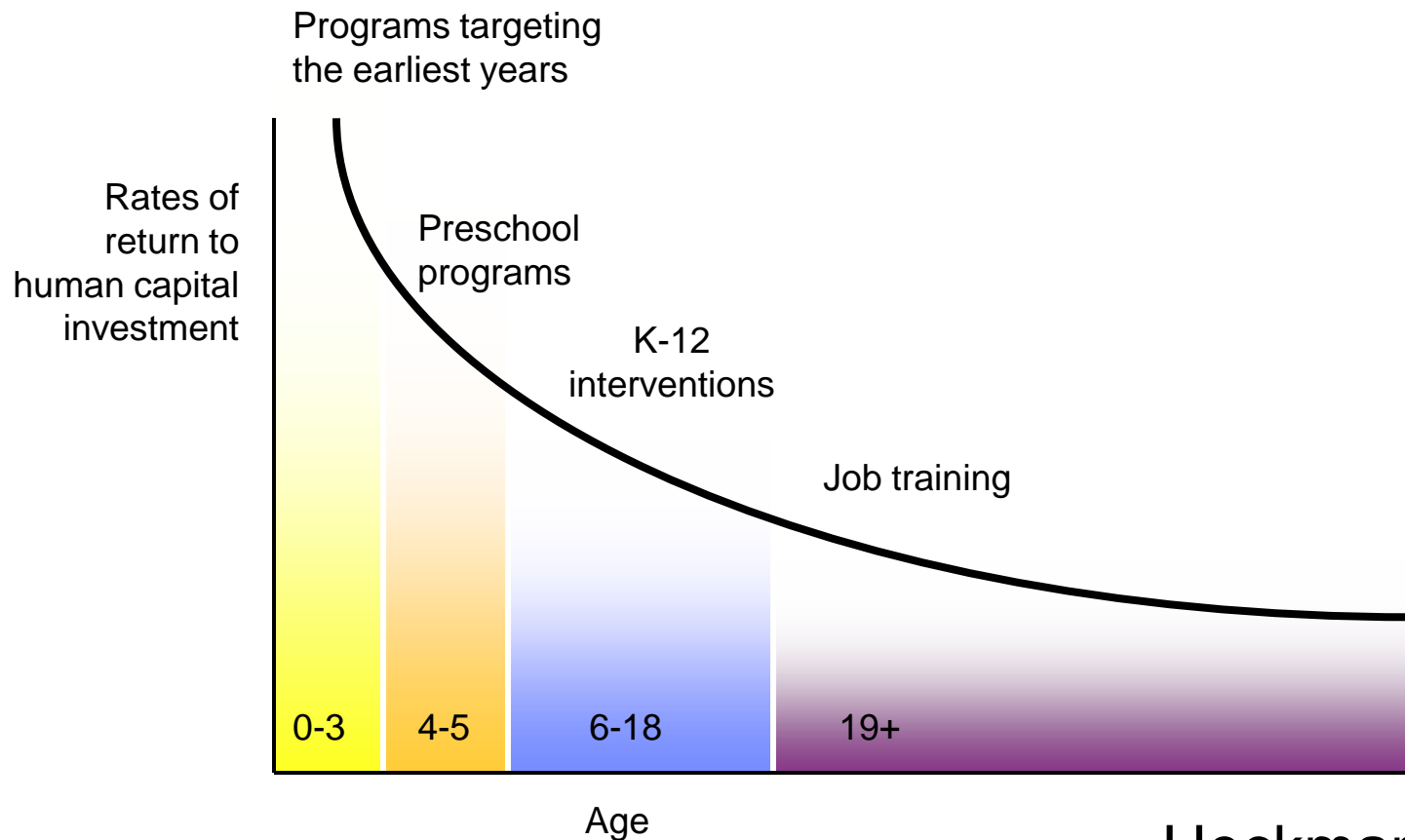
Extreme Neglect Diminishes Brain Power



Source: C. A. Nelson (2008); Marshall, Fox, & the BEIP Core Group (2004).

The brain's activity can be measured in electrical impulses—here, “hot” colors like red or orange indicate more activity, and each column shows a different kind of brain activity. Young children institutionalized in poor conditions show much less than the expected activity.

Preventive Intervention is More Efficient and Produces Higher Returns than Later Remediation



Heckman, J. (2007)