ACES, TOXIC STRESS AND THE LIFE COURSE MODEL

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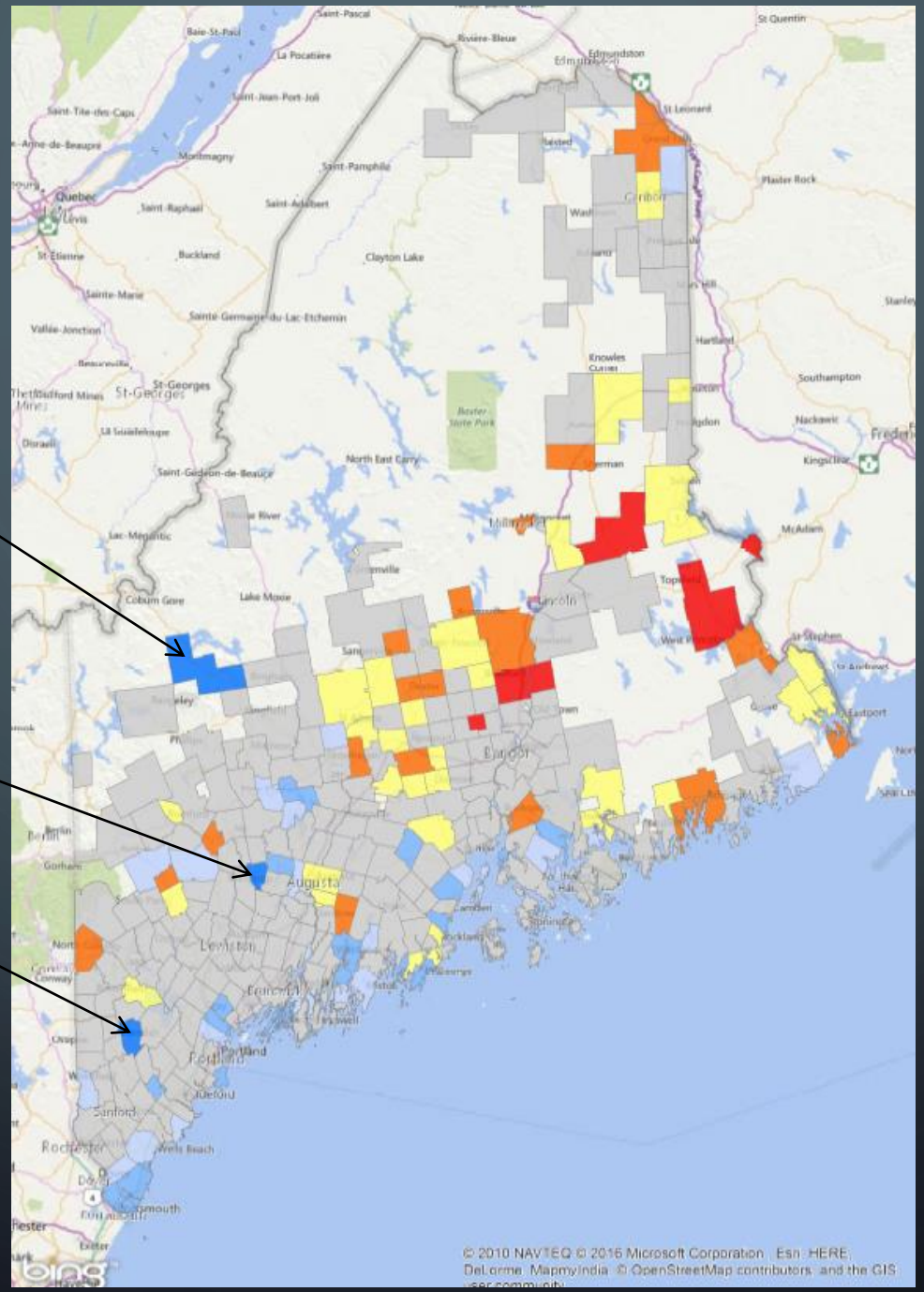
Aggregated to 10,000 Population-years

LE = 85.1
Carrabassett Valley
Coplin
Eustis
Wyman

LE = 83.8
Wayne

LE = 86.6
Limington



LE by Area, 2001-2010

Difference from state (yrs.)

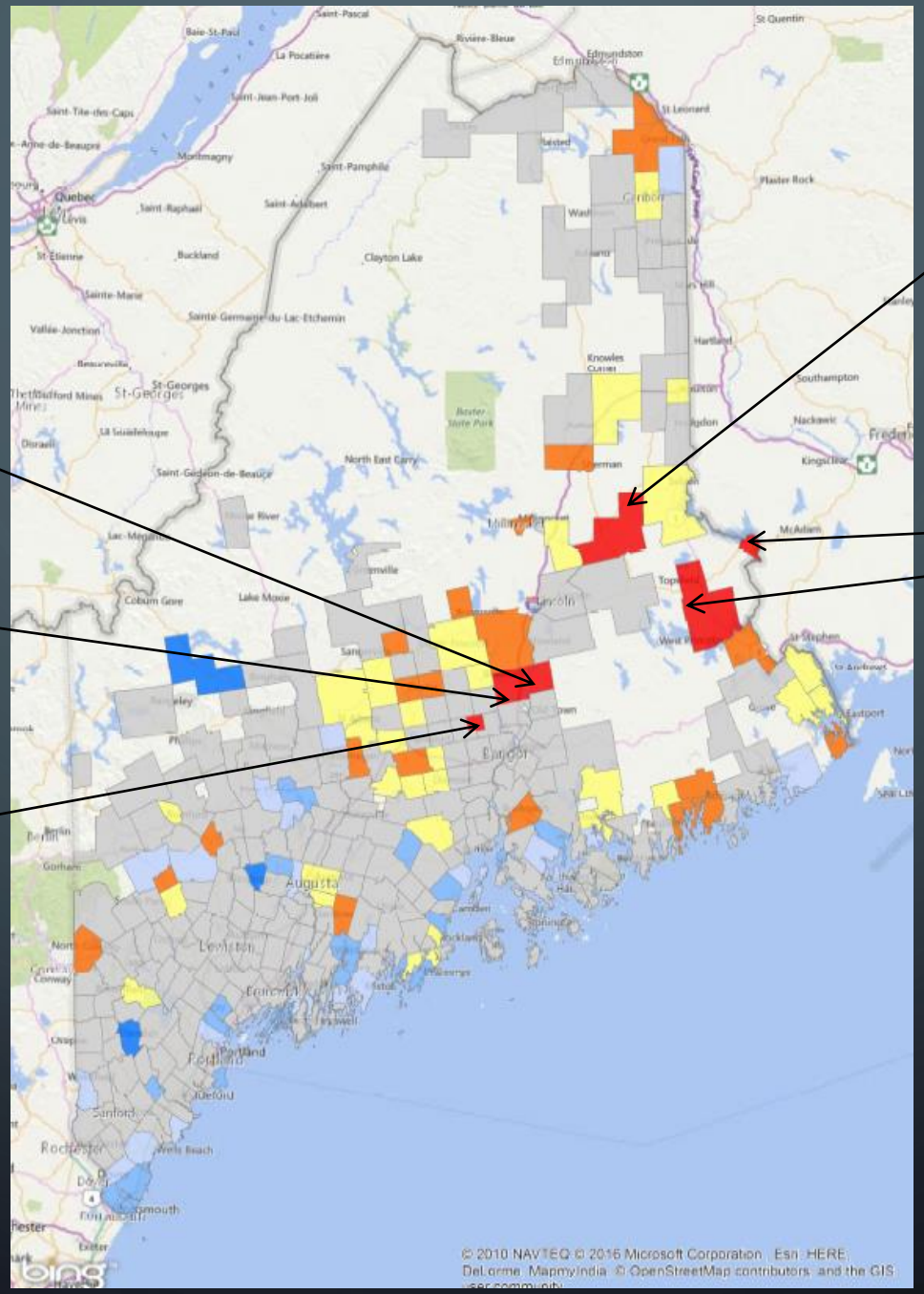
- -6.9 to -5.0
- -4.9 to -3.0
- -2.9 to -2.1
- -2.0 to +2.0
- 2.1 to 3.0
- 3.1 to 5.0
- 5.1 to 8.1

Aggregated to 10,000 Population-years

LE = 72.2
Greenbush

LE = 73.0
Alton
Argyle

LE = 73.2
Kenduskeag



LE = 71.6
Macwahoc
Mattawamkeag
Kingman
Drew
Reed

LE = 72.3
Grand Lake Stream
Talmadge
Topsfield
Vanceboro
Waite
Passamaquoddy Indian Twp

LE by Area, 2001-2010

Difference from state (yrs.)

- -6.9 to -5.0
- -4.9 to -3.0
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- 2.1 to 3.0
- 3.1 to 5.0
- 5.1 to 8.1

KEY QUESTIONS

- Why are some groups more likely to suffer from cardiovascular disease, HIV, or cancer?
- Why are some patients more or less likely to adhere to treatment regimens?
- Why does life expectancy vary based on where you live?
- Why do health disparities exist and persist across population groups?
- What are the factors that influence the capacity of individuals or populations to reach their full potential for health and well-being?

1. Explain how early life experiences influence long-term health and development
2. Discuss the key concepts of ACES, toxic stress and life course theory
3. Discuss “social determinants of health” and provide examples of determinants impacting the health of individuals
4. Construct ways to apply understanding of ACES and life course theory to practice

EPIDEMIOLOGY AND SOCIAL EPIDEMIOLOGY

- Epidemiology: The study of the distribution and causes of diseases
- Social Epidemiology: Study of societal factors that determine patterning of disease within and across populations
  - How society "gets into the body."
  - Is there any epidemiology that is *not* social?
    - Social variation in what is being studied

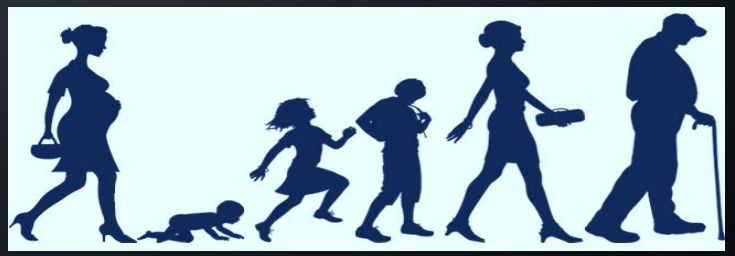
SOCIAL EPIDEMIOLOGY DEFINITION

- Social epidemiology focuses on the social factors contributing to incidence or prevalence of disease (as opposed to the physical or biological).
- Branch of epidemiology that studies the social distribution and social determinants of states of health

Berkman and Kawachi, 2000

LIFE COURSE THEORY

- Health develops along a continuum, not disconnected unrelated stages.
- Health outcomes result from the interplay of social, economic, and environmental factors mixed with biological, behavioral and psychosocial issues.
- Interplay occurs across a person's life and have cumulative affect.



KEY CONCEPTS OF LIFE COURSE THEORY (T2E2)

- **Timeline** – health is cumulative and longitudinal
- **Timing** – health and health trajectories are particularly affected during critical/sensitive periods.
- **Environment** – the broader environment affects health and development.
- **Equity** – health inequality reflects more than genetics and personal choice.

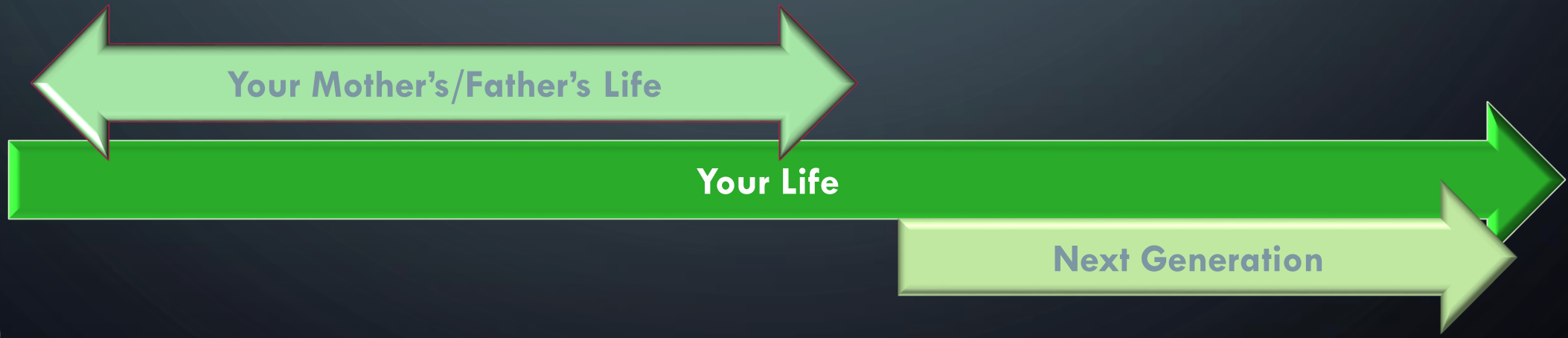
– Fine and Kotelchuck

LIFE COURSE THEME #1:
TIMELINE

- Health develops over a lifetime
- Health improves or diminishes based in part on exposures to risk and protective factors.
- There are cumulative and longitudinal impacts on an individual's life span and across generations.

TIMELINE

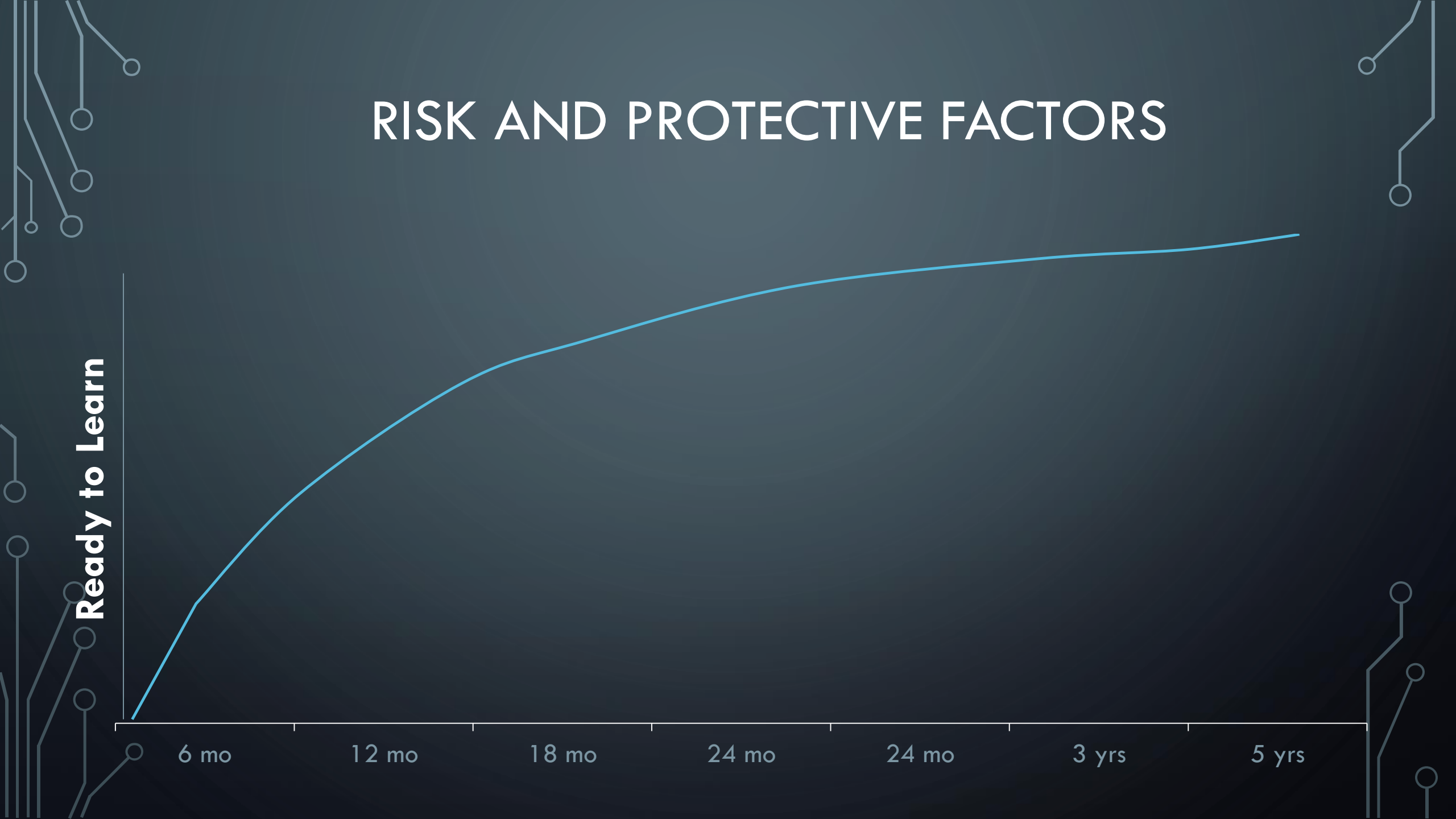
- Special attention is placed on the relationship between the health of parents and the health of their children



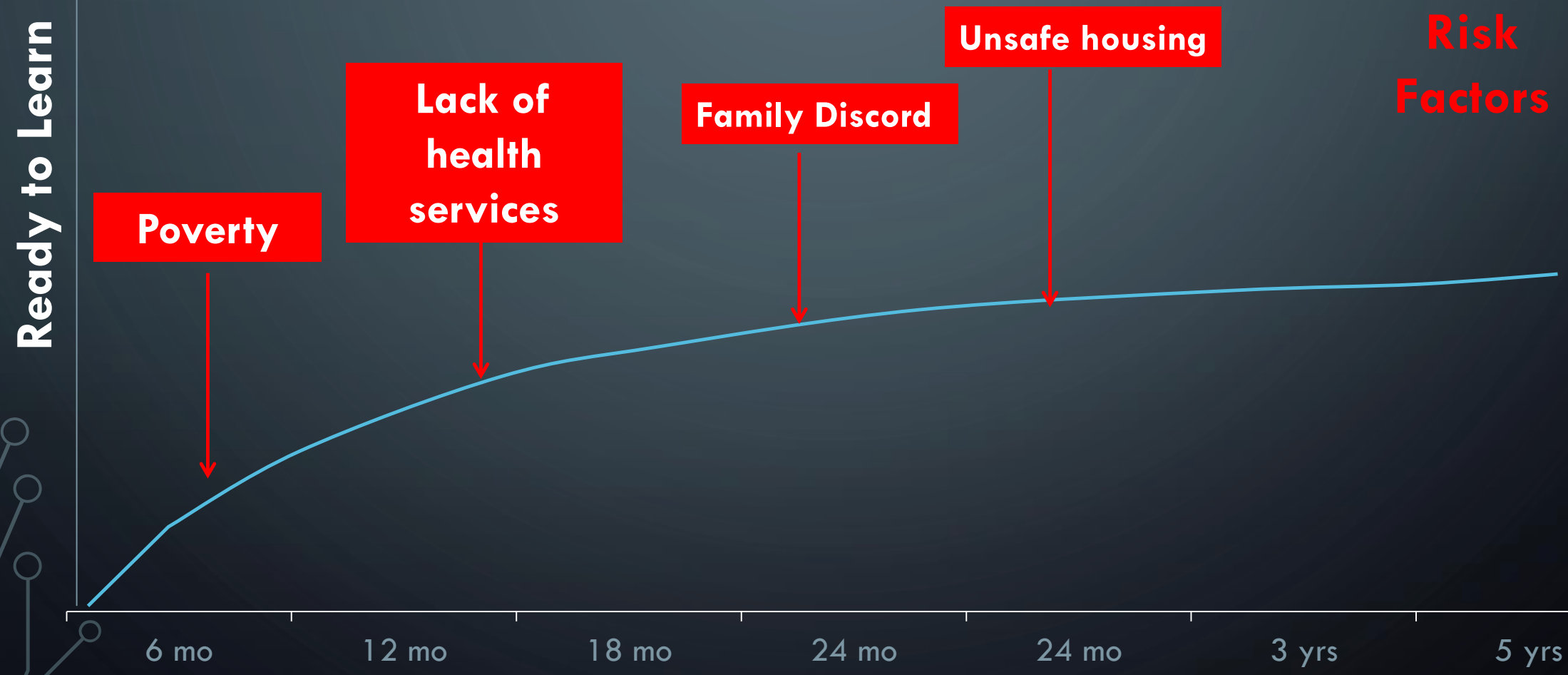
CUMULATIVE EFFECTS

Chronic stress results in wear and tear on the body's adaptive systems, leading to declining health and function over time.

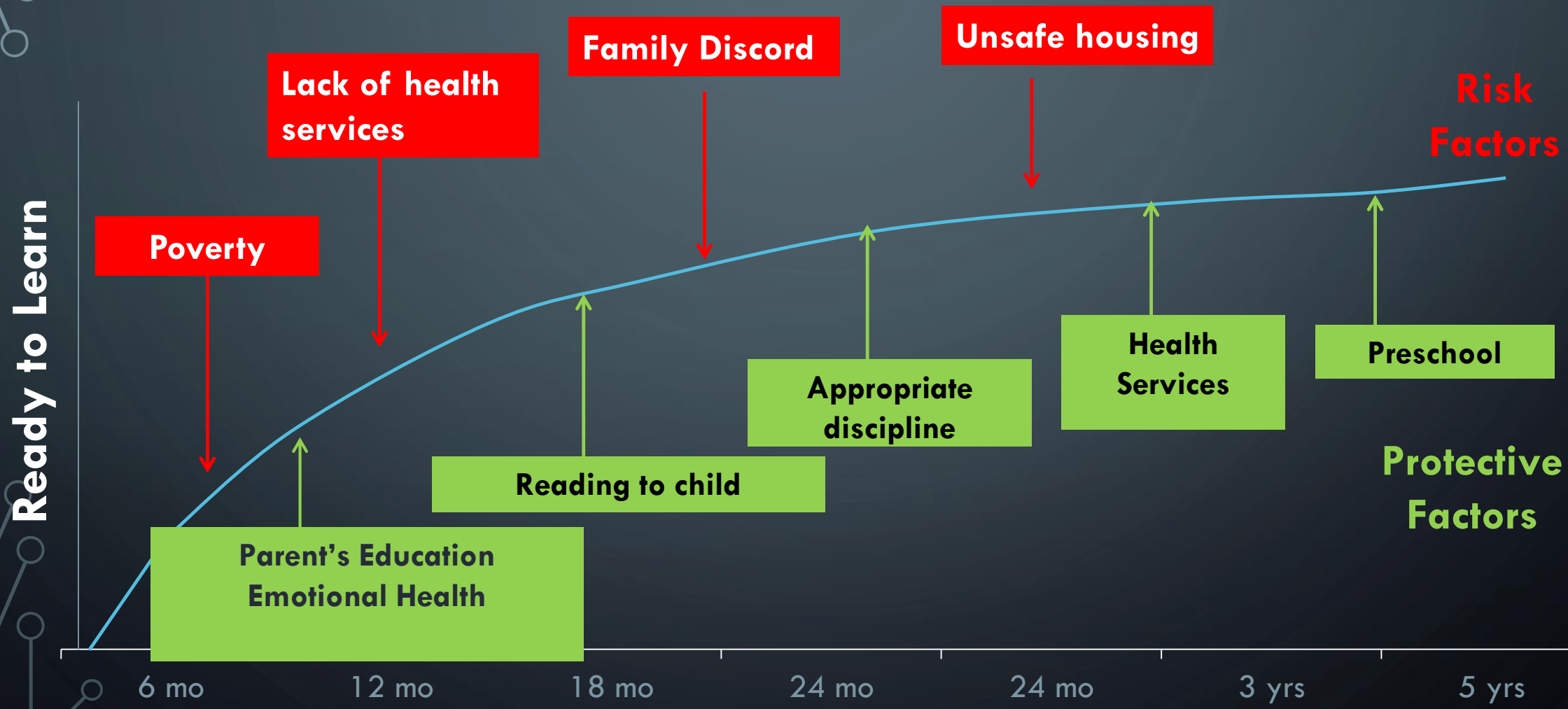
RISK AND PROTECTIVE FACTORS



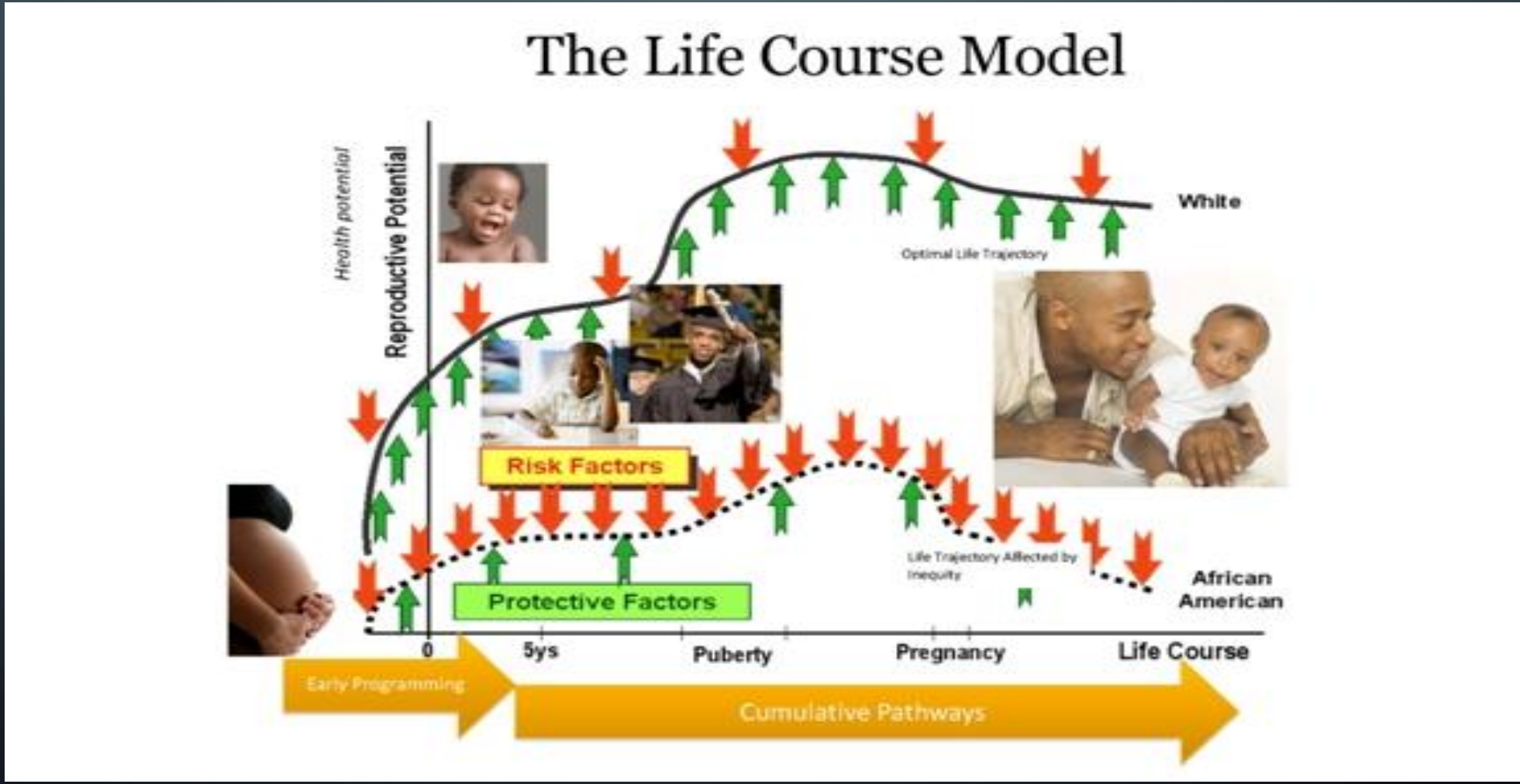
RISK AND PROTECTIVE FACTORS



RISK AND PROTECTIVE FACTORS



RISK AND PROTECTIVE FACTORS AND HEALTH DISPARITIES



Lu MC, Halfon N. Racial and ethnic disparities in birth outcomes: a life-course perspective.
Maternal Child Health J. 2003;7:13-30.

ADVERSE CHILDHOOD EXPERIENCES (ACE)

- Study by Robert Anda and Vincent Felitti
- https://www.ajpmonline.org/article/S0749-3797(98)00017-8/abstract
- https://www.cdc.gov/violenceprevention/childabuseandneglect/acestudy/aboutace.html

ACE STUDY RESULTS

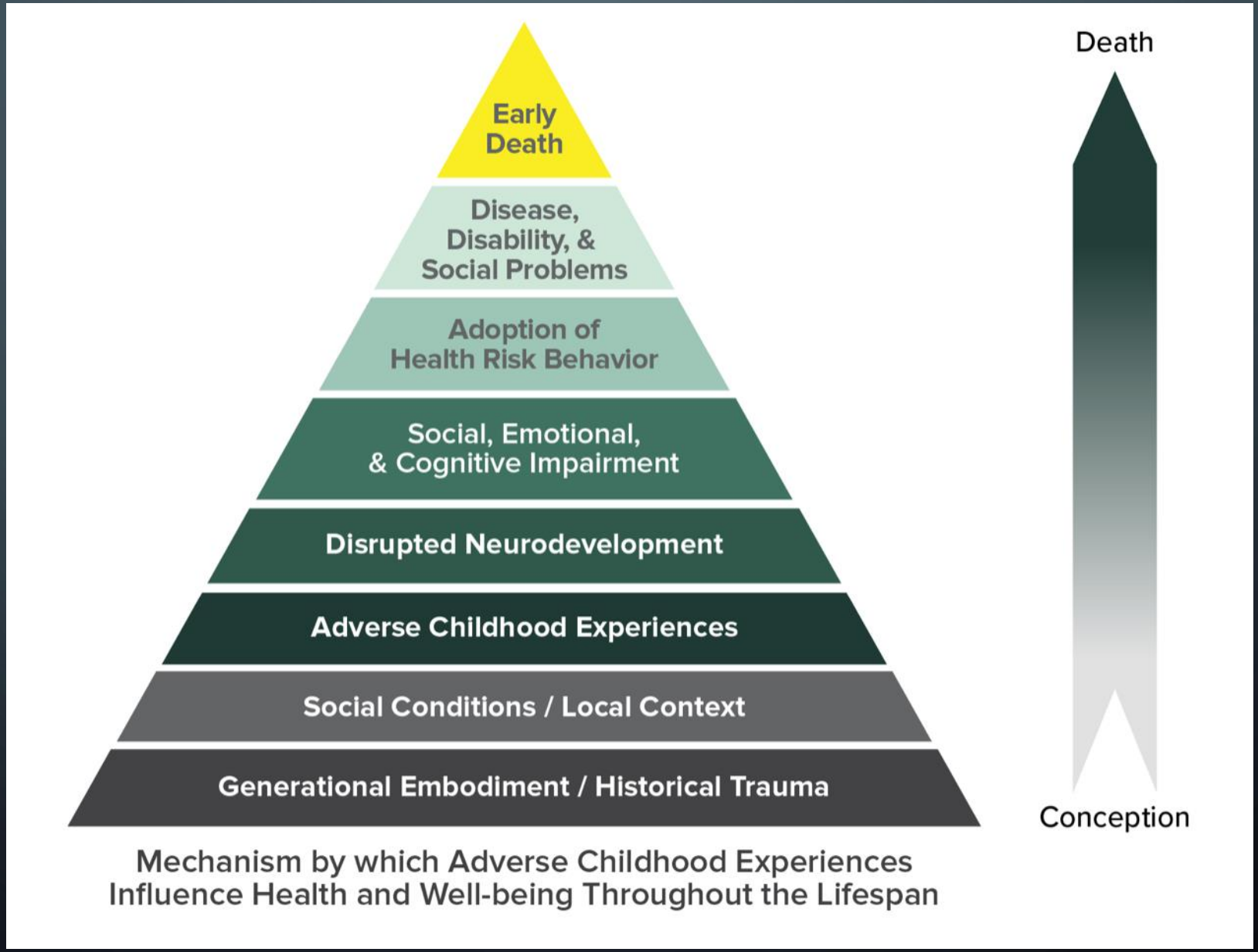
- More than half (almost 2/3) had at least one ACE
- 1 in 8 had four or more ACEs
- Average pediatrician will see 2-4 children with an ACE score of 4 or more each day

ACES AND HEALTH FINDINGS

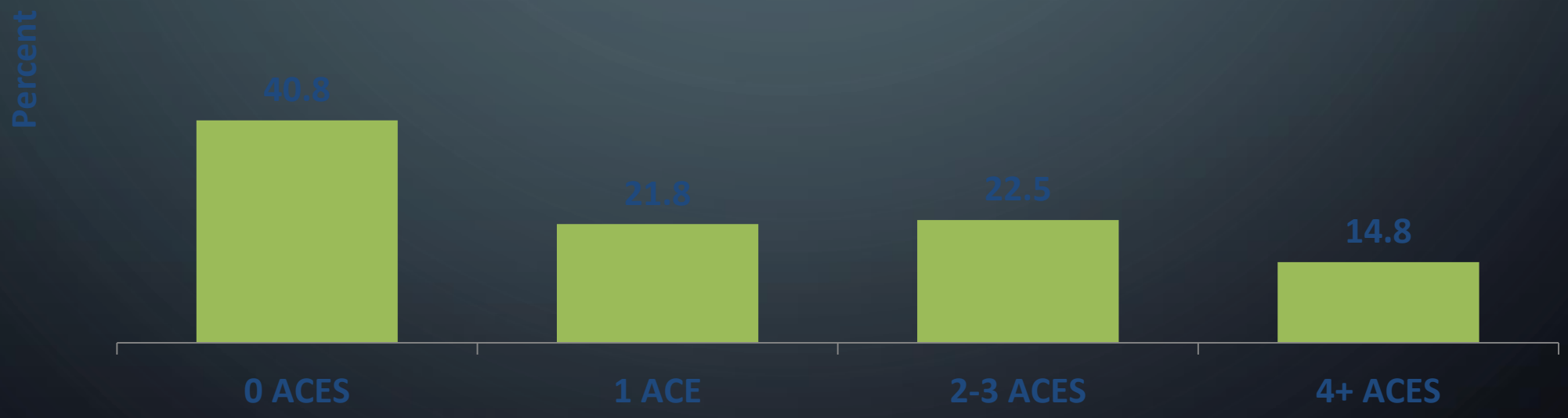
- Chronic obstructive pulmonary disease
- Depression
- Fetal death
- Health-related quality of life
- SUD
- Ischemic heart disease
- Liver disease
- Poor work performance
- Financial stress
- Poor academic adhievement
- Risk for interpersonal/intimate partner and sexual violence
- Multiple sexual partners
- Sexually transmitted diseases
- Smoking
- Suicide attempts
- Unintended pregnancies
- Early initiation of smoking and sexual activity
- Adolescent pregnancy

https://www.cdc.gov/violenceprevention/acestudy/about.html

RELATIONSHIP BETWEEN ACES AND HEALTH



SIXTY PERCENT OF MAINE ADULTS HAVE EXPERIENCED AT LEAST ONE ACE

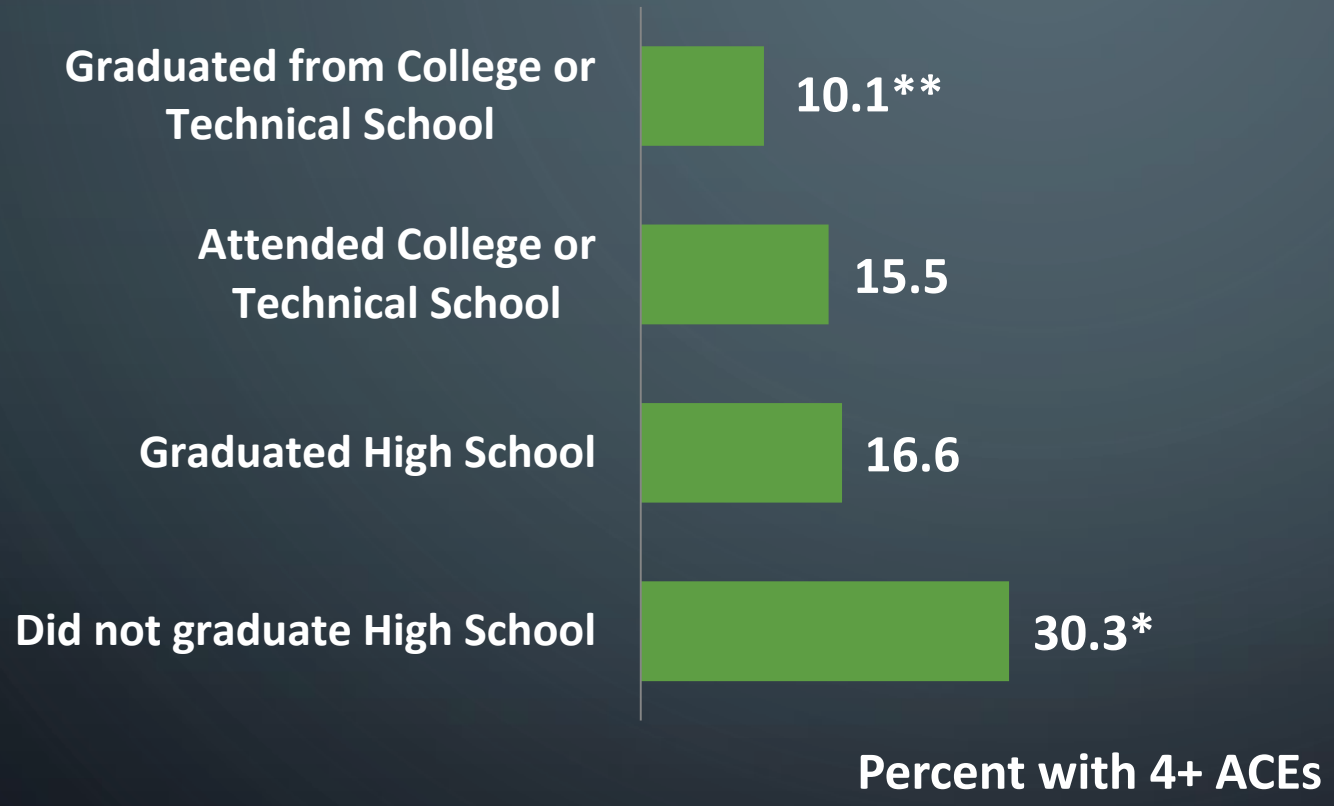


BRFSS, 2010

THOSE WITH LOWER INCOMES ARE MORE LIKELY TO HAVE 4+ ACES

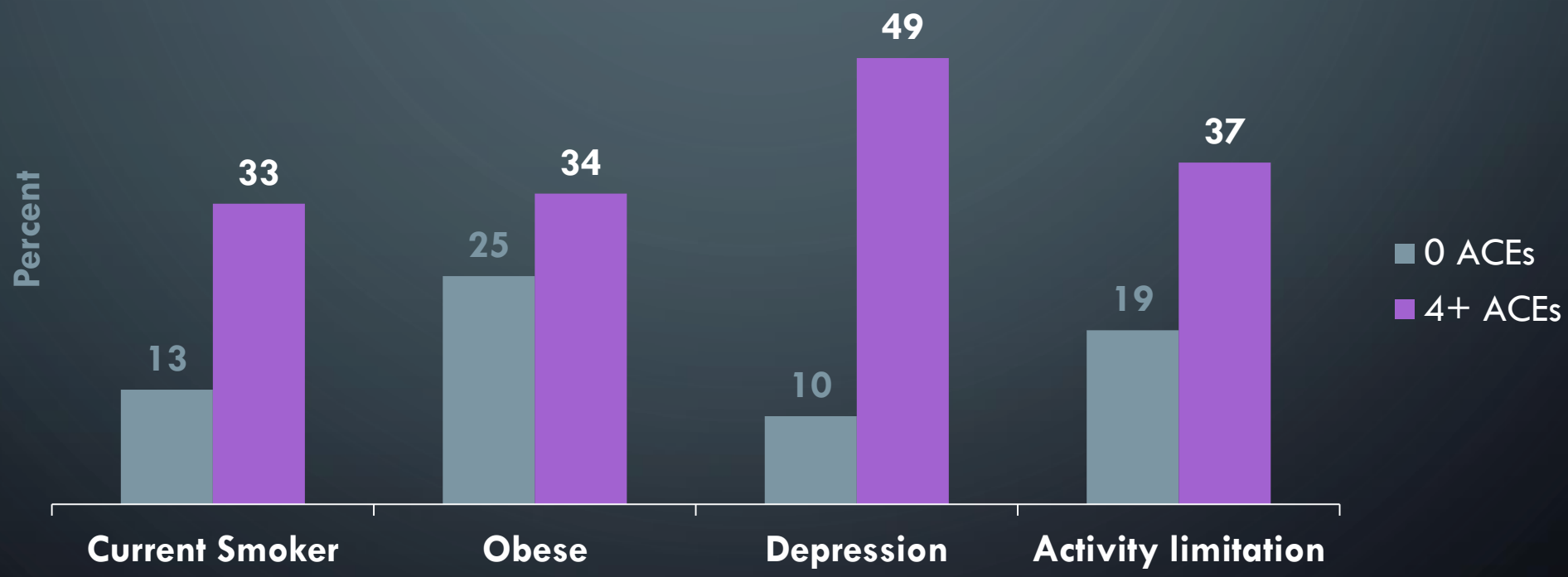
*Statistically significantly higher than income groups over $25,000.

ADULTS WITH 4+ ACES ARE LESS LIKELY TO HAVE A HIGH SCHOOL EDUCATION

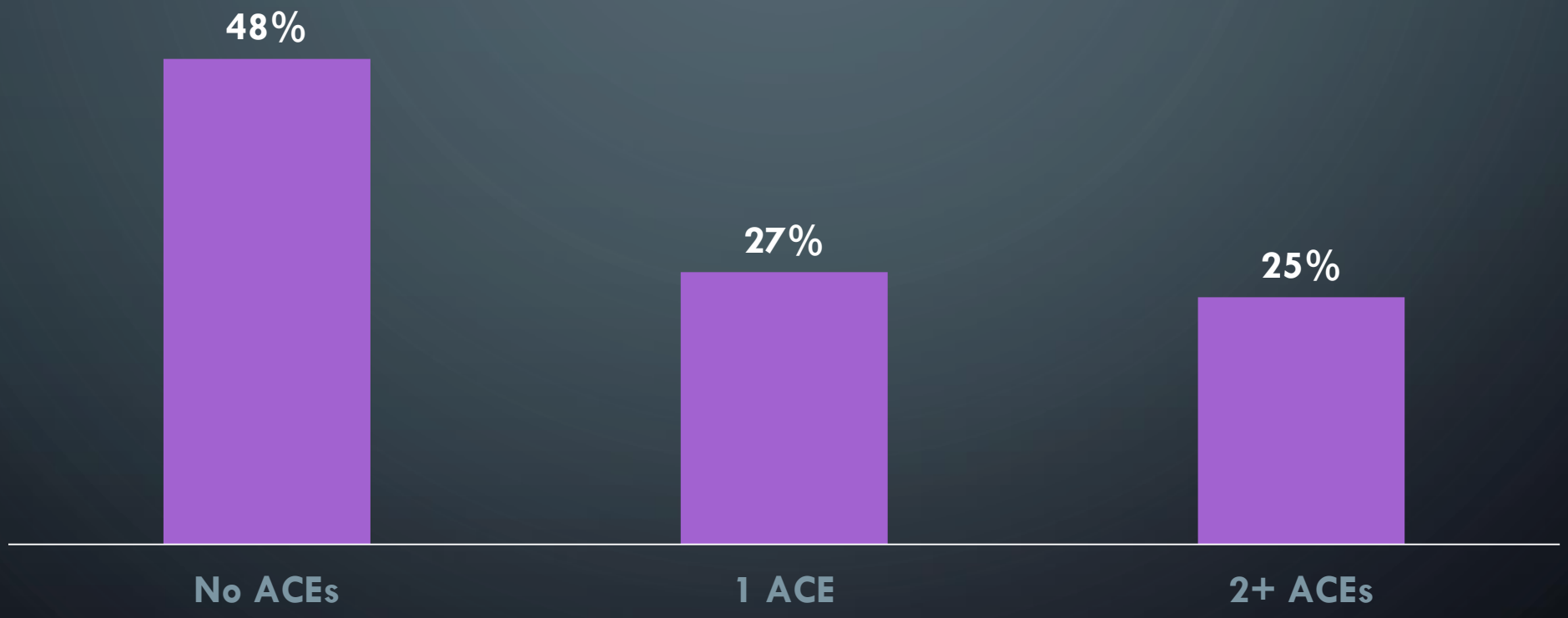


*Statistically significantly higher than all other education groups.
** Statistically significantly lower than all other education groups..

THOSE WITH 4+ ACES ARE MORE LIKELY TO HAVE POOR HEALTH



1 IN 4 MAINE CHILDREN HAVE 2 OR MORE ACES

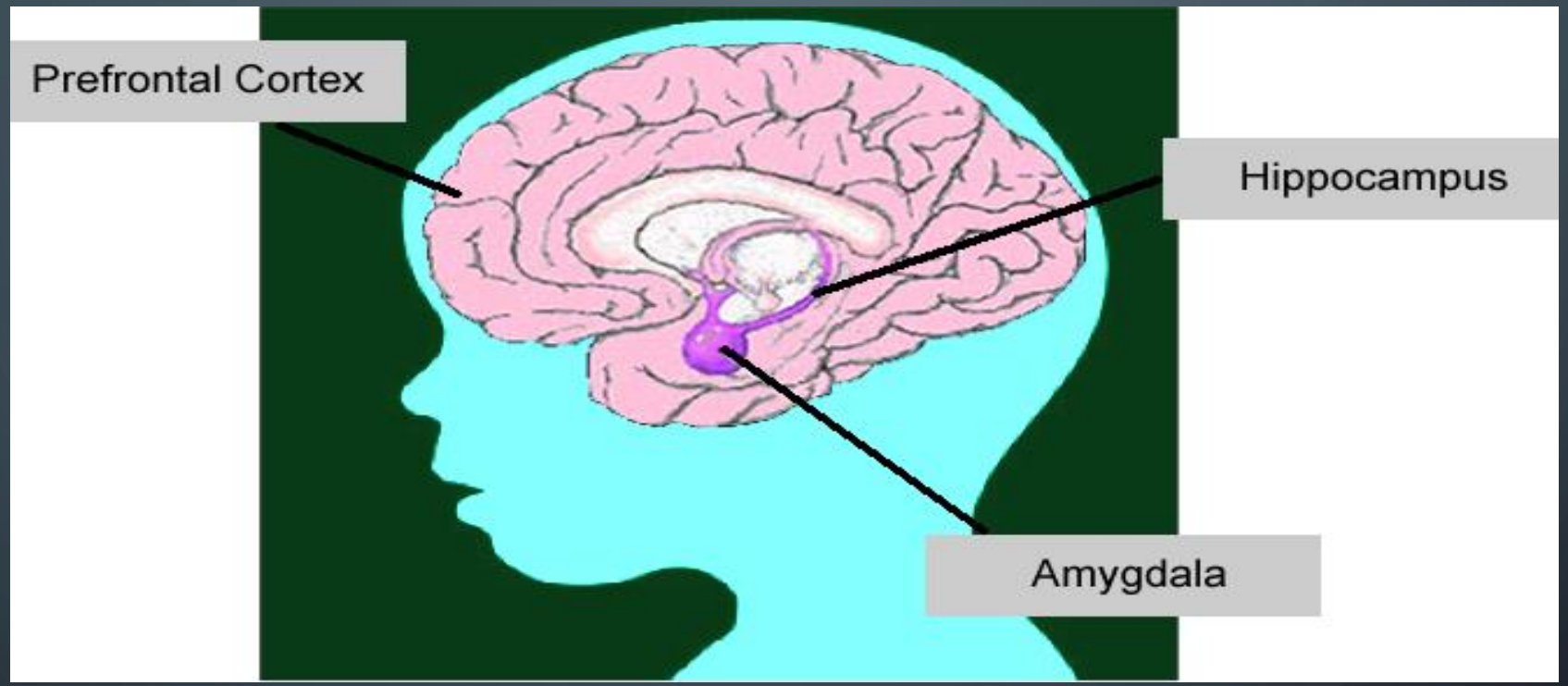


NSCH, 2016

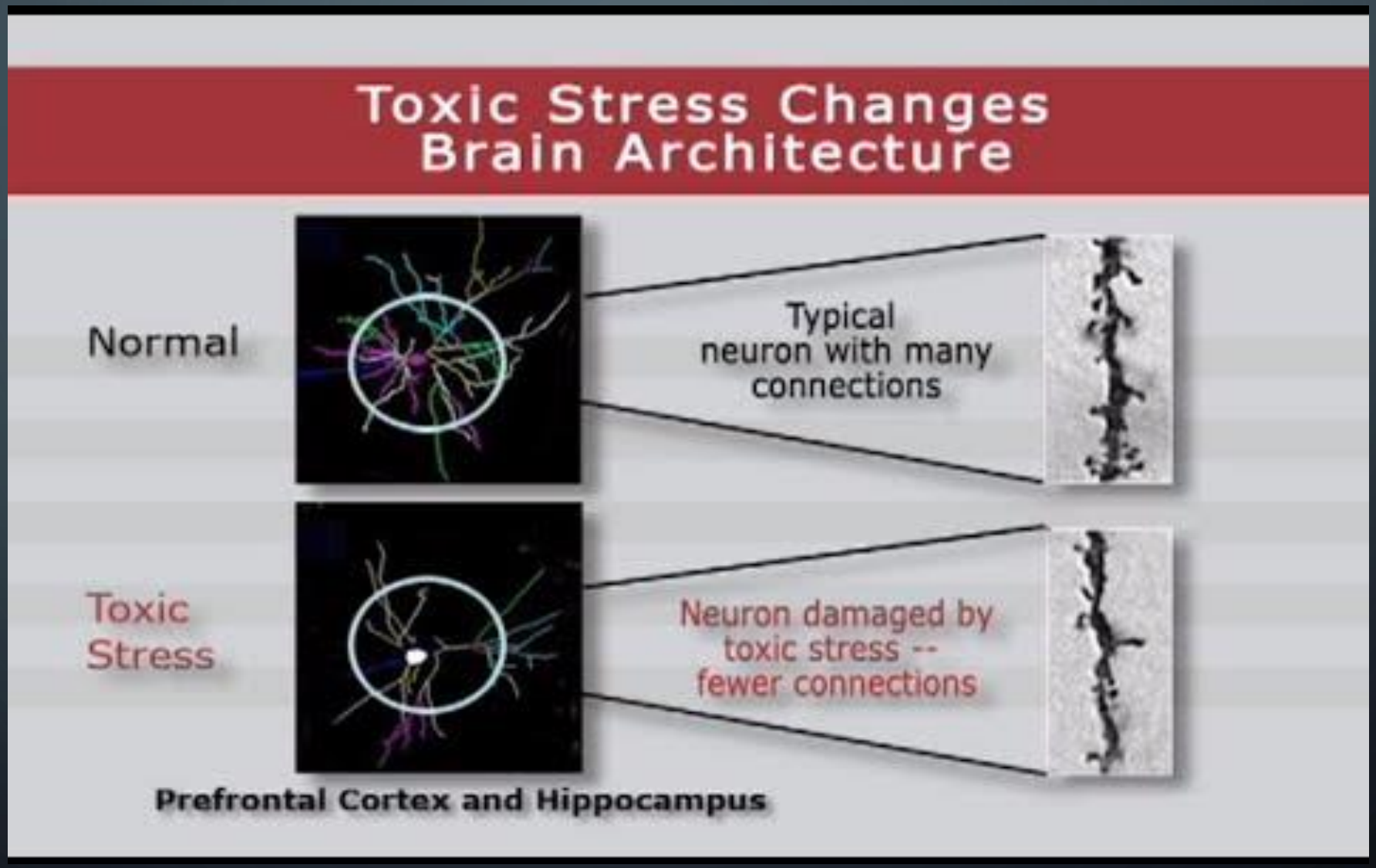
TOXIC STRESS

- Long lasting, frequent, or strong intensity
- More extreme precipitants of childhood stress (ACEs)
- Insufficient social-emotional buffering (Deficient levels of emotion coaching, re-processing, reassurance and support)
- Potentially permanent changes and long-term effects

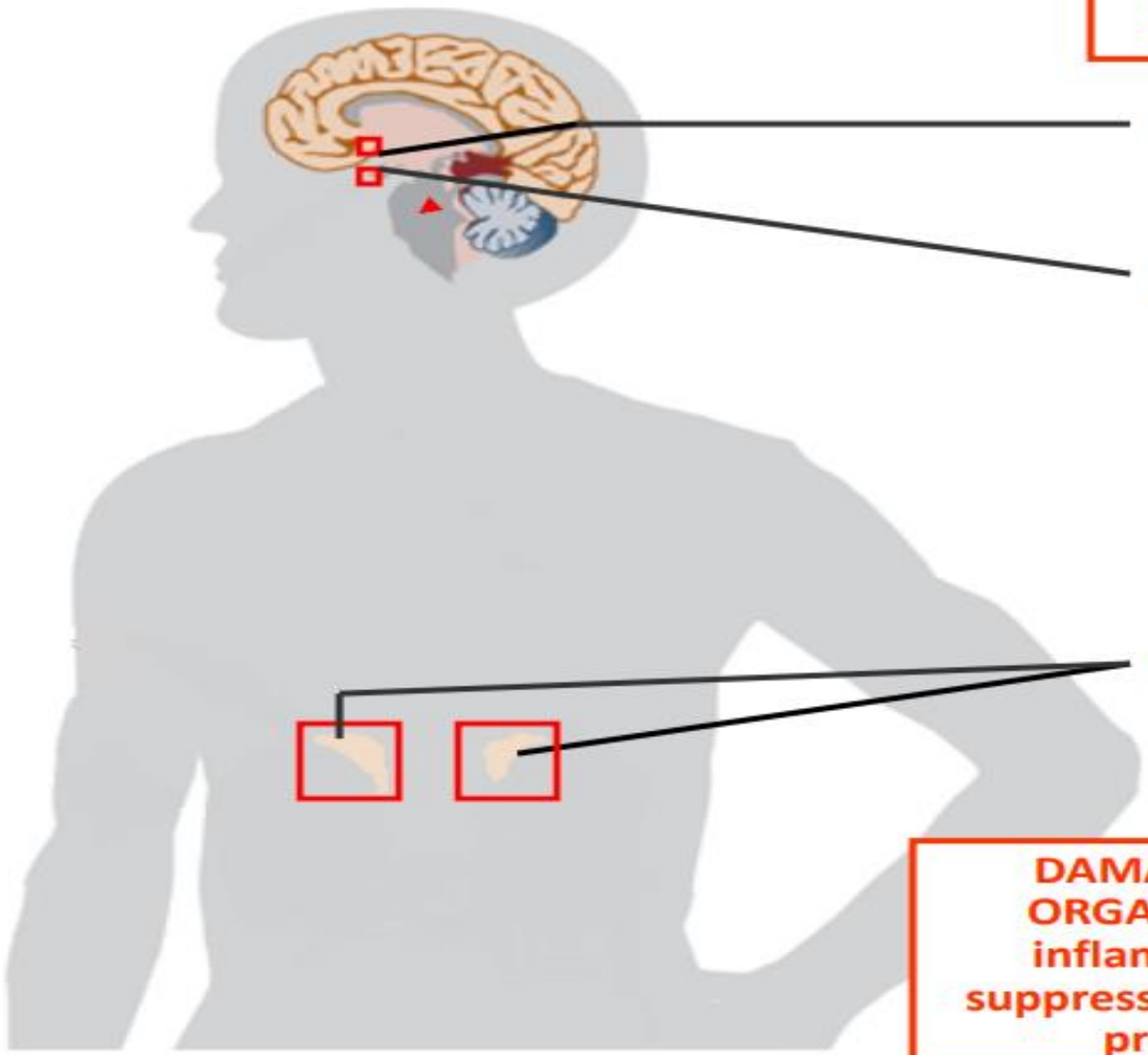
TOXIC STRESS AND THE BRAIN



- Constant presence of adrenaline and cortisol
- Toxic stress changes architecture of the brain
- Damages the prefrontal cortext
- Epigenetics


Toxic Stress Changes
Brain Architecture
Normal
Typical
neuron with many
connections
Toxic
Stress
Neuron damaged by
toxic stress --
fewer connections
Prefrontal Cortex and Hippocampus

How could stress affect health?



STRESSOR

Hypothalamus
CRH

Pituitary Gland
ACTH

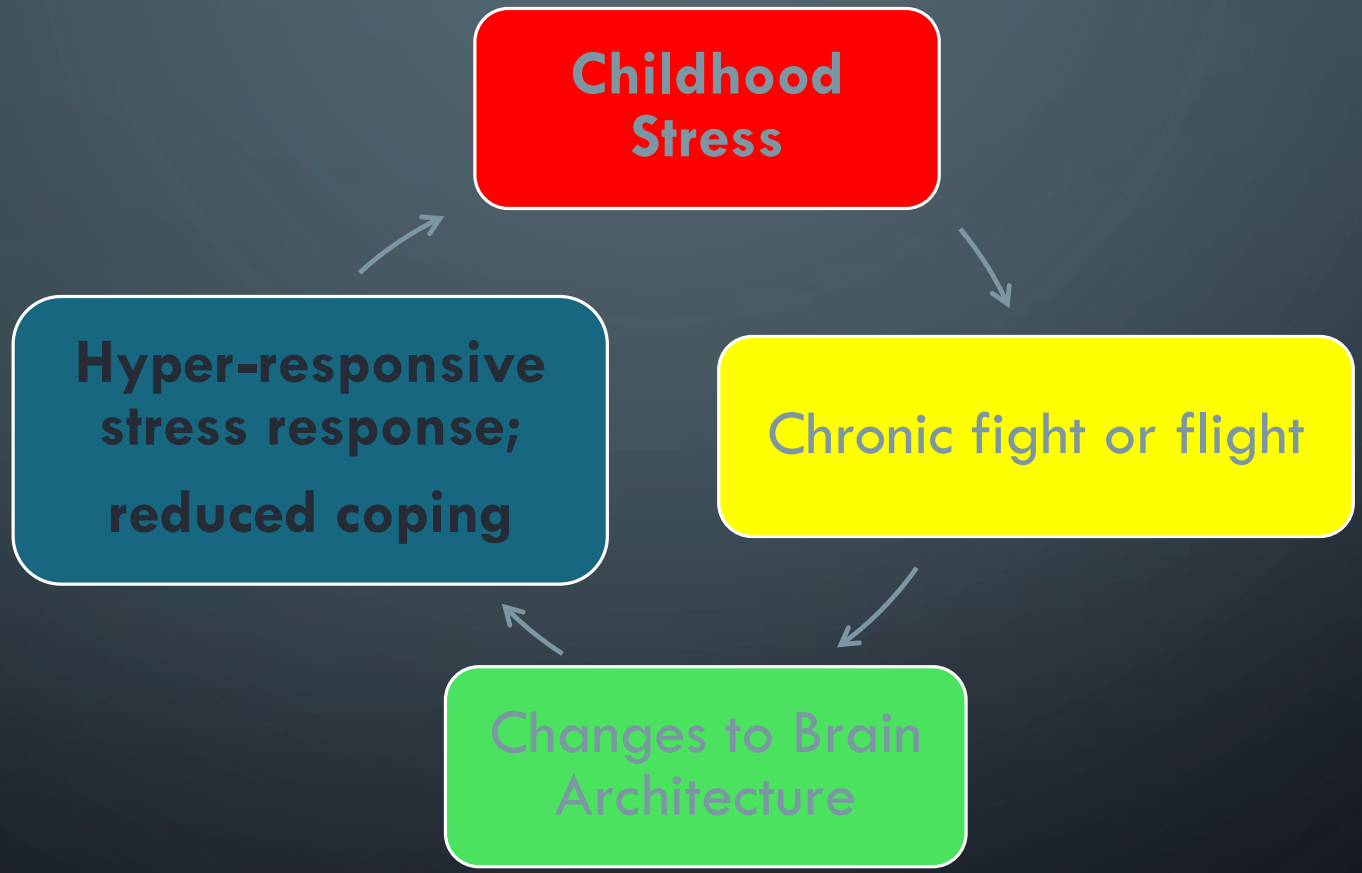
Adrenal Glands
CORTISOL

DAMAGE TO MULTIPLE ORGANS & SYSTEMS → inflammation, immune suppression, chronic disease, premature aging

IAL DISPARITIES IN HEALTH
rnia, San Francisco

Braveman, P.

IMPACT OF CHILDHOOD STRESS



EPIGENETICS

Epigenetics: Which genes are turned on/off, when, and where

- Ecology (environment/experience) influences how the genetic blueprint is read and utilized
- Ecological effects at the molecular level
- Stress-induced changes in gene expression
- “Genes may load the gun, but the environment pulls the trigger”
- Through epigenetic mechanisms, the early childhood ecology becomes biologically embedded, influencing how the genome functions

WHAT WOULD IT LOOK LIKE TO ADDRESS HEALTH CONSIDERING A PERSON'S "TIMELINE"?

- Greater focus on health promotion from the youngest ages forward.
- Focus on developing services and systems that provide routine, early identification of health risks and early intervention to address and minimize the impact of risks.

WHAT WOULD IT LOOK LIKE TO ADDRESS HEALTH CONSIDERING A PERSON'S "TIMELINE"?

- Improve caregiver/community capacity to prevent or minimize risk factors (e.g., promote the safe, stable and nurturing relationships that turn off the physiologic stress response)
- Improve caregiver/community capacity to promote healthy, adaptive coping skills

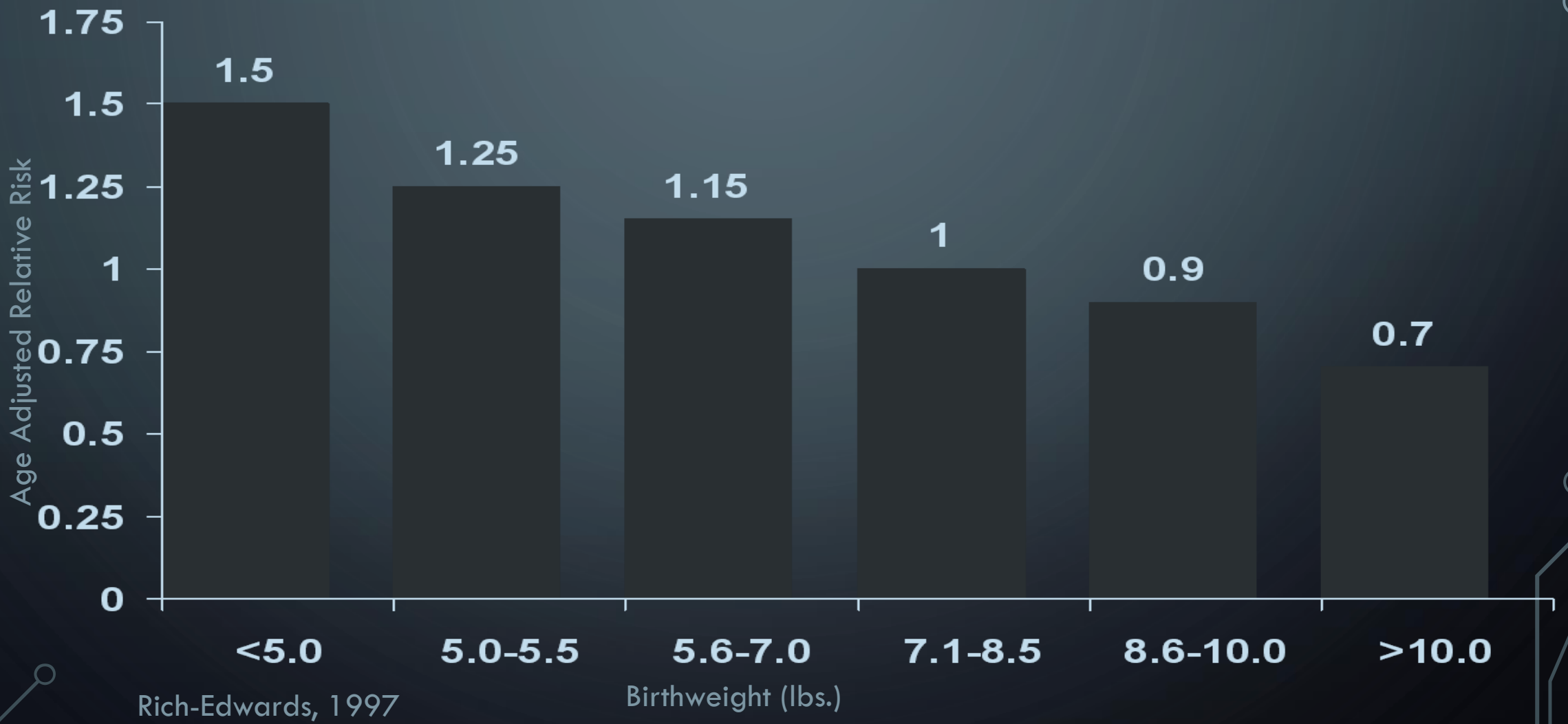
LIFE COURSE THEME #2: TIMING

- **Critical Period**: Time when certain things must occur for normal development to occur
- **Sensitive Period**: Time when a particular develop occurs most easily

BARKER HYPOTHESIS/FETAL ORIGINS HYPOTHESIS

- Introduced in 1990 by David Barker
- Intrauterine growth retardation, low birth weight, and premature birth related to later hypertension, coronary heart disease, and non-insulin-dependent diabetes
- Fetal programming can permanently shape the body's structure, function, and metabolism and contribute to adult disease.

BIRTHWEIGHT AND CORONARY HEART DISEASE (BARKER HYPOTHESIS)

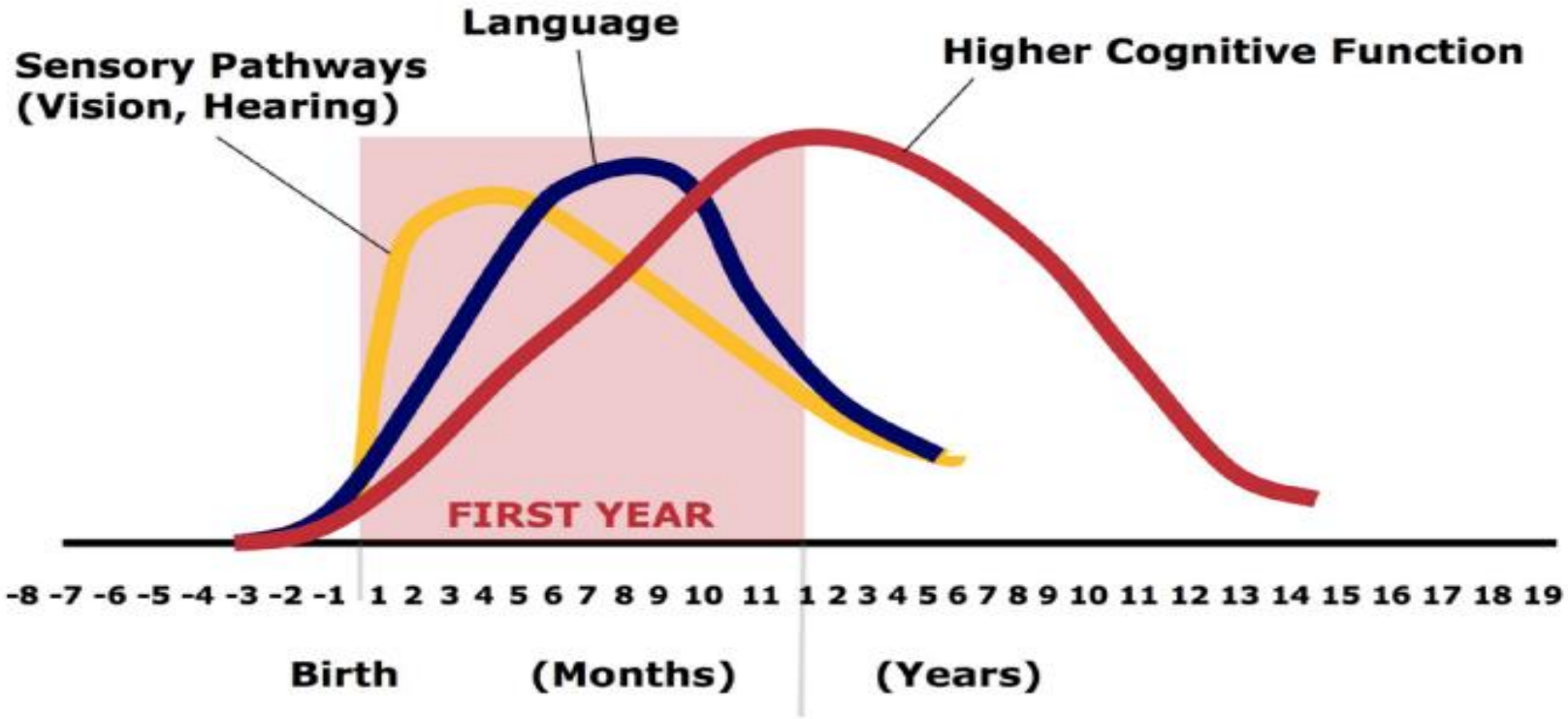


Rich-Edwards, 1997

Center on the Developing Child
HARVARD UNIVERSITY

Human Brain Development

Neural Connections for Different Functions Develop Sequentially



Source: C.A. Nelson (2000)

WHAT WOULD IT LOOK LIKE IF YOU ADDRESSED HEALTH BY TAKING "TIMING" INTO CONSIDERATION?

- Assure the availability of services and supports during critical or sensitive periods throughout the lifespan.
- Focus on interventions that help assure a healthy pregnancy for mother and baby and services and supports that help assure the healthy development of children – and their families – during the period of early childhood.

LIFE COURSE THEME #3: ENVIRONMENT

- Physical, social, and economic environments shape health and disease patterns across populations and communities.
- Environment includes not only physical factors, but also social and economic factors, and the capacity of the community to engage in change

Ecological Model

The interplay of biological, social, and environmental factors

Genetics, behaviors choices knowledge

Parents, siblings, extended family, peers

Neighborhoods, schools, parks, workplaces

Health, education, and legal systems, media, business

Economic systems, cultural values and ideals

Place

Where you live affects your health

Risky Places

Poor Health

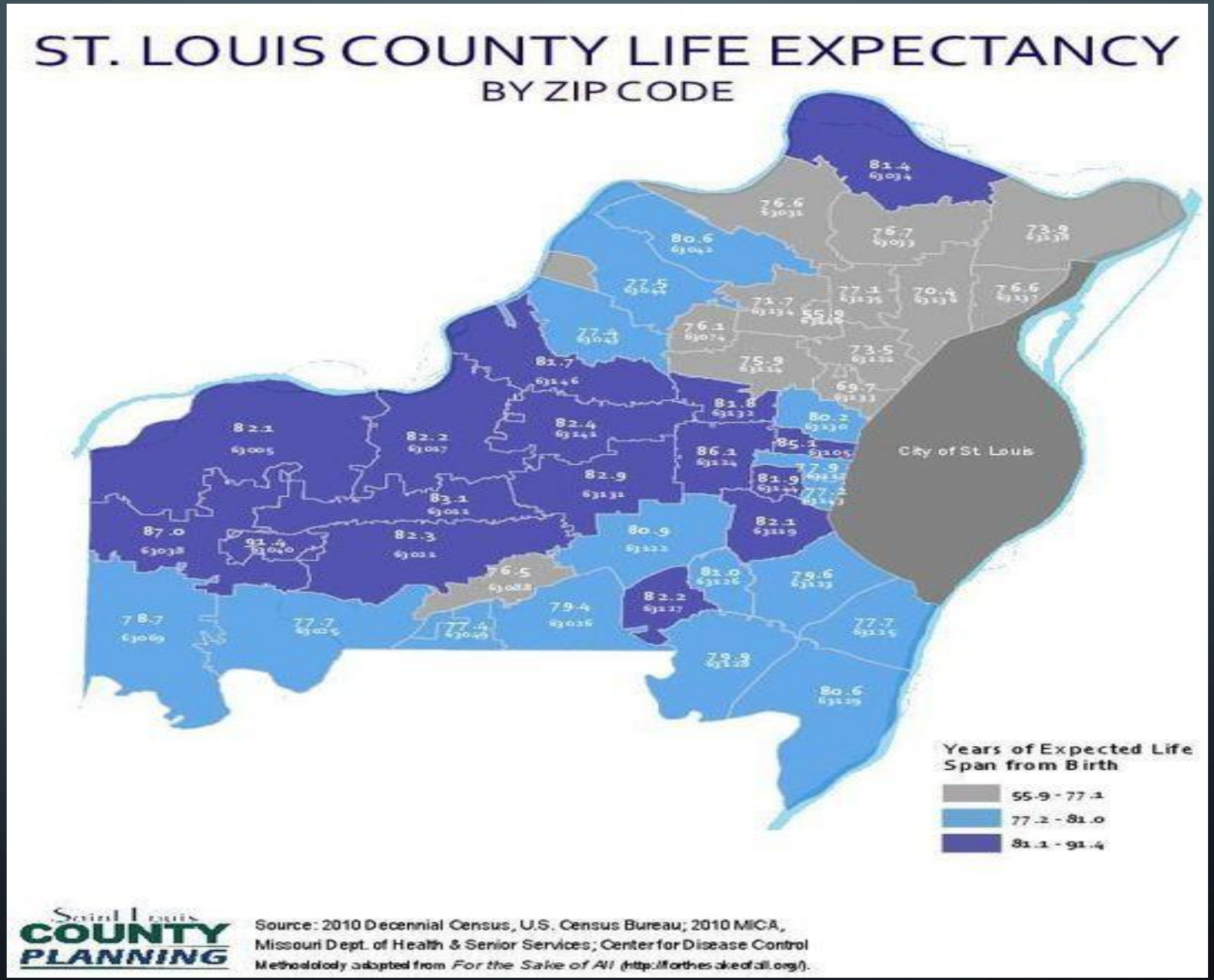
- High rates of crime
- Presence of environmental toxins
- Segregation and isolation
- Lack of jobs, housing, transportation, healthy food, health care, social services

Protective Places

Good Health

- Food stores with fruits and vegetables
- Healthy and safe places to walk and play
- Access to health care and social services
- Safe schools that prepare children for future employment


STOCKTON
95202
Life Expectancy
73
IRVINE
92606
Life Expectancy
88
Your ZIP Code shouldn't predict how long you'll live, but it does.
www.calendow.org
health happens here


ST. LOUIS COUNTY LIFE EXPECTANCY
BY ZIP CODE
City of St Louis
Years of Expected Life Span from Birth
55.9 - 77.1
77.2 - 81.0
81.1 - 91.4
Source: 2010 Decennial Census, U.S. Census Bureau; 2010 MICA, Missouri Dept. of Health & Senior Services; Center for Disease Control
Methodology adopted from For the Sake of All (http://forthesakeofall.org/).

"Morbidity and mortality are not random, but geographically and socially patterned to render some people winners and others losers."

Candice Miller et al, 2010 http://media.axon.es/pdf/75773_1.pdf

Poverty

Policies

Institutions

Laws

Access to education

Employment opportunities

Social marginalization

Access to tobacco cessation programs

Ease of access to tobacco and alcohol

Lack of money to purchase healthy foods

Live where healthy food not easily available

Access to health screenings, health insurance, health care

Tobacco and alcohol use

Poor nutrition

Physical inactivity

Elevated cholesterol

High blood pressure

Diabetes

Heart disease

HOW CAN WEALTH AFFECT OUR HEALTH?

WEALTH CAN BUY:

- Medical care
- Housing and neighborhood conditions
- Nutrition and physical activity options
- Services
- Less stress
- Family stability

PARENTS' WEALTH SHAPES CHILDREN'S:

- Education
- Occupation
- Wealth

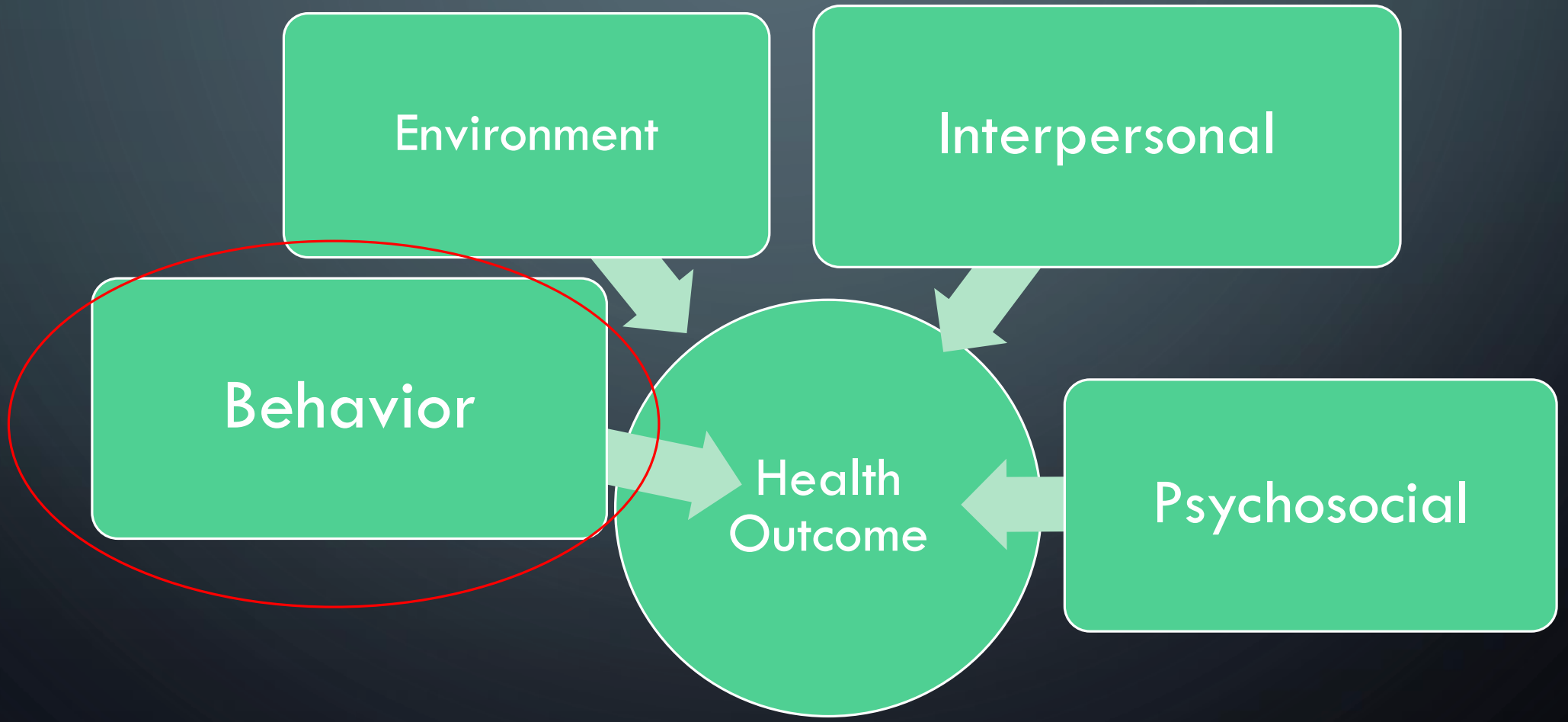
HOW WOULD YOU ADDRESS HEALTH CONSIDERING A PERSON'S ENVIRONMENT?

- Link people to service systems that can address environmental factors (e.g., employment services, housing, family support programs, etc.)
- Promote integrated, multi-sector service systems and assure that those systems are easily accessed.
- Develop population and place-based community strategies aimed at changing environments, and addressing root cause determinants of health.
- Requires alliances that may go beyond the usual reach of public health (e.g., with land use planners, parks and recreation, housing developers and public housing authorities, etc.), and it requires partnering with community residents in ways that enable communities to effect change.

LIFE COURSE THEME #4: EQUITY

- Differences in health across populations and communities cannot be explained solely in terms of genetic make-up or individual choices, but rather reflect the impact of broader societal and environmental conditions over time.

DETERMINANTS OF HEALTH



SOCIAL DETERMINANTS OF HEALTH

- Focusing on an individual's lifestyle ignores social influences on health.
- Health behaviors are a consequence of the social conditions and environment in which people live.
- Behavioral choices are situated within historical, political, economic and community context

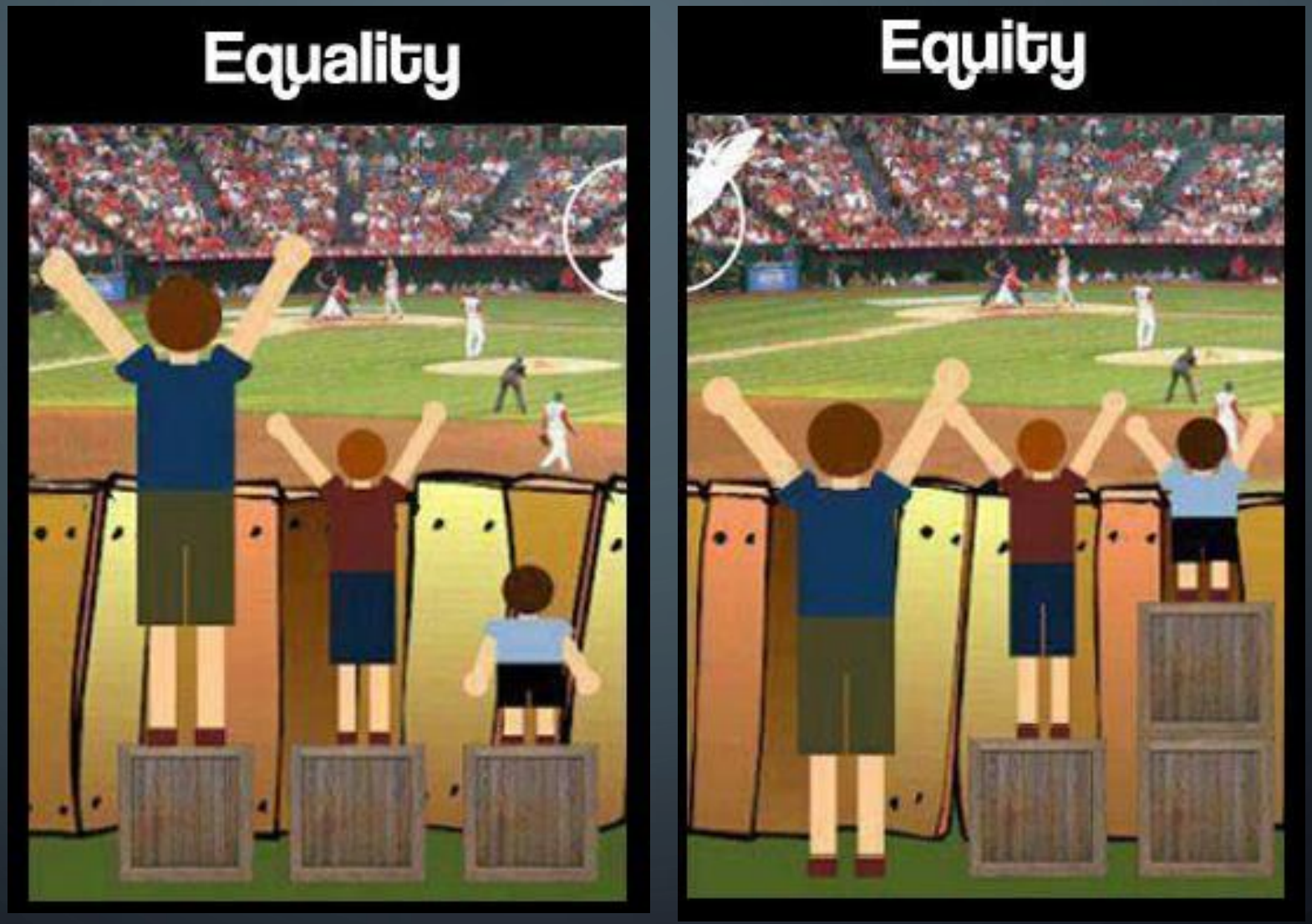
HEALTH EQUITY

- **Health Equity** is the "attainment of the highest level of health for all people."
- **Health Inequities** are differences in health that are avoidable, unfair, and unjust.
- **Health Disparities** are differences in health outcomes among groups of people linked with social, economic and/or environmental disadvantage. Health disparities are avoidable and unequitable.

U.S. Department of Health and Human Services. http://www.healthypeople.gov/sites/default/files/PhaseI_0.pdf

Health Equity Institute, San Francisco University. http://healthequity.sfsu.edu/content/defining-health-equity

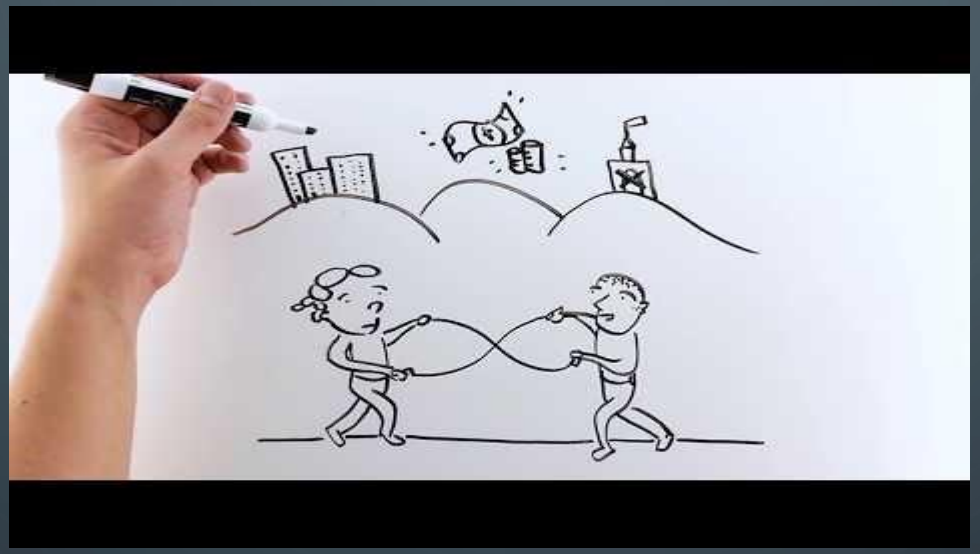
Braveman P. What is health equity: And how does a life course approach take us further toward it? *Maternal and Child Health Journal* 2014. 18:366-372.


Equality
Equity

HEALTH INEQUITIES CAN BE CAUSED BY:

- **Social conditions**: When a person or group is treated differently because of their race, sex, class, sexual orientation, or immigration status.
- **Economic conditions**: Unequal opportunities can lead to less access to educational and employment opportunities.
- **Environmental conditions:** Where you live can affect your health due to neighborhood conditions, economic opportunities, school quality, access to healthy food, opportunities for physical activity, exposure to violence, cleanliness of the environment, and social support.

CLIFF ANALOGY



Source: Camara Jones, https://www.youtube.com/watch?v=2zAol4eKdFo

HOW DO YOU ADDRESS EQUITY?

- Go beyond tracking disparities, to identify and address root causes of disparities at the population level.
- Use an “equity lens” to continually assess the potential for differential impact of public health interventions, even those that are evidence-based.
- Interventions that focus on individual behavior changes need to take into account the broader social and environmental context in which people live.

SUMMARY: LIFE COURSE THEORY

- Considers health an integrated continuum across the life course
- Health outcomes across the life span result from a complex interplay of biological, behavioral, social, and environmental factors
- Critical developmental periods such as pregnancy, childhood, and adolescence differentially impact health trajectories
- Opportunities to address institutional racism and abate risk factors with protective factors

Griffith, 2010

What can we do?

Improving health requires collaboration across sectors

Economic

Employment opportunities
Fair Wages
Family and medical leave
Paid sick days

Education

High performing schools
Access to higher education
Public preschool
Continuing education and vocational school

Health

Healthy Pregnancies
Access to quality medical and mental health care
Clear health communication
Disease management

Community

Parenting support
Social services
Social support
Tolerance and respect
Cultural competence

Physical Environment

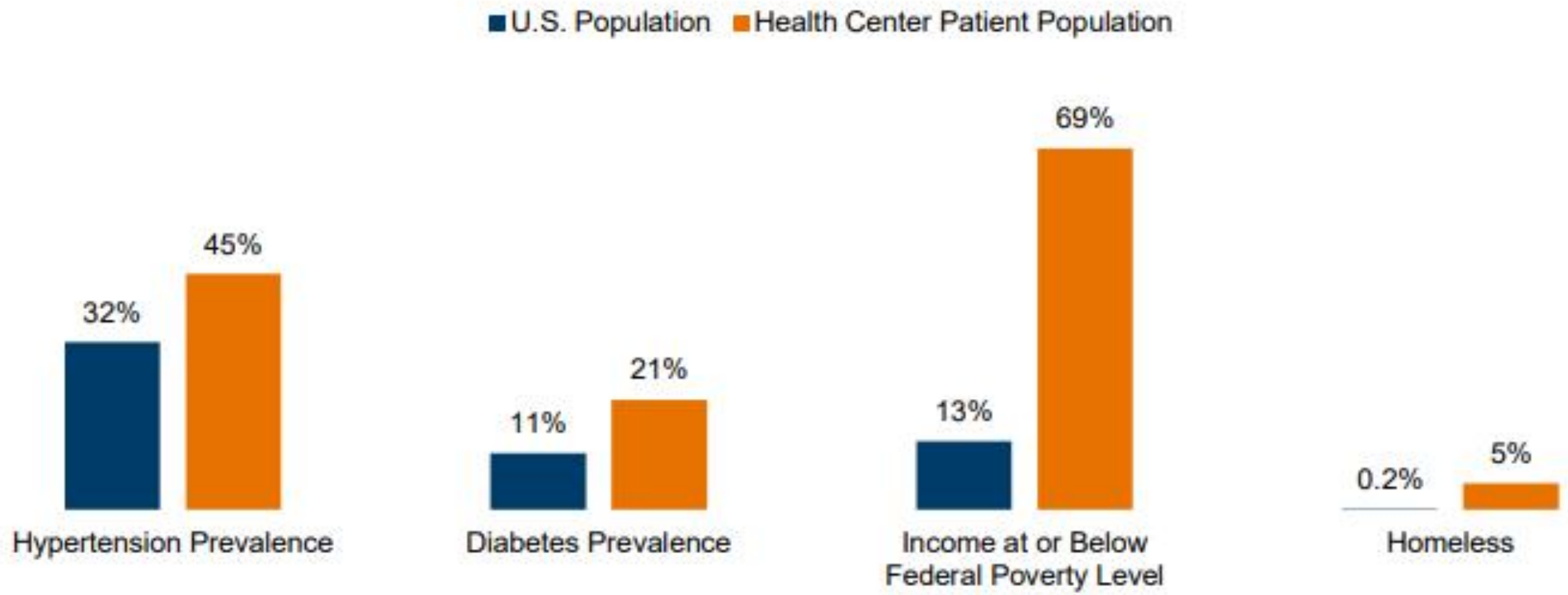
Safe neighborhoods and schools
Sidewalks, parks and playgrounds
Healthy food options
Public transportation

- “Throughout life and at all stages, even for those whose trajectories seem limited, risk factors can be reduced and protective factors enhanced, to improve current and subsequent health and well-being”

-Fine and Kotelchuck

Health center patient populations are more complex because they have higher rates of chronic conditions and social risk factors associated with poorer health outcomes.

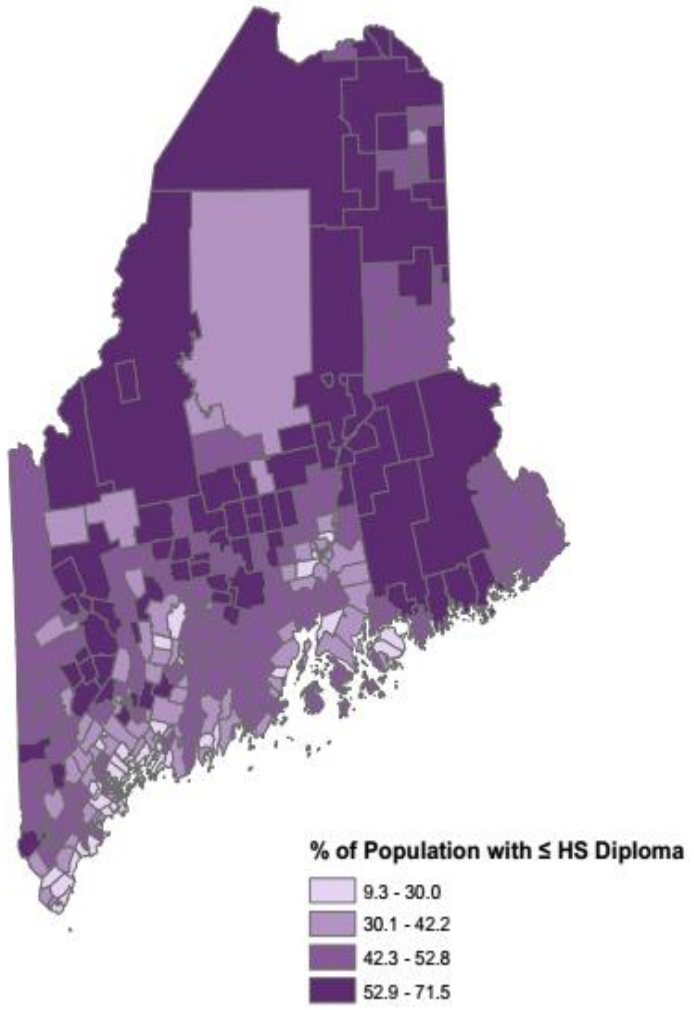
Percent of U.S. population vs. health center patient population for selected demographics, 2017[4]



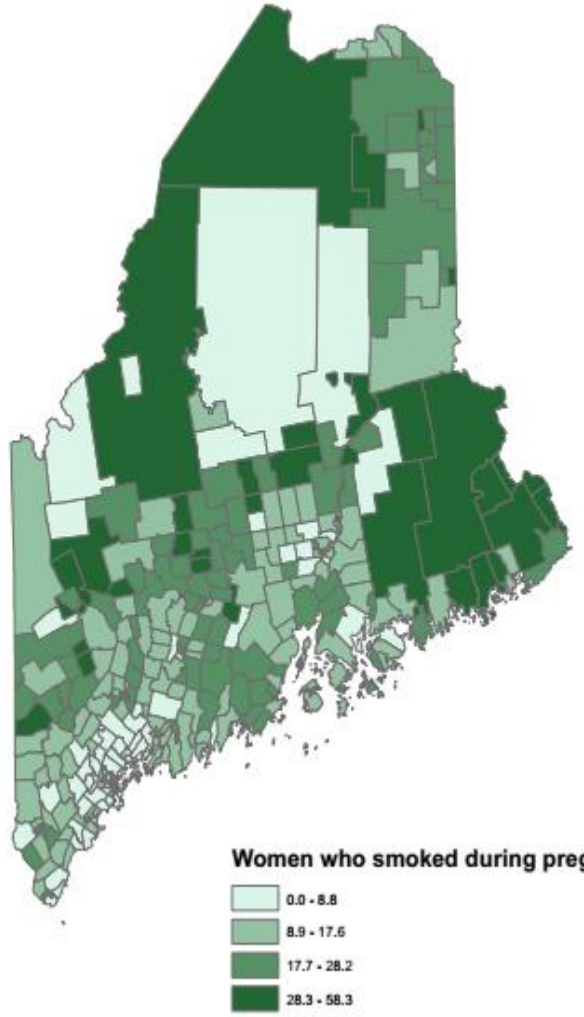
Source: National Association of Community Health Centers, May 2019

http://www.nachc.org/wp-content/uploads/2019/05/Growth_in_Patients_with_Complex_Needs_5.30.19.pdf

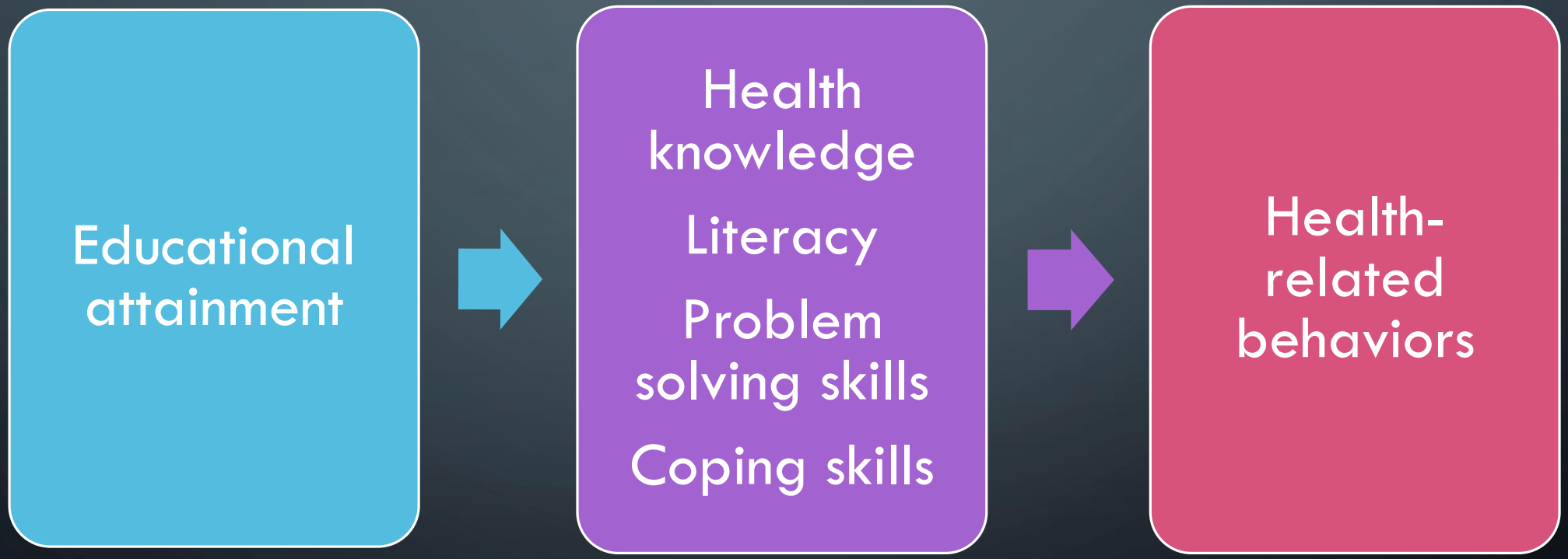
Percent of Population with High School Diploma or Less by Census Tract, 2014



Smoking During Pregnancy by Census Tract, 2014-15



HOW DOES EDUCATION IMPACT HEALTH?



Braveman, P.

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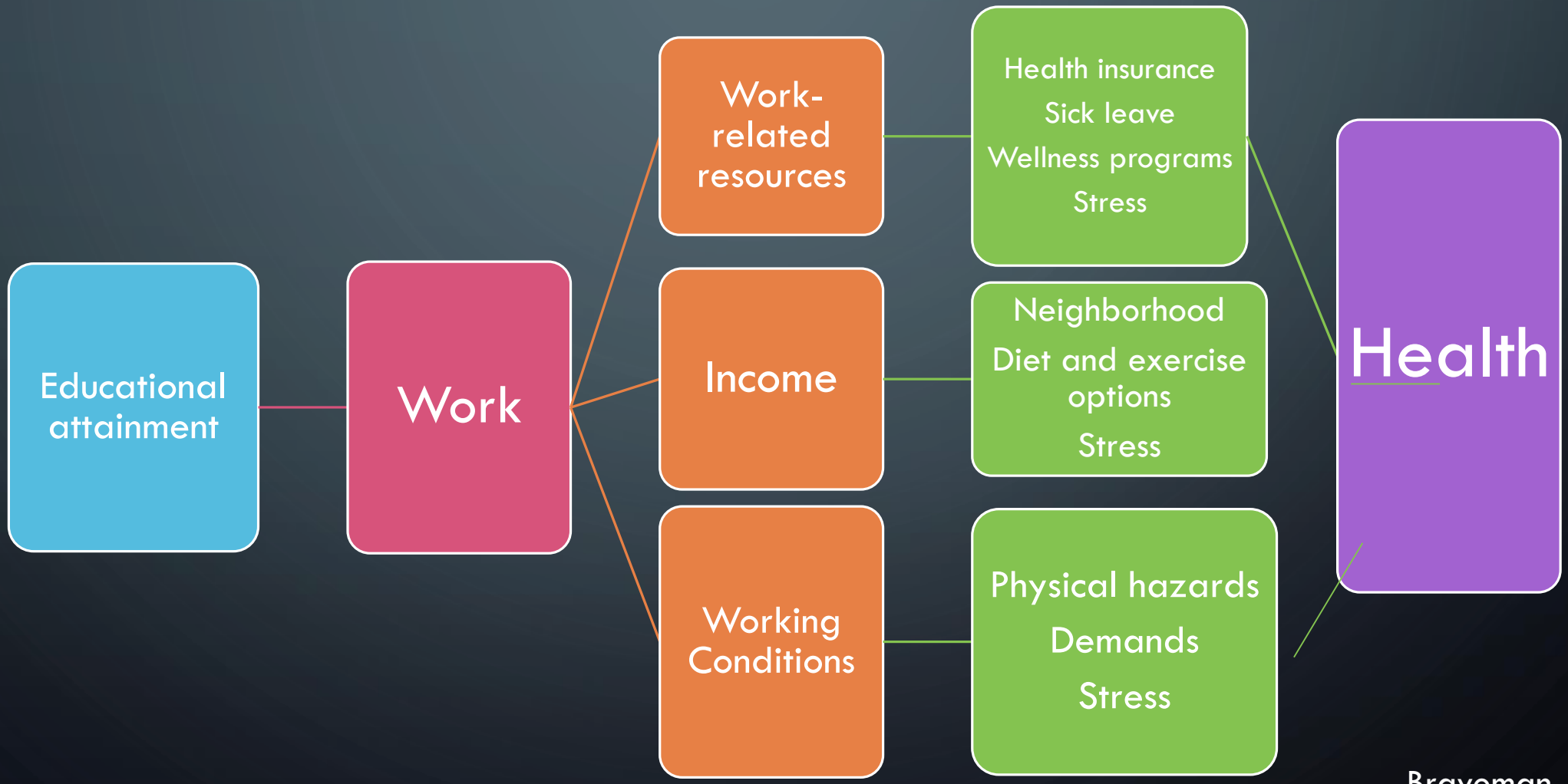

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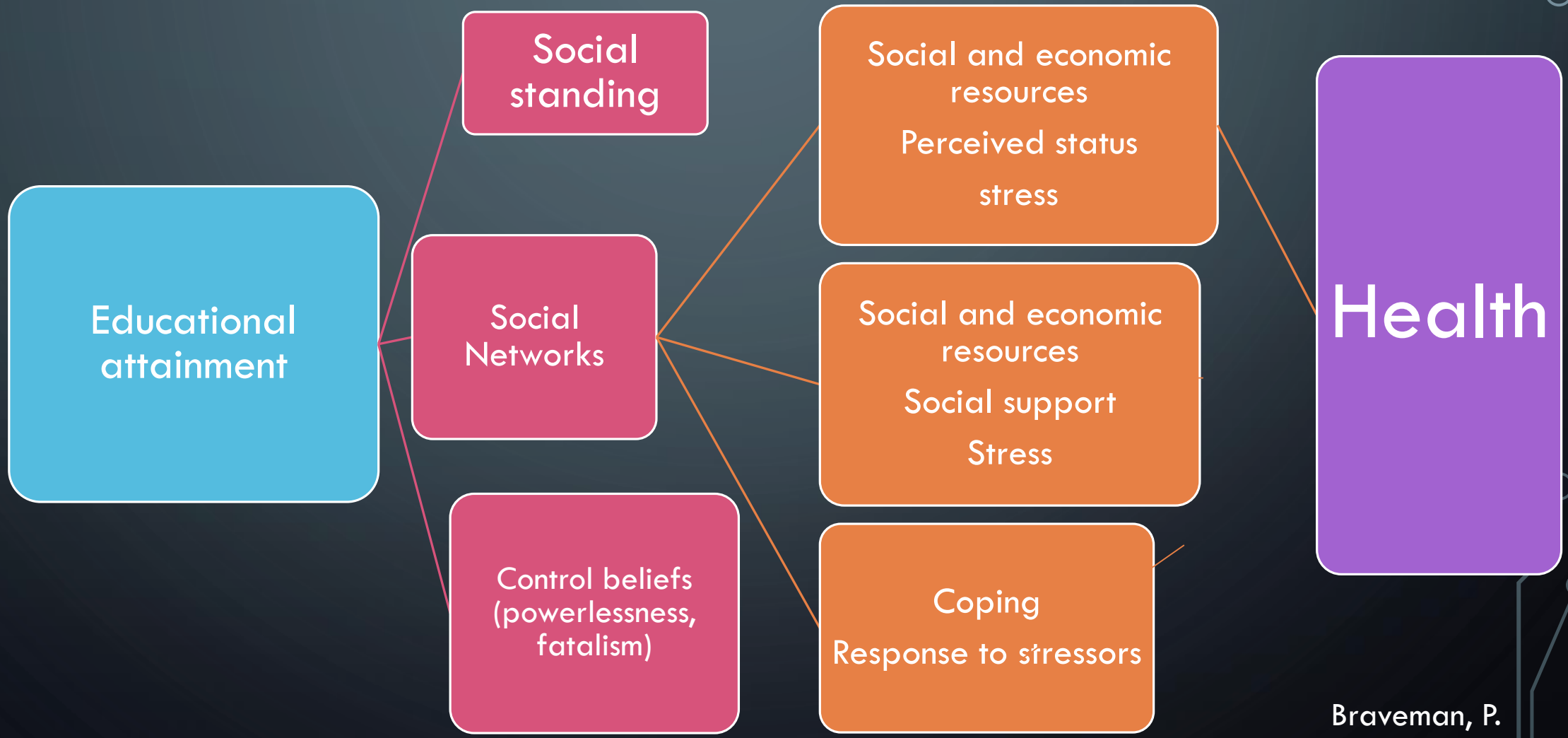

Braveman, P.

Economic Stability	Neighborhood and Physical Environment	Education	Food	Community and Social Context	Health Care System
Employment	Housing	Literacy	Hunger	Social integration	Health coverage
Income	Transportation	Language	Access to healthy options	Support systems	Provider availability
Expenses	Safety	Early childhood education		Community engagement	Provider linguistic and cultural competency
Debt	Parks	Vocational training		Discrimination	Quality of care
Medical bills	Playgrounds	Higher education		Stress	
Support	Walkability				
	Zip code / geography				

Health Outcomes

Mortality, Morbidity, Life Expectancy, Health Care Expenditures, Health Status, Functional Limitations

MAINE PUBLIC HEALTH DATA

- Maine Shared Community Health Needs Assessment reports - https://www.maine.gov/dhhs/mecdc/phdata/MaineCHNA/
- Maine CDC Data Reports

  https://www.maine.gov/dhhs/mecdc/navtabs/data.shtml

FINDING SOCIAL DETERMINANTS DATA

Interactive atlas of heart disease and stroke

https://nccd.cdc.gov/DHDSPAtlas/Default.aspx?state=ME

Healthy People 2020

https://www.healthypeople.gov/2020/topics-objectives/topic/social-determinants-of-health/objectives

Social Vulnerability Index

https://svi.cdc.gov/factsheet.html

Institute of Health Metrics and Evaluation, University of Washington

https://vizhub.healthdata.org/subnational/usa

CLINICAL INTERVENTIONS

WHAT CAN WE DO SYSTEMICALLY?

ADDRESSING ACES AND TOXIC STRESS

- Addressing Readiness to Change

ADDRESSING ACES AND TOXIC STRESS

- Educating staff and patients on the importance of addressing trauma and ACEs

ADDRESSING ACES AND TOXIC STRESS

- Deciding who to assess and when

ADDRESSING ACES AND TOXIC STRESS

- Deciding how to screen https://www.ncjfcj.org/sites/default/files/Finding%20Your%20ACE%20Score.pdf
- LEC5 https://www.ptsd.va.gov/professional/assessment/documents/LEC5_Standard_Self-report.PDF
- PTSD-PC
- https://www.ptsd.va.gov/professional/assessment/documents/pc-ptsd5-screen.pdf

ADDRESSING ACES AND TOXIC STRESS

- Identifying community resources and appropriate interventions for patients and families
- https://www.traumainformedcare.chcs.org/what-is-trauma-informed-care/