

**Prenatal and Early Life
Risk Factors for Chronic
Disease**

-or-

**“How Adversity Gets
Under the Skin”**

Ann Bullock, MD

“A scientific consensus is emerging that the origins of adult disease are often found among developmental and biological disruptions occurring during the early years of life. These early experiences can affect adult health in 2 ways—either by cumulative damage over time or by the biological embedding of adversities during sensitive developmental periods. In both cases, there can be a lag of many years, even decades, before early adverse experiences are expressed in the form of disease. From both basic research and policy perspectives, confronting the origins of disparities in physical and mental health early in life may produce greater effects than attempting to modify health-related behaviors or improve access to health care in adulthood.”

“Adverse pre- and postnatal experiences can have a profound effect on the course of health and development over a lifetime. The premise underlying this phenomenon, known as *developmental programming*, is that biological events that occur during fetal and postnatal life predispose the child to an elevated risk of subsequent problems in physical and mental health. Babies with low birth weight, for example, have an increased lifetime risk for cardiovascular disease, diabetes, and learning difficulties.”

“A Science-Based Framework for Early Childhood Policy: Using Evidence to Improve Outcomes in Learning, Behavior, and Health for Vulnerable Children”, Center on the Developing Child at Harvard University, August 2007, p.6 <http://www.developingchild.harvard.edu>

Framework for Chronic Disease

- CD is the product of multiple stressors/risk factors which are cumulative over lifetime (genetic, biological, behavioral, social/experiential, economic)
- Stressors affect both physiologic regulatory systems as well as health behaviors
- Different health “trajectories” are the product of risk and protective factors
- While stressors have effects throughout life, the body is especially vulnerable to them during critical developmental periods

Early Life Experience and the Brain

“The recurring theme in a neurodevelopmental point of view is the remarkable malleability of the developing brain. The brain’s exquisite sensitivity to experience in early childhood allows traumatic experiences during infancy and childhood to impact all future emotional, behavioral, cognitive, social, and physiologic functioning.”

Child Adolesc Psychiatr Clin N Am 1998;7(1):33-51

“What you walk around with are the first two to five years of your life.”

Frank Langella, actor

USA Today, p 2D

12/3/08

Brain Development

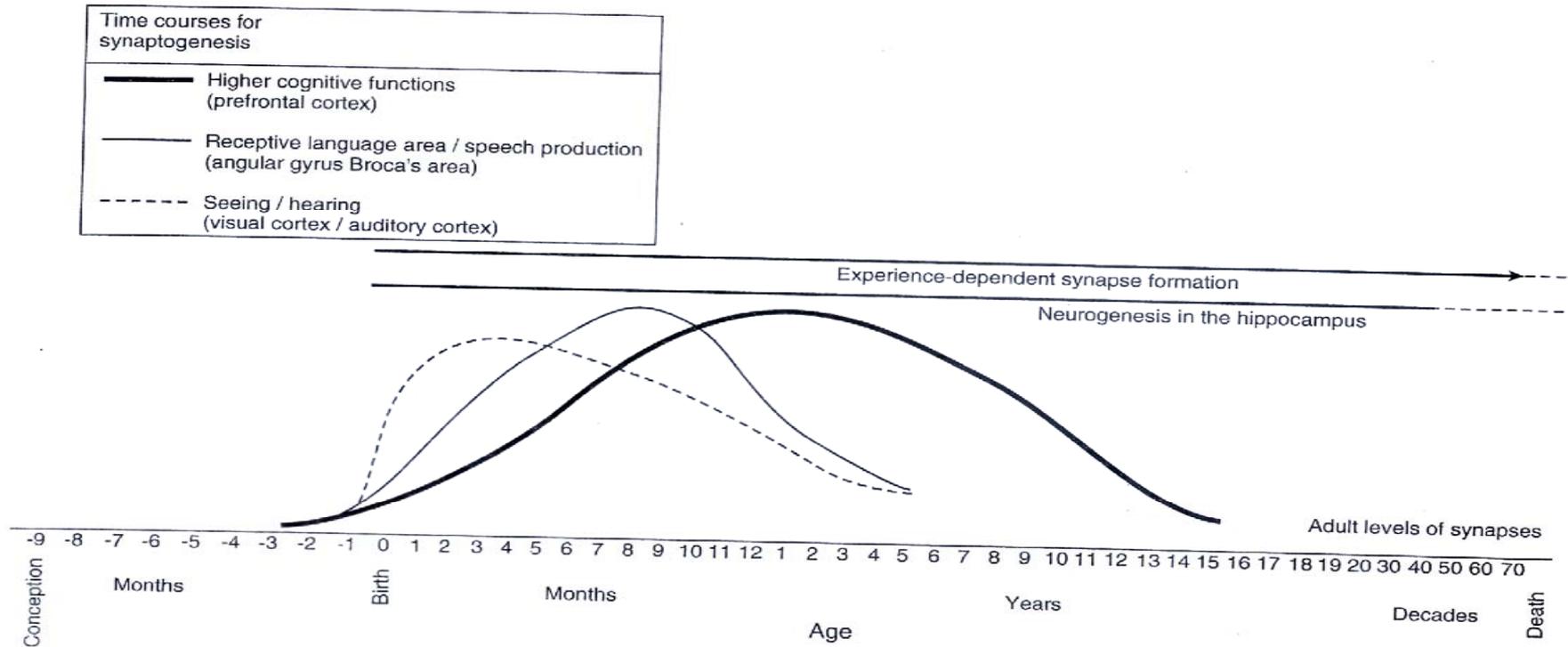


FIGURE 8-1 Human brain development. SOURCE: Charles A. Nelson, University of Minnesota. Reprinted with permission.

TABLE 8-1 Conditions and Substances that Affect the Developing Brain

| Needed for Normal Brain Development | Detrimental or Toxic |
|---------------------------------------|--|
| Oxygen | Alcohol |
| Adequate protein and energy | Lead |
| Micronutrients, such as iron and zinc | Tobacco |
| Adequate gestation | Prenatal infections |
| Iodine | Polychlorinated biphenyls (PCBs) |
| Thyroid hormone | Ionizing radiation |
| Folic acid | Cocaine |
| Essential fatty acids | Metabolic abnormalities (excess phenylalanine, ammonia) |
| Sensory stimulation | Aluminum |
| Activity | Methylmercury |
| Social interaction | Chronic stress |

Note: The listed factors are not intended to be exhaustive.

Early Life Risk Factors for Obesity at Age 7 years

1. Parental obesity
2. Birth weight
3. Very early BMI or adiposity rebound/Weight gain in 1st yr/Catch-up growth score for wt at ages 8 & 18 mos
4. >8 hrs/week TV watching at age 3 yrs
5. Short sleep duration at age 3 yrs
6. **Not**: energy intake, junk food, SES, gest age, breastfeeding

Reilly, *et al.* 2005. *BMJ*, doi:10.1136/bmj.38470.670903.E0

Other studies: youth obesity predicted by depression, psychopathology, behavior problems, low cognitive stimulation, lack of “collective efficacy”

International Diabetes Federation

Conference on Type 2 Diabetes Etiologies

2002

1. Genetics
2. Fetal Origins
3. Lifestyle
4. Stress

1. Genetics

- *Genes Inherited*

- only 15% of genome in cells expressed at any given time

- **Epigenetics**

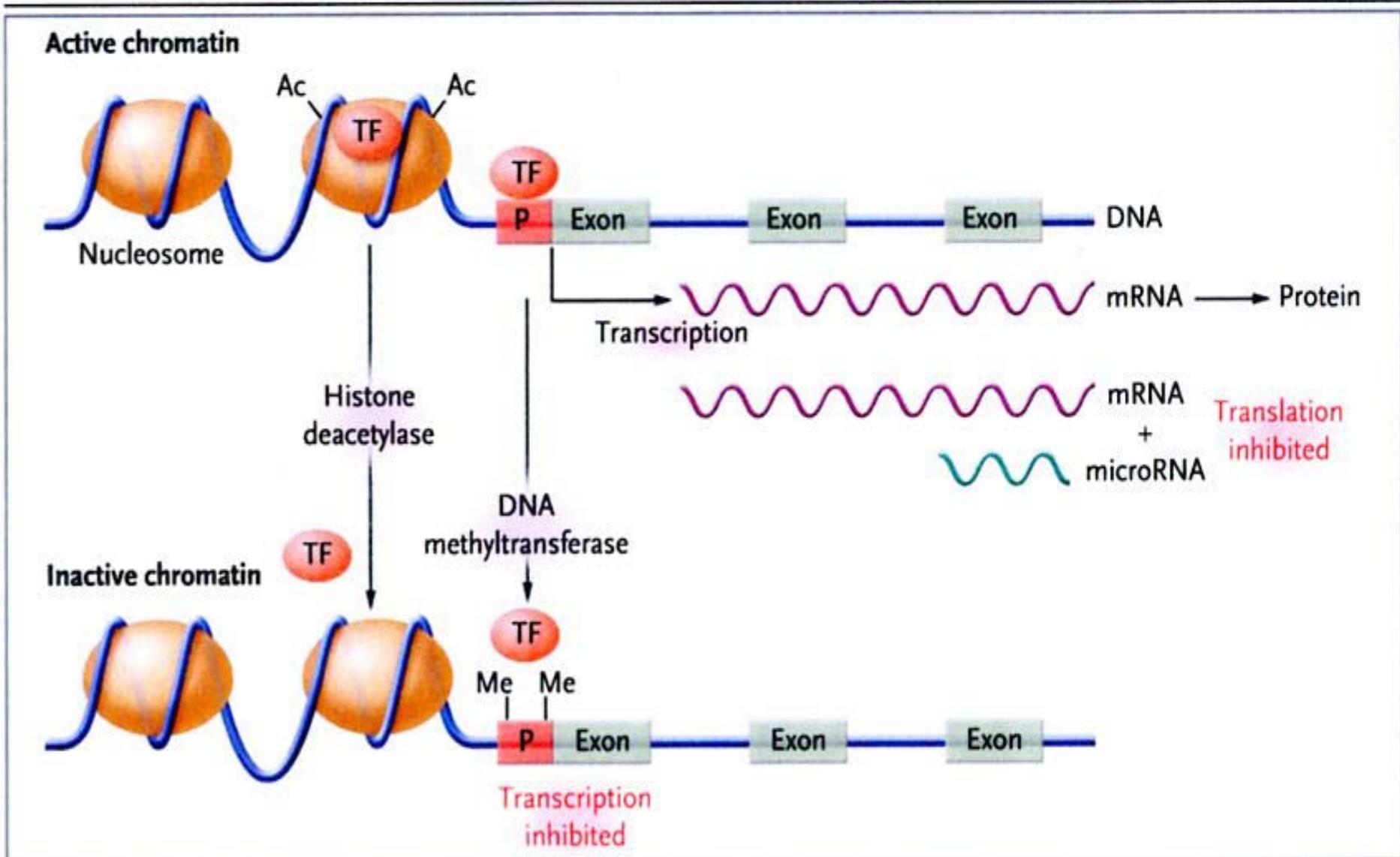
- Genes *Expressed*

- reaction to environmental stimuli

- not always reversible if at key developmental stage

- mechanisms: chromatin methylation, histone acetylation, microRNA

JAMA 294(17):2221-4, 2005 and *NEJM* 359:61-73, 2008



Epigenetics

“The proposed mechanism by which nurture affects nature is straightforward: maternal care reduces methylation, reduced methylation increases expression of the (glucocorticoid) receptor, and with more receptors in the hippocampus, there is less reaction to stress. However, there is no change in gene sequence; the changes are only in DNA methylation and gene expression. Hence, these kinds of effects are called *epigenetic*. Epigenetic mechanisms can provide a potential pathway by which early experience can have lasting effects on behavior.” *JAMA* 294(17):2221-4, 2005, p. 2222

Epigenetics

- Different phenotypes can be originated from the same genotype in response to environmental stimuli—study of monozygotic twins
PNAS 2005;102(30): 10604-10609
- Interaction between prenatal undernutrition and high-fat postnatal nutrition: alters expression of key genes of the hypothalamic appetite regulatory network and associated with increased levels of plasma leptin and insulin in rats resulting in obesity. “These findings are consistent with the predictive adaptive response hypothesis that neuroendocrine development during fetal life may be based on predictions about postnatal environmental conditions. Increased susceptibility to diet-induced obesity develops if a mismatch between the anticipated and the actual conditions are encountered.”
Journal of Endocrinology 2007;193: 31-37

“It is biologically impossible for a gene to operate independently of its environment: genes are *designed* to be regulated by signals from their immediate surround, including hormones from the endocrine system and neurotransmitters in the brain—some of which, in turn, are profoundly influenced by our social interactions. Just as our diet regulates certain genes, our social experiences also determine a distinct batch of such genomic on-off switches.”



2. Fetal Origins



- Alcohol/Drugs
- Nutrition
- Smoking
- Maternal Diabetes
- Toxic/Infectious Exposures
- Maternal Low Birth Weight
- Maternal Stress/Mental Health
 - Mother's own Childhood
 - Current/Prenatal

Prenatal Depression Effects on the Fetus and Newborn

- Mothers with depressive symptoms
 - ↑prenatal cortisol, ↓dopamine/serotonin levels
 - ↑likely to deliver prematurely and have LBW babies
- Newborns of mothers with depressive symptoms:
 - ↑ cortisol and ↓dopamine/serotonin levels
 - ↓neurobehavioral profiles

Infant Behavior & Development 27:216-229, 2004

- Preterm delivery risk increases with depression severity
 - 44% of 791 pregnant patients had depressive symptoms, half of them severe

Human Reproduction 2009 24(1):146-153

Prenatal Effects on HPA Axis Persist

- Prenatal exposure to maternal anxiety associated with high, flattened cortisol pattern (HPA axis dysregulation) in adolescents
- Which was in turn associated with depressive symptoms in adolescent girls

Neuropsychopharmacology 33:536-545, 2008

Risk of Type 2 Diabetes

- Review of 30 studies worldwide: Inverse relationship between birth weight and risk of diabetes
 - U-shaped association in Native American groups

JAMA 300:2886-2897, 2008

- Cohort study of 6,425 subjects born in Sweden between 1925-1949: Both fetal growth (SGA) and preterm birth strongly associated with diabetes risk

Diabetes 58:523-526, 2009

Risk of Type 2 Diabetes

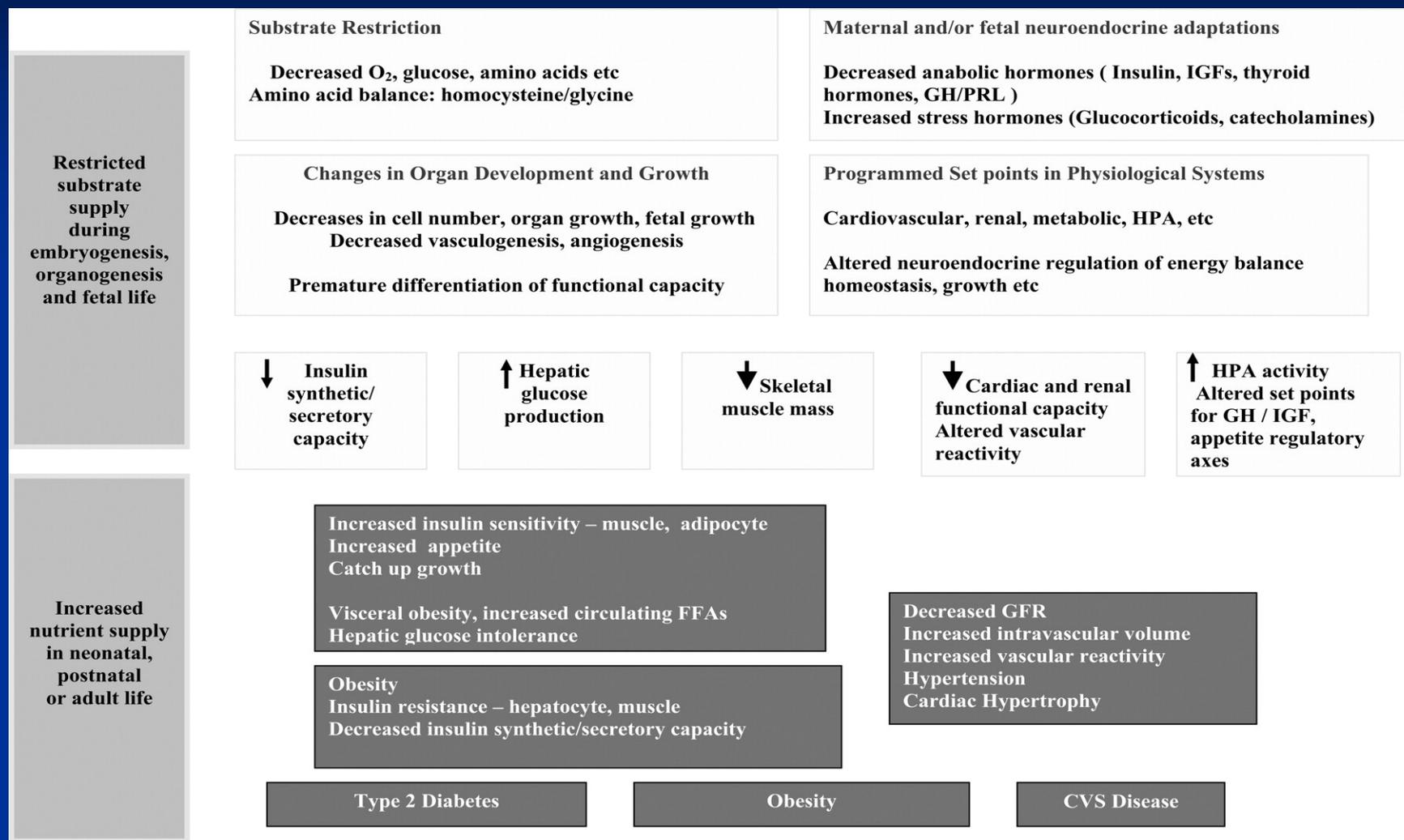
- Fetuses of obese mothers develop insulin resistance *in utero*
 - “...maternal obesity creates a significant risk for the next generations with metabolic compromise already apparent at birth.”
Diabetes Care 2009;32:1076-1080
- Rapid weight gain in the first 3 months of life is associated with several determinants of CVD and type 2 diabetes in early adulthood

JAMA 2009;301(21)2234-2242

“Fetal Programming of Type 2 Diabetes”

“...intrauterine environment may modify gene expression permanently. ...They might also be inherited transgenerationally, affecting the health of future generations. ...During intrauterine life, there are waves of epigenomic modification, intimately associated with growth and development, and opportunities galore for environmental factors to influence these processes. A fetus thus programmed travels a path of limited options.”

FIG. 7. The physiological mechanisms underlying the programming of the separate and combined elements of the metabolic syndrome



McMillen IC, et al. *Physiol. Rev.* 85: 571-633 2005;
doi:10.1152/physrev.00053.2003

How Parental Adversity Gets Transmitted to the Next Generation

- Epigenetic changes in egg, sperm passed on
- Prenatal undernutrition and/or psychosocial stress: Maternal cortisol buffered by placental enzyme, but this can be overwhelmed
 - Reduce cell development, even including overall fetal growth
 - Stress hormone cascade leading to preterm birth
 - Change HPA axis set points in fetus
 - adaptive prediction?
- Early life exposure to parental behaviors (e.g. nurturing vs abuse) creates epigenetic changes in stress reactivity
 - Glucocorticoid receptor gene expression altered in suicide victims who had experienced childhood abuse *Nature Neuroscience* 12:342-348, 2009

Stress of Racism

- “The lifelong accumulated experiences of racial discrimination by African American women constitute an independent risk factor for preterm delivery.”
 - Odds ratio of 2.6
 - Independent of maternal sociodemographic, biomedical, and behavioral characteristics.

Am J Public Health. 94:2132–2138, 2004

Prenatal Stress

- “Thus, prenatal stress—whether nutritional or psychosocial in origin—shapes a wide range of traits that influence future risk of developing CVD, including how the body manages and distributes glucose and lipids, regulates blood pressure, and responds physiologically to stress.”
- “...stressors experienced by one generation, such as imbalanced nutrition or psychosocial stress, can perpetuate changed biological settings to offspring...”

Am J Hum Biol 21:2-15, 2009

3. Lifestyle

Overeating as an *Adaptive Response*

- Prevalence of overweight in women increases as food insecurity increases

Journal of Nutrition. 131:1738-1745, 2001

- Food Insecurity associated with depression and anxiety in mothers and behavior problems in children

Pediatrics 118(3):e859-e868, 2006

- Carbohydrates affect brain serotonin levels

Obes Res 1995 Suppl 4:477S-480S

- “Comfort Foods” reduce HPA axis stress response with its attendant anxiety

Proc Natl Acad Sci 100(20):11696-11701, 2003

Endocrinology 145:3754-3762, 2004

Overeating and Psychological Distress

“Youths who overeat may have or be at risk for serious psychological distress, including deficits to self-esteem, compromised mood, and suicide risk. Overeating may be a tangible behavior that signals the need for intervention.”

Ackard et al, Pediatrics 2003;111:67-74

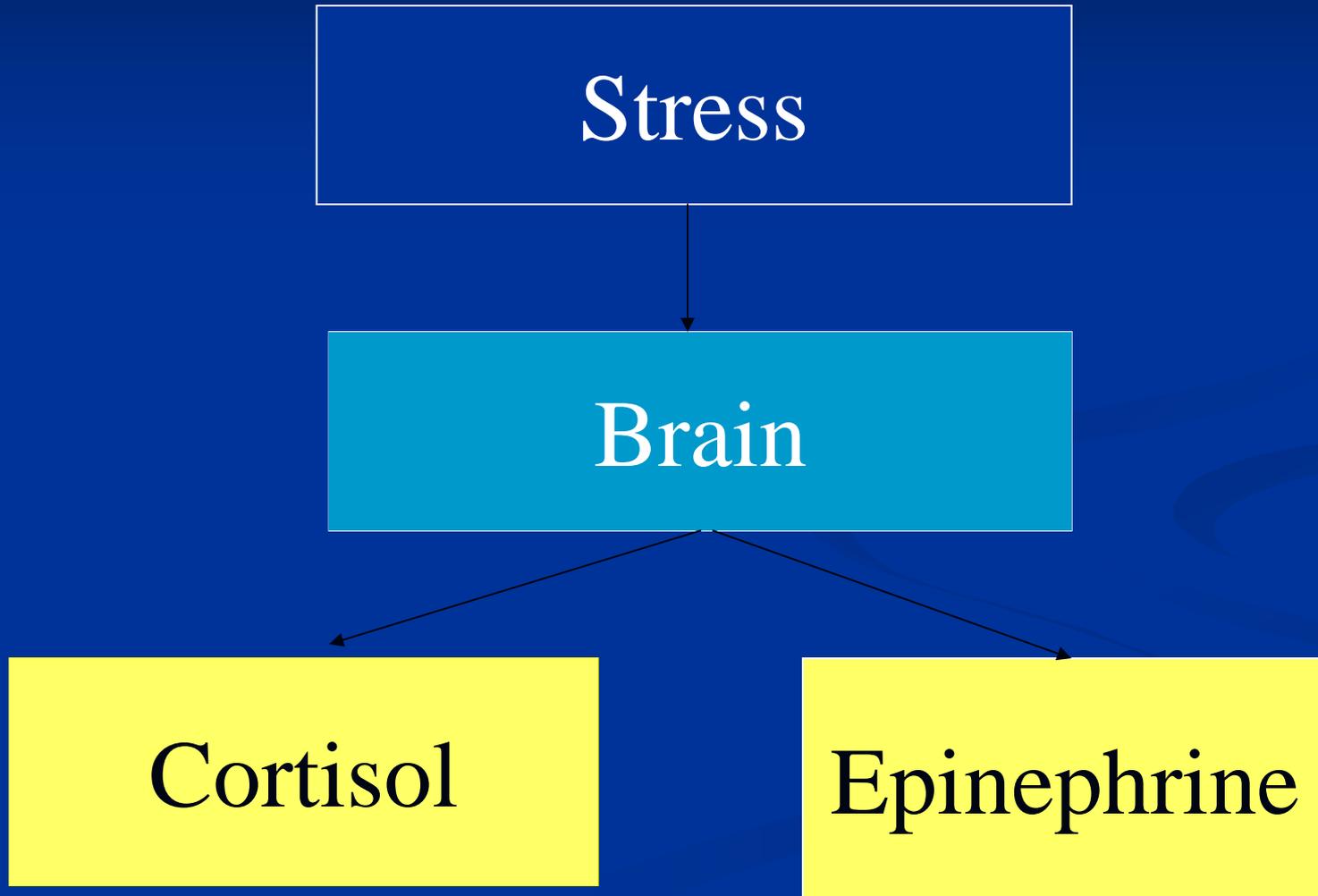


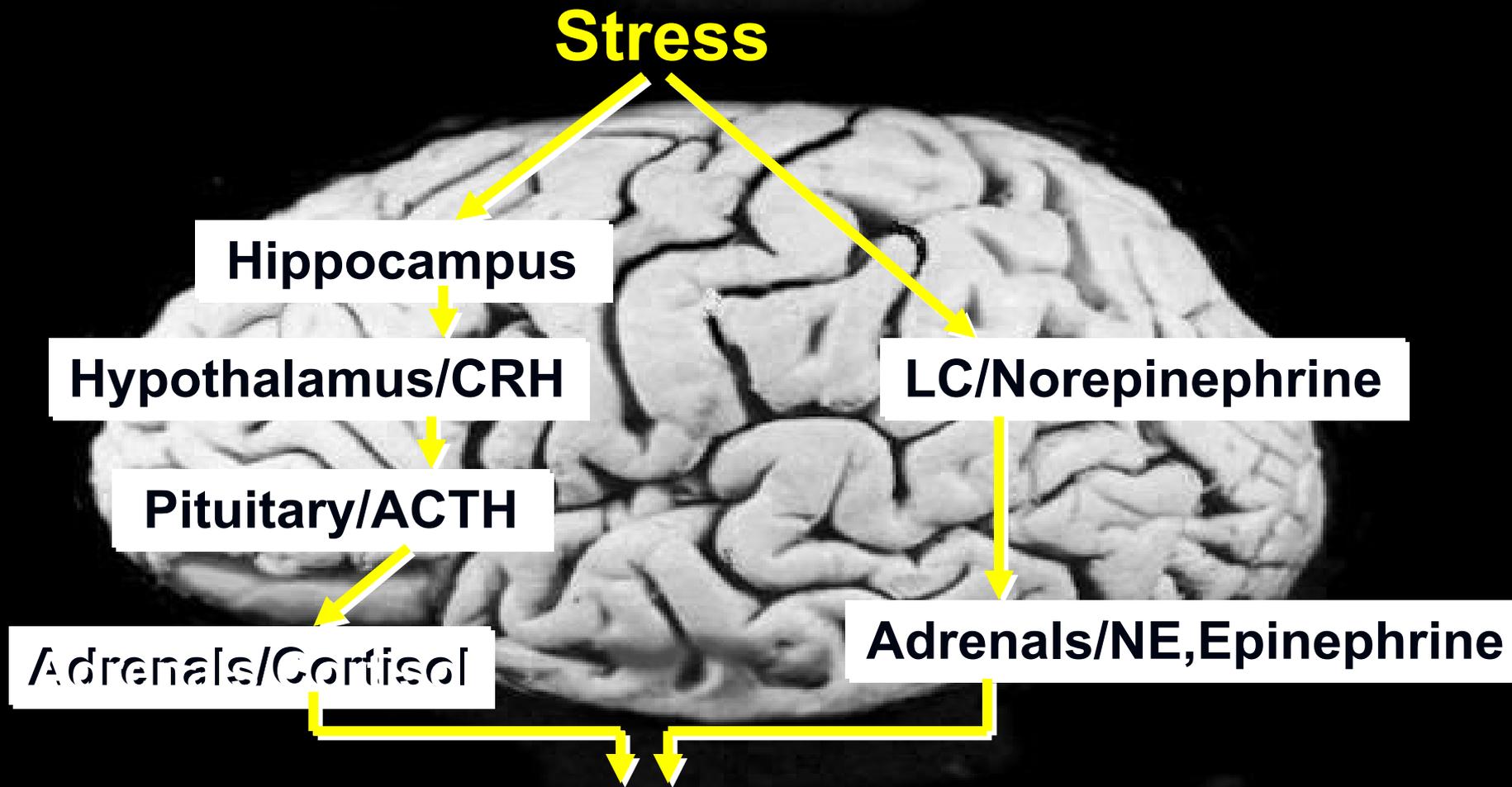
4. Stress

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

“A Science-Based Framework for Early Childhood Policy: Using Evidence to Improve Outcomes in Learning, Behavior, and Health for Vulnerable Children”, Center on the Developing Child at Harvard University, August 2007, p.10 <http://www.developingchild.harvard.edu>

Basic Stress Pathway





Endothelial Dysfunction

↑ Insulin Resistance

↓ Insulin secretion, GH, LH, testosterone, TSH

Releases hepatic glucose, ↑ TG, fibrinogen, CRP, VLDL, ↓ HDL

↑ Blood Pressure & Heart Rate

Adapted from *J Clin Endocrinol Metab*
1998;83:1842

Posttraumatic Stress Responses

“the long-term consequences of trauma are far-reaching...”

- Context of the trauma
- Age/stage of life
- Loss of family/cultural coherence
- Pre-trauma characteristics
- Life conditions post-trauma
- Symbolic/moral meanings

Posttraumatic Stress Responses

- PTSD
- Depression
- Anxiety
- “Demoralization”

Kroll, *JAMA* 2003;290:667-670

Native Americans and Trauma

■ Adverse Childhood Experiences (ACE) Study

--Overall Exposure: 86% (among 7 tribes)

| | <u>Non-Native</u> | <u>Native</u> |
|-------------------|-------------------|---------------|
| Physical Abuse-M | 30% | 40% |
| Physical Abuse-F | 27 | 42 |
| Sexual Abuse-M | 16 | 24 |
| Sexual Abuse-F | 25 | 31 |
| Emotional Abuse | 11 | 30 |
| Household ETOH | 27 | 65 |
| Four or More ACEs | 6 | 33 |

ACE Score ≥ 4

- 4-12 x risk for alcoholism, drug abuse, depression and suicide attempt
- 2-4 x risk for smoking, teen pregnancy, STDs, multiple sexual partners
- 1.4-1.6 x risk for severe obesity
- Strong graded relationship at all levels of ACEs for almost all outcomes, including heart disease

Am J Prev Med 1998;14:245-258 and *Circulation* 2004;110:1761-1766

Original Trauma

Amygdala

Any input which amygdala interprets as like original trauma

Recreates body state at time of original trauma

Cortisol

Epinephrine

Original emotion re-experienced: fear, rage, sadness

Adapted from LeDoux, *The Emotional Brain*, 1996

The brain itself is changed by stress

- Complex process of “sculpting” the brain, converting experience into neuronal changes
 - Corticosteroids
 - Brain-derived neurotrophic factor (BDNF)
 - Chronic stress and depression:
 - shrink the hippocampus and prefrontal cortex
 - Memory, selective attention, executive function/decision making
 - potentiate growth of the amygdala
 - Fear/hypervigilience, anxiety, aggression

Childhood Trauma Predicts Adult Health

- Helsinki Birth Cohort, 1934-44 Study
- 320 had been evacuated abroad during WW II—separated from their parents
 - Mean age at evacuation: 4.8 years old
 - Mean duration of evacuation: 1.7 years
- 60 years later, compared with children not evacuated, evacuees were much more likely to have:
 - CVD (OR 2.0) and hypertension
 - Type 2 Diabetes (OR 1.4)
 - Depressive symptoms (OR 1.7)
 - Earlier menarche, first childbirth, more children, shorter interbirth intervals
- “This study is among the first to show that early life trauma predicts higher prevalence of cardiovascular disease and type 2 diabetes in late adulthood, in a longitudinal clinical study setting.”

“Childhood Trauma...

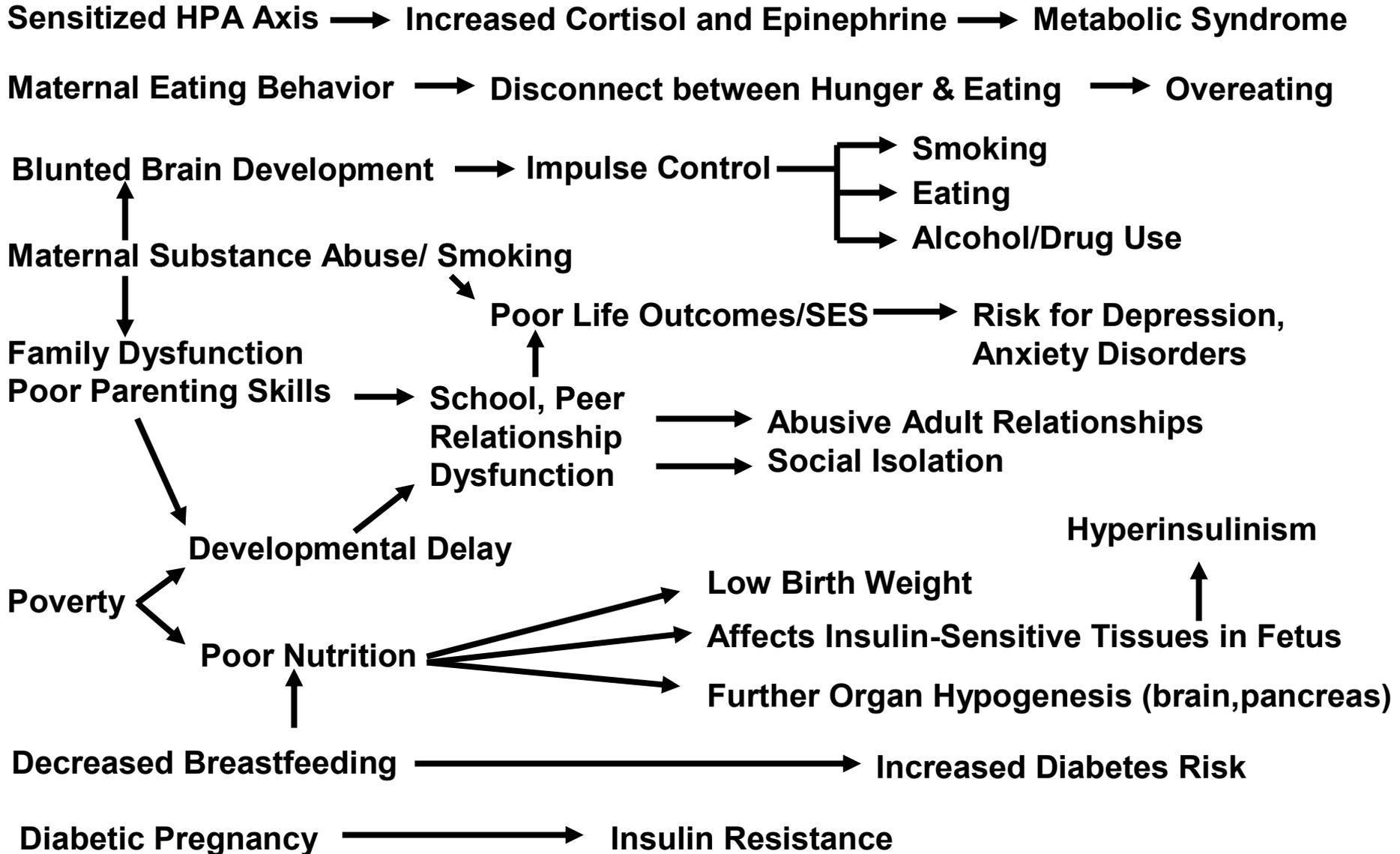
- “...is probably our nation’s single most important public health challenge... ..chronic maltreatment has pervasive effects on the development of mind and brain. Developmental trauma sets the stage for unfocused responses to subsequent stress, leading to dramatic increases in the use of medical, correctional, social, and mental health services.”
- “Complex trauma”: e.g. abuse; neglect; exposure to DV, community violence; poverty; caregiver psychopathology—compounded when caregiver the source of trauma or even if they are unable to support and help child process trauma experiences

van der Kolk, 2005. *Psychiatric Annals* 35(5):374-378

Domains of Impairment in Children Exposed to Complex Trauma

| I. Attachment | IV. Dissociation | VI. Cognition |
|---|--|--|
| <p>Problems with boundaries</p> <p>Distrust and suspiciousness</p> <p>Social isolation</p> <p>Interpersonal difficulties</p> <p>Difficulty attuning to other people's emotional states</p> <p>Difficulty with perspective taking</p> | <p>Distinct alterations in states of consciousness</p> <p>Amnesia</p> <p>Depersonalization and derealization</p> <p>Two or more distinct states of consciousness</p> <p>Impaired memory for state-based events</p> | <p>Difficulties in attention regulation and executive functioning</p> <p>Lack of sustained curiosity</p> <p>Problems with processing novel information</p> <p>Problems focusing on and completing tasks</p> <p>Problems with object constancy</p> <p>Difficulty planning and anticipating</p> <p>Problems understanding responsibility</p> <p>Learning difficulties</p> <p>Problems with language development</p> <p>Problems with orientation in time and space</p> |
| II. Biology | V. Behavioral control | VII. Self-concept |
| <p>Sensorimotor developmental problems</p> <p>Analgesia</p> <p>Problems with coordination, balance, body tone</p> <p>Somatization</p> <p>Increased medical problems across a wide span (eg, pelvic pain, asthma, skin problems, autoimmune disorders, pseudoseizures)</p> | <p>Poor modulation of impulses</p> <p>Self-destructive behavior</p> <p>Aggression toward others</p> <p>Pathological self-soothing behaviors</p> <p>Sleep disturbances</p> <p>Eating disorders</p> <p>Substance abuse</p> <p>Excessive compliance</p> <p>Oppositional behavior</p> <p>Difficulty understanding and complying with rules</p> <p>Reenactment of trauma in behavior or play (eg, sexual, aggressive)</p> | <p>Lack of a continuous, predictable sense of self</p> <p>Poor sense of separateness</p> <p>Disturbances of body image</p> <p>Low self-esteem</p> <p>Shame and guilt</p> |
| III. Affect regulation | | |
| <p>Difficulty with emotional self-regulation</p> <p>Difficulty labeling and expressing feelings</p> <p>Problems knowing and describing internal states</p> <p>Difficulty communicating wishes and needs</p> | | |

Diabetes Trajectory by School Entry



Reducing Prenatal and Early Life Risk Factors for Chronic Disease

Ann Bullock, MD

Children's stress hormone levels correlate with mother's SES and depressive state

Biol Psychiatry 48(10):976-80, 2000

Income inequality/child relative poverty: related to increased adult morbidity and mortality, including from diabetes, CVD, alcoholic cirrhosis, injuries

JAMA 301 (4):425-426, 2009

Childhood Stress Affects Adult Stress Hormone Responses

- Heim et al looked at pituitary-adrenal and autonomic responses to stress in adult women with a history of childhood sexual or physical abuse.
- Even years after the abuse ended, patients still hypersecreted stress hormones, even in response to mild stresses.

JAMA 2000;284:592-597

“Research has suggested that an accumulation of multiple risk factors in areas of family structure (e.g. parental employment, father’s absence, teen parenthood), human capital (e.g. maternal education, maternal verbal ability), and mental health (e.g. maternal depression, stressful life events) is associated with lower IQ scores as early as age 2-4 years and more behavior problems by age 3.”

Fuligni and Brooks-Gunn from *Promoting Health: Intervention Strategies from Social and Behavioral Research*, 2000

Collective Efficacy

- “The willingness of community members to look out for each other and intervene when trouble arises”
- Associated with adolescent obesity and risk for overweight, CVD, premature mortality
- Independent of neighborhood SES

*“Where did we
learn how to do
this???”*

Eduardo Duran, PhD

Recognize the Behaviors/Beliefs We Have as the Result of Trauma

- Distrust—of the government, institutions, our own leaders, supervisors, etc even to our own detriment--“they” are out to get us
- Sense of never having “enough”
- Spend/eat/use what you have now as it may be taken from you
- We will not live to be old, so it doesn’t matter what we do now
- Indians who get an education are “apples”

More Behaviors/Beliefs

- Our culture, language and way of life are inferior—and learning them is somehow wrong
- “Everyone” does alcohol and drugs—and they make the pain go away for awhile
- “Love” is not to be trusted and is often linked with emotional/physical/sexual abuse
- I have no control over my world
- I am not worthwhile



The “trajectory” toward chronic disease, mental health and learning problems is set by school entry

- Prevention programs don't start early enough
- True prevention must start prenatally and continue throughout childhood
- What types of interventions might be effective?

Cultural/Group Support

- Pima Pride/Action
 - DPP pilot study
 - People randomized to “Action” group
 - Structured diet/exercise meetings
 - People randomized to “Pride” control group
 - Unstructured activities emphasizing Pima culture and history
- *“Pima Pride” group showed more positive outcomes on every biological parameter measured*

Narayan et al, Diabet Med 1998;15:66-72

Breastfeeding

Exclusive breastfeeding for the first 2 months of life was associated with an odds ratio for Type 2 diabetes of 0.41 (adjusted for age, sex, parental diabetes, and birthweight) in a study in Pima Indians

Lancet 1997;350:166-168

Disconnect between hunger and satiety happens early in life

- Study in 2 daycare centers found:

1. Children's "disregulated energy intake" is related to mothers' weight and perceived control over eating.

2. Instituting an age-appropriate intervention which helped children focus on their own internal cues resulted in improved ability to self-regulate eating.

Harlem Children's Zone

- Led by Geoffrey Canada, focus on education
- Goal: to break the cycle of poverty in Harlem— “...to transform every aspect of the environment that poor children were growing up in; to change the way their families raised them and the way their schools taught them as well as the character of the neighborhood that surrounded them.”
- “Conveyor belt” of intensive services: Baby College—day care--pre-school—kindergarten—elementary school—middle school—high school

Whatever It Takes, 2008, Paul Tough

Break the Depression Cycle

- 2-3x increased risk for anxiety and disruptive behavior disorders and major depression in children of depressed parents
- “These offspring problems often begin before puberty, continue into adolescence and adulthood and can be transmitted to the next generation.”
- Treating children is difficult and controversial
- *But treating the mothers' depression reduces symptoms in both mothers and children*

Stimulation in Early Childhood: Has Effects Years Later

- Psychosocial stimulation (weekly play sessions with mother and child over 2 years) given to growth retarded children age 9-24 months resulted in less anxiety, depression, attention problems and higher self-esteem *16 years after the intervention.*
- Intervention aimed to improve the mother-child relationship: listening and talking to children, allowing them to experience success/praise, reducing punishment

Walker, *et al.*. 2006. *BMJ*, doi:10.1136/bmj.38897.55208.2F

Parenting Groups Improve Antisocial Behavior in Children

- “Harsh, inconsistent parenting is strongly associated with antisocial behaviour in children...”
- Intervention was a series of group classes which focused on parenting skills and support
- Resulted in “a large reduction in antisocial behaviour” in the children

The economics of early life intervention

- “The available evidence suggests that for many skills and human capabilities, later intervention for disadvantage may be possible, but it is much more costly than early remediation to achieve a given level of adult performance.”
- “Simple economic models show the importance of accounting for early and late investments and for examining the technological possibilities and economic costs of late remediation for early environmental influence.”

James J. Heckman *PNAS* 2007;104(33):13250-13255



Nurse-Family Partnership Program Overview

February 7, 2006



FAMILIES SERVED

- **Low income pregnant women**
 - Usually teens
 - Usually unmarried
- **First-time parents**



THREE GOALS

1. **Improve pregnancy outcomes**
2. **Improve child health and development**
3. **Improve parents' economic self-sufficiency**

Elements of the Nurse-Family Partnership

- Mothers enroll voluntarily early in pregnancy
- Home visits by nurses over 2½ years
- Powerful relationships with families build on native strengths
- Construct program around each family's goals and values
- Nursing guidelines are rich with resources to nurture multiple, inter-related aspects of health

Nurses and Families Attend To:

- Personal health
- Environmental health
- Life course development
- Maternal (Parental) role
- Building support systems through family, friends, community
- Connections to other health and human services as needed

Consistent Program Effects*

- Improved prenatal health
- Fewer childhood injuries
- Fewer subsequent pregnancies
- Increased intervals between births
- Increased maternal employment
- Improved school readiness

*Effects observed in at least two of the three trials (Elmira, Memphis, Denver)



ELMIRA LONG-TERM RESULTS: Benefits to Mothers

Fewer convictions

↓ 72%

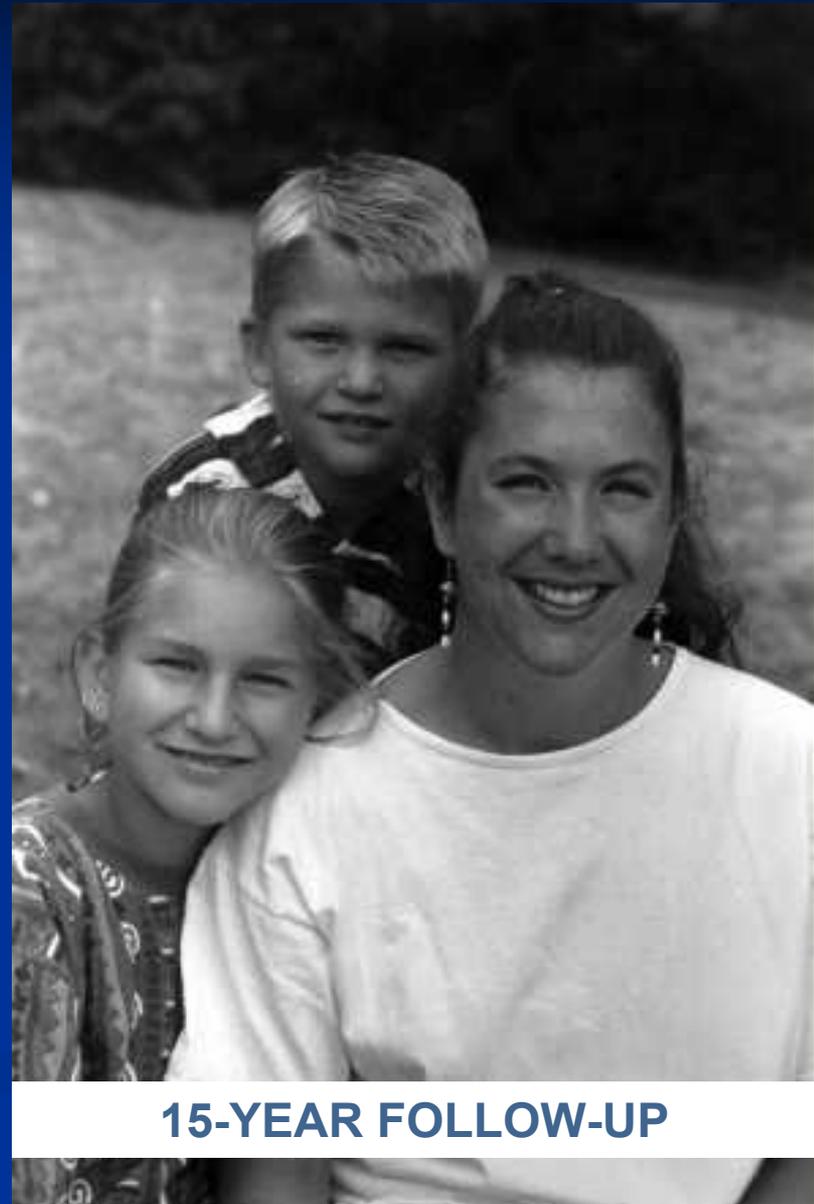
Fewer days in jail*

↓ 98%

Fewer arrests

↓ 61%

* Impact on days in jail is highly significant, but the number of cases that involved jail-time is small, so the magnitude of program effect is difficult to estimate with precision



15-YEAR FOLLOW-UP

ELMIRA LONG-TERM RESULTS: Benefits to Children

Abuse & Neglect

↓ 48%

Arrests

↓ 59%

Adjudications as PINS*
(person in need of supervision) for incorrigible behavior

↓ 90%

* Based upon family-court records of 116 children who remained in study-community for 13-year period following end of program.



15-YEAR FOLLOW-UP

Effects on Child Development Memphis 6-Year

- Higher IQ's
- Better language development
- Fewer mental health problems



Nurse-Family Partnership

- “The most rigorously evaluated example of a program that promotes safe, stable, and nurturing relationships and environments...”
JAMA 2009;301(21):2262-4
- “in a series of rigorous experimental evaluations, the Nurse Family Partnership has produced multiple, positive impacts on families and children, including fewer subsequent pregnancies, increased maternal employment, higher cognitive performance, and better social behavior by children in the preschool years, as well as (in the study with the longest-term follow-up) fewer arrests in adolescence” (p. 13).

“A Science-Based Framework for Early Childhood Policy: Using Evidence to Improve Outcomes in Learning, Behavior, and Health for Vulnerable Children”, Center on the Developing Child at Harvard University, August 2007, p.6
<http://www.developingchild.harvard.edu>

“...we are placing bets on the value of early intervention, beginning prenatally with a mother’s first pregnancy, and extending throughout the first years of life and beyond, as one of the surest ways to begin to address past centuries of neglect and improve the prospects of American Indian and Alaska Native children in this century.”

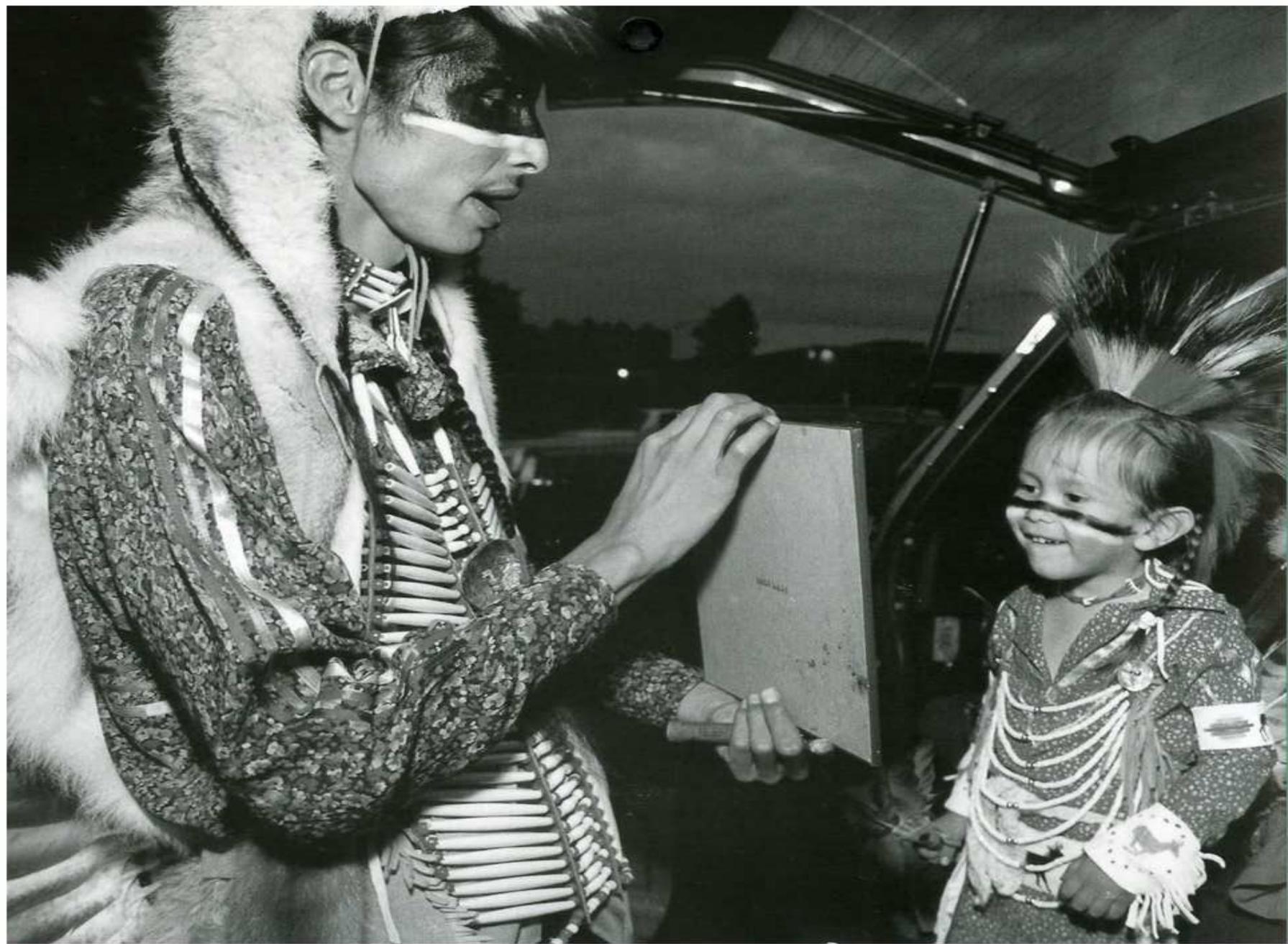
Sarche and Spicer, *Ann NY Acad Sci* (2008) 1136:126-136

<Preconception Conception--- Birth Early Childhood Adolescence >

Nutrition Fruit/Veg Supplementation WIC+ WIC+ School Food Programs
Breastfeed “Backpack Foods”

Depression Screen: high schools, family planning/prenatal/well child/WIC clinics
&Substance Treatment: CBT, EMDR, DBT, groups, dual diagnosis
Abuse Coping Skills classes: emotions (e.g. LifeSkills), racism, finances, relaxation
Find ways to help pregnant women abstain from drugs/alcohol/smoking

“Parenting” Nurse-Family Partnership-----
Case manage all pregnancies Family Planning
Parenting classes—pay parents to attend-----
Play groups/psychosocial stimulation
Parent-Child Interaction Therapy Mentoring
DSS/Court referrals Pregnant teens group
Harlem Children’s Zone: Strong Day Care—Head Start—Schools
Coping skills for kids, bullying interventions
Renew tribal traditional pregnancy/child-rearing practices



Body-Centered Interventions

Relaxation/Centering Techniques
Breathing/Guided Imagery



Meditation

Progressive Muscle Relaxation *Diabetes Care* 25:30-34, 2002

Biofeedback-assisted relaxation *Diabetes Care* 28:2145-9, 2005

Yoga/Tai Chi/Qi-Gong *Diabetes Care* 25:241-2, 2002

Massage and other body work techniques

Acupuncture (helps with chronic pain)

Emotional-Support Interventions

Individual and Group Therapy

Talking Circles/Support Groups

Group Medical Visits *Diabetes Care* 27:670-675, 2004

Historical Trauma Interventions

Activity Therapies: Art, Theatre, Movement

EMDR/Trauma Processing

Reconnecting Eating with Hunger Cues

Pediatrics 2000;106:1429-1435

Spiritual Support Interventions

- Traditional activities
 - Ceremonies
 - Sweatlodges
- Faith-based groups
 - Churches
- 12-step groups, Wellbriety

Community Interventions

- Prenatal Support and Nutrition
- Breastfeeding/Infant Nutrition
- Infant Mental Health
- Prenatal and Early Life Nurse Home Visits

Pediatrics 2004;114:1560-1568

- Excellent Day Care
- Strong Schools with high staff:student ratios, after school programs, mentoring

Goodman et al, J Pediatr 2003;143:452-6

- Coping and Parenting Skills Programs

