The First 1000 days: The Importance of Early Brain and Childhood Development

Translating Developmental Science into Healthy Lives

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Disclosures

• I have no disclosures

Learning Objectives

• Understand the role of toxic stress in the intergenerational transfer of health disparities;
• Present an organizing, integrated, ecobio developmental framework;
• Discuss ways early childhood professionals might advocate in translating science into healthier life courses
Critical Concept #1

Childhood Adversity has Lifelong Consequences.

Significant adversity in childhood is strongly associated with unhealthy lifestyles and poor health decades later.

ACE Study Findings

- Childhood experiences are powerful determinants of who we become as adults

ACE Categories

<table>
<thead>
<tr>
<th>Category</th>
<th>Women (n=9,367)</th>
<th>Men (n=7,970)</th>
<th>Total (n=17,337)</th>
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</thead>
<tbody>
<tr>
<td>Abuse</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>- Emotional</td>
<td>13.1%</td>
<td>7.6%</td>
<td>10.6%</td>
</tr>
<tr>
<td>- Physical</td>
<td>27.0%</td>
<td><strong>49.9%</strong></td>
<td><strong>28.3%</strong></td>
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<tr>
<td>- Sexual</td>
<td>24.7%</td>
<td>16.0%</td>
<td>20.7%</td>
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<tr>
<td>Household Dysfunction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Mother Treated Violently</td>
<td>13.7%</td>
<td>11.5%</td>
<td>12.7%</td>
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<tr>
<td>- Household Substance Abuse</td>
<td>29.5%</td>
<td>23.8%</td>
<td>26.9%</td>
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<td>- Household Mental Illness</td>
<td>23.3%</td>
<td>14.8%</td>
<td>19.4%</td>
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<tr>
<td>- Parental Separation or Divorce</td>
<td>24.5%</td>
<td>21.8%</td>
<td>23.3%</td>
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<tr>
<td>- Incarcerated Household Member</td>
<td>5.2%</td>
<td>4.1%</td>
<td>4.7%</td>
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<tr>
<td>Neglect*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Emotional</td>
<td>18.7%</td>
<td>12.4%</td>
<td>14.8%</td>
</tr>
<tr>
<td>- Physical</td>
<td>9.2%</td>
<td><strong>10.7%</strong></td>
<td><strong>9.9%</strong></td>
</tr>
</tbody>
</table>

* Wave 2 data only (n=8,667)  Data from www.cdc.gov/nccdphp/ace/demographics
The higher the ACE Score, the greater the likelihood of:

- Severe and persistent emotional problems
- Health risk behaviors
- Serious social problems
- Adult disease and disability
- High health, behavioral health, correctional and social service costs
- Poor life expectancy

For example:

Higher ACE Score = significant rise in chronic health conditions:

- Sexually Transmitted Disease
- Liver Disease
- COPD
- Ischemic Heart Disease
- Autoimmune Disease
- Lung Cancer

Adverse Childhood Exposures and Alcohol Dependence Among Seven Tribes, American Journal of Preventative Medicine, 2003

- Alcohol Dependence correlated to:
  - Physical Abuse and Boarding School in Men
  - Sexual Abuse and Boarding School in Women
Current Conceptual Framework Guiding Early Childhood Policy and Practice

The True Nature of Preventive Medicine

Developing a Model of Human Health and Disease
Defining Adversity or Stress

- How do you define/measure adversity?
- Huge individual variability
  - Perception of adversity or stress (subjective)
  - Reaction to adversity or stress (objective)
  - Hypothalamic-Pituitary Axis Reactivity
    - Levels of Cortisol
    - Epinephrine/Norepinephrine
    - Inflammatory markers
  - National Scientific Council on the Developing Child (Dr. Jack Shonkoff and colleagues)
    - Positive Stress
    - Tolerable Stress
    - Toxic Stress

Positive Stress
- Brief, infrequent, mild to moderate intensity
- Most normative childhood stress
  - Inability of the 1.5 month old to express their desires
  - The 2 year old who stumbles while running
  - Beginning school or daycare
  - The big project in middle school
- Social-emotional buffers allow a return to baseline
  (responding to non-verbal clues, consolation, reassurance, assistance in planning)
- Builds motivation and resiliency
- Positive Stress is NOT the ABSENCE of stress

Positive Stress
- Tolerable Stress
- Toxic Stress

Tolerable Stress
- Levels of Cortisol
- Epinephrine/Norepinephrine
- Inflammatory markers

Toxic Stress
- Hypothalamic-Pituitary Axis Reactivity
- Levels of Cortisol
- Epinephrine/Norepinephrine
- Inflammatory markers
Defining Adversity or Stress

- **Toxic Stress**
  - Long lasting, frequent, or strong intensity
  - More extreme precipitants of childhood stress (ACEs)
    - Physical, sexual, emotional abuse
    - Physical, emotional neglect
    - Household dysfunction

- **Insufficient social-emotional buffering**
  - Deficient levels of emotion coaching, re-processing, reassurance and support

- Potentially permanent changes and long-term effects
  - **Epigenetics**: there are lifelong / intergenerational changes in how the genetic program is turned **ON** or **OFF**
  - **Brain architecture**: the mediators of stress impact upon the mechanisms of brain development / connectivity

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**ACEs Impact Multiple Outcomes**

- **Smoking**
- **Alcoholism**
- **Promiscuity**
- **High Perceived Risk of HIV**
- **Obesity**
- **Skeletal Fractures**
- **Illicit Drugs**
- **Multiple Somatic Symptoms**
- **Cancer**
- **Liver Disease**
- **Chronic Lung Disease**
- **Ischemic Heart Disease**

**ACEs**

- **General Health and Social Functioning**
  - **Married to an Alcoholic**
  - **Difficulty in job performance**
  - **Depression**
  - **Sleep Disturbances**
  - **Memory Disturbances**
  - **Panic Reactions**
  - **Pain**
  - **Anxiety**

**Prevalent Diseases**

- **Relationship Problems**
- **High perceived stress**
- **Teen Paternity**
- **Unintended Pregnancy**
- **Early Age of First Intercourse**
- **Sexual Dissatisfaction**

**Critical Concept #2**

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 epigenetic markers**
Through epigenetic mechanisms, the early childhood ecology becomes biologically embedded, influencing how the genome is utilized.

**Critical Concept #3**

**Developmental Neuroscience:**
- Synapse and circuit formation are experience and activity dependent.
- **Ecology** (environment/experience) influences how brain architecture is formed and remodeled.
- Early childhood adversity results in a vicious cycle of stress.
- Diminishing cellular plasticity limits remediation.
- Potentially permanent alterations in brain architecture and functioning.

**Early Experiences are Crucial**
- By age 3, 80% of synaptic connections are already made.
- By the second decade of life growth levels off and pruning begins.
- Increased experiences define the wiring of an infant's brain.
Two Types of Plasticity

**Synaptic Plasticity**
- Variation in the **STRENGTH** of individual connections
- Development of long term and working memory
- Dysfunction results in working memory deficits

**Cellular Plasticity**
- Variations in the **NUMBER (or COUNT)** of connections
- Billions of connections made, many redundant
- “Pruning” of connections after age 5-6

5 Days   2 Months

1 Year  28 Years

Human Brain at Birth  6 Years Old  14 Years Old
Brain Structure (and Function)

- **Brain Stem & Cranial Nerves:**
  - Vital functions
  - Swallowing

- **Cerebellum:**
  - Smooth movements
  - Coordination

- **Occipital Lobe:**
  - Visual processing

- **Parietal Lobe:**
  - Integration of sensory data and movement

- **Temporal lobe (outside):**
  - Processing sound and language

- **Limbic System (inside):**
  - Emotions and impulsivity
  - + The Gas Pedal +
  - Amygdala

- **Frontal lobes:**
  - Abstract thought, reasoning, judgment, planning, impulse and affect regulation, consequences

- **PFC (with some hippocampal help):**
  - + The Brake +

Impact of Early Stress

- **CHILDOIHD STRESS**
  - Hyper-responsive stress response; calm/coping
  - Chronic “fight or flight;” adrenaline / cortisol

Development results from an ongoing, re-iterative, and cumulative dance between nurture and nature

- **Experience**
  - Protective and Personal (versus Insecure and Impersonal)

- **Brain Development**
  - Alterations in Brain Structure and Function

- **Epigenetic Changes**
  - Alterations in the Way the Genetic Program is Read

- **Behavior**
  - Adaptive or Healthy Coping Skills (vs. Maladaptive or Unhealthy Coping Skills)
Declining plasticity in the developing brain results in potentially permanent alterations in brain functioning and development.

Eco-Bio-Developmental Model of Human Health and Disease

Ecology Becomes biology, And together they drive development across the lifespan

Critical Concept #4

The Science of Early Brain and Child Development

One Science – Many Implications

The critical challenge now is to translate developmental science into effective policies and practices for families w/ children to improve education, health, and lifelong productivity.
Critical Concept #4

For young children, Caregivers create the environment for brain development!

- Caregivers can turn off physiologic stress response by addressing physiologic and safety needs
- Turns off the physiologic stress response by promoting healthy relationships and attachment
- Notes and encourages foundational coping skills as they emerge

Early Childhood professionals are ideally placed!

- Promote this sort of “Purposeful” Parenting
- Advocate for a public health approach to address toxic stress

Addressing Toxic Stress

• **Primary / Universal Prevention**
  - Proactive, universal interventions to make stress positive instead of tolerable or toxic
  - Acknowledges that preventing all childhood adversity is impossible and even actively building resilience (“immunizing” through positive parenting, 7C’s of resilience, promoting optimism, “One Minute” social-emotional learning)
  - SE Buffers for caregivers allow the physiologic stress response to return to baseline

Promoting the Five R’s of Early Childhood Education

• **READING** together - daily
• **RHYMING** - playing and cuddling
• **ROUTINES** - help children know what to expect of us - what is expected of them
• **REWARDS** for everyday successes – PRAISE is a powerful reward
• **RELATIONSHIPS** reciprocal and nurturing – foundation of healthy child development
• **Secondary / Targeted Preventions**
  - Focused, targeted interventions for those deemed to be "at high risk"
  - Home Visiting (Healthy Steps, Parents as Teachers, Nurse Family Partnership)
  - Parenting Play/Support Programs
  - More likely to be effective; minimize "damage"

**Addressing Toxic Stress**

**Linking Early Childhood Professionals through Home Visiting**

- Screening, Risk Stratification, Communication
  - Personnel dedicated to this position (health concierge)
  - Ability to connect more important than education
  - Can sign up families for text4baby and healthychild.org “push” notifications, select blogs, Facebook groups
  - Can facilitate appointments or point-of-care referral

**Home Visiting Partners for Higher Risk Families**

- Child Health Investment Partnership of the Roanoke Valley
- Home Visiting with a Health Focus
  - Parents As Teachers
  - Oral Health
  - Asthma Management
  - Pregnant Moms
  - Behavioral Health
Pediatric “Extensive” Care

Routine Medical/Social Screening

- Screening, Risk Stratification, Communication
  - Personnel dedicated to this position (health concierge)
  - Communication with Child Care and Head Start
  - Becomes a “point of contact” for the practice
  - Can sign up families for text4baby and healthychild.org “push” notifications, select blogs, Facebook groups
  - Can facilitate appointments or point-of-care referral

Safe Environment for Every Kid
**Results**

100% families receive early childhood education
90% 2yr olds UTD on well visits and immunizations
100% children are screened for lead, Hgb, development

100% children have a Dental Home
66% of children have had a dental visit by age 3
97% have had an oral health assessment and fluoride varnish

145 children in program 2011-2012
84% well controlled
84% minimal inhaler use
90% decrease in ED visits
82% decrease in school absence due to asthma

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**WHAT are we DOING?!**

Universal Primary Preventions
- Bright Futures
- Connected Kids
- Social-Behavioral Milestones
- Relationships as a “vital” sign
  - **Basic EBCD Competencies**

Targeted Interventions
- Screening for risks (assess the ecology)
- Refer to/advocate for EBI
  - **Mid-level Competencies**

Evidence-Based Treatments
- Screening for diagnoses
- Common factors approach
- Refer for/advocate for EBT
  - **Advanced Competencies**

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**Addressing Toxic Stress**

- **Treatment** of the consequences
  - **Evidence-based treatments**
    - Trauma Focused Cognitive Behavioral Therapy
    - Parent-Child Interactive Therapy
  - **Reactive** – some “damage” already done!
    - Very **COSTLY**
    - Efficacy linked to age and chronicity
      - Declining **brain plasticity?**
    - Insufficient **number of / access** to providers
    - Persistent **STIGMA**
      - “Character Flaws” vs. “Biological Mal-adaptations”
Childhood Adversity → Poor Adult Outcomes

**Toxic Stress**
- Epigenetic Modifications
- Disruptions in Brain Architecture

**Behavioral Adverse Outcomes**
- Maladaptive behaviors
- Non-communicable Diseases

SUMMARY

- **What can I do?**
  - Understand the ecobiodevelopmental framework (advocate for a collaborative, public health approach to address toxic stress)
  - Help children figure out how to turn off their stress response (parent/child skills)
  - Recognize the relationship as a vital sign

SUMMARY

- **What can I do?**
  - Develop purposeful partnerships with Pediatric healthcare providers
  - Incorporate practice process to screen, refer, and follow all children
  - Intervene early for those children who appear unable to turn off their stress response (secondary and tertiary prevention)
**SUMMARY**

- What can I do?
  - Provide parents information on Adverse Childhood Experiences
  - Understand and learn about parents’ adverse childhood experiences
  - Refer parents for resources to help them address their own stress and health concerns.

**A Public Health Parable:**

- Man by the river hears someone drowning
- Being a good swimmer, he rescues the person
- Before catching his breath, he hears another in need, and another, and another...
- The man, exhausted, begins to walk away
- Asked where he’s going, he responds...

**“I’m going upstream to prevent others from falling in!!”**
We’re in the “building health and developmental assurance” business.....

Physical health
Developmental health
Relational health

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

Frederick Douglass