Social Determinants of Health:

Lifetime Consequences of Maltreatment;
Children as the Key to Lifespan Health;
Brain Development Related to Social Determinants.

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Disclosure:

- I have no relevant financial relationships with manufacturers of any commercial products nor provider of commercial services discussed in this CME activity.
- I do not intend to discuss unapproved/investigative use of a commercial product/device.
Why Are Social Determinants Important?

- The Heckman Equation
- Felitti, Anda: The Adverse Childhood Experiences (ACE) Studies
- Evolving Science in Brain and Human Development
  - The Effects of Toxic Stress
Health and Economics

- While not all children are able to become adults, it is certainly true that all adults once were children.

- Developing science underscores the need to invest in children’s health, education, and general well-being in order to avoid the continuation of an unsustainable health care system, and a failing system of education.
James J. Heckman

- Nobel Memorial Prize Winner
- Professor of Economics, University of Chicago
- Equation on Human Capital Development is a Solution for Securing America’s Economic Future.
Many major economic and social problems in America — crime, teenage pregnancy, high school dropout rate, adverse health conditions — can be traced to low levels of skill and social ability such as attentiveness, persistence and impulse control.
Professor Heckman found that early nurturing, learning experiences and physical health from ages zero to five greatly impact success or failure in society. The most economically efficient time to develop skills and social abilities is in the very early years when developmental education is most effective.
Professor Heckman shows that disadvantaged families are least likely to have the economic and social resources to provide the early developmental stimulation every child needs as a basic opportunity for future success in school, college, career and life.
Professor Heckman studied decades worth of data from early childhood development programs that gave disadvantaged children and their families developmental support.
Invest in educational and developmental resources for disadvantaged families to provide equal access to successful early human development.

Develop cognitive skills, social skills and physical well-being in children early — from birth to age five when it matters most.

Sustain early development with effective education through to adulthood.

Gain a more capable, productive and valuable workforce that pays dividends to America for generations to come.
The Heckman Equation:

Investing in early childhood development builds the human capital we need for economic success.
What determines health?

- Biological
  - Genetics
  - Pre- and perinatal factors
  - Physical health
  - Gender
  - Trauma

- Psychological
  - Relations with parents/siblings
  - Family dynamics
  - Personality
  - Resilience
  - Adaptability

- Social/Cultural
  - SES
  - Family stability
  - Social capital
  - Work/employment
  - Value system
  - Neighborhood/Housing
  - Religion
  - HC Policy
  - HC System
ACCESS → Access to and equity in healthcare are key health determinants.

NORTH TULSA
Shorter Life Expectancy

SOUTH TULSA
Longer Life Expectancy

14 Year difference in Life Expectancy

ACCESS → Access to and equity in healthcare are key health determinants.
Brain Development
Human Brain Development
Synapse Formation Dependent on Early Experiences

Sensory Pathways (Vision, Hearing)
Language
Higher Cognitive Function

Conception
Birth
(Months)
(Years)
Age

Through epigenetic mechanisms, the early childhood ecology becomes biologically embedded, influencing how the genome is utilized.
Advantages of an **EBD** Framework

- Underscores the need to improve the early childhood **ecology** in order to:
  - Mitigate the **biological** underpinnings for educational, health and economic **disparities**
  - Improve **developmental/life-course trajectories**

- Highlights the pivotal role of **toxic stress**
  - Not just “**step on the gas**” or enrichment
  - But “**take off the brake**” by treating, mitigating or immunizing against toxic stress
Brain development in the context of poverty

THE IMPACT OF POVERTY ON BRAIN DEVELOPMENT: MULTIPLE PATHWAYS

- Inadequate Nutrition
- Substance Abuse
- Maternal Depression
- Exposure to Environmental Toxins
- Trauma/Abuse
- Quality of Daily Care

POVERTY

EARLY BRAIN DEVELOPMENT
Hardship & Stress, Isolation & Exclusion, Adverse Health
Allostasis and Allostatic Load

- Environmental stressors (work, home, neighborhood)
- Major life events
- Trauma, abuse
- Perceived stress (threat, helplessness, vigilance)
- Individual differences (genes, development, experience)
- Behavioral responses (fight or flight; personal behavior — diet, smoking, drinking, exercise)
- Physiologic responses
- Allostasis
- Adaptation
- Allostatic load
Positive & Tolerable Stress

Repeated “hits”

Physiologic Response

Normal response repeated over time

Time
Toxic Stress
Epigenetics

**Epigenetic Mechanisms**
- Development (in utero, childhood)
- Environmental chemicals
- Drugs/Pharmaceuticals
- Aging
- Diet

**Health Endpoints**
- Cancer
- Autoimmune disease
- Mental disorders
- Diabetes

**DNA Methylation**
Methyl group (an epigenetic factor found in some dietary sources) can tag DNA and activate or repress genes.

**Histone Modification**
The binding of epigenetic factors to histone “tails” alters the extent to which DNA is wrapped around histones and the availability of genes in the DNA to be activated.
How Does Social Environment get Embedded into Biology?

Neighborhood
- Air
- Water
- Soil
- Parks
- Libraries
- Violence

Poverty

Unmet needs
1. Material
   - Food
   - Money
   - Access
   - Housing
2. Caregiving
   - Emotional
   - Learning

Stress

HPA
Gene experience

- Brain
- Immune
- CV

Poor Health in Childhood and Adulthood
Social Environment: Example One

- Survey of 67,853 Nurses
  - Report childhood physical abuse: 54%
  - Report childhood sexual abuse: 34%

- Increased Risk for Adult Type 2 diabetes:
  - 26% – 69%, for moderate to severe abuse.

Example Two

- Survey of 68,505 Nurses
- Risk of Uterine Fibroids with increasing severity of childhood abuse:
  - 8% - 36%
- Also found that an emotionally supportive relationship during childhood was protective against this risk.

- Jarrett RB, Epidemiology, 11/2010
Example Three

- Interpersonal Violence (IPV), and "Housing Disarray" cause (or, are associated with) an increase in incidence of childhood asthma.

- Cumulative or Multiple Stressors are most important.

- J Epidemiol Community Health, 2010
Example Four

- Among women with chronic pain syndromes, childhood maltreatment histories were associated with increased diurnal cortisol levels.
- Abuse can lead to long-term changes in HPA activity.
- Important to evaluate childhood experiences in fibromyalgia and pain syndrome patients.

Nicolson NA, et al, Psychosomatic Medicine, 2010
Example Five

- Poverty, mediated by chronic stress –
- Associated with decreased working memory in young adults.

Evans GW, Schamberg MA, Proceedings of the National Academy of Science, 2009
Last Example

- Childhood Traumatic Stress –
- Increases the likelihood of hospitalization with a diagnosed autoimmune disease, “decades into adulthood.”

Dube SR, et al, Psychosomatic Medicine, 2009
Adverse Childhood Experience (ACE) Study

• Adverse Childhood Experiences (ACEs) are very common

• ACEs are strong predictors of later health risks and disease

• This combination makes ACEs the leading determinant of the health and social well-being of our nation

  ➢ Recurrent physical abuse
  ➢ Recurrent emotional abuse
  ➢ Contact sexual abuse
  ➢ An alcohol and/or drug abuser in the household
  ➢ An incarcerated household member
  ➢ Someone who is chronically depressed, mentally ill, institutionalized, or suicidal
  ➢ Mother is treated violently
  ➢ One or no parents
  ➢ Emotional or physical neglect
# Categories of Adverse Childhood Experiences

<table>
<thead>
<tr>
<th>Category</th>
<th>Prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Abuse, by Category</strong></td>
<td></td>
</tr>
<tr>
<td>Psychological (by parents)</td>
<td>11%</td>
</tr>
<tr>
<td>Physical (by parents)</td>
<td>11%</td>
</tr>
<tr>
<td>Sexual (anyone)</td>
<td>22%</td>
</tr>
<tr>
<td><strong>Household Dysfunction, by Category</strong></td>
<td></td>
</tr>
<tr>
<td>Substance Abuse</td>
<td>26%</td>
</tr>
<tr>
<td>Mental Illness</td>
<td>19%</td>
</tr>
<tr>
<td>Mother Treated Violently</td>
<td>13%</td>
</tr>
<tr>
<td>Imprisoned Household Member</td>
<td>3%</td>
</tr>
</tbody>
</table>
Adverse Childhood Experiences Score

Number of categories adverse childhood experiences are summed …

<table>
<thead>
<tr>
<th>ACE score</th>
<th>Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>48%</td>
</tr>
<tr>
<td>1</td>
<td>25%</td>
</tr>
<tr>
<td>2</td>
<td>13%</td>
</tr>
<tr>
<td>3</td>
<td>7%</td>
</tr>
<tr>
<td>4 or more</td>
<td>7%</td>
</tr>
</tbody>
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• More than half have at least one ACE
• If one ACE is present, the ACE Score is likely to range from 2.4 to 4
Mechanisms by which Adverse Childhood Experiences influence health and well-being throughout the lifespan
Brain Growth vs. Public Spending

Total Cost of One Year’s Cases

$1,038,461,500

- These are dollars spent over several years by DHS, Medicaid, Health and Mental Health, Juvenile Justice, and Adult Criminal Justice.
- Spent per year on ONE YEAR’S cohort of abuse and neglect victims.
- These are **budgeted** dollars!
Newest Data from CDC, 2012

- Based on available United States data from 2008
  - 772,000 US cases
  - 1,740 Fatal Cases (est)
Most Recent OK Data

- 2012 confirmed reports of child maltreatment: 9,842 (28% lower than 2006)
- Acceptance rate for reports:
  - Oklahoma County: 33%
  - Tulsa County: 58%
Upside-Down Economics

- Lifetime Cost per case of maltreatment:
  - $210,000
- Lifetime Cost per fatal case:
  - $1,273,000

We Cannot Afford to Ignore Prevention!

- Lifetime Cost to OK taxpayers to pay for all costs of the 10,000 children abused in 2012:

$210 Billion
Protect Our Children

- Preserve the Future of Oklahoma
- Protect the Economy of Our State
What are YOUR Thoughts?
How do We Achieve:

Success
Thank You for Inviting Me!