

03/18/14

**PRESENTATION:
SCIENCE AND
ECONOMICS OF
EARLY LIFE
TOXIC STRESS BY
ALASKA
PEDIATRIC
PARTNERSHIP**

<TARGET><BILL></BILL><SUBJECT>03-18-14 PRESENTATION
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The Science and Economics of Early Life Toxic Stress

“It is easier to build strong children than to repair broken men.”

-Frederick Douglas

Goal of a Nation

- ▶ To produce a well-educated and healthy adult population that is sufficiently skilled to participate in a global economy and to become responsible stakeholders in a productive society.
 - American Academy of Pediatrics Technical Report
“The Lifelong Effects of Early Childhood Adversity and Toxic Stress”



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How Do We Do That

- ▶ Use sound science, which shows:
 - Need to invest in clinical practice that addresses complex social, economic, environmental, and developmental issues that influence population-based health disparities
- ▶ Sound investments in interventions that reduce adversity in early childhood years
 - Many adult diseases originate in early childhood
 - Changes the system to a “well-care” model rather than “sick-care”



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A New Framework

- ▶ Early development is not nature vs. nurture, but it's nature and nurture working with each other over time
 - Thus, adversity early in childhood can permanently impair learning, behavior, and health (mental and physical)



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Physiologic Response to Stress in Kids

- ▶ Stress without the buffering response of a strong adult relationship causes prolonged secretion of stress hormones
 - Cortisol, norepinephrine, epinephrine, etc.
 - Potentially permanent changes in gene regulation

- ▶ Both of these responses are beneficial in the short term with adult support, but can be damaging to health if they occur over long periods of time
 - Constant wear and tear



Evidence

The Adverse Childhood Experience Study:

- Collaborative between CDC and Kaiser Permanente HMO.
- > 17,000 adults surveyed about adverse childhood experiences.
- Average participant age - 57 years.
- Medical histories available for all participants.

V Felitti et al. 1998. Am J Prev Med 14:245-58.



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Adverse Childhood Experience Study

10 adverse childhood experiences surveyed:

1. Physical abuse
2. Sexual abuse
3. Emotional abuse
4. Emotional neglect
5. Physical neglect
-
6. Witness domestic violence
7. Mental illness in home
8. Family member incarcerated
9. Alcohol/drug problems
10. Parental separation or divorce



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ACE: Prevalence data

- ▶ Prevalence of ACEs in study group:
 - Sexual abuse = 21%
 - Domestic violence in childhood home = 13%
 - Substance abuse in home = 28%
 - Parental separation or divorce = 24%
 - Physical abuse = 28%
 - Emotional neglect = 15%
 - Emotional abuse = 11%
 - Physical neglect = 10%
 - Mental illness in home = 20%
 - Criminal household member = 5%

M Dong et al. (2003) Child Abuse and Neglect v27, pp 625-639.



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ACE: Prevalence data

▶ Key finding:

- About 2/3rd of those surveyed reported at least one ACE.
- The 1/3 of participants with no reported ACEs were consistently healthier across all measures.



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ACE Score

- ▶ ACE score = total number of ACEs experienced.
 - Examples:
 - Childhood history of exposure to domestic violence only
 - ACE score = 1
 - Childhood history of parental alcoholism and physical abuse
 - ACE score = 2.
 - Childhood history of physical neglect, sexual abuse, and parental divorce
 - ACE score = 3.
 - Up to a maximum score of 10.

- ▶ Key finding: higher ACE score = greater risk for health problems.



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World Health Organization Study of Adverse Childhood Experiences and Health

Adverse childhood experiences are risk factors for:

- Heart disease 2.19x
- Asthma 1.55x
- Diabetes mellitus 1.59x
- Osteoarthritis 1.44x
- Chronic back/neck pain 1.59x
- Frequent/severe headaches 1.63x

KM Scott et al. 2011. Arch Gen Psychiatry 68:838-44.



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Risky Behavior & ACEs

Stepwise increased risk for:

- Smoking
- Alcohol abuse
- Over eating and obesity
- Illicit drug use
- Promiscuity
- IV drug use



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Behavioral Health & ACEs

Stepwise increased risk for:

- Clinical depression
- Suicide
- Domestic violence
- Anxiety disorders
- Hallucinations
- Sleep disturbances
- Autobiographical memory disturbances
- Poor anger control
- Relationship problems
- Employment problems



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Reproductive Health & ACEs

Stepwise increased risk for:

- Early age at first intercourse
- Teen pregnancy
- Unintended pregnancy
- Teen paternity
- Fetal death



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Health Measures Now Linked to Adverse Childhood Experiences Score

▶ Stepwise increased risk for:

- Heart disease
- Asthma
- Diabetes
- Cancer
- COPD
- Skeletal fractures
- Sexually transmitted diseases
- Liver disease
- Autoimmune disorders
- Osteoarthritis
- Smoking
- Alcohol abuse
- Over eating and obesity
- Illicit drug use
- Promiscuity
- IV drug use
- Clinical depression

▶ And

- Autobiographical memory disturbance
- Poor anger control
- Relationship problems
- Employment problems
- Early age at first intercourse
- Teen pregnancy
- Unintended pregnancy
- Teen paternity
- Fetal death
- Suicide
- Domestic violence
- Anxiety disorders
- Hallucinations
- Sleep disturbances
- Chronic pain
- Headaches
- Early death



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Increasing ACEs in Spokane Elementary School Children

	Academic Failure	Severe Attendance Problems	Severe School Behavior Concerns	Frequent Reported Poor Health
Three or More ACEs N =248	3	5	6	4
Two ACEs N=213	2.5	2.5	4	2.5
One ACE N=476	1.5	2	2.5	2
No Known ACEs =1,164	1.0	1.0	1.0	1.0



The Mechanism of Change

Epigenetics

- ▶ Compelling new science showing how nurture can affect nature
 - Molecular biological methods to change gene expression without changing the gene itself
 - Done by changing the chemical composition of regulatory segments of the gene
 - DNA methylation
 - Modification of histones



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Epigenetics in Rats

- ▶ Rat mothers who groom and lick their pups during the first week of life have pups that have a less vigorous response to stress as adults than mothers who don't groom well
 - Appears to be caused by DNA methylation and histone changes in stress-related genes
- ▶ Stressed rat mothers with bad nurturing behavior have pups with poor cognitive skills as adults and persistent changes in stress-related gene expression



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Epigenetics Passed from Moms to Children

- ▶ Fetal exposure to maternal stress influences future stress responses in a negative way
 - Moms who are stressed (stressful event, increased anxiety, depression) during pregnancy are more likely to have kids with:
 - Preterm birth
 - Poor emotional coping skills
 - Decreased cognitive abilities
 - Increased fear response to stimuli
 - Increased anxiety
 - These effects are mediated by histone modification and DNA methylation



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Adult and Childhood Epigenetics

- ▶ Adults with a history of childhood maltreatment who then committed suicide had altered stress gene regulation
- ▶ Kids raised in institutional environments (Romanian orphanages)
 - Epigenetic changes in regions of brain development

How Do These Epigenetic Changes Affect People

- ▶ Structural brain changes: Smaller hippocampus (memory), smaller corpus callosum (connections between the hemispheres of the brain), smaller prefrontal cortex (reasoning, emotional control), larger amygdala (anxiety and release of stress hormones from the pituitary)
- ▶ Inflammation/immunological changes: C-reactive protein levels elevated in adults with history of early adversities
- ▶ Endocrine changes: Dysregulation of stress hormones, decreased oxytocin
- ▶ Shortened chromosomal telomeres: Linked to early onset of chronic disease



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But These Effects Can Be Reversed

- ▶ Example: A prevention program that reduced ACEs in families from 3 to 1 results in:
 - Reduction in suicide attempts
 - Risk for alcohol dependence cut in half for next generation
 - And so on for 33 health measures studied to this point



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The Birth Experience and Bonding

- Costa Rica - policy change increased mother-infant post-partum contact and reduced abandonment ~ 70% (n~78,000).

L. Mata et al. (1988) In Programs to Promote Breastfeeding, ed. B. Jelliffe, Oxford Univ. Press.

- Thailand - hospital adopts UNICEF proposal increasing mother-infant contact resulting in decreased abandonment, (n~4000 births).

B Baranasin (1991) Asia-Pacific J Public Health v5:217-220.

- Russia - large maternity hospital increased mother-infant contact in at-risk women resulting in ~46% reduction in infant abandonment (n~20,000).

N. Lvoff et al. (2000) Arch Pediatr Adolesc Med v154:474-77.



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Innate Influences: Breastfeeding

- ▶ Study: 6,621 mother-infant pairs followed over 15 years (Australia)
- ▶ Results:
 - After controlling for 18 potential confounding variables mothers who nursed 4 months or more were still 2.6x less likely to maltreat child

L Strathearn et al (2009). Pediatrics v123:483-93.



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Costs of Child Abuse: USA

- ▶ \$104 billion spent annually for the direct costs of child abuse
- ▶ An additional \$69.5 billion spent for indirect costs including special education, mental and physical health care and juvenile delinquency
- ▶ Cost per maltreated child ~\$182,000

C Wang and J Holton (2007) Economic Impact Study funded by Pew Charitable Trusts, and S. Fromm (2001) Total estimated costs of child abuse and neglect in the United States: Statistical evidence, <http://member.preventchildabuse.org/site/>



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Costs of Child Abuse: USA

- ▶ Over \$124 billion in costs/year (Fang et al., 2012)
- ▶ Lifetime cost per victim of nonfatal child maltreatment is \$210,012:
 - \$144,360 productivity losses
 - \$6,747 criminal justice costs
 - \$32,648 childhood health care costs
 - \$10,530 adult medical costs
 - \$7,999 special education costs
 - \$7,728 child welfare costs



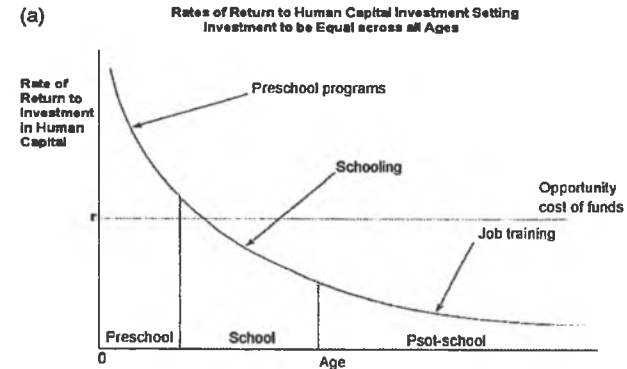
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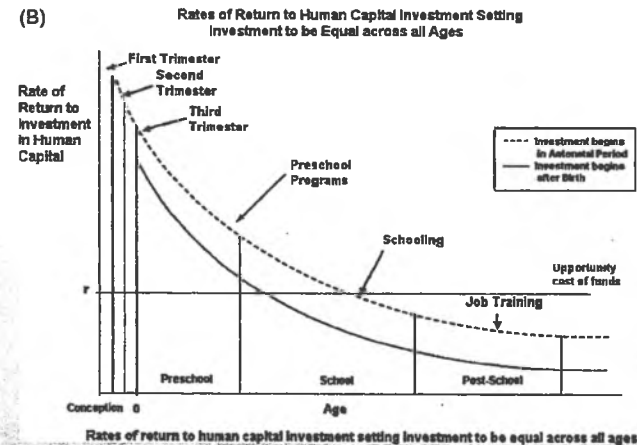
Econometrics of Early Intervention & Prevention

- ▶ Funding early interventions should provide the largest possible return on investment.
 - AAPP Triple P and HelpMeGrow initiatives

Doyle et al. (2009) Investing in Early Human Development. In: Economics and Human Biology v7: pp1-6



Rates of return to human capital investment setting investment to be equal across all ages
Source: Carneiro and Heckman, 2003



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Washington State Institute for Public Policy—WSIPP

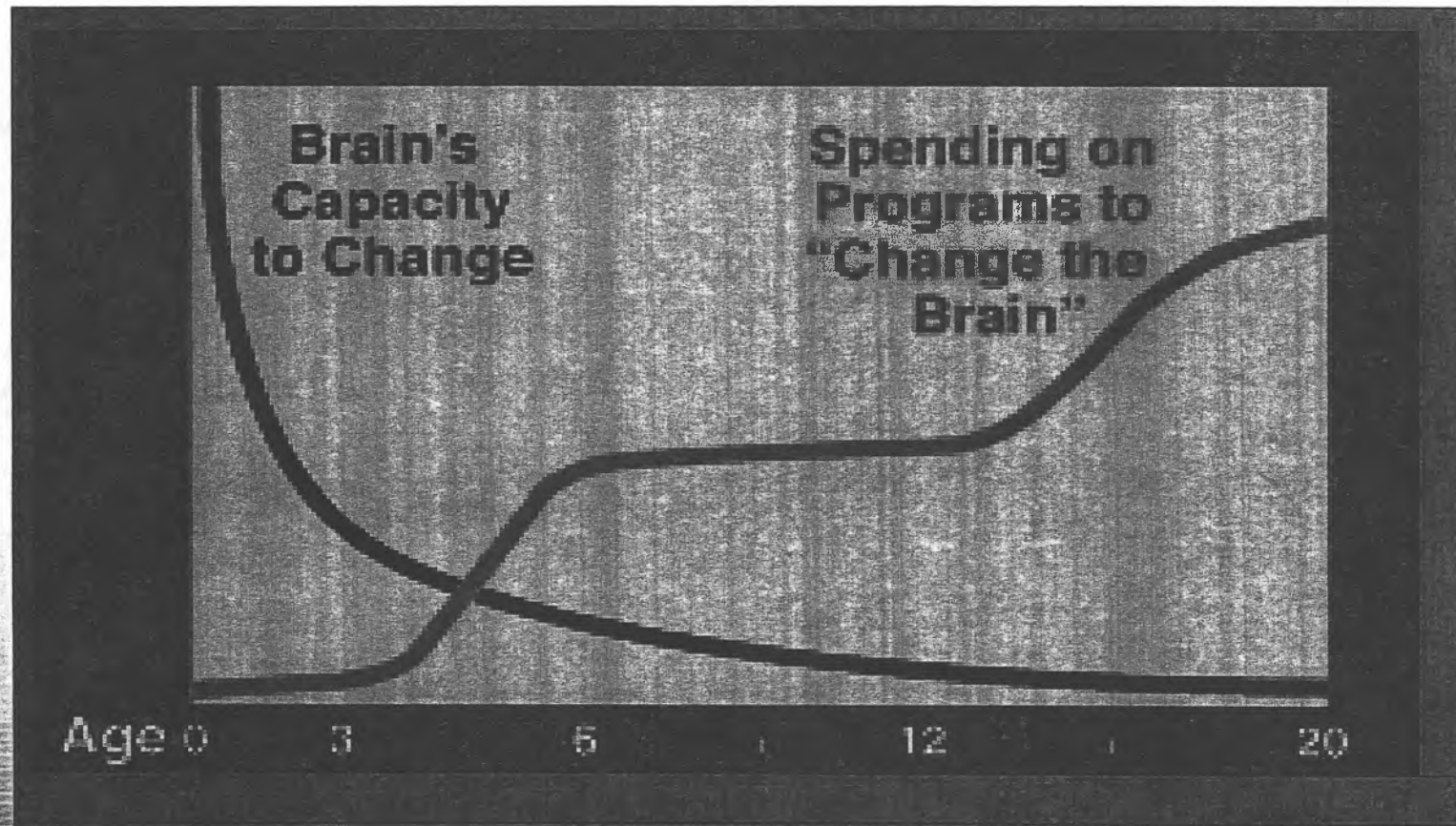
- ▶ Most early childhood interventions have a benefit to cost ratio of great than \$1.00
 - Evidence based interventions
 - Can be applied locally or statewide
 - Much more effective than intervening in later years, when the issues are much more ingrained



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Public Investment in Children by Age



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How Do We Change from:

▶ This



▶ To This



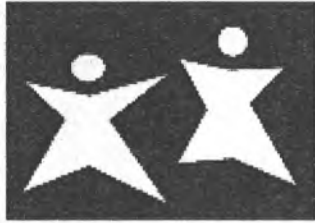
Everyone has to help!!!



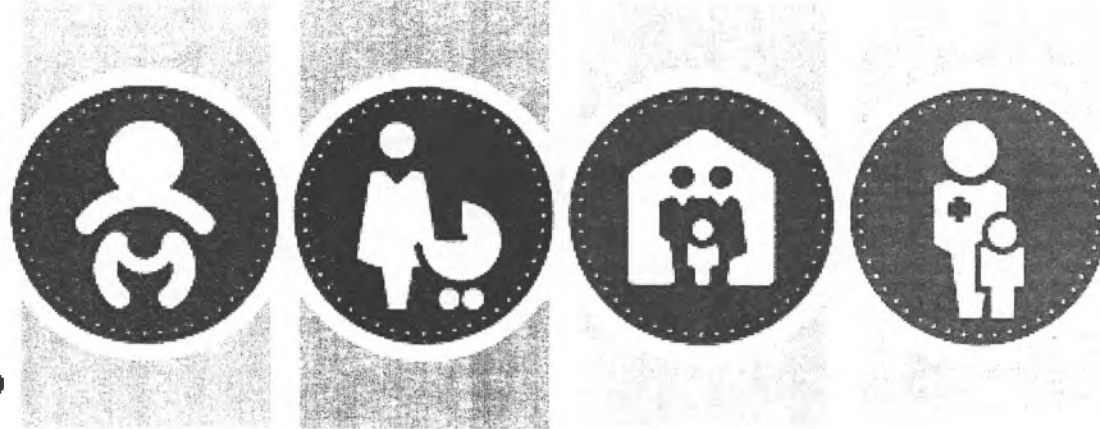
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AAPP's First 1,000 Days of Life Campaign for Alaska's Children



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AAP's EBCD* Initiative



- ▶ “Building Brains, Forging Futures”
- ▶ “It’s all about Nurturing Relationships: Early relationships build their brains and our future.”

▪ *EBCD = Early Brain and Child Development

Some steps for EBCD promotion

- ▶ Minimize toxic stress (socioeconomic distress, substance abuse, maltreatment, maternal depression, ACE score)
- ▶ Promote positive parenting and supportive relationships for families (social capital, home visitors, relational monitoring)
- ▶ Provide an environment for healthy development (avoidance of environmental toxins, optimal nutrition, early literacy promotion, media impacts, prevent catastrophic disease)
- ▶ Development enhancing activities (ROR, face time, + interpersonal relationships, quality preschool programs, positive parenting)
- ▶ EC coordination with medical homes (medical homes, ECCS grants, home visiting, etc.)
- ▶ Screen for families at risk and refer to other community-based services (dev. delay, substance abuse, social capital)

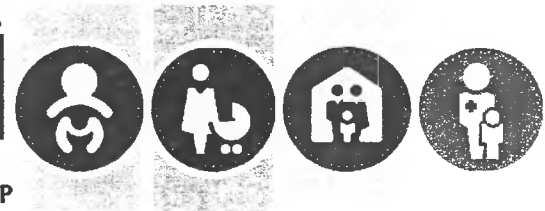


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Collective Impact

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- ▶ Annual AAPP Pediatrics Symposium—2013
 - Various community members, pediatricians, public health officials, nurses, etc came together to:
 - Define 4 areas that AAPP can have impact
 - Goal is to reduce ACEs and toxic stress in Alaska kids



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First 1,000 Days of Life Campaign Workgroups



Increase breastfeeding rates



Increase immunization rates



Increase access to a primary
care provider within the
medical home



Decrease child abuse & neglect



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AAPP Initiatives: Triple P

- ▶ Triple P—Positive Parenting Program
 - Gives parents practical strategies to:
 - Build healthy family relationships
 - Manage their children's behavior
 - Prevent developmental problems
 - Delivered in the Primary Care setting to target specific problem issue or behavior
 - WSIPP benefit to cost ratio = \$8.74
 - www.triplep.net



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AAPP Initiatives

HelpMeGrow

- ▶ Connects at-risk children with the services they need
 - Training for primary care offices to provide effective developmental screening to facilitate early detection
 - Builds collaboration across sectors to improve access
 - Identifies gaps and barriers to access systems
 - Four Core Components
 - Child health care provider outreach
 - Community outreach
 - Centralized telephone access point
 - Collection of data
 - www.helpmegrownational.org



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Our Role

- Guide vision and strategy
- Support aligned activities
- Establish shared measurements
- Build public will
- Advance policy
- Mobilize funding—501c3



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First 1,000 Days of Life Campaign

- ▶ To join a workgroup contact:
- ▶ Stephanie Monahan
- ▶ stephanie@a2p2.com
- ▶ 907-903-6770
- ▶ www.a2p2.com



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