



## A Great Start for Minnesota's Children: A Pediatrician's Perspective

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January 5, 2023

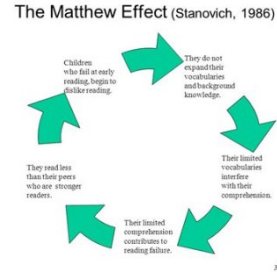
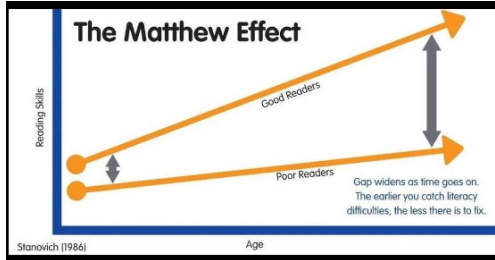
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### Agenda

- The search for early intervention and why?
- The Brain is Built by Experience
- How do Pediatricians monitor this growth?
- Adverse Childhood Experiences (ACE) and Stress
  - How this impacts brain development
- Resilience

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# Teach a Child to Read



3

## Start With Kindergarten?

Copper et.al 2018

**TABLE 2**  
Adjusted Means (SE) of Fifth-Grade Outcomes for the Kindergarten Reading/Social Skills Subgroups (Controlling for Gender, Minority Status, Income, and Fifth-Grade Social Competence)

Subgroup	Kindergarten social skills			Pairwise differences <sup>a</sup>
	Low	Average	High	
<b>Fifth-grade reading (T score)<sup>b</sup></b>				
Kindergarten reading—low	41.61 (1.35)	44.74 (0.83)	42.80 (2.26)	b*
Kindergarten reading—average	51.13 (0.65)	51.02 (0.36)	53.08 (0.76)	a*, c**
Kindergarten reading—high	62.98 (3.05)	58.97 (0.70)	58.77 (1.07)	ns
<b>Fifth-grade math (T score)<sup>c</sup></b>				
Kindergarten reading—low	44.08 (0.95)	44.60 (0.67)	42.61 (3.53)	ns
Kindergarten reading—average	50.88 (0.61)	50.96 (0.28)	52.49 (0.54)	a*, c <sup>†</sup>
Kindergarten reading—high	62.40 (2.17)	58.34 (0.60)	57.71 (0.96)	ns

<sup>a</sup>Pairwise differences within kindergarten reading level indicated the following: a = mean level of fifth-grade outcome significantly different between subgroups with low and high kindergarten social skills; b = mean level of fifth-grade outcome significantly different between subgroups with low and average kindergarten social skills; c = mean level of fifth-grade outcome significantly different between subgroups with average and high kindergarten social skills.

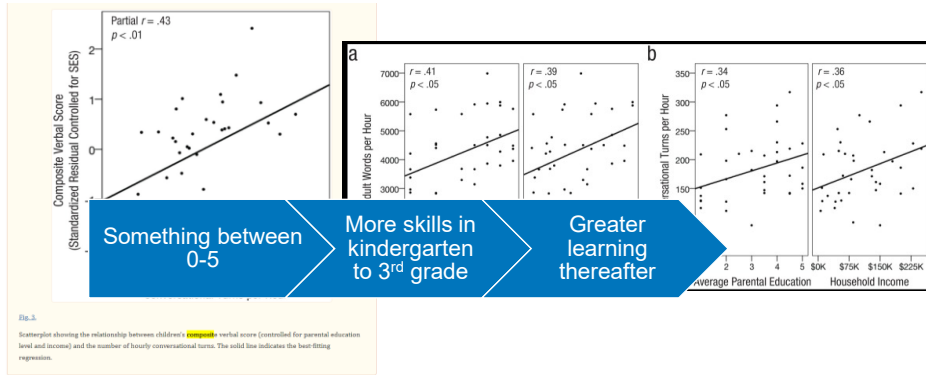
**Kindergarten Reading was predictive of 5<sup>th</sup> grade reading and math scores (regardless of social skills)**



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# No, Start Earlier!

Beyond the 30 Million Word Gap (Romeo et. Al 2018)



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## BRAINS ARE BUILT THROUGH EXPERIENCE



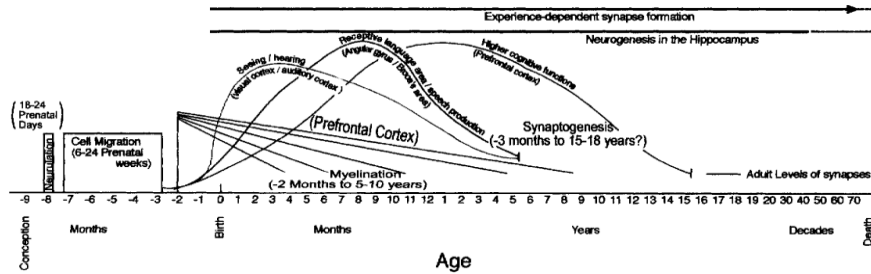
6

# We Build Lots Of Neuronal Connections And Then Experience Edits To Make Beauty!



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# There Is A Critical Time And Order To Connections



Note: This graph illustrates the importance of prenatal events, such as the formation of the neural tube (neurulation) and cell migration; critical aspects of synapse formation and myelination beyond age three; and the formation of synapses based on experience, as well as neurogenesis in a key region of the hippocampus (the dentate gyrus), throughout much of life.

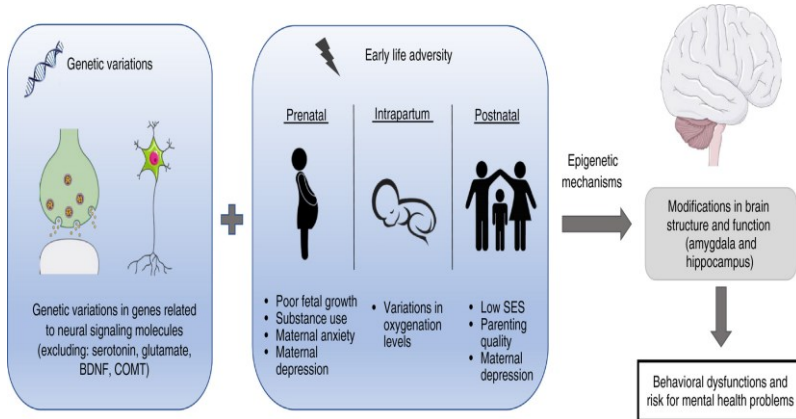
Figure 1 The Developmental Course of Human Brain Development

Published in American Psychologist 2001  
 Developmental science and the media. Early brain development.  
 R. Thompson, G. Nelson



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## How To Establish A Great Start?



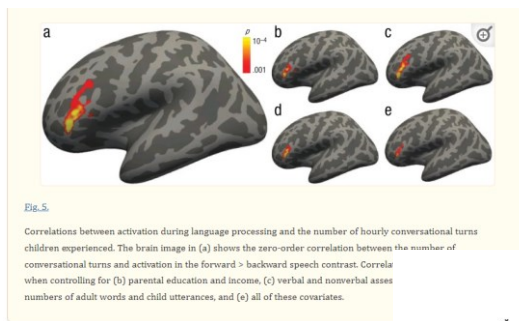
Genetic and Physical Health (including nutrition and basics) + Developmental Experiences (Including safety/People/ Interaction) = A Great Start

Develop Med Child Neuro, Volume: 61, Issue: 10, Pages: 1127-1133, First published: 11 February 2019, DOI: (10.1111/dmcn.14182)

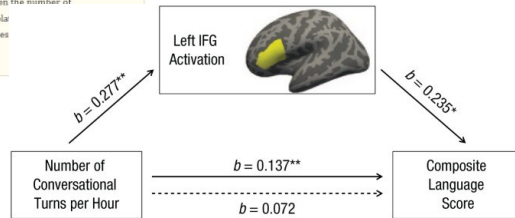


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## Examine A Brain Built By Positive Experience

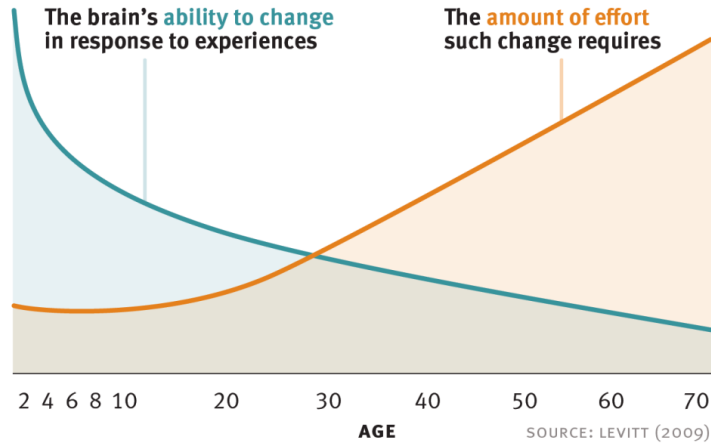


**Experience actually activated and built a part of the brain!**



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## Building Off These Experiences Gets Harder



Center on the Developing Child HARVARD UNIVERSITY

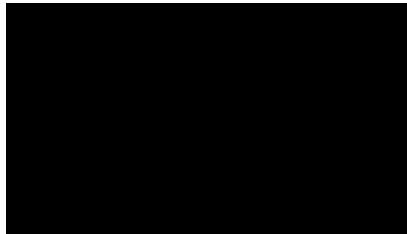
www.developingchild.harvard.edu



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## Serve And Return

- Young children naturally reach out for interaction through babbling, facial expressions, and gestures,
- Adults respond with the same kind of vocalizing and gesturing back at them.
- This back-and-forth process is fundamental to the wiring of the brain, especially in the earliest years.
- Foundational pathways are constructed to then allow all other learning that is to come
- Relationships for further learning are built as well



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# Take Aways



The substrate of the brain is built early



The brain requires experiences to build and shape



Attentive, loving adults can make this happen



## HOW DO PEDIATRICIANS MONITOR THIS GROWTH?



# Preventative Health Care

**Recommendations for Preventive Pediatric Health Care**  
Bright Futures/American Academy of Pediatrics

American Academy of Pediatrics  
ASSOCIATION OF CHILD NEUROLOGISTS

Bright Futures  
BRIGHT FUTURES CENTER FOR CHILD DEVELOPMENT

Each child and family is unique. Therefore, these Recommendations for Preventive Pediatric Health Care are designed for the care of children who are receiving competent parenting, have no manifestations of any important health problems, and are growing and developing in a satisfactory fashion. Developmental, psychosocial, and chronic disease issues for children and adolescents may require frequent counseling and treatment visits separate from preventive care visits. Additional visits also may become necessary if circumstances suggest variations from normal.

These recommendations represent a consensus by the American Academy of Pediatrics (AAP) and Bright Futures. The AAP continues to emphasize the great importance of continuity of care in comprehensive health supervision and the need to avoid fragmentation of care. Refer to the specific guidance by age as listed in the Bright Futures Guidelines (Figure 3). Shaw JS, Duncan PK, eds. Bright Futures Guidelines for Health Supervision of Infants, Children, and Adolescents. 6th ed. Elk Grove Village, IL: American Academy of Pediatrics; 2017.

The recommendations in this statement do not indicate an exclusive course of treatment or standard of medical care. Variations, taking into account individual circumstances, may be appropriate. Copyright © 2019 by the American Academy of Pediatrics; updated March 2019. No part of this statement may be reproduced in any form or by any means without prior written permission from the American Academy of Pediatrics except for one copy for personal use.

RECOMMENDATION	INFANCY												TODDLERHOOD												PRESCHOOL CHILDHOOD												ADOLESCENCE											
	Prenatal	Newborn <sup>1</sup>	1-2 yr	2 mo	4 mo	6 mo	12 mo	15 mo	18 mo	24 mo	3 yr	4 yr	5 yr	6 yr	7 yr	8 yr	9 yr	10 yr	11 yr	12 yr	13 yr	14 yr	15 yr	16 yr	17 yr	18 yr	19 yr	20 yr	21 yr																			
<b>HEALTHY</b>	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*																		
<b>MEASUREMENTS</b>																																																
Length/height and weight	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*																			
Head circumference	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*																			
Weight-for-length	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*																			
Body Mass Index <sup>2</sup>																																																
Blood pressure	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*																			
<b>SCREENING</b>																																																
Hemoglobin <sup>3</sup>	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*																			
Ironemia <sup>4</sup>	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*																			
<b>DEVELOPMENTAL/BEHAVIORAL HEALTH</b>																																																
Developmental screening <sup>5</sup>																																																
Autism Spectrum Disorder Screening <sup>6</sup>	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*																			
Developmental Surveillance	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*																			
Psychosocial/Behavioral Assessment <sup>7</sup>	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*																			
Tobacco, Alcohol, or Drug Use Assessment <sup>8</sup>																																																
Depression Screening <sup>9</sup>																																																
Maternal Depression Screening <sup>10</sup>																																																
<b>PHYSICAL EXAMINATION</b>																																																
<b>PROCESSES</b> <sup>11</sup>																																																
Newborn Blood <sup>12</sup>	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*																			
Newborn Bilirubin <sup>13</sup>	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*																			
Critical Congenital Heart Disease <sup>14</sup>	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*																			
Intussusception <sup>15</sup>	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*																			
Ascariasis <sup>16</sup>	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*																			
Lead <sup>17</sup>																																																
Tuberculosis <sup>18</sup>	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*																			
Distemper <sup>19</sup>	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*																			
Sexually Transmitted Infections <sup>20</sup>																																																
<b>IMMUNIZATION</b>																																																
Central Pneumonia																																																
<b>ORAL HEALTH</b> <sup>21</sup>																																																
Fluoride Varnish <sup>22</sup>	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*																			
Fluoride Supplementations <sup>23</sup>	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*																			
<b>ENVIRONMENTAL GUIDANCE</b>	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*																			



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## We Take Steps To Ensure Physical Health



- Newborn Blood Screening
- Hearing Screening
- Pulse Oximetry Screening
- Bilirubin Screening

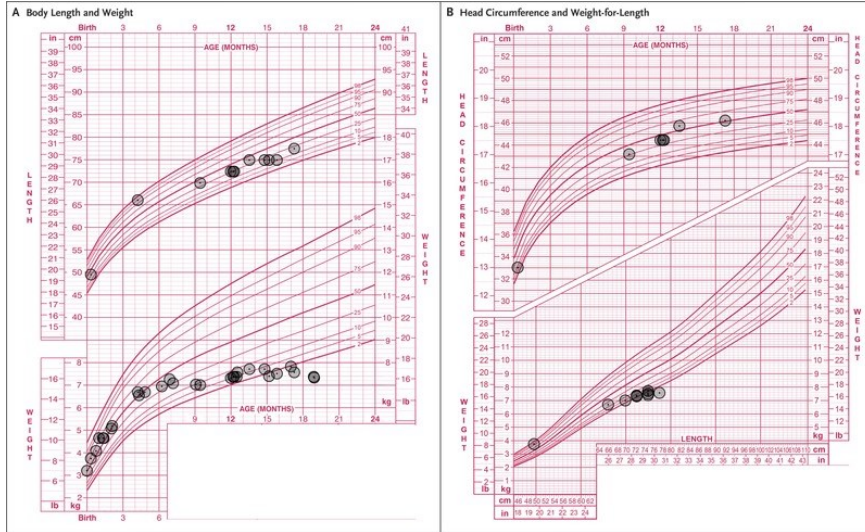
Pompe disease  
 Primary T cell lymphopenia  
 Propionic acidemia  
 Severe combined immunodeficiency  
 Short-chain acyl-CoA dehydrogenase deficiency  
 Sickle cell disease  
 Sickle cell disease  
 Spinal muscular atrophy (SMA)  
 5-βeta thalassaemia  
 Tri-functional protein deficiency  
 Tyrosinemia (I type)  
 Very long-chain acyl-CoA dehydrogenase deficiency  
 3-hydroxyadiponocyclopropanoate  
 2-Methyl-3-hydroxybutyric acidemia  
 2-Methylbutyryl-CoA dehydrogenase deficiency  
 3-Hydroxy-3-methylglutaryl-CoA lyase deficiency  
 3-Methylcrotonyl-CoA carboxylase deficiency



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## Growth Metrics



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## We Take Steps To Ensure Developmental And Social Health

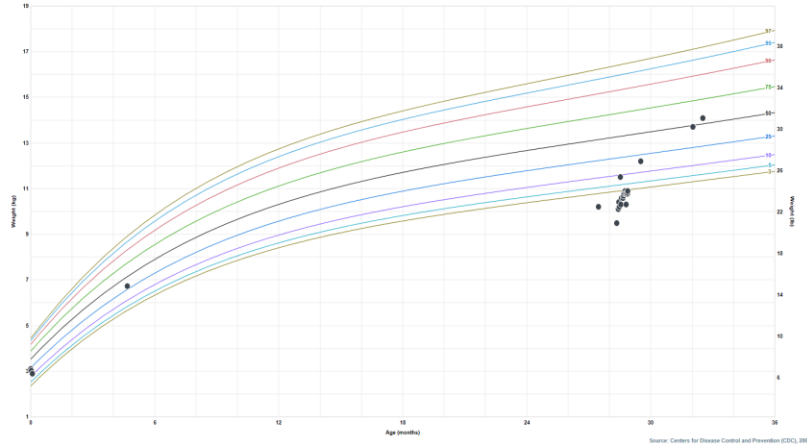


- Development (ensuring the appropriate therapies)
- Social Determinants of Health (food, housing, safety)
- Are Parents ok and Supported? (Depression etc.)



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## Take Steps to Intervene and Promote Development Growth



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## Take Aways



Genetic and Physical Health (including nutrition) + Developmental Experiences (safety/loving people/interaction) =

**A Great Start**



Missing any piece of this equation presents a challenge and part of a pediatrician's job (and all of our job) to identify and support.



1/5/2023

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# ADVERSE CHILDHOOD EXPERIENCES (ACEs)



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## ACE Study From 1995 to 1997

**AJPM** American Journal of Preventive Medicine  
A Journal of the American College of Preventive Medicine and Association for Prevention Teaching and Research

Articles & Issues ▾ Free CME Collections ▾ For Authors and Reviewers ▾ Journal Info ▾ Society Int'l

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May, 1998 Volume 14, Issue 4, Pages 245-258 Next Article ▾

**Relationship of Childhood Abuse and Household Dysfunction to Many of the Leading Causes of Death in Adults**

The Adverse Childhood Experiences (ACE) Study

Vincent J. Felitti MD, FACP, FRCPC Robert F. Anda MD, MS, Dale Nordenberg MD, David F. Williamson MS, PhD, Alison M. Spitz MS, MPH, Valerie Edwards BA, Mary F. Koenig PhD, James S. Marks MD, MPH

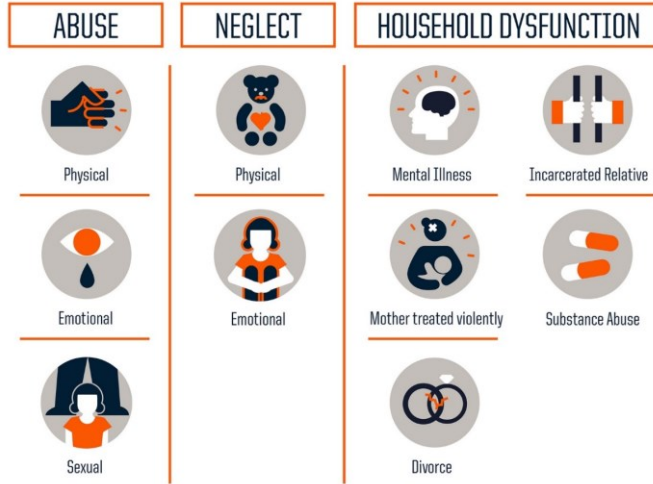
PlusX Metrics  
 DOI: [https://doi.org/10.1616/0749-3727\(98\)00017-9](https://doi.org/10.1616/0749-3727(98)00017-9)

Demographic Information	Percent (N = 17,337)
<b>Gender</b>	
Female	54.0%
Male	46.0%
<b>Race/Ethnicity</b>	
White	74.8%
Hispanic/Latino	11.2%
Asian/Pacific Islander	7.2%
African-American	4.5%
Other	2.3%
<b>Age (years)</b>	
19-29	5.3%
30-39	9.8%
40-49	18.8%
50-59	19.9%
60 and over	46.4%
<b>Education</b>	
Not High School Graduate	7.2%
High School Graduate	17.6%
Some College	35.9%
College Graduate or Higher	39.3%



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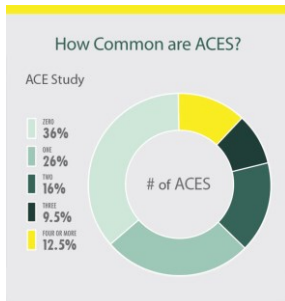
# What Are The ACEs?



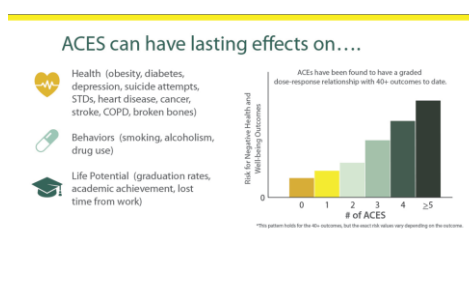
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# ACEs are...

## 1 Very Common

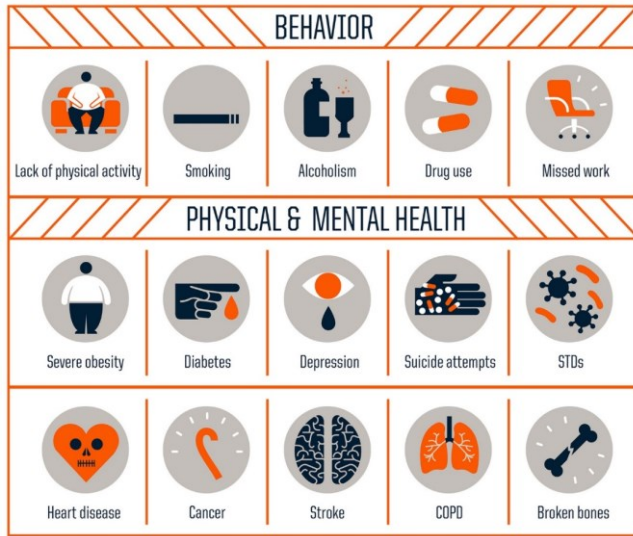


## 2 Dose Responsive



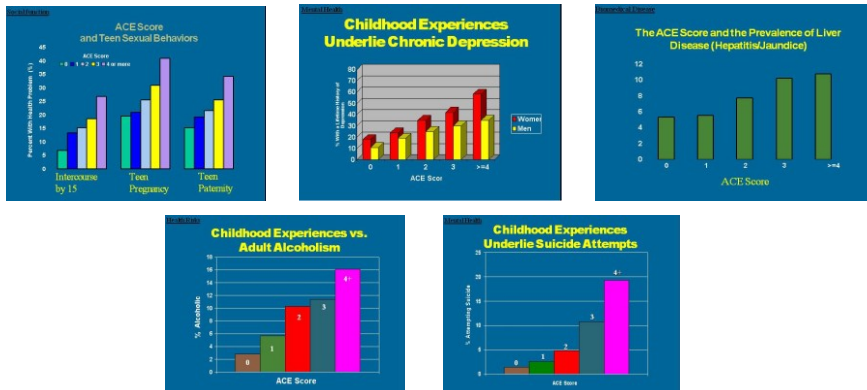
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# Measured Outcomes



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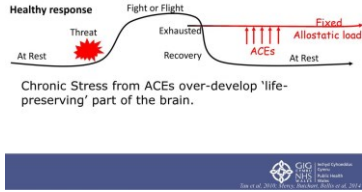
# Stepwise Relationship To All Sorts Of Challenges



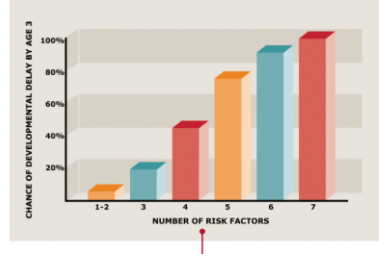
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# The Impact of ACEs on Brain Development

The Impact of ACEs on Brain Development

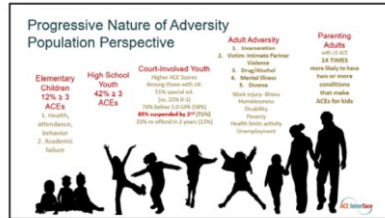
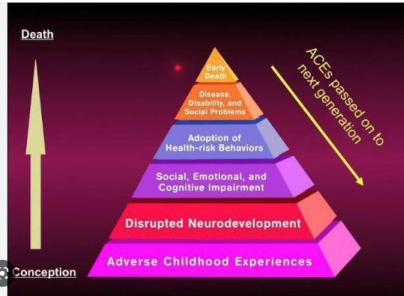


90-100% Chance of Developmental Delays When Children Experience 6-7 Risk Factors



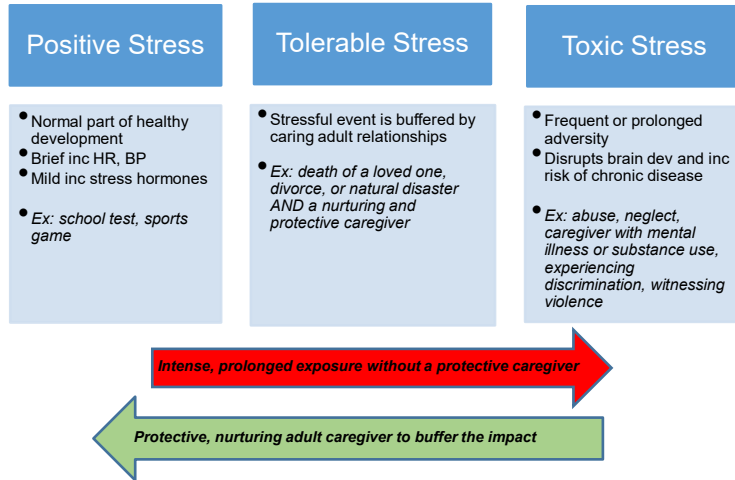
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# How Do Aces Affect The Lifespan



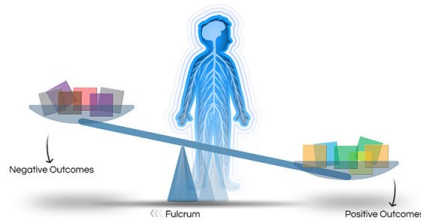
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## Stress is NOT trauma



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## Resiliency Can Be Built in Several Ways



- At least one stable relationship with a caregiver, adult
- Building a sense of self efficacy and control
- Skills of self regulatory capacity
- Culture, faith, hope
- Learning to cope with manageable positive stresses



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# PATHWAYS TO RESILIENCE

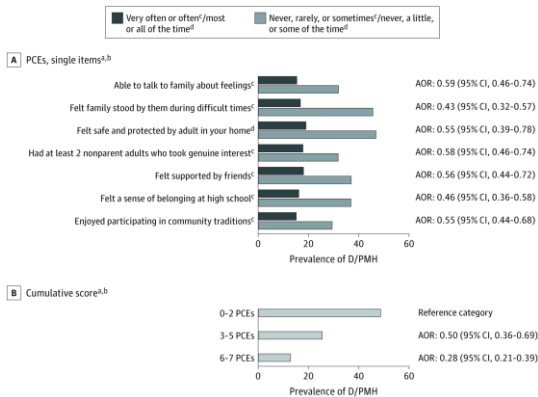
Resilience is the ability to bounce back from setbacks in our lives. It is the way we can prevent stress from causing serious physical, mental and emotional issues. Practicing positive and often simple activities can actually **retrain our brain to be more resilient!**

FOR CHILDREN	FOR EVERYONE	FOR ADULTS
<ul style="list-style-type: none"> <li> Positive Role Models</li> <li> Supportive Adults</li> <li> Parental Involvement</li> <li> Caring Community</li> <li> Increased Parent-Infant Contact</li> <li> Increased Knowledge of Child Development</li> </ul>	<ul style="list-style-type: none"> <li> Supportive Relationships</li> <li> Healthy Food</li> <li> Exercise</li> <li> Smile</li> <li> Talk About Feelings</li> <li> Music</li> <li> Art</li> <li> Walk in the Woods</li> <li> Gratitude</li> <li> Positive Thoughts</li> <li> Laugh</li> <li> Hope</li> <li> Volunteer</li> </ul>	<ul style="list-style-type: none"> <li> Acknowledge Trauma</li> <li> Seek Support</li> <li> Identify Emotional Triggers</li> <li> Mental Health and Substance Abuse Treatment</li> <li> Create Safe and Stable Nurturing Relationships</li> </ul>



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## Positive Childhood Experiences



<sup>a</sup>Bethell et al.

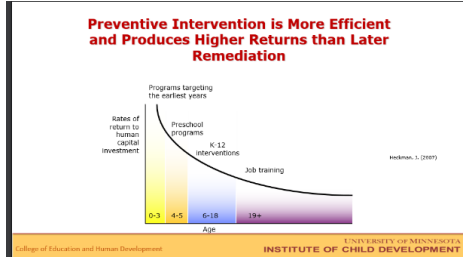
Positive Relationships & Experiences  
=  
Improved Mental Health



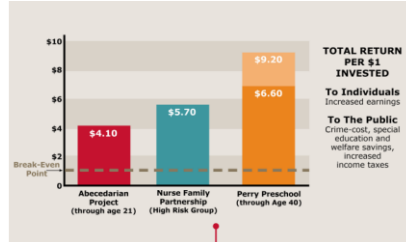
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# An impressive ROI



**\$4-\$9** IN RETURNS FOR EVERY DOLLAR INVESTED IN EARLY CHILDHOOD PROGRAMS



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## Take Aways



Challenging situations early in life are common and they add up



They affect early childhood development and long-term health. They change patterns of behavior and physiology



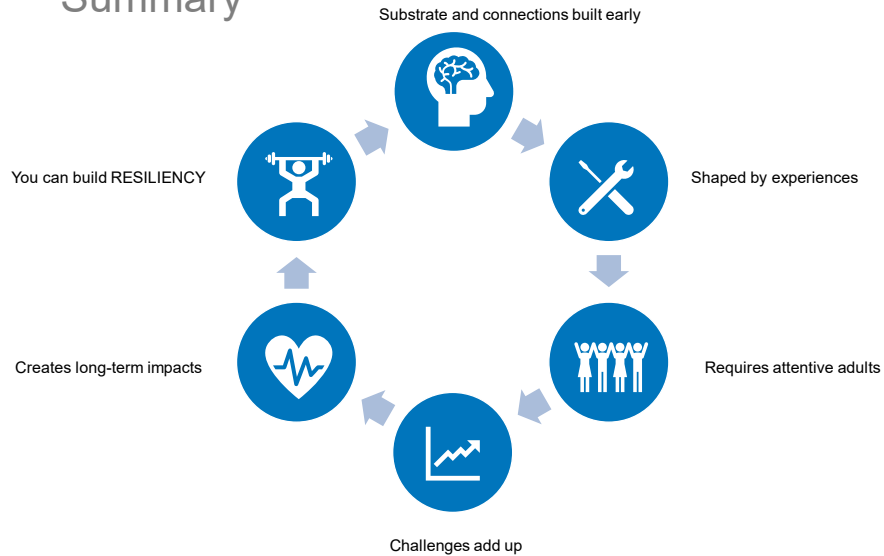
They are not destiny and relationships, and learning can help build resiliency



1/5/2023

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## Summary



## What Can We Do?

### **Physical Health (Nutrition) + Developmental Experiences (Loving People, Safety, Interaction) = A Great Start**

- Are we supporting and encouraging new families in these areas?
  - Nutrition
  - Resources to be safe and healthy
  - Parenting skills and support
  - Social Connections and Community, Childcare
- Are we supporting and encouraging children in these areas?
  - Nutrition screening
  - Responsive Care and consistency of care
  - Language Development and Talking to children
  - Social connections
- Are we actively combating adverse experiences and building resilience?

# QUIZ



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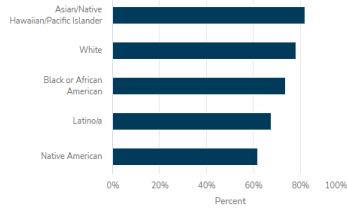
# THANK YOU



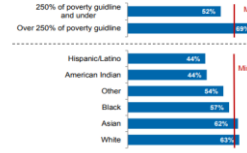
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1 School readiness of Minnesota kindergarten students, by race and ethnicity

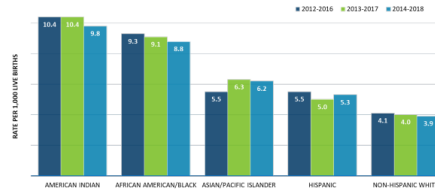


Overall kindergarten proficiency rate by household poverty status and race/ethnicity, 2010



INFANT MORTALITY

Figure 2. Minnesota Infant Mortality Rate by Maternal Race/Ethnicity, 5-year averages, 2012-2018



FAMILY AND COMMUNITY	Urban-Rural Classification	All Births n (%)	Infant Death	
			Rate <sup>a</sup>	OR <sup>b</sup> (95%CI)
Metropolitan	Large central metropolitan	2,927 (480)	5.15 (3.14-8.31)	1.08 (1.01-1.16)
	Large fringe metropolitan	2,754 (786)	3.3 (2.0-4.9)	1.00
	Medium metropolitan	2,492 (999)	3.4 (2.2-5.3)	1.19 (1.12-1.25)
Small metropolitan	Small metropolitan	1,068 (628)	6.16 (4.9-7.9)	1.32 (1.16-1.49)
	Rural	969 (396)	6.00 (5-7)	1.26 (1.20-1.32)
Noncore (most rural)	Noncore (most rural)	638 (525)	8.14 (6.4-10.4)	1.32 (1.26-1.39)
	Total	11,881 (814)	6.4 (5.4-7.6)	—

