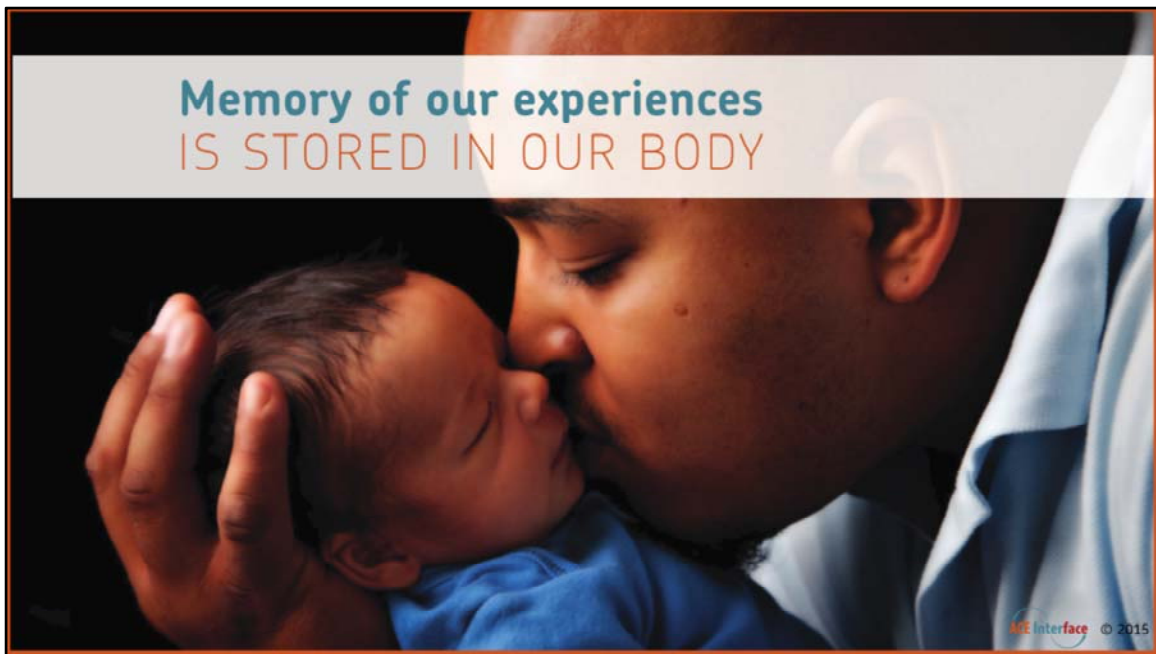
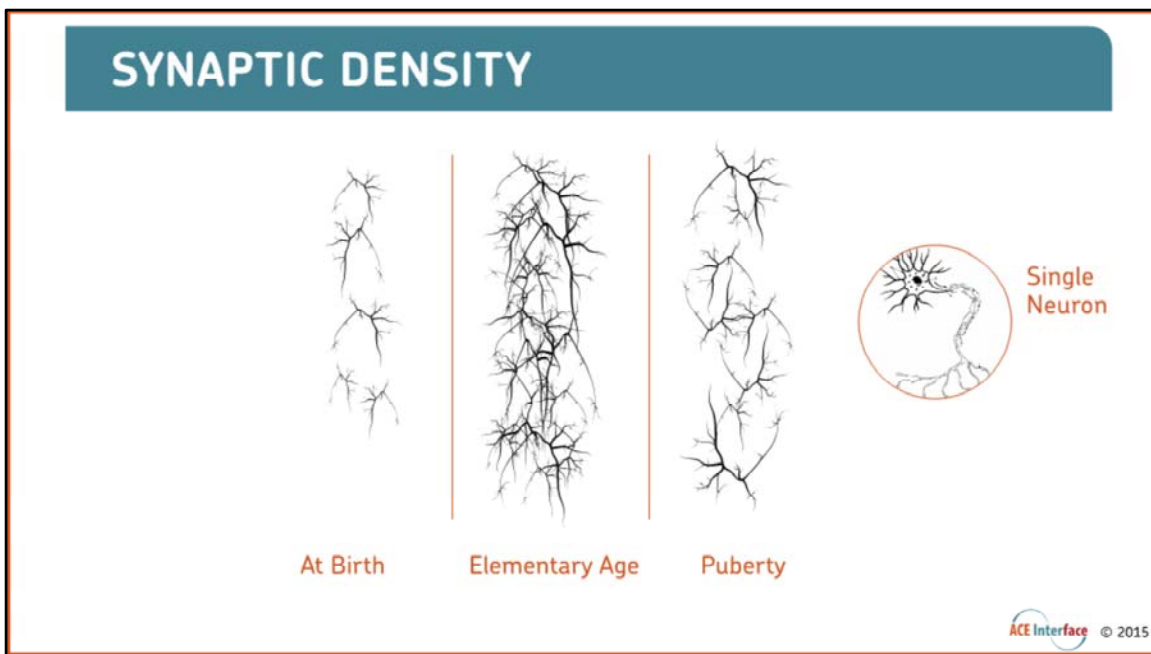




What if the largest public health discovery of our time is about the smallest of us?



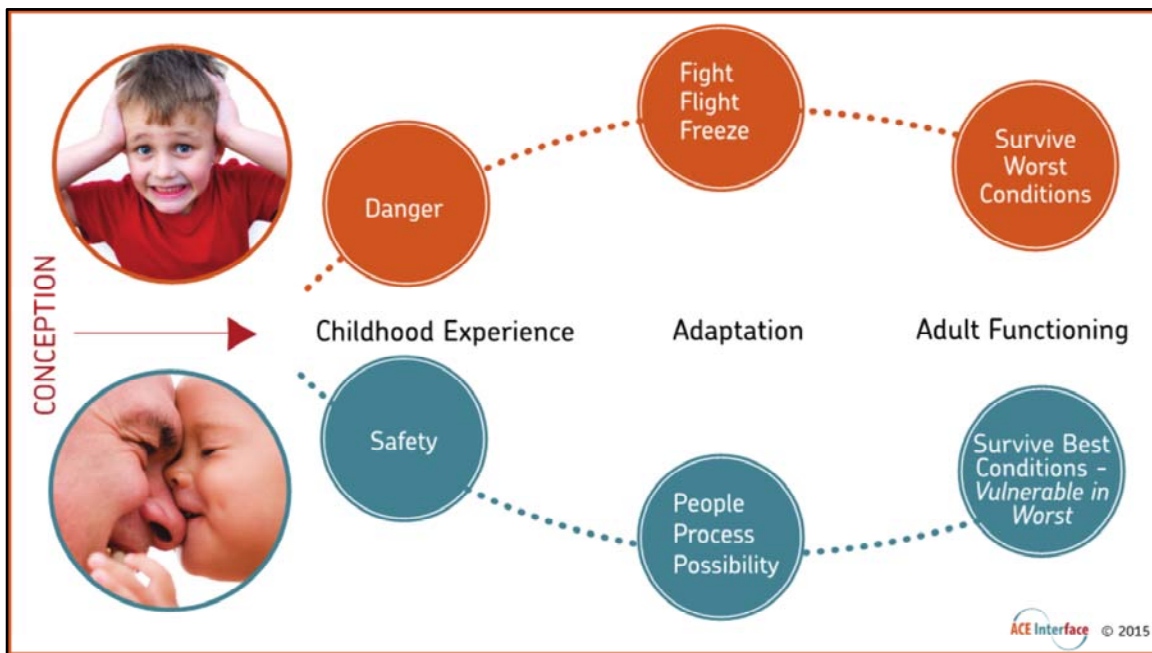
From that first spark of life, as cells divide and form a tiny beating heart, a fragile skeletal structure, a central nervous system... the experience of being in relationship with another person and with the world around us has profound impacts on who we are and who we will become. Although we can recall and describe with words much of what's happened in our lives, the memory of human experience is stored in our bodies, and not just our minds.



On the far left we see a set of brain cells--or neurons--and what they might look like at the time of birth. There aren't many connections between these cells at birth; babies are born with only the connections and brain functions they need at that point in life.

Most of the wiring of our brains occurs as the result of life experience from our senses. By age six those same brain cells now have many connections. The wiring of the brain--or the making of complex neural networks is experience dependent. What gets experienced the most tends to lead to more robust connections between nerve cells that form networks. This is a process called branching or "arborization".

The last section of the slide represents age 14--about the time of puberty. Notice that there are now fewer connections between the brain cells than there were at age 6. This is because the least "experienced" connections tend to withdraw at about the time of puberty. This process is called "pruning". This phenomenon helps to explain why neglect--or not getting the experiences we need can have such a powerful negative impact on health and social functioning.



Every person's life is unique. But for illustration, let's imagine two worlds – one is mean and dangerous. The second is kind and generous.

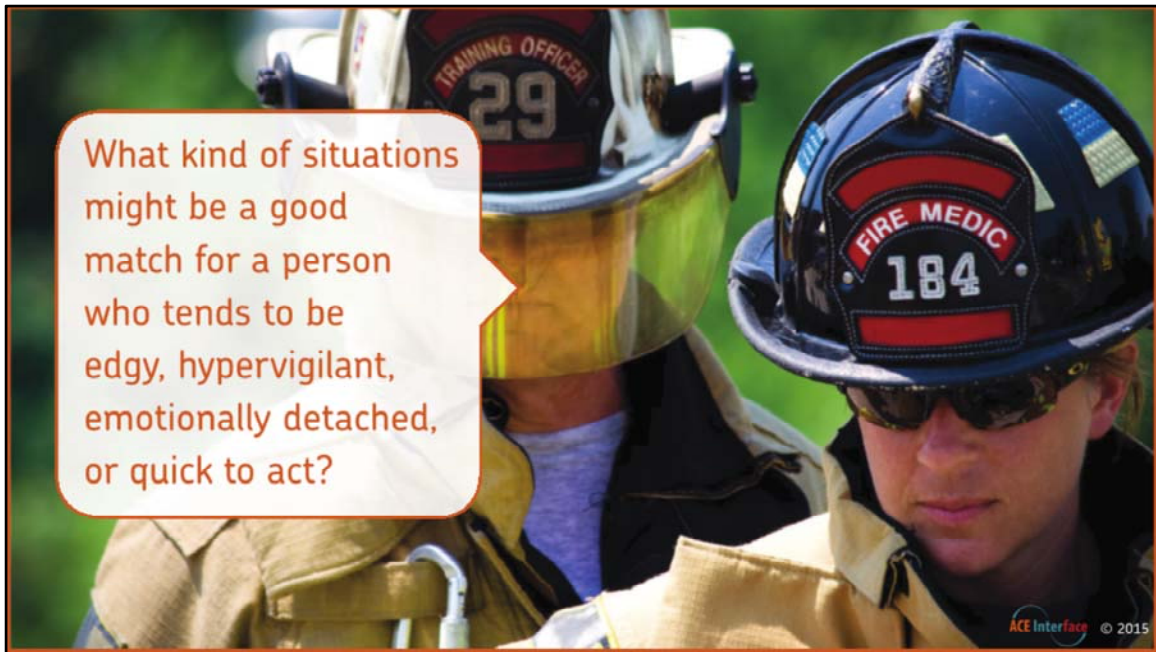
Traumatic experience during development – like abuse, neglect, and chaotic relationships– generates predictable patterns of brain architecture, behavior, and traits.

Humans are only really made to be under stress for about 20 minutes at a time – long enough to prepare for a fight, or to hide. So experiences that cause stress chemicals to be continuously produced, for example child abuse, neglect, or even being in a war zone, have a big impact on development. Under these circumstances, our bodies tend to prepare for life in a dangerous world.

Stress hormones exert influence on cells, chemicals and wiring. They sculpt brains that are wired for certain characteristics – like being edgy, hot tempered, impulsive and hypervigilant, or being withdrawn, dissociated, or numb. This is the path outlined on the top line of the slide. For example, people who have had traumatic stress from conception to the toddler years will likely have a higher baseline of the stress hormones like cortisol in their bodies. As a result, these folks may have a very short fuse, be self-focused, and may have a difficult time shifting gears from emotion to problem-solving. If there is more danger just around the corner, being focused on others and thinking through options wouldn't contribute to survival—readiness for a next danger would.

But the downside is that when stress hormones, like cortisol, hang around for a long time, they are toxic to brain cells. This toxicity includes making it difficult for brain cells to develop healthy neural networks and can even cause brain cells to die. That is why we call continuous stress, trauma, and episodic unpredictable stress: "toxic stress".

Dr. Teicher calls the lower path in this diagram the "benevolent-world" path. The world is kind, easy-going, helpful and free from traumatic stress. People growing up on this path are more likely to develop a brain—with cells and wiring and chemistry -- for being focused, flexible and relationship oriented.



What kind of situations might be a good match for a person who tends to be edgy, hypervigilant, emotionally detached, or quick to act? How might these kinds of adaptations be useful in this environment? *(Take 5 minutes for popcorn response)*

One common belief in our society is that the people whose experience takes them on the top path are maladaptive and the people along the bottom path are adaptive. That's untrue...both pathways are adaptive. Both brains are adapting to their experience.

And that's good for us as a species. The people whose brains adapt to a dangerous or stressful world are more likely to survive when life is tough. The people whose brains adapt to a safe world are likely to be prepared to meet society's expectations in tranquil times. Our experiences get wired into our biology.

# ADAPTATIONS VS EXPECTATIONS

WHEN BIOLOGY  
collides  
WITH SOCIAL  
EXPECTATIONS  
we run into  
**TROUBLE**




ACE Interface © 2015

Dr. Teicher says it's when our biology collides with social expectations that we run into trouble. If you put a person from the benevolent world into the chaotic and turbulent environment of, say, riot control, that person may struggle unless he has learned some very specific skills.

Likewise, a child adapted to a dangerous stressful world may not sustain patience. He or she may not share, cooperate or use words as a first choice.

When that child comes to school and we ask her to sit still, share, and cooperate, there can be a painful disconnect that is hard for everyone. The child will have to be actively taught the skills required to succeed in this context just as we would train a person from the benevolent path how to act in a chaotic and dangerous environment.


## EFFECTS OF MALTREATMENT



type of maltreatment

GENDER

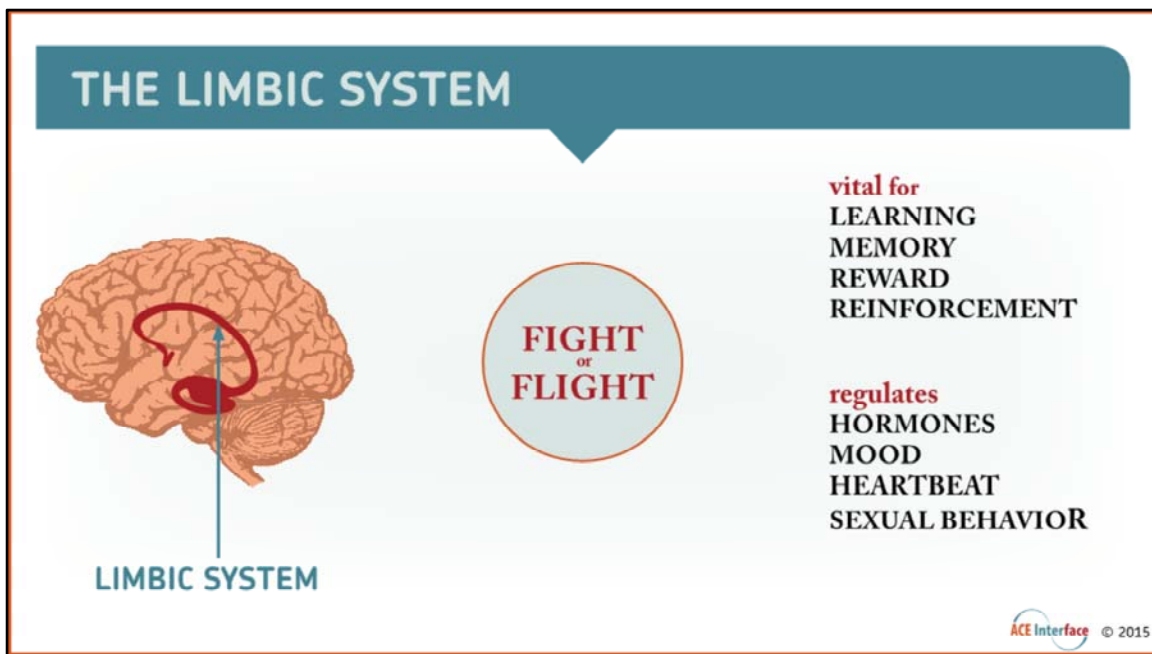
A G E



© 2015

With his team at Harvard and McLean Hospital, Dr. Martin Teicher learns about *the human brain and biology* through a systematic process, isolating one factor at a time. He compares the brains of people who have experienced neglect or abuse to brains of people who have not. His findings suggest that maltreatment effects brain development in predictable ways. Not all experience generates the same effects.

There are at least three known variables that determine the effects of maltreatment: the type of maltreatment, gender, and age at the time of the maltreatment.



One of those elaborate systems is the limbic system. The brain regions in the limbic system control many things including physical balance, internal temperature regulation, and digestion.

The functions we will focus on are the system's ability to regulate hormones, mood, heartbeat and sexual behavior. The limbic system is vital for learning, memory and reward reinforcement processes that help us stay on a healthy track.

The limbic system has an important role in the "fight or flight" response to danger.

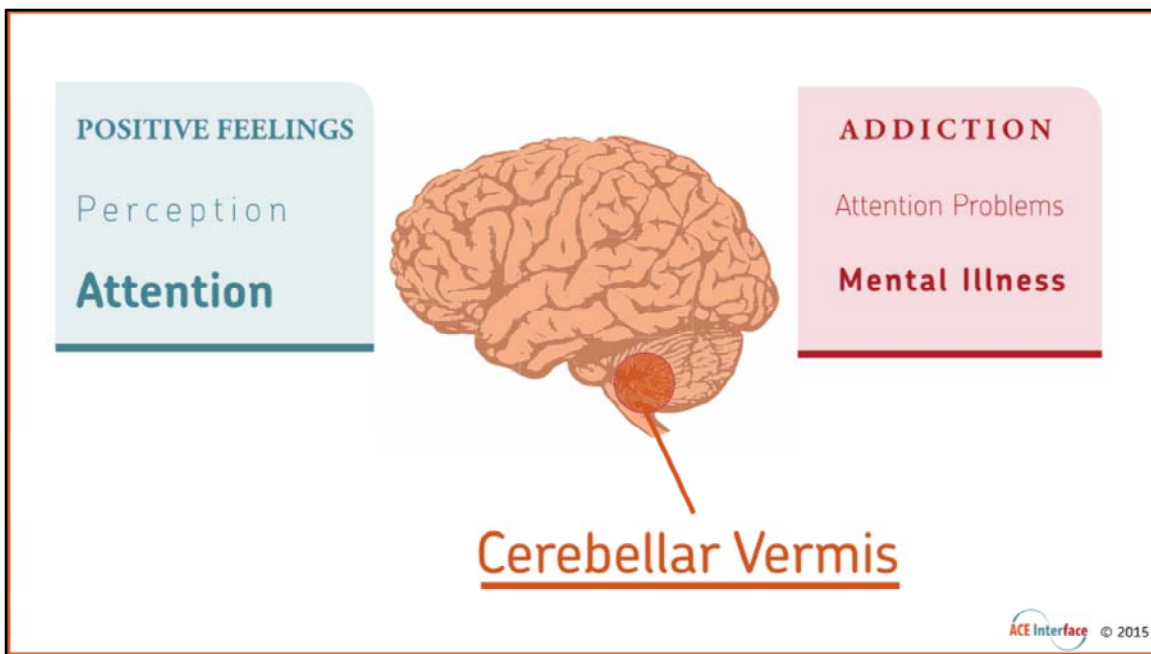


The hippocampus and amygdala are vulnerable to all forms of maltreatment in the first three years of life, and to sexual abuse through age five. But the effects of the maltreatment may not be seen for another nine to 13 years.

At birth, the hippocampus has granule, or "seedling" cells that are biologically programmed to grow and mature around puberty and in adolescence.

Delayed symptoms from toxic stress can occur because stress hormones like cortisol kill the seedling cells.

When these cells are killed, the effect can't be seen until years later -- when they fail to grow and produce the brain mass needed for specialized functioning.

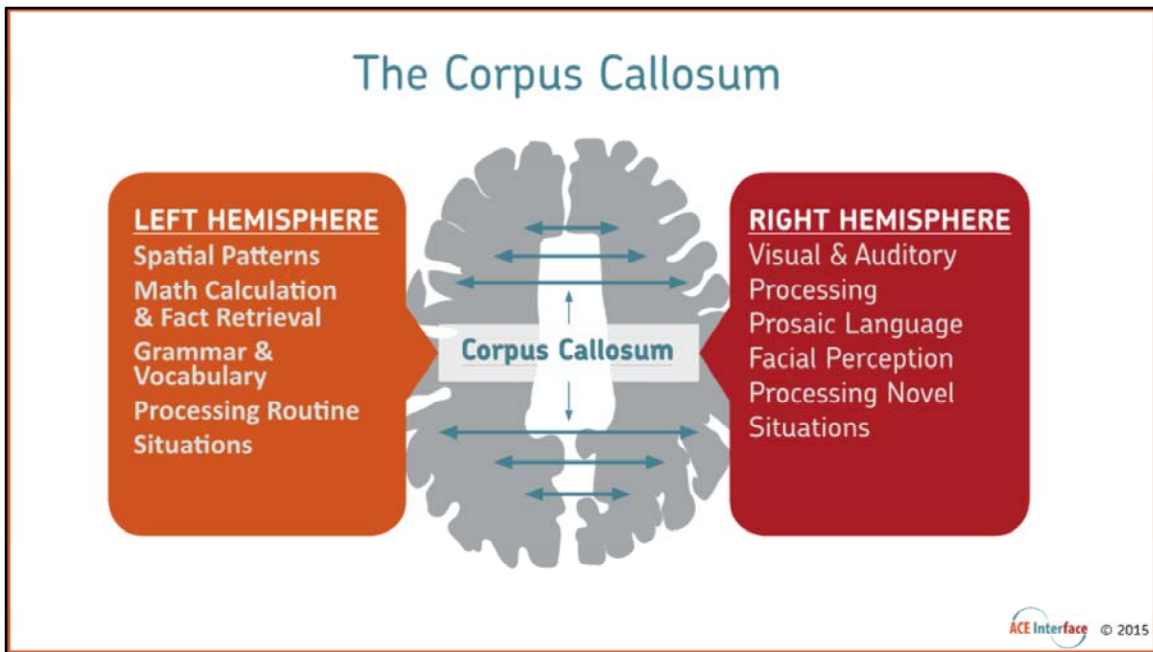


Another brain region with seedling cells is the Cerebellar Vermis, which connects the 2 halves of the cerebellum. The Vermis helps us to move through our physical environment and enables us to perceive peripheral details in the world around us.

It's the part of our brain that pays attention to what a group of strangers standing at the side of the road might do, even while we continue to walk toward our destination. So it's no surprise that one consequence of maltreatment is attention problems, including Attention Deficit Disorder (ADD) and Attention Deficit Hyperactivity Disorder (ADHD).

The Vermis is also the part of the brain that regulates the release of our "feel-good" brain chemistry, norepinephrine and dopamine. Research on abuse and this region show not only reduced size of the Vermis, but decreased blood flow and functionality as well. With limited access to positive feelings, it isn't surprising that impacts to this region can lead to vulnerability for depression and substance abuse.

Children who have experienced four or more ACEs are THREE times as likely to take ADHD medication when compared with children with less than four ACEs

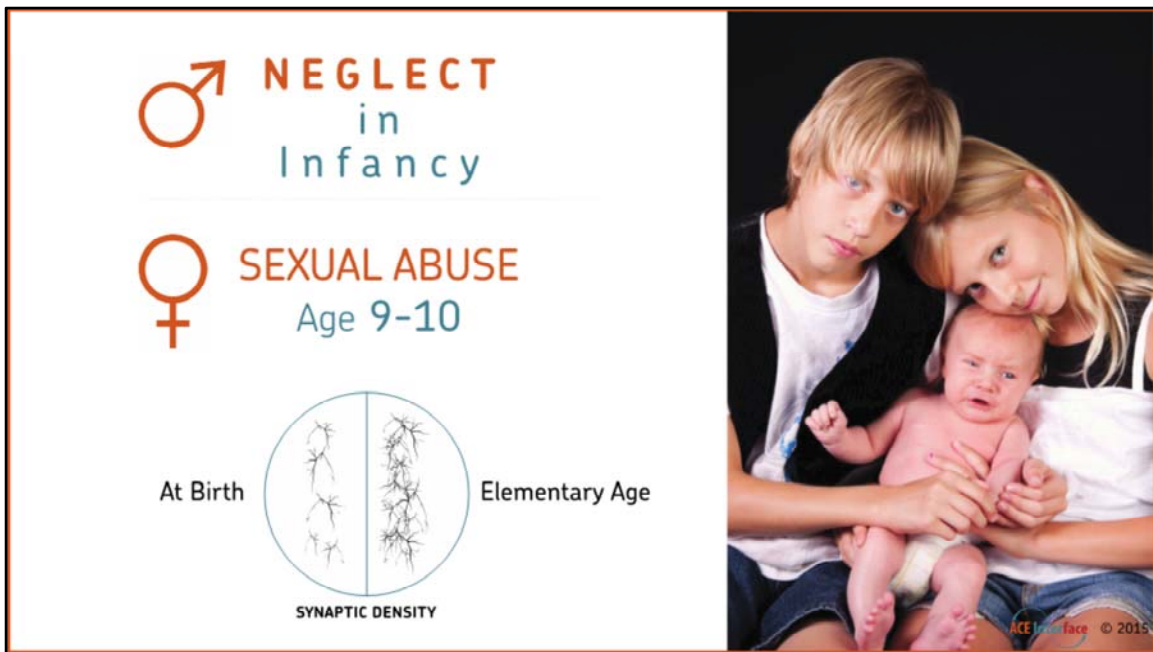


Some brain regions have several periods of sensitivity that span throughout childhood. The corpus callosum is one of these.

It's a superhighway that connects the right and left hemispheres of the brain.

Each hemisphere of the brain is specialized to control movement and feeling in the opposite half of the body; and each hemisphere specializes in processing certain types of information, such as language or spatial patterns. In order to coordinate movement or think about complex information, the right and left hemispheres must communicate with each other.

The Corpus Callosum helps us to interpret and apply symbols and to integrate language and mathematics – it is the part of the brain we used when we were given “story problems” in school.



Exposure to neglect in infancy (especially for boys); and exposure to sexual abuse around ages 9 and 10 (especially for girls) have powerful impacts on the Corpus Callosum. Exposure impedes cell division and interrupts myelination of nerve fibers, which is the fatty layer of insulation that helps nerve cells to communicate.

Maltreatment also disrupts electrical activity, making cross-brain communication less reliable. Less cross-brain communication can lead to an inability to integrate rational ideas when in a highly emotional state.

You may know someone who doesn't seem able to respond when you ask him or her to calm down so you can talk through a problem. This may not be a choice; it may be a biological adaptation to childhood experience.



Perhaps you have wondered if it really matters whether or not adults intervene when children are name calling, harassing, or bullying other children.

The answer is that it matters very much if we are serious about reducing anxiety, depression, anger-hostility, dissociation, and drug use. Peer and parental verbal abuse have equal effects, according to research published by Dr. Teicher in 2010. Peer verbal abuse during the middle school years has significant impacts on all of these symptoms.

If we want to improve math scores and capabilities in science, technology, and engineering, we need to be intentional about reducing toxic stress in early and middle childhood when toxic stress can affect math and memory competencies.

If we want people to be able to perceive danger coming and have the capabilities necessary to negotiate out of a jam, we must pay attention to toxic stress from middle childhood through the teen years.

Witnessing domestic violence in the elementary years as well as sexual abuse prior to age 12 are known to have effects on the visual cortex, literally limiting the field of vision and limiting visual memory. And, sexual abuse in the middle teen years (15-16) also affects the cortex, leading to difficulty interpreting visual information, thinking abstractly and reasoning through conflict.



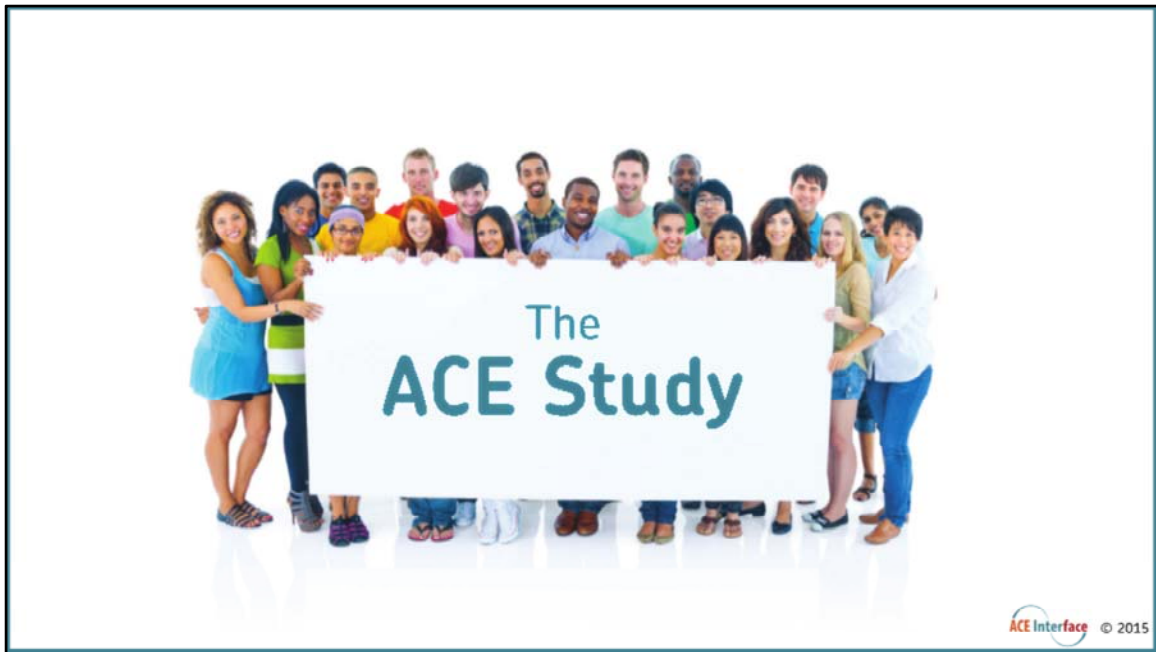
We've talked about sensitive developmental periods when toxic stress has profound effects on human development. But these childhood times are also windows of opportunity for building resilience – after all, the developing brain is sensitive to all kinds of experience.

By paying attention to sensitive developmental periods, we can do a better job protecting children and providing the kinds of challenges and supports that may remediate earlier periods of toxic stress and promote life-long health and well-being.

We have a collective choice: we can actively develop skills and accommodations that enable everyone to contribute to community, or we can continue our societal pattern of rejecting people when they have normal adaptive responses to childhood adversity.

If you remember only one thing from this information about brain development, I hope it will be that toxic stress can be hardwired into biology.

Before we assume that a person's behaviors are a rebellious choice, let's think about the possibility that adversity may be at the heart of the challenges we see.



We have been talking about the effects of toxic stress on individuals. Now, we're going to switch gears and talk about the effects of toxic stress on the population as a whole. The field of epidemiology is where we'll turn.

Epidemiologists are scientists who study the origins of disease, disability, productivity and health in a population. They help us to focus our efforts on issues and processes that will make the most difference for the well-being of everyone.

We're going to talk about a large epidemiological study about the enduring effects of Adverse Childhood Experience. Dr. Rob Anda and Dr. Vincent Felitti are the co-principal investigators of the study, which they call "The ACE Study".



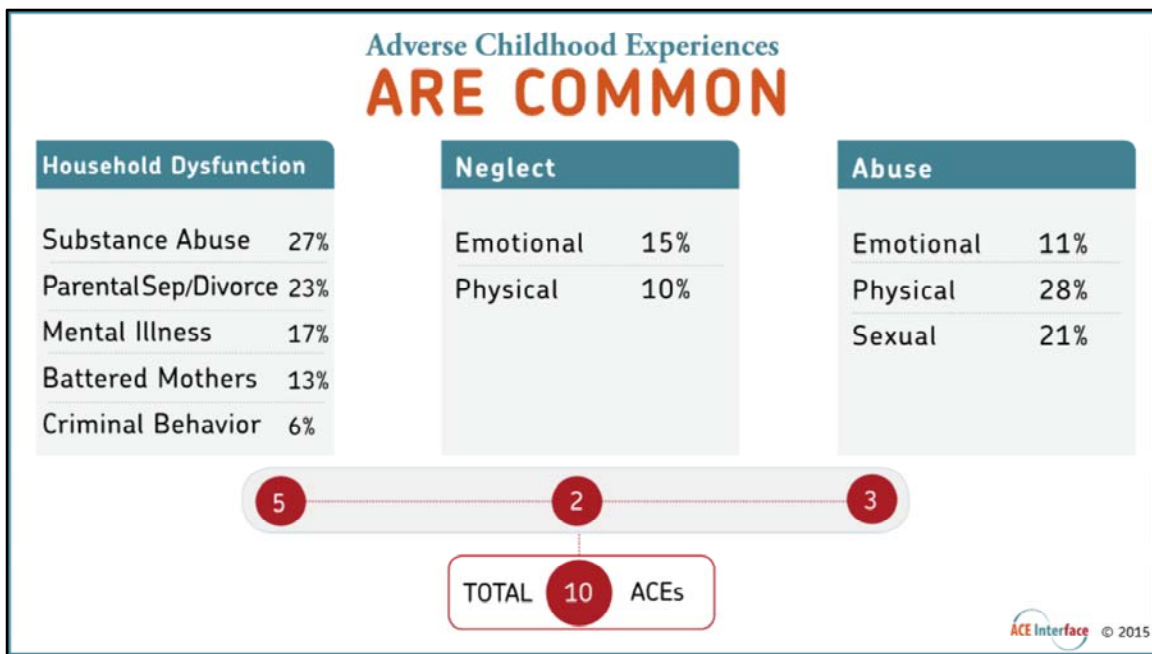
Most prior studies of the health and social effects of childhood abuse focused on a single type of adversity such as sexual abuse. The ACE Study broadened the picture to include multiple types of childhood stressors. In addition, the Study measured a wide array of health and social problems. This is how the ACE study expanded the knowledge into a broader public health perspective.

So, the ACE Study is unique because it provides the potential to understand how multiple forms of childhood stressors can affect many important public health problems. Design of the ACE Study began in 1991; in 1994 the CDC provided funding to conduct the ACE Study at the Department of Preventive Medicine in San Diego.

More than 17,000 adult members of the Kaiser Health insurance plan completed a survey about adverse childhood experiences (ACEs), health behaviors, disease risks and disease, mental health and substance abuse, and other health and social problems; their ages ranged from 19 to 94 years.

Study participants were generally well educated—most had attended college and only 6% did not have a high school diploma (as compared with 13% of the US population).

They were predominantly White middle class people who had access to some of the best health care in the world. Study participants are still being followed to assess the relationship of ACEs to causes of death, incidence of diseases, health care utilization, and use of prescription medications.

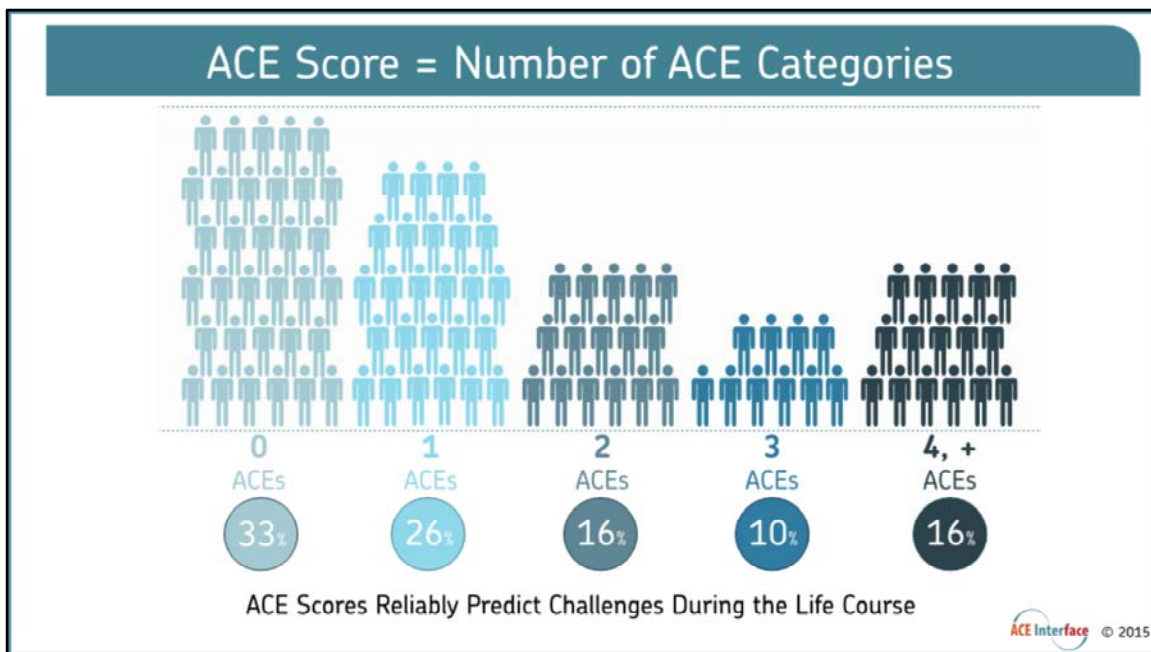


This slide shows the 10 categories of adverse childhood experiences that were studied.

The first group are indicators of Household Dysfunction, which include: growing up with substance abusing household members—alcohol or drugs, parental separation or divorce, growing up with mentally ill household members or caregivers, witnessing intimate partner violence—specifically having a battered mother, or criminal behavior as evidenced by having a household member imprisoned.

Three forms of childhood abuse were studied: emotional, physical, and sexual. And two forms of neglect were included: emotional and physical.

As you can see from the percentages on the slide, ACEs are common in this middle class well educated population.



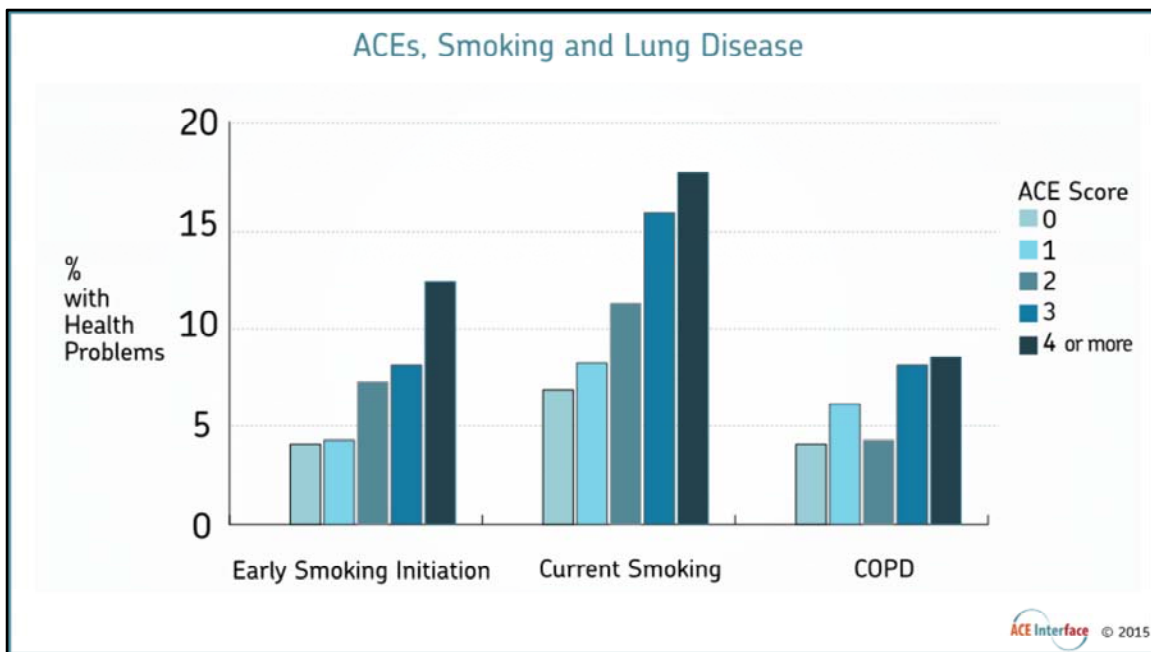
Because adverse childhood experiences are so highly interrelated it did not make sense to look at how single categories of ACEs influenced health and social problems. Instead Drs. Anda and Felitti developed an ACE Score.

This score is simply a count of the number of categories of ACEs that each person reported -- from 0 to 10. Each category counts as 1 point in the ACE Score. So, if a person experienced physical abuse, no matter how many times, or what the severity of the abuse, the ACE Score is 1; if the person experienced physical abuse and had a substance abusing parent, the ACE Score is 2, and so forth.

Think of the ACE Score as a measure of the childhood “biologic stress dose”. As the ACE Score goes up—on average the exposure to the developmental effects of toxic stress increases.

In this illustration you see that only a third of people in the Study had an ACE Score of zero. 16% had scores of 4 or more.

Adverse Childhood Experiences are common; and they tend to cluster. ACEs are a hidden burden in the study population.



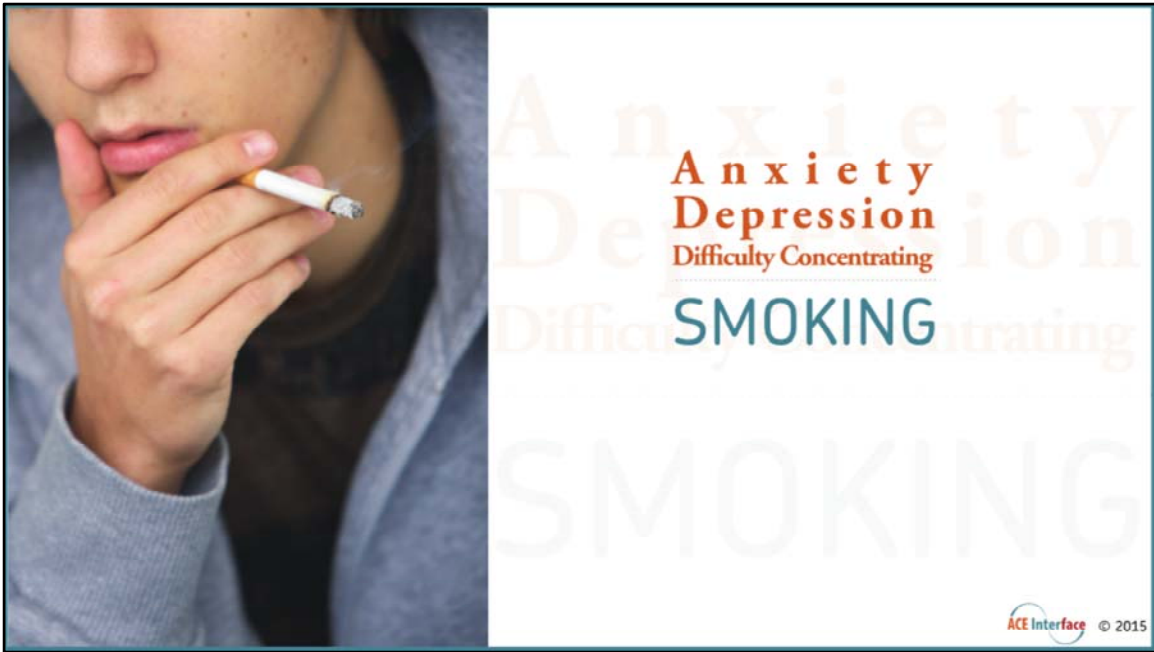
All of the data slides from the ACE Study that I'll show you today are formatted in this same way. Along the bottom – horizontal axis – are the ACE scores, from zero on the left to 4 or more on the right. The vertical axis is the percent of people who have the disease or condition.

So, in this first set of bars -- on the far left, we see that the percent of people who became regular cigarette smokers by age 12 goes up as each level of the ACE Score goes up.

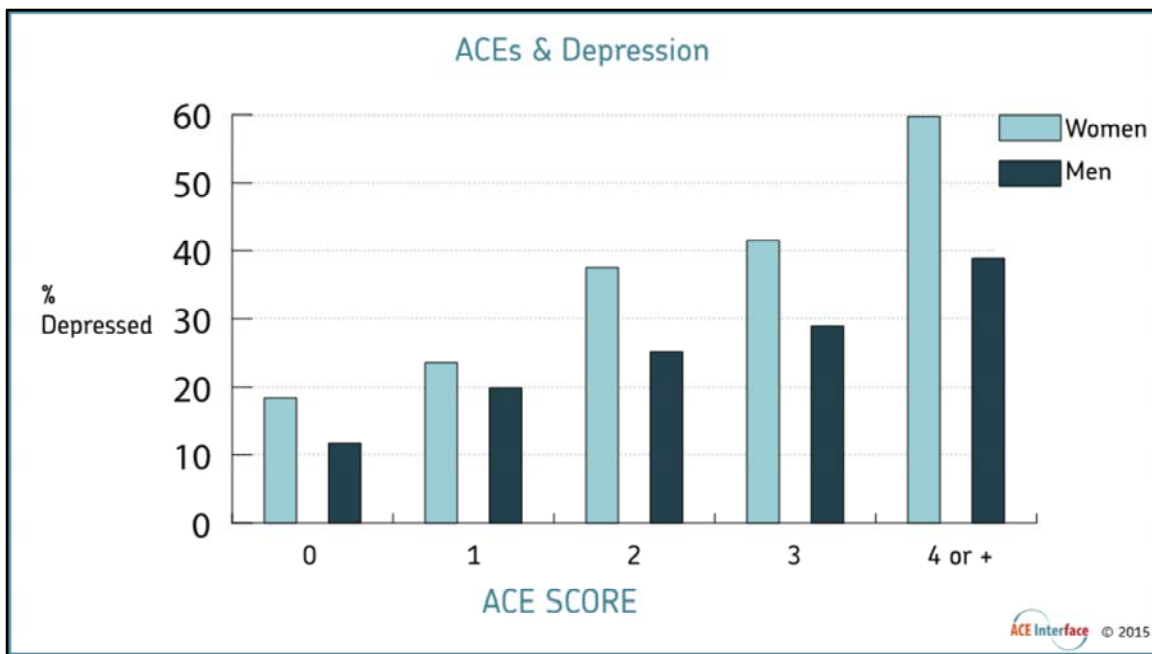
In the second set of bars, we see the percent who were smokers as adults also goes up in a stepwise fashion as the Score goes from 0 to 4 or more.

People with higher ACE scores have increased risk of chronic obstructive pulmonary disease, or COPD. About 4% of people with an ACE score of zero developed COPD; while more than double that percent of people - about 9% - with an ACE score of 4 or more developed COPD.

ACEs lead to early onset of smoking, which is sustained throughout adulthood and eventually leads to a high risk of smoking-related lung disease.



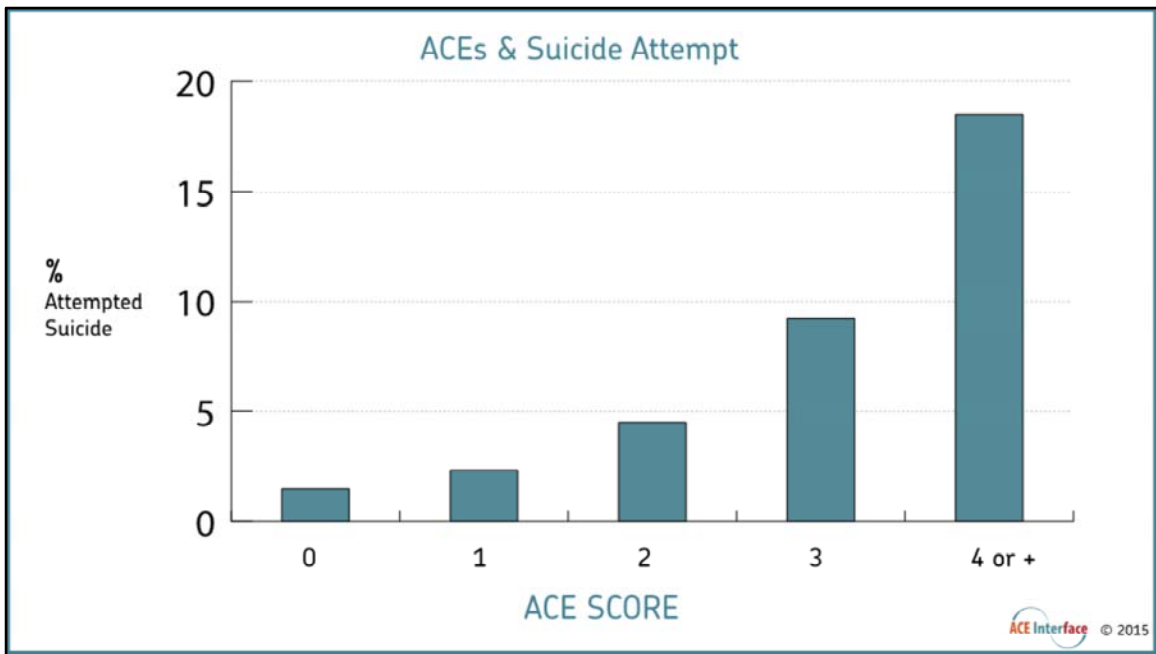
ACEs can result in depression and anxiety. Nicotine can reduce symptoms of depression and anxiety; so the benefits of nicotine in reducing these unpleasant emotions-might help to explain why knowledge of health risks due to smoking are not enough for some people to quit.



Depression is the leading cause of disability in developed countries.

Here we see that the risk of depression increases for both men and women in a “dose-response” fashion as the ACE Score goes up.

ACEs are held in the body, leading to mental, physical, behavioral health problems in adulthood. Some of those problems are unintentionally handed to the next generation. Becoming an alcoholic, marrying an alcoholic, and suffering from depression are a part of the intergenerational transmission of Adverse Childhood Experiences.



One of the strongest relationships seen in the ACE Study is between ACEs and the risk of suicide attempts. People with an ACE Score of 4 have almost 20 times the risk of suicide attempts as people with an ACE Score of 0.

## EXAMPLES OF ACE-ATTRIBUTABLE PROBLEMS

Alcoholism & Alcohol Abuse

Chronic Obstructive  
Pulmonary Disease

Coronary Heart Disease

Depression

Drug Abuse & Illicit Drug Use

Fetal Death

Intimate Partner Violence

Liver Disease

Mental Health Problems

Obesity

Sexual Behavior Problems

Smoking

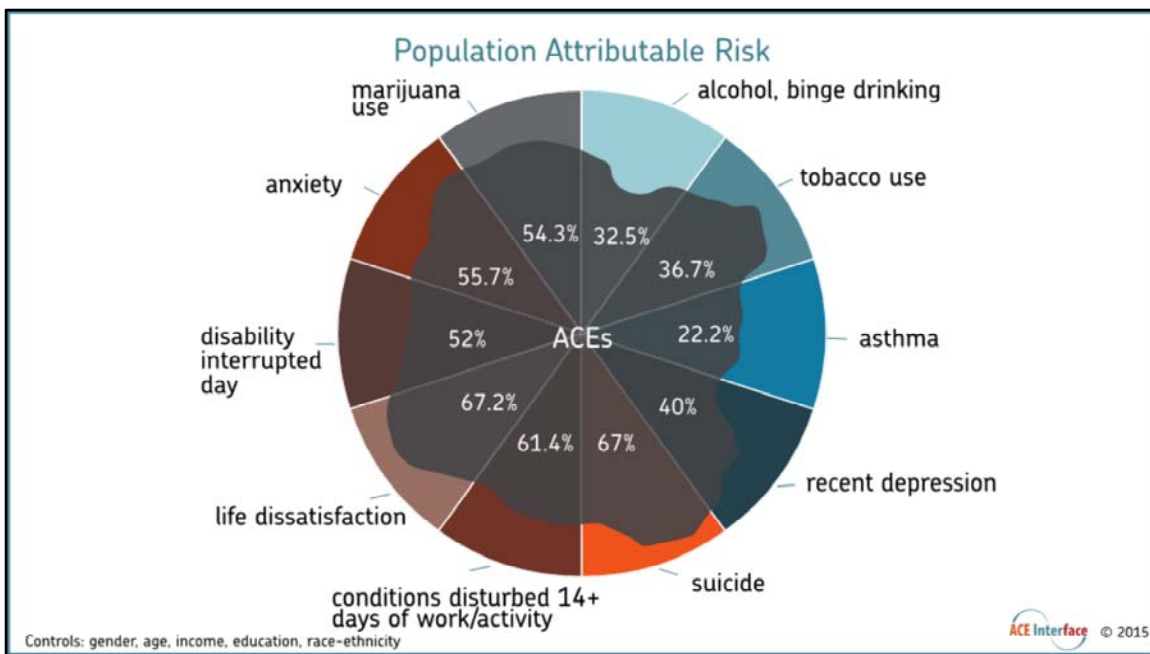
Unintended Pregnancy

Violence

Workplace Problems

Here is a list of some of the health and social problems documented by ACE Study publications. Because ACEs have a powerful impact on many health and social problems, the ACE researchers concluded that ACEs are the leading cause of health and social problems in our nation. And this should lead to thinking about prevention.

We are living in a time with stunning potential for shifting the trajectory of health and wellbeing for generations to come.



So how do we put this all together to make a case for understanding ACEs as powerful pathway to health and wellbeing?

Now we understand that ACEs are common and have a strong cumulative impact on the risk of common health and social problems. Preventing ACEs and their intergenerational transmission is the greatest opportunity for improving the well-being of human populations. In fact, the ACE Study team and ACE Interface believe this is the greatest opportunity of our time... perhaps of all time.

This slide shows the percentage of various health and social problems that epidemiologists estimate are caused by ACEs. The calculation that is commonly used to do this in public health studies is called Population Attributable Risk; this is displayed as a percentage as an "oil spill" on this slide. The percentage of a problem coated by the oil spill represents the percentage of each problem that is potentially preventable by preventing ACEs.

The percentages are quite large. In fact the high percentages on this chart are rarely seen in public health studies.

The cumulative effects of ACEs reflect a powerful opportunity for prevention – no matter if you are working to prevent heart disease or cancer, end homelessness or hopelessness, or improve business profitability – as we align a portion of our work around a common goal of preventing the accumulation of ACEs and moderating their effects, we will reduce all of these problems, and many others, all at once!



Early trauma and stress leads to predictable patterns of development. We don't know what all those patterns are, but we know quite a lot. We know that there are cognitive, attentional and social outcomes that emerge.

Children who experienced adversity may have slowed language development or diminished, which can lead to special education, school failure and ultimately, dropping out. Children with attention problems, especially if they are undiagnosed and untreated not only experience academic failure, but are at risk of behavior problems that result in suspension and expulsion, which in turn are correlated with delinquency, dropping out, and entry into the juvenile justice system.

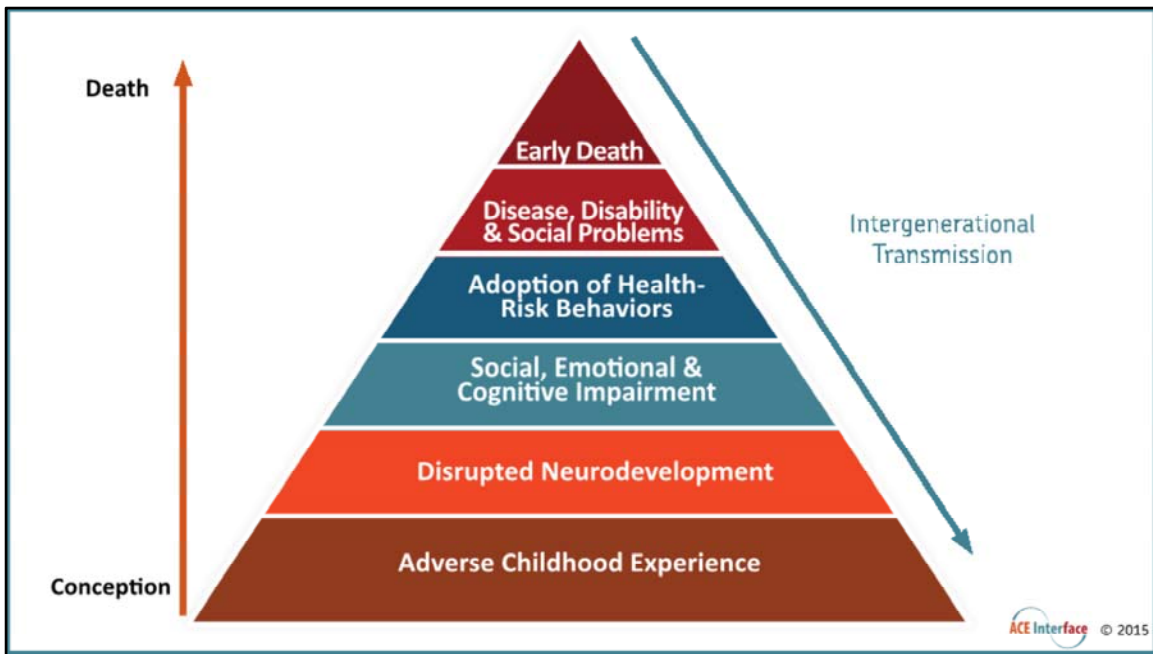
Children also experience social failure and behavior problems that involve tantrums, aggression, and outbursts. This creates a fast track to trouble at school, suspension, aggression and delinquency.

In addition, these kids are at serious risk of early and chronic alcohol, tobacco and drug use.

Interestingly, the newest nicotine studies suggest that early smoking inhibits the development of pre-frontal lobes, which creates risk for impulsive and extreme behavior in late adolescence.

This combination is a fast track to poor life outcomes. And the epidemiological evidence tells us it's also the fast track to poor adult mental and physical health. Achieving economic well-being is certainly against the odds.

Now we have to acknowledge that not every victim of adverse childhood experiences will have this life path. The numbers tell us that at least half of the people in this room experienced adverse childhood experience, and yet here we are, making a contribution.



We've see how ACEs effect health throughout the life course... from conception to early mortality. And we've also seen how people exposed to ACEs tend to develop the same behaviors and health and social problems that become ACEs for the next generation.

That's why we now show the arrow on the right side of the pyramid to emphasize the need to disrupt their intergenerational transmission.



The ACE study provides us with straight-forward information about the consequences of toxic stress during childhood.

This scientific research gives us powerful information we can use every day to improve health, safety, prosperity and longevity. But the ACE study isn't a detailed roadmap of services or programs; it is an invitation for us to be pioneers.

This news is simply too important to wait for someone else to design a detailed roadmap.

Through our collective knowledge and action, we are the ones with the power to shift the dynamics within our own families, communities and society that lead to high ACE scores.

## Core Protective Systems

Capabilities

Attachment  
&  
Belonging

Community  
Culture  
Spirituality

**“Nurturing the healthy development of these protective systems affords the most important preparation or ‘inoculation’ for overcoming potential threats and adversities in human development. Similarly, damage or destruction of these systems has dire consequences for the positive adaptive capacity of individuals.”**

*Ann Masten, 2009*

When people hear about the ACE Study findings, they often ask about resilience. People get excited about the notion of resilience, in part because it reminds us that our supportive actions matter. Our desire for resilience leads naturally to a search for ways to help families and communities.

Three protective systems interact and guide positive adaptation. These powerful systems are individual capabilities, attachment and belonging with caring and competent people, and protective community, faith, and cultural processes.

What do we know about individuals who do well despite adversity? We know that the three protective systems are nested: people do best when they are living in thriving families and communities. We can help one another to develop personal attributes that help us all weather life's storms. Personal attributes like positive view of one's life, self-efficacy and self-regulation are all discussed at length in the resilience literature.

## Family Protective Factors

CENTER FOR THE STUDY  
OF SOCIAL POLICY'S

strengthening families™  
A PROTECTIVE FACTORS FRAMEWORK

Parental  
resilience

Social  
connections

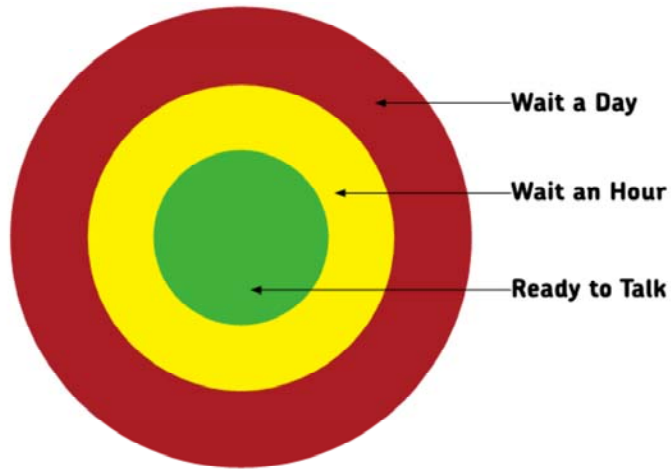
Knowledge of  
parenting and  
child  
development

Concrete  
support in  
times of need

Social and  
emotional  
competence  
of children

Here is a quick review of the protective factors themselves. Remember, these is not a complete list of all the characteristics that can be protective factors in the lives of families. But it is a list of critical ones that we all have the opportunity to influence with the families we work with.

## Trauma-Informed School Discipline



ACE Interface © 2015

One alternative high school principal, after learning that some people are not biologically wired to be rational at the same time they are emotionally triggered, developed a new discipline process that has dramatically reduced problems in his school.

He made a simple graphic of a green-yellow-red colored target, with green in the center and red as the outer band. In this school, teachers and students identify their emotional state before any disciplinary conversation can begin. If either person is “in the red” – they wait hours or even a day before they begin to talk about what went wrong and what should be done about it. Once teens have calmed, they can be active partners in taking care of the school, taking care of one another and taking care of themselves.

As we learn more about how trauma is hard-wired into biology, we can begin to challenge old assumptions and develop accommodations – like the simple target -- that help people participate more fully in community life. After adopting changes at Lincoln High School, including the one described here, suspensions dropped by 85%. This makes the students more likely to graduate and less likely to enter the criminal justice system.

## Trauma Informed Schools – Jim Sporleder

- Teach Students & Parents About Stress
- Create a Culture of Safety
- Students of Concern Meetings
- Book Study Groups
- Encourage and Support Staff
- Staff and Student Surveys (HOT MAPPING)
- Self evaluations
- School Resource Officer

## Trauma Informed Schools – Jim Sporleder

- KEEP BUILDING RELATIONSHIPS
- Review Disciplinary and Attendance Stats
- Review Grades
- Review Target Areas
- Identify Training Needs

Why Traditional discipline Doesn't work WITH MOST CHALLENGING KIDS

Conventional wisdom is *WRONG*  
Challenging kids lack *SKILL* not will  
It is rarely a motivation issue!

Traumatized kids have not lacked consequences or motivation, they lack skills

Do we tell and react or Ask and Respond?

- Annoyed
- Angry
- Hurt
- Hopeless

Annoyed = Undue Attention If you find yourself feeling annoyed, irritated worried or guilty it is your emotional que that the youth is likely wanting or needing more attention than you can give them. One of our innate reactions is to remove ourselves or isolate them, which may exacerbate the youth's behavior.

Angry = Power If we feel angry, we tend to engage in a power struggle feeling like if we give in, they win or we exert our power and they loose, often then feeling even more powerless

Hurt = Revenge If the youth feels hurt and retaliates externally or internally it can often look like bullying us, other youth, and self-defeated or not worthy. Retaliation can invoke retaliation, which for the youth often leads to more hurt, creating a vicious cycle.

Hopeless = Assumed Inadequacy Often a youth will just give up, displaying helplessness. They want to be left alone so they have no expectations to live up to. We as staff, like parents, often feel like giving up, doing for, overhelping and feeling helpless to do any more. They don't lack will they lack skill

Treat challenging behavior like you would any other learning disability

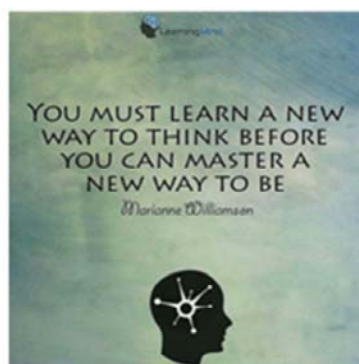
- Assess which skills are lagging
- Use a different approach to teach those skills in increments our kids can handle

Research in neurosciences has shown the kids we work with are delayed in the development of crucial skills or have significant difficulty applying these skills when they are...

**MOST NEEDED!**

Do we *Tell and React* or *Ask and Respond*?

- Annoyed
- Angry
- Hurt
- Hopeless



### **Example of how to implement a Trauma Informed Approach: Que Card**

#### **Empowering Youth and Families to Achieve Lifelong Success (Y.E.S. House Mission Statement)**

1. All behavior is communication. Have a conversation not an argument.
2. What is the message behind the behavior? Identify options.
3. Utilize cool down and coping skills. Deescalate the situation
4. Listen more than talk. Are you the right person at the right time?
5. **Never impose a consequence during the escalation phase.**  
Explore & identify options.
6. What is the new agreement? Fix the future, don't punish the past.



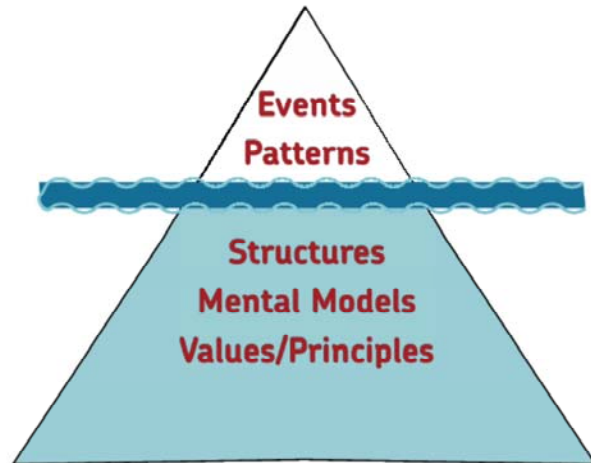
Example of Secondary and Elementary Calming Kits depending on Developmental Level




An example of an Elementary Calming Area


## Invite Transformation

We Increase Probability  
of Lasting Change When  
We Notice and Act  
**“Below the Waterline”**



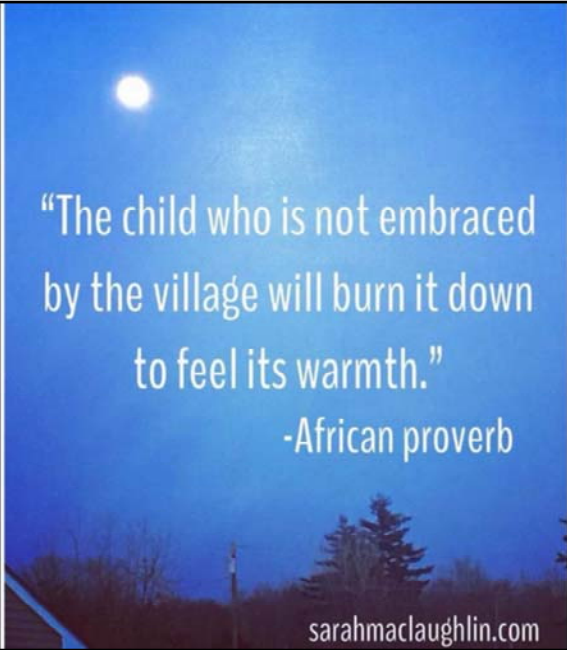


How are you feeling about information shared related to the ACE study?



ACE Interface © 2016

Invite participants to personally reflect on how they are feeling about the information shared related to the ACE Study, and record their thoughts on the handout.



“The child who is not embraced  
by the village will burn it down  
to feel its warmth.”

-African proverb

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As we work to prevent accumulation of ACEs, – Let’s keep in mind that we don’t have to get to ACE Scores of zero – bringing scores down any amount will have huge effects.

We might not be able to prevent a first ACE from occurring in a family. But we certainly can notice when children have five ACEs and make sure that number doesn’t go to ten!

As we thread through all of our work a new focus of supporting adults – particularly adults who, through no fault of their own, experienced many ACEs when they were children – we will prevent ACEs for the next generation.

We live at a time of great hope and promise. The largest public health discovery of our time – perhaps of all time – is about family, community, children – it’s about us. Our action to prevent ACEs – whether large or small – can profoundly improve our future.

Thank you.