Adverse Childhood Experiences, or "ACEs," are stressful or traumatic experiences that disrupt the safe, nurturing environments that children need to thrive. Exposure to ACEs can lead individuals toward the adoption of unhealthy habits and the onset of negative long-term health and economic issues.

Adverse childhood experiences that may negatively impact development include the following:

- Child maltreatment
- Family dysfunction
- Witnessing community violence
- Living in poverty
- Homelessness
- Bullying by peers, siblings and others
- Death of a parent

ACEs cause stress and challenges during childhood, adolescence, and into adulthood. Some adult outcomes associated with ACEs include the following:

- Heart disease
- Diabetes
- Obesity
- Cancer
- Liver disease
- Intimate partner violence
- Depression
- Suicide attempts
- Poor anger control
- Smoking
- Substance abuse
- Multiple sexual partners
- Unintended pregnancies
- Fetal death

The more exposure to ACEs a person has, the more his or her risk increases for the issues above.

However, there is hope! Research shows that providing safe, stable, and nurturing relationships early in life can buffer the damaging effects of childhood adversity. Tennessee can do a number of things to both prevent and reduce ACEs across the state and to build protective factors in and around children so they can grow up to be healthy and happy.
Trauma during childhood can have critical implications throughout the lifespan.

The Adverse Childhood Experiences (ACE) Study is a large-scale, ongoing research collaboration assessing the link between negative childhood experiences and negative adult outcomes. The study was initiated by Dr. Robert Anda and Dr. Vincent Felitti in 1995-1997 with more than 17,000 participants at Kaiser Permanente in San Diego, California in partnership with the Centers for Disease Control and Prevention (CDC). Each participant in the study had a physical examination and completed a confidential survey that contained questions about childhood maltreatment and family dysfunction as well as current health status and behaviors. Participants with exposure to early traumatic stressors, termed adverse childhood experiences or ACEs, showed an increased risk for both short-term and long-term health and social problems (see figure 1). As the number of ACEs increased for each person so did the amount of risk in a number of categories, suggesting that vulnerability builds with each ACE exposure. Both the findings and ongoing assessment tell a compelling story about the relationship between childhood stress and the risk for a multitude of problems across the lifespan.

Figure 1

Sources: CDC http://www.cdc.gov/bfrs and ACE Study http://aceres.org Figure adapted by Dr. Robert Anda
In 2012, Tennessee included an ACEs module in the Behavioral Risk Factor Surveillance System (BRFSS), a telephone survey conducted by the CDC, to see how ACEs affect the state’s general population. The Tennessee Department of Health then analyzed data from 7,056 adults to assess outcomes. Data presented in this report may underestimate the prevalence of ACEs in Tennessee since BRFSS data collection excludes certain groups of individuals including those who are homeless, in prison, or do not have phones. In addition, ACEs data is population level data and should not be used to predict individual risk.

ACEs are widespread, common and prevalent in Tennessee. ACEs are found across the state, with multiple counties in which 42% of the population has experienced two or more ACEs (see figure 4). Overall, 52% of the statewide population had at least one ACE, while 21% had three or more ACEs (see figure 2). Emotional abuse, substance abuse and parental separation or divorce rank as the most common adverse experiences (see figure 5). In addition, males and females are exposed to adverse childhood experiences at about the same rate with the exception of sexual abuse, for which females report higher rates of exposure (see figure 3).

Figure 2: Prevalence of ACEs in TN

Figure 3: Prevalence of Specific ACEs in TN by Gender

Figure 4: ACE Scores Across TN Counties, Percent of Population with an ACE Score of 2 or More

Figure 5: Prevalence of ACEs in TN by Category

A person with four or more ACEs is *twice as likely to be out of work* and be in the lowest income bracket as a person with 0 ACEs (see figure 6).

A person with four or more ACEs is *half as likely to have health care coverage* as a person with 0 ACEs (see figure 6).

A person with four or more ACEs is *less likely to be married* and *more likely to be separated or never married* than a person with 0 ACEs (see figure 7).

A person with four or more ACEs is *less likely to graduate high school* and *much less likely to graduate college* as a person with 0 ACEs (see figure 8).

ACEs IN TENNESSEE: HEALTH OUTCOMES AND BEHAVIORS

Figure 9: HIV Risk Factors by ACE Score
A person with four or more ACEs is eight times as likely to have HIV risk factors as a person with 0 ACEs (see figure 9).

Figure 10: Depression Diagnosis by ACE Score
A person with four or more ACEs is four times as likely to have depression as a person with 0 ACEs (see figure 10).

Figure 11: Number of Days with Poor Health in Last 30 Days by ACE Score
A person with four or more ACEs has seven days of poor mental health and six days of poor physical health each month on average (see figure 11).

Figure 12: Substance Use by ACE Score
A person with four or more ACEs is more likely to binge drink and smoke cigarettes as a person with 0 ACEs (see figure 12).

Figure 13: Health Outcomes by ACE Score
The more ACEs a person has, the more likely he or she is to have asthma.

Note: Compared to other state and national data, the Tennessee Health Outcomes data does not follow the typical data pattern where the more ACEs a person has, the higher his or her risk becomes (dose-response pattern). The reason for this is unclear at this time.
ACEs and Brain Development

Adverse childhood experiences are stressful.

Though experiencing some stress is a normal part of healthy brain development, cumulative adverse childhood experiences are a type of stress that negatively affects brain development. The National Scientific Council on the Developing Child has identified three primary types of stress:

<table>
<thead>
<tr>
<th>Positive Stress</th>
<th>Tolerable Stress</th>
<th>Toxic Stress</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Brief increase in heart rate</td>
<td>• More prolonged activation of stress response</td>
<td>• Prolonged activation of stress response</td>
</tr>
<tr>
<td>• Mild elevation of stress hormones</td>
<td>• Stress buffered by adult support</td>
<td>• Disruption of brain architecture</td>
</tr>
<tr>
<td>• “Fight or Flight”</td>
<td>• Example: Grieving the loss of a loved one with support</td>
<td>• No adult support</td>
</tr>
<tr>
<td>• Example: Getting immunized at doctor’s office</td>
<td></td>
<td>• Example: Experiencing abuse and neglect</td>
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</tbody>
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ACEs are harmful.

Traumatic experiences, including ACEs, can be particularly harmful during infancy and early childhood when the brain is immature and in some ways fragile. The nature and severity of the disruption in brain development is dependent on the type of experience, the level and duration of exposure, and the timing during the developmental process. Toxic stress that occurs continually or is triggered by multiple sources can have a cumulative toll on an individual and can actually damage brain cells (see figure 14).

Figure 14: Persistent Stress Changes Brain Architecture

Sources: Rodley et. al. (2004) and Bock et. al. (2005)
ACEs and stress are not the only factors that affect brain development. Many factors, both internal and external, affect brain development. During infancy, babies’ brains are developing 700 synapses per second; within the first year, development of neural connections in the brain peaks in sensory pathways such as vision, hearing, language and higher cognitive functions (See Figure 15). Sometimes, it’s easier to think about brain architecture compared to a house’s foundation. In the brain and a house, it’s important to have a strong and solid foundation at the beginning so there are fewer problems later.

So, what kinds of things can build a strong and solid foundation? Positive interactions with infants can help facilitate optimal brain development. Early on, it is important to talk, sing, rhyme and read to/with a baby—even before the baby has begun to talk. These types of routines will help children pick up language and can actually predict reading levels later. Also, “Serve and Return” is essential in shaping brain architecture. Serve and Return happens when a baby ‘serves’ a behavior such as babbling, facial expressions, gestures and other noises to provoke interaction with an adult, and the adult ‘returns’ the same kind of behavior. This type of back-and-forth communication between caregiver and baby is actually fundamental to the wiring of the brain. Other behaviors that are very important for a baby’s brain development include breastfeeding, good nutrition, regular sleep, medical check-ups and appropriate and consistent discipline. Healthy development of the brain is critical for many life course outcomes including achievement, health, and successful parenting of the next generation.

Practicing these behaviors will instill protective factors and resilience in children so they are more likely to bounce back if, at some point, they do experience ACEs. Though prevention and reduction of ACEs is ideal, protective factors that lead to resiliency can help to decrease the effect ACEs have on later life outcomes. Imagine putting a sponge in the middle of the Population Attributable Risk ‘ACEs oil spill’ graph (see Figure 16) - risk for all of these outcomes can be decreased simultaneously if ACEs were prevented, reduced or mitigated. That’s why it’s important to start early!
