

**Prevention of Short- and Long-term Impacts of Adverse Childhood Experiences (ACEs)
through Widespread Implementation of the Community Resiliency Model**

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Abstract

Adverse Childhood Experiences (ACEs) are harmful events (e.g., physical or sexual abuse, neglect, observing a parent with an alcohol or drug addiction) that are experienced before the age of 18. Various research studies described in this paper have reported prevalence rates of ACEs that vary between 22 and 45%. With each additional reported ACE, there is an increased risk of diseases (e.g., heart disease, cancer) and mental health disorders (e.g., depression, anxiety). The Community Resiliency Model (CRM) is a public health model that teaches individuals to respond to their body's reactions to stressors by performing behavioral skills that return the body to sense of calm. Teaching school administrators, teachers, and students about their window of stress tolerance and triggers allows for all to understand behavioral issues and learn how to effectively cope with stress. This paper details the physical and mental health impacts of ACEs, and proposes the adoption of policy that will promote widespread implementation of the CRM in North Carolina schools and communities.

Abbreviations

ACEs – Adverse Childhood Experiences

ACTH - adrenocorticotrophic hormone

ADHD – attention deficit hyperactivity disorder

BRFSS – Behavioral Risk Factor Study Surveillance

CDC – Centers for Disease Control and Prevention

COPD – chronic obstructive pulmonary disease

CRF - corticotrophin releasing factor

CRM – Community Resilience Model

HPA - hypothalamic-pituitary-adrenal axis

CDC/K-P – Centers for Disease Control and Prevention - Kaiser Permanente study cohort

PNS – parasympathetic nervous system

PVN - paraventricular nucleus of the hypothalamus

SAMHSA – Substance Abuse and Mental Health Services Administration

STI – sexually transmitted disease

SNS – sympathetic nervous system

SVC – serious, violent, chronic

TRM – Trauma Resilience Model

TF-CBT – trauma-focused cognitive behavioral therapy

WSCC – Whole School, Whole Child, Whole Community

Introduction

The ACEs Study. In the mid-1990's Drs. Robert Anda and Vincent Felitti were both researching the outcomes of stress on the human body. At the Center for Disease Control and Prevention (CDC), Dr. Anda studied individuals with substance abuse and chronic stress, while Dr. Felitti discovered nearly fifty-five percent of the patients at his obesity clinic had a history of sexual abuse as a child (Radford, J. & Bradwell, J, 2016). When the doctors were introduced, they began a landmark, three-year retrospective study. Felitti et al., funded by the CDC, started with a cohort of nearly 13,500 adults enrolled in Kaiser Permanente who visited the San Diego Health Appraisal Clinic between August -November, 1995 and between January- March, 1996 for "standardized medical evaluation(s)" (1998, p. 246). A week following their evaluations, the cohort received the study survey in the mail. The survey included questions about risk behaviors, self-perceived health, and childhood experiences.

The childhood experiences questions grouped exposures into the following categories: three types of abuse including emotional/verbal, physical, and sexual; and four types of household dysfunction including witnessing physical abuse or substance abuse, or having a parent or family member with mental illness or who was incarcerated. After two survey mailings, the researchers received just over 9,500 responses for a 70.5% response rate. The researchers examined survey responses and health data taken from respondents' medical evaluations to draw conclusions. The study results showed that Adverse Childhood Experiences, or ACEs, are connected with short- and long-term physical and mental health outcomes (Felitti et al., 1998). The study also introduced the ACEs scoring system by assigning one point for each experience, so that an individual's ACE score equals the sum of reported experiences. The scoring system is used as the standard measurement of ACEs, and has been replicated by other researchers. The

data collected in the original Felitti et al. study was used to examine physical and mental health effects of ACEs in subsequent studies. A second round of data collection from Kaiser Permanente health plan members near San Diego was conducted shortly after the first study. The combined database equaled over 17,000 study participants, and has been used by researchers on several studies that will be discussed. The CDC/K-P acronym will be used to refer to the original combined database throughout this paper.

Since the 1998 publication by Felitti et al., many studies have been conducted that demonstrate the psychological and physical impact of ACEs. However, beyond child abuse prevention, recommendations are limited on ways to create safeguards to the lasting effects of ACEs. The primary goal of this paper will be to discuss the biological and neurological impact of ACEs and make a policy recommendation of widespread implementation of a public health model that can create a buffer on the short- and long-term effects of ACEs.

A literature search conducted via PubMed and Google Scholar using the key words: adverse childhood experiences, childhood neglect, childhood abuse, household dysfunction, resiliency, and resiliency and adverse childhood experiences yielded 56 related articles. The articles were reviewed for relevance, after which, seven articles were discarded. A total of 49 articles, one book, two personal communications, and six websites were used as references for this paper. The terms ACE, ACEs, negative experience, stress, stressor, toxic stress, trauma, and childhood trauma are used interchangeably.

Definition. The Substance Abuse & Mental Health Services Administration (SAMHSA) defines Adverse Childhood Experiences (ACEs) as “stressful or traumatic events, including abuse and neglect...[happening before the age of 18 that] include household dysfunction, such as

witnessing domestic violence, or growing up with family members who have substance abuse disorders (SAMHSA, 2018).” The ten experiences considered the standard list of ACEs are:

1. Physical abuse
2. Sexual abuse
3. Emotional/verbal abuse
4. Physical neglect
5. Emotional neglect
6. Witnessing domestic violence
7. Living with a substance-abusing family member
8. Living in a household where a parent or family member has mental illness
9. Having parents who were divorced or separated
10. Having a family member go to prison (Radford & Bradwell, 2016).

Since the original ACEs study, several tools have been developed to determine the level of ACEs or childhood trauma. However, Bethell et al. (2017), after studying fourteen different assessments for ACEs determined that they all measured the same or similar experiences. The authors felt that all the tools established to measure ACEs were useful ways to provide health education and promotion and creating ways to reduce the effects of ACE (Bethell et al., 2017). The above list of ACEs will be used as the standard for this paper when discussing severity of ACEs.

Prevalence. The original ACEs study by Felitti et al. found that 22% of the survey respondents had at least one ACE, and 25% had two or more (1998). A research brief published by the non-profit organization Child Trends found similar prevalence rates among children they surveyed with 45% reporting at least one ACE, and ten percent having three or more (Sacks,

Murphey and Moore, 2014). According to data collected in 2010 from the CDC's Behavioral Risk Factor Surveillance System (BRFSS), a national study conducted via phone survey, 24% of respondents had one ACE and 14% had four or more (CDC, 2016a).

As many studies in this paper will describe, there is a positive association between an increased ACEs score and short- and long-term risk of disease (Felitti et al., 1998). In other words, the higher the ACEs score, the higher risk of mental or physical illness.

Stress Mechanisms. Before discussing further physiologic and mental health effects of ACEs, it is worthwhile to review how the brain interprets negative experiences and converts to stress. The major pathway for stress response can be found in the hypothalamic-pituitary-adrenal axis (HPA). Changes in the HPA result from negative childhood experiences. The brain's response to negative experiences can be described as follows:

“When a stress response occurs, corticotrophin releasing factor (CRF) is excreted by the paraventricular nucleus of the hypothalamus (PVN). The release of CRF from the PVN stimulates the release of adrenocorticotrophic hormone (ACTH) from the anterior pituitary. When ACTH binds to receptors in the adrenal medulla, glucocorticoids are released into the circulation. Glucocorticoids,...bind to receptors in the hippocampus, PVN, and pituitary to modulate the continuance or cessation of the response as well as adaptation. Exposure to chronic stressors, particularly during development, leads to modifications in receptor systems in the HPA axis and thereby hypo- or hyper-active stress responses. Because glucocorticoids also modulate metabolism and immune function, chronic stimulation of the HPA axis can have profound effects on the entire body” (Neigh, Gillespie, & Nemeroff, 2009, p. 390).

In most people, this biological reaction to stressors initiates a fight, flight, or freeze response as a protective reaction to stress. However, repeated stressors contribute to a sustained level of the stress hormone, cortisol, in the body, leading to physiological changes throughout many bodily systems and resulting stress-related disease (Johnson, 2018b; Neigh, et al., 2009).

When faced with a stressful situation, the autonomic nervous system, consisting of the sympathetic nervous system (SNS) and parasympathetic nervous system (PNS), goes into action to respond and stabilize the body's reaction. Upon release of the stress hormone, the SNS triggers several reactions in the body, preparing it to either fight, flight, or freeze. The liver releases additional sugar into the blood stream for energy, breathing increases to provide extra oxygen, digestion slows, the pupils dilate, and blood moves from the internal organs to the extremities to allow movement. All of these bodily changes allow the body to physically respond to a stressor (Miller-Karas, 2015).

Once the stressor has passed, the PNS acts to return to normal all the work of the SNS. Breathing slows, blood returns to the internal organs, the pupils constrict, and digestion resumes. The work of the SNS and PNS, for many, helps to maintain a normal reactive response to stress, what Miller-Karas calls the "Resilient Zone." On a daily basis, the body is charged with stressors when the SNS goes into action, and restored to a normal restful state as the PNS takes over. When the body is no longer able to suitably respond to stressors, due to either hyper-response or hypo-response, we fall out of the Resilient Zone, putting the body at risk for resulting mental or physical health effects due to trauma (Miller-Karas, 2015).

Long-term response to repeated stress. The brain's development is "dramatically affected by early experience" (Salomon-Weiss and Wagner, 1998, p. 356). Many complex neural networks are formed or weakened by age five as a result of positive or negative sensory exposure, respectively, early in life. As a result, the developing central nervous system is reactive to the environment (Salomon-Weiss & Wagner, 1998).

Not all who experience childhood trauma have the same lifetime mental and physical health response. Similar to their ability to increase risk for some diseases, genetics may provide a

protective factor in mitigating stress. However, poor stress response can also be passed on to future generations as a result of ACE (Neigh, et al., 2009).

Repeated exposure to trauma causes “wear and tear” on an individual (Geronimus et al., 2006, p. 827). As an individual is exposed to repeated life stressors, the body becomes limited in its ability to bounce back and combat disease (Juster, McEwen & Lupien, 2010) and emotional distress (Strine and Chapman, 2005). Inability to cope with trauma impairs the body’s ability to relax and also contributes to sleep disturbance; thus, poor sleep and unrest further adds stress (Chapman, et al., 2011).

Research of the developing brains of children discovered positive intervention reduced the impact of mental retardation and developmental delay and had significant impact on intelligence. However, the timing of the intervention was critical. Earlier intervention techniques may provide the brain with skills and techniques that mitigate stressors (Salomon-Weiss & Wagner, 1998).

The Impact of ACEs

In this section, research will be presented on the lasting mental and physical health impacts of ACEs.

Risky Behaviors. Several researchers found that individuals reporting a higher number of ACEs often develop risky behaviors, such as alcohol and drug use, smoking, and risky sexual behavior, in an effort to cope with the memory of the experience. Some risky behaviors that have been found to contribute to the leading causes of death may be conducted as a coping mechanism to ACEs (Felitti, 2009). These behaviors include smoking, drinking, and overeating. Strong associations have been found among individuals reporting four or more ACEs with risky sexual

behavior and alcohol problems, as well as the use of drugs and violence against self or others (Hughes, et al., 2017).

A universal theme in the study of ACEs is the link between a higher ACE score and risky behavior and poorer physical and mental health outcomes. Based on a study of the CDC/K-P cohort, individuals reporting five or more ACEs had 40% greater rate of prescription drug use than those who reported no ACE history. The relationship between a higher ACE score and increased rate of prescription drug use was consistent for decades after the adverse event took place (Anda et al., 2008).

In a 2003 study, Dube, Felitti, Dong, Giles & Anda looked at the outcome of ACEs among four different birth cohorts and found that each additional report of ACEs increased the risk of smoking, alcoholism, depression, multiple sexual partners, sexually transmitted diseases, and suicide attempts. Having a history of ACEs increases the risk of ever using alcohol, and certain ACEs were found to lead to early alcohol initiation (Dube et al., 2005).

Having a parent who was an alcoholic also contributes to the risk of developing alcoholism and depression. A retrospective study of the CDC/K-P cohort found that the risk of alcohol abuse and depression increased with each additional ACE reported. And the relationship was very strong between depression and growing up in a home where parents abused alcohol (Anda et al., 2002).

ACEs may also contribute to increased risky sexual behavior. Hillis, Anda, Felitti, Nordenberg, & Marchbanks (2000) found a positive association between the percentage of individuals with sexually transmitted diseases and a previous history of ACEs. The higher score of reported ACEs, the higher risk of sexually transmitted diseases.

In a study of over 1,500 patients consulting a physician for bariatric surgery, over 19% reported being a victim of childhood sexual abuse and over 22% reported being physically abused as a child. Those with a higher ACEs score had an increased risk of using food as a coping mechanism leading to excessive weight gain and obesity. This is also known as food addiction, similar to other risky behaviors used to cope, such as drug use or risky sex, and replacing food as the coping mechanism to soothe and calm feelings of anxiety and guilt as a result of abuse. Together, childhood trauma and food addiction reduced the chance of a successful and sustained weight loss after bariatric surgery (Holgerson, et al., 2018).

Individuals who experienced ACEs as a child have an increased risk of being a victim of sexual assault as an adult. For those who experienced childhood sexual abuse, they were at an even greater risk to be a sexual abuse victim again as an adult (Ports, Ford, & Merrick, 2016).

Having a history of childhood trauma may also contribute to criminal activity in teenagers and adults. A study using a sample of 151 convicted criminals in San Diego, California who were court ordered to psychological treatment were compared to non-offenders using statistical data from the CDC. The criminals had convictions of stalking, sexual misconduct, domestic violence, child abuse, or other violence. Results showed the criminal offenders had four times the number of ACEs when compared to the non-offenders. Having an ACEs score of eight or higher was found more often in the criminal offender population. And those convicted of a sexual abuse crime (of an adult or child) were more likely to have experienced child sexual abuse (Reavis, et al., 2013). In Florida, researchers used data from a cohort of 22,575 juvenile offenders to determine the relationship between ACEs and the risk of becoming a serious, violent, chronic (SVC) offender. SVC offenders were defined as juveniles with four or more felonies, at least one of them violent. They were compared to offenders who committed only one

non-violent offense. Results showed the likelihood of becoming a SVC offender increased with each additional ACE reported (Fox, et al., 2015). For example, as shown in Table 1, juveniles who reported six ACEs were 200% more likely to be a SVC offender.

Number of reported ACEs	Increased risk of becoming a SVC offender
2	70%
4	140%
6	200%

Table 1. Increased risk among SVC offenders compared to one-time offenders (Fox, et al., 2015).

Chronic Disease. ACEs have been found to contribute to the risk of developing several chronic diseases. A retrospective cohort study of the CDC/K-P cohort discovered those with a history of multiple ACEs had a significantly higher risk of ischemic heart disease. However, that risk was mediated, or brought upon, by depression and anger, which are psychological factors that have been associated with previous ACEs (Dong, et al., 2004). Likewise, in a later study, smoking was a partial mediator to chronic obstructive pulmonary disease (COPD) among those with a history of childhood trauma decades after the events occurred (Anda et al., 2008).

Using Behavioral Risk Factor Study Surveillance (BRFSS) data of 4,230 individuals in all 50 states plus Puerto Rico, Guam and the United States Virgin Islands, Brown, Thacker, & Cohen (2013), studied the link between ACE and the report of a cancer diagnoses. They found that there was a higher rate of cancer diagnosis among those with a history of ACEs (10%) than the national average (4.2%). The strongest association of a cancer diagnosis in adulthood was found among those with a history of sexual abuse. The researchers attributed the increased rate of cancer diagnosis to disease progression as a result of ACEs as opposed to a causal relationship (Brown, Thacker, & Cohen, 2013).

In a study conducted in 2015, the researchers looked at the relation of ACEs and physical, mental, and developmental conditions in childhood. The study data was derived from a telephone survey of adults with children. The researchers included in their survey physical conditions such as diabetes, asthma, hearing or vision problems, and cerebral palsy. Mental conditions included attention deficit hyperactivity disorder (ADHD), anxiety, depression, and behavioral problems. The developmental conditions consisted of learning or speech difficulties, autism or mental retardation. The results showed that children whose parents reported them having at least one ACE, were more likely to have one of the physical, mental, or developmental conditions on the list. Those with a higher ACE score were more likely to have conditions in each of the categories (Bright, Knapp, Hinojosa, Alford, & Bonner, (2015).

Autoimmune Diseases. Associations also exist between childhood trauma and autoimmune diseases. Researchers studying the CDC/K-P cohort determined that with higher ACE score, there was an increased risk for hospitalization for a diagnosed autoimmune disease including idiopathic myocarditis (seventy percent increased risk), myasthenia gravis (eighty percent), and a one hundred percent increase for rheumatoid diseases (Dube et al., 2009).

Reduced quality of life. ACEs is also associated with reported fewer days of good health, reduced quality of life, and premature death. In a 2014 cohort analysis of adults 18 to 79 years of age, categorized into four age groups, researchers found that higher ACEs scores resulted in respondents reporting fewer days of good health. Older respondents reported one additional day of poor physical health for each ACE. Poor physical health and poor mental health were measured by survey respondents indicating how many days in the last month their physical/mental health was “not good” (Logan-Green, Green, Nurius, & Longhi, 2014, p. 5). On the contrary, younger respondents who reported a history of childhood trauma appeared to have

more days of poor mental health. The researchers also discovered that use of resilience, in this case sleep, social support, and life satisfaction moderated the effect of ACEs and provided better health days (Logan-Green, Green, Nurius, & Longhi, 2014).

Individuals reporting childhood maltreatment experienced “significant and sustained” reduced quality of life related to health issues (Corso, Edwards, Fang, & Mercy, 2008, p. 1098). Researchers used data from the CDC/K-P study cohort comparing individuals who reported ACEs to those reporting no ACEs. According to the authors, those who experienced abuse or neglect as children may have 2 years of quality-adjusted life years lost (Corso, Edwards, Fang, & Mercy, 2008).

Risk of early death. In one of the most often quoted statistics regarding ACEs, Brown and colleagues (2009) conducted a retrospective cohort study and conducted additional follow up to determine the death rate of those who completed the original ACE survey. The researchers found those reporting six or more ACEs died nearly twenty years earlier than those reporting no childhood trauma (Brown, et al., 2009).

Premature death is also reported among family members of those experiencing ACEs. Premature death of a family member was found to be more likely among survey respondents who reported ACEs, with the highest likelihood among those who were physically neglected, witnessed a parent using drugs, or having a family member sent to prison (Anda et al., 2009).

Psychological effects. Several research studies have found associations between ACEs and mental health illnesses including depression (Chapman, et al., 2004), psychosis (Varese et al., 2012, Schalinski, Fischer, & Rockstroh, 2015), attempted suicide (Dube et al., 2001), and attention deficit hyperactivity disorder (ADHD) (Brown et al., 2016) among other conditions.

Winger, Ressler, & Bradley found that psychotic disorders caused by childhood trauma persist up to 40 years after the event occurred (2014).

Adults with a history of childhood sexual abuse often report depression, anxiety, post-traumatic stress disorder, and dissociative disorder, formerly known as multiple personality disorder. In a 2005 study, participants who reported being sexually abused as a child also reported shame, self-blame, struggling to establish healthy romantic relationships, and negative coping techniques which researchers identified as mediators between childhood sexual abuse and adult emotional distress (Whiffen & MacIntosh, 2005).

Shame, brought on by emotional abuse as a child, has been related to feelings of anxiety and depression. Those who reported they felt shame as a result of early childhood abuse often reported the desire to “disappear” (O’Daughtery-Wright, Crawford, Del Castillo, 2008, p. 65), leading to the notion of dissociation, or detachment from reality. Self-sacrifice was sometimes reported as a coping mechanism due to the belief that their needs and desires must be repressed in order to be loved or accepted by others. This coping strategy often resulted in anxiety and depression (O’Daughtery-Wright, Crawford, Del Castillo, 2008).

With each additional reported ACE, the risk of depression increases (Chapman, et al., 2004) and self-reported low mental health scores are more prevalent (Edwards, Holden, Felitti, & Anda, 2003).

Adults reporting seven or more ACEs reported hallucinations five times more often than those who reported zero ACEs. In a study of the CDC/K-P cohort, respondents reported ACEs associated with abuse, neglect, family violence, and substance abuse by a parent or family member. Having an ACE score of at least one increased hallucinations by 1.2 to 2.5 times.

Patients hospitalized for mental illness with hallucinations had a history of childhood trauma (Whitfield, Dube, Felitti, & Anda, 2005).

In a literature review, research found that specific ACEs were associated with mental health outcomes. For example, experiencing the death of a close family member was associated with depression, obsessive compulsive disorder, and physical symptoms of which no cause could be determined. The review also demonstrated increased risky behaviors among those with schizophrenia and suicidal thoughts who experienced childhood trauma (Rosenberg, Lu, Mueser, Jankowski, & Cournos, 2007).

ACEs are also related to sleep disturbances. Using the CDC/K-P data, researchers compared self-reported ACEs and sleep disturbance, defined as having trouble falling or staying asleep or feeling tired after waking. Results showed a positive association with the number of ACEs reported and increased report of sleep disturbance. Those reporting five or more ACEs were twice as likely to report sleep disturbance (Chapman, et al., 2011).

Discussion

As the presented literature search has shown, ACEs are associated with a variety of adverse physical health outcomes including increased risk of cancer diagnoses, COPD, heart disease, autoimmune disease, reduced quality of life, and shorter life span. Those with a history of childhood trauma also have associated mental health problems including depression, anxiety, increased risk of hallucinations and suicidal tendencies. Having a higher ACE score appeared to increase the risk of negative physical and mental health outcomes. Risky behaviors such as smoking, alcohol and drug use, and having multiple sexual partners may be a mediator to some mental and physical health outcomes. However, it is not clear if ACEs increase risky behavior or

if individuals with a history of childhood trauma use these behaviors as a way to cope with traumatic memories.

Mitigating ACEs. The previous sections of this paper clearly demonstrate the negative impacts of ACEs on long-term health outcomes. The remainder of this discussion will focus on ways to mitigate, or create safeguards, that will reduce the impact of ACEs and provide specific recommendations for policy change. Early researchers of ACEs have made recommendations for public health leaders to develop ways to mitigate the effects of childhood trauma. Anda and Brown (2007) advocated for public health funding to support children during the time when ACEs can interrupt brain development. In a later publication, experts argued for public health interventions to include approaches to mitigate the short- and long-term impact of ACEs (Anda, Butchart, Felitti, and Brown, 2010). Still others compared the need for interventions aimed at “reducing risks that compromise quality of life” to public health’s duty to provide vaccinations or encourage helmet use among bicyclists (Foege, 1998, p. 355). Another paper published in 2017 from public health experts at Johns Hopkins Bloomberg School of Public Health used multiple ways to engage stakeholders, reviewed literature, and developed several recommendations for providers and public health professionals to address the negative impact of ACEs on long-term health and quality of life. The recommendations were:

1. “Translate the science of ACEs, resilience, and nurturing relationships;
2. Cultivate the conditions for cross-sector collaboration;
3. Fuel ‘launch and learn’ research policy and practice, innovation, implementation and learning; and
4. Restore and reward relationships of self, family, and community, self-care, prevention, and healing” (Bethell, et al., 2017, p. 40,).

Protective factors. There do seem to be factors that act to protect an individual with a history of trauma. Prevent Child Abuse North Carolina suggests several protective factors that may prevent child abuse. Children who have at least one nurturing adult in their lives often perform better academically, develop healthy behaviors, and are better equipped to cope with stress. (Prevent Child Abuse North Carolina, 2016). Those with a history of childhood trauma who had a positive adult role model are more likely to have better coping skills and resiliency, and are less likely to use alcohol or drugs. These individuals may also have characteristics such as mental toughness and religious faith (Wingo, Ressler, and Bradley, 2014). The protective effect of family may decrease other risky behaviors such as unprotected sex and prevent against psychological and emotional disorders (Hillis, et al., 2010).

Evidence-based techniques for addressing ACEs – Cognitive Behavioral Therapy. A common psychotherapeutic method for treating individuals with a history of trauma is cognitive behavioral therapy (CBT). Often just used over the course of a few months, CBT focuses on understanding the trauma and its effects, teaches calming skills and ways to rethink the trauma, and encourages healthy behaviors such as adequate sleep, physical activity, and healthy food choices (SAMHSA, 2017). Among children who experienced sexual abuse, trauma-focused cognitive behavioral therapy (TF-CBT) has been shown to reduce mental health symptoms after trauma such as depression and emotional pain due to the trauma (Cohen, et al., 2004).

The Trauma Resiliency Model & Community Resilience Model. Building resiliency to toxic stress as a result of ACEs is the premise of the Trauma Resiliency Model (TRM). Resilience acts as a protective technique against the harms induced by stress, allowing an individual to bounce back from stressors (Karatsoreos & McEwen, 2011). The Resilient Zone describes the ebb and flow of the body's responses to emotional and physical stressors each day.

As described earlier, as the body interprets stress, physical changes begin as the sympathetic nervous system is charged up. Once the stressor is defused, the parasympathetic nervous system returns the body to its restful state and releases the stressor, and the body stays within the Resilient Zone (Grabbe & Miller-Karas, (2018)). See Figure 1 below.

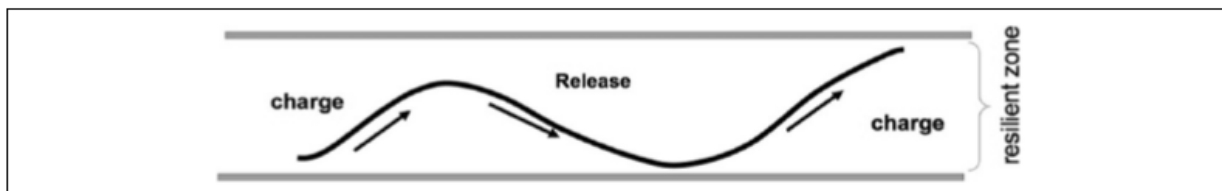


Figure 1. The Resilient Zone. (Grabbe & Miller-Karas, (2018)).

Staying within the Resilient Zone is the ideal response to stress. However, some stressors kick the body out of the Resilient Zone into highs (hyper-arousal) or lows (hypo-arousal). When these stressful experiences build upon each other without the body releasing stress, toxic stress arises. This contributes to the inability to bounce back after stressors, whether traumatic or normal every day challenges (Miller-Karas, 2015).

Using resiliency techniques helps an individual manage the charge and release of stressors in order to stay within the Resilient Zone. Miller-Karas provides a series of stabilizing exercises that allow individuals experiencing toxic stress to regulate the body's reaction (2015). The skills taught in the TRM are meant to reset the nervous system and the body's response to stress and move the awareness of the stressor away so the body can regulate itself. Skills 1-6 are considered as the Community Resilience Model (CRM) since it is a peer-to-peer model. Anyone can be trained in the CRM to help others self-regulate during times of high stress. The CRM is not therapy, yet promotes self-care and empowerment by focusing on positive resolutions to stress (Johnson, 2018a). Skills 7-9 are meant to be used 1:1 by a trained mental health clinician (Grabbe & Miller Karas, 2018).

The skills of the CRM are:

1. *Tracking*. The act of noticing small changes in the body in response to an event, stressor, or memory, which create sensations that are either “pleasant, unpleasant, or neutral (Miller-Karas, 2015, p. 37). An unpleasant experience may cause elevated heart rate and faster breathing (the result of the SNS response), while a pleasant experience may cause the body to take a deep breath in and out (the result of the PSNS response). Being aware of these somatic changes alerts the individual to the stressor, so that techniques can be used to stabilize the body’s response (Miller-Karas, 2015).
2. *Resourcing and resource intensification*. The development of external, internal, or imaginary resources can stabilize an individual during a stressful experience. External resources can be anything in the environment that provides a pleasant or neutral sensation. Examples include a person, place, pet, pastimes, or religious beliefs. Internal resources are personal skills or characteristics that create pride. When individuals cannot think of an external or internal resource, they are encouraged to create an imagined resource, such as a place they would like to visit or a skill they would like to build. (Miller-Karas, 2015).
3. *Grounding*. This skill helps the user become aware of how the body feels against another object. Users are instructed to consider how their feet, legs, back, arms, and head feel against the object. By sitting in a chair, lying in bed, or leaning against a wall, the user pulls attention away from the stressor towards the part of the body connecting with the inanimate object (Miller-Karas, 2015).
4. *Gesturing*. The use of gestures is another skill that can stabilize the body’s response to stress. Gestures are often expressed without conscious effort and are personal to an

individual. Examples are self-soothing gestures (e.g., deep sigh or rubbing hands), celebratory gestures (e.g., fist pump or jumping up and down), or a gesture expressing a spiritual belief (e.g., the Catholic sign of the Cross) (Miller-Karas, 2015).

5. *Help Now!* This strategy is intended for use when an individual experiences hyperarousal and cannot stabilize the body's response. The suggested skills for this strategy include using strength to push against a wall, looking around the room and noticing the different colors or temperature, walking around the room and counting backwards from ten. These skills are meant to interrupt and redirect the body's response to stress (Miller-Karas, 2015).
6. *Shift and Stay.* The next skill is one that incorporates exercises 1-5. After tracking a stressor, the user may use one of any of the aforementioned exercises to stabilize their reaction to stress. When the reaction is strong or prolonged, the user may choose to shift their awareness to the exercise and stay there until calm is restored (Miller-Karas, 2015).
The following three skills are reserved for clinicians who have received training in TRM.

These skills are used during one-on-one counseling sessions.

7. *Titration.* This skill challenges individuals to manage smaller pieces of the physical sensations connected to their trauma or stressor. Clinicians probe individuals for details about the sensation by asking them to "concretize" the sensation (p. 48). The clinicians ask questions about the feel of the sensation, if it has a size or color. At this point, the clinician gently pushes the individual to experience a smaller piece of the trauma by going to the "edge" of the stressor (p. 48). This allows the individual to manage the trauma in chunks rather than being overwhelmed by the full-blown event (Miller-Karas, 2015).

8. *Pendulation.* Allowing individuals to feel sensations of wellbeing while experiencing the negative effects of a stressor is the premise of pendulation. When a clinician notices physical reaction in her client such as clenching fists, she can ask him to become aware of another part of the body that feels calm and relaxed. This exercise further instills the skill of shifting negative sensations away from the stressor to sensations of wellbeing (Miller-Karas, 2015).
9. *Completion of Survival Responses.* The human body has several responses to a traumatic event as referenced earlier that prepare for fight, flight, or freeze. When the threat ceases, the PSNS restores calm to the body. Examples of physical release of a stressor include shaking, crying, and yawning, among others. When a stressor is stifled, the body puts a brake on the trauma so that it cannot be released. An example of this is a son being told by his father not to cry after being physical abused for misbehaving. Failing to release may cause the trauma to become “stuck” in the body (p. 50). The clinician uses this skill to develop interventions that allow the individual to re-experience the stressor and work to reduce the negative sensations associated with it (Miller-Karas, 2015).

Current Implementation of CRM. The CRM has been nationally and globally implemented in schools and communities. Communities in Germany, Northern Ireland, Guatemala, China, Turkey, Serbia, South Africa, Sierra Leone, and several others have used the CRM to build resilience among their populations (Miller-Karas, 2017). Research conducted by the San Bernardino Department of Behavioral Health used data collected from 109 participants who reported mental and physical symptoms related to stress. The study participants were considered vulnerable (e.g., LGBT, African-Americans, Veterans), and were instructed in the CRM skills. Table 2 shows results of post-training survey after participants were trained on the

CRM skills. For example, 82% of participants agreed using the skills of CRM would be helpful to reduce symptoms of depression (Trauma Resilience Institute, 2013).

Stress-related emotional/physical symptom	Percentage of participants who reported they will use CRM to reduce symptoms
Depression	82%
Anxiety	58%
Hostility	59%
Somatic	59%

Table 2. Results of CRM skill implementation in San Bernardino County, California (Trauma Resilience Institute, 2013).

In addition to the study in San Bernardino County, the Department of Defense considers the skills of CRM as a promising practice when addressing trauma (Miller-Karas, 2017).

CRM as a Prevention Intervention. The skills of CRM can be used as a preventative intervention on the lasting effects of ACEs. When implemented in schools, particularly in early grades, the CRM provides primary, secondary, and tertiary prevention of the effects of trauma. The CRM equips children who have or have not experienced trauma with skills to deal with stressful situations as they occur and avoid buildup of toxic stress. Children who learn how to recognize the physical changes in their bodies when a stressor occurs and have the skills to mitigate the negative response will build resilience to trauma. Just as other healthy behaviors are taught to children, such as wearing a protective helmet while riding a bicycle, the CRM skills provide protection against the stress from trauma. Resilience builds as the skills are adopted as healthy behaviors (Miller-Karas, 2015).

CRM skills used as secondary prevention among children can reduce and perhaps eradicate emotional distress as response to a trauma. Miller-Karas provides the following example from a school counselor where CRM was implemented.

“...On Monday I sat on the floor in the hallway talking with a fourth-grade student who was deeply distressed. She had experienced a nighttime of wakefulness, hearing domestic violence down the hall and having to escape from a furious dad who chased them down the road as they tried to flee (to grandpa’s where they arrived safely). She expressed fear and deep grief over the loss of her home and the relapse of her dad. ...it was easy to help her build a resource around the sense of safety she felt when she reached grandpa’s house...After another round of becoming activated and resourcing again she decided she’d like to try and make it through the school day...Because the teacher was trained in CRM, she was able to reach out to the student in need and reduce the risk of the student developing further trauma symptoms while also promoting resiliency” (Miller-Karas, 2015, p. 68).

For children who have a history of ACEs and resulting emotional distress, the CRM skills act as tertiary prevention to treat every day effects of past traumatic experiences. In another example described by Miller-Karas, a 13-year-old girl with an alcoholic father and experienced emotional abuse, had resulting depression and engaged in self-harming behaviors. After learning to track her body’s sensations to stress and use the skills of CRM, the girl’s self-harming behaviors stopped and she was better able to manage her stress (Miller-Karas, 2015).

Policy Recommendations. The CDC’s Whole School, Whole Community, Whole Child (WSCC) considers several factors that contribute to an optimal learning environment for students. WSCC goes beyond school providing healthy food in the cafeteria and opportunities for physical activity via recess and physical education class. The other considerations that are provided to help children to excel in school include family involvement, employee wellness for teachers and staff, the physical environment, mental and physical health, and community

engagement (CDC, 2018). The CRM is a logical addition as a program to achieve the Counseling, Psychological, and Social Services component of WSCC.

School districts can take actions to build resilience in their community. In North Carolina, the Kate B. Reynolds Foundation awarded the Public School Forum over \$412,000 for four schools in eastern North Carolina to create trauma-resilient environments. The selected schools will provide training for teachers and staff of the physical and mental health effects of stress that cause disruptive behaviors, and learn techniques to mitigate the effects of stress (Public School Forum of North Carolina, 2018).

Limitations of the research. The information collected in the CDC/K-P study and the second wave of survey collection among the same population shortly after produced a rich database of over 17,000 participants with the potential for research studies examining ACEs and their impact on a variety of diseases and mental health disorders. Of the studies presented in this paper, 19 include data derived from the CDC/K-P study cohort. The study participants were all enrolled in a Kaiser Permanente health plan, employed, and lived in the San Diego area. This creates the risk of selection bias among those in the health plan who responded to the survey. An assumption might be made that the study participants were healthier, with fewer reported ACEs or positive health outcomes despite having a history of ACEs. However, a history of trauma was found throughout the study participants resulting in a variety of physical and mental health impacts. And numerous studies not including data from the CDC/K-P cohort confirm the prevalence of ACEs and their long-term impact.

Conclusions

This paper documents the prevalence of ACEs and provides estimates of their short- and long- term impacts. Improved policies are needed so that the incidence of ACEs is prevented and better identified. However, in the meantime, the focus of this paper is to make recommendations about policy changes that will reduce the impact of ACEs.

Trauma resulting from ACEs has long-lasting physical and mental health impacts. Diseases such as STIs, cancer, heart disease, and autoimmune disorders have all been linked to a history of trauma. The increased risk of disease may be exacerbated by adoption of risky behaviors as coping mechanisms such as smoking, alcohol and drug use, and having multiple sexual partners. ACEs have also been proven to contribute to mental health disorders such as depression, anxiety, and post-traumatic stress disorder. When trauma is either ignored or repressed, toxic stress builds over time. Stress accumulation contributes to risk of poor coping behaviors, physical and mental health.

Maintaining control over stress starts by recognizing physical response to stress. Either hyper- or hypo-response to stress causes the body to fall out of the Resilient Zone. The CRM provides an ideal opportunity for widespread implementation in communities and schools districts since it can be taught by anyone, layperson or professional. Where CRM is adopted in a community or school, it helps everyone understand and recognize that even seemingly minor events may trigger a hyper- or hypo-response to stress. Learning and implementing the skills of the CRM can help to suppress the ill effects of stressful events and perhaps prevent increased risk to physical and mental health impacts.

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