THE POLICY IMPLICATIONS OF THE BIOLOGY OF TRAUMA

by

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Modern research has revealed one of the greatest public health crises in the United States: the epidemic of toxic stress in childhood. Physicians have found that significant exposure to toxic stress through Adverse Childhood Experiences (ACEs) increases the risk of seven out of the ten leading causes of death in the US. To address this public health crisis, policy is uniquely equipped to prevent toxic stress and ACEs before they occur and create support services for those affected. However, a disconnect remains between scientific research and policy. Through a survey of existing literature on toxic stress and U.S. policy and two expert interviews, I aim to identify the implications of medical research on creating trauma-informed policy responses to the toxic stress epidemic in the U.S. By identifying specific areas of policy that should be utilizing research on toxic stress, this project intends to demonstrate how science can help inform modern policy.

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Table of Contents

Background 1
Research Questions 3
Overview of the Biology of Trauma 4
Incarceration: The Trauma of Parental Separation 9
Substance Abuse: The Trauma of Poor Relational Health 11
Child Maltreatment: The Trauma of Abuse and Neglect 15
Policy Responses to Emerging Research on Trauma 18
Discussion 21
- Mass Incarceration of Parents 21
  - Cash Bail and Pretrial Incarceration 21
  - In-Person and Video Visitation 22
  - Trauma-Informed Training for Prison and Jail Employees 23
  - Parental Substance Abuse Disorders 25
  - Parenting-Targeted Approaches 25
  - Family Treatment Drug Courts 25
- Child Maltreatment 26
  - Family-Engaged Preschool 26
  - Parenting-Skills Training 27
  - Trauma-Focused Treatment 29

Conclusion 30
Bibliography 33

Background

Adverse Childhood Experiences (ACEs) were first defined in 1998 by American physician Dr. Vincent Felitti (Felitti et al., 1998). ACEs are high-stress events which cause long term physiological and psychiatric challenges in developing youth. These events include physical, emotional, or sexual abuse, parental separation or divorce, community violence, and the incarceration, mental illness, or substance abuse of parental figures. In 1998, Felitti used a medical questionnaire of these ten experiences to assign Kaiser patients an ACE score, ranging from zero to ten, which was then compared to their adult health status. Dr. Vincent J. Felitti's Adverse Childhood Experience Study was the first medical research to identify early trauma as an independent predictor of future health consequences, counter to previous theories attributing negative outcomes to personal lifestyle choices. The groundbreaking study established the long-term biological effects of childhood trauma; like exposure to lead or pesticides, continued exposure to trauma can directly cause physical illness. This discovery validated further efforts to measure the correlation between high ACE exposure and the prevalence of physiological and societal issues.

An exploration of ACE prevalence and consequences and U.S. policy shows the role governments can play in causing exposure to ACEs. Explicit facilitation of ACEs takes the form of policies and programs which create direct exposure to trauma. ACE exposure is also facilitated implicitly through the disparate opportunities and quality of life among socio-economic and racial minorities. The emerging field of childhood trauma in medicine identifies the relationship between systemic policies and ACE

exposure. By learning to identify systems that facilitate trauma, we can learn to prevent ACEs before they occur.

The most critical challenge of creating trauma-informed policy is communicating scientific discoveries to policymakers. The field of ACE research is not familiar to the public, and interdisciplinary collaboration is needed for meaningful change. Nancy Rodriguez, Director of the National Institute of Justice, identifies three steps to reducing the research-to-practice gap: relevance to criminal justice practitioners, legitimacy within the criminal justice field, and accessibility to those without science backgrounds (Rodriguez, 2016). Communicating scientific discoveries to other fields can be challenging, particularly with research that is still developing with time. Communicating trauma-informed policy reforms addressing implicit practices can be more complicated, as research does not always pinpoint policy solutions. While the discovery of physiological consequences does not offer direct policy changes for resolution, it offers policymakers and activists hard evidence of the existence of systemic racism and supports sociological solutions.

To translate scientific discoveries regarding ACEs into trauma-informed policy, an interdisciplinary understanding and collaboration is essential. This paper intends to connect policy issues to the physiological harm they cause through ACE and toxic stress exposure, and to suggest evidence-based improvements to U.S. policy to combat the toxic stress epidemic.

Research Questions

The research questions this thesis will investigate are “How does childhood trauma produce forms of biological dysregulation, that pose significant public health challenges” and “How can U.S. public policy address ACEs and toxic stress?”

I investigated these questions through a careful synthesis of a diverse and extensive secondary literature on these subjects. This survey of existing scholarship included medical, biological, and public policy research. In addition, I interviewed two experts, Dr. Deanna St. Germain of Kid’s First Center and Federal Judge Michael J. McShane of the District of Oregon.

Overview of the Biology of Trauma

The study of trauma in medicine has gained prominence in medical and public health research in recent decades as findings reassert that adverse childhood trauma is an underlying cause of many chronic diseases. In addition to physical health consequences, ACE's have been linked to disparate lifestyle outcomes and societal issues. The role of policy in minimizing adverse childhood experiences has not been sufficiently studied. In reviewing the existing literature on ACEs as a public health crisis, I intend to demonstrate the significant physical implications of widespread exposure to trauma, and to establish the need for further research into the role of social policy in reducing ACE exposure.

Adverse Childhood Experiences, abbreviated as ACEs, were first defined in 1998 by American physician Dr. Vincent Felitti. ACEs are high-stress events which cause long term physiological and psychiatric challenges in developing youth. These events include physical, emotional, or sexual abuse, parental separation or divorce, community violence, and the incarceration, mental illness, or substance abuse of parental figures. Dr. Vincent J. Felitti's Adverse Childhood Experience Study was the first medical research to identify early trauma as an independent predictor of future health consequences, disproving previous theories attributing negative outcomes to personal lifestyle choices. The study established the long-term biological effects of childhood trauma; like exposure to lead or pesticides, continued exposure to trauma can directly cause physical illness. This discovery led to further efforts to measure the correlation between high ACE exposure and the prevalence of physiological and societal issues.

Cumulative trauma from high ACE exposure can result in the toxic stress response. The toxic stress response is a prolonged physiological stress response, known to interfere with brain and organ development in children, which in turn increases lifelong increased risk for physical and psychological disorders (Mersky et al., 2017). The toxic stress response is not psychological, but a biological dysregulation of the human stress-response system resulting from significant trauma exposure in childhood. In a 2019 report, the US National Academy of Sciences, Engineering, and Medicine defined the toxic stress response as:

> "Prolonged activation of the stress response systems that can disrupt the development of brain architecture and other organ systems and increase the risk for stress related disease and cognitive impairment, well into the adult years. The toxic stress response can occur when a child experiences strong, frequent, and/or prolonged adversity—such as physical or emotional abuse, chronic neglect, caregiver substance abuse or mental illness, exposure to violence, and/or the accumulated burdens of family economic hardship—without adequate adult support. Toxic stress is the maladaptive and chronically dysregulated stress response that occurs in relation to prolonged or severe early life adversity. For children, the result is disruption of the development of brain architecture and other organ systems and an increase in lifelong risk for physical and mental disorders." (National Academies of Sciences, Engineering, and Medicine, 2019).

Biological markers of trauma have also been tentatively identified. A 1999 study found reduced telomere length, a biomarker of aging, at accelerated levels in individuals

with extreme childhood stress. (Puterman et al., 2016). A Brazilian study found significantly increased rates of hormonal imbalances in child abuse survivors, particularly dysfunction of the hypothalamic-pituitary adrenal axis (HPA) (Mello et al., 2009). The HPA regulates neuroendocrine responses to stress, and overactivity of the HPA is strongly associated with depression (Heim et al., 2008). Children with high ACE scores also exhibit higher cortisol excretion in response to common stressors like exercise or social interaction (Ouellet-Morin et al., 2011). Cortisol is a hormone biomarker of stress and inflammation produced by the HPA. Abnormal cortisol secretions contribute to a cascade of health issues, such as metabolic syndromes (Hansen et al., 1999) and coronary artery disease (Nijm et al., 2009).,

Research has suggested that the single most important factor in preventing the toxic stress response and its long-term consequences is relational health (Jaffee et al., 2013). Relational health is the quality and capacity of nurturing relationships. The Journal of the American Academy of Pediatrics identifies safe, stable, nurturing relationships (SSNRs) as the single greatest antidote to childhood adversity (Garner et al., 2021). Science does not fully understand why or how relational health is able to battle adversity, but it likely has to do with the importance of social interaction in early development and brain architecture (National Scientific Council on the Developing Child, 2007).

In the decades since the first clinical reference of ACEs, Dr. Felitti's findings have proven universal and relatively invariant across cultures. The Asia-Pacific Journal of Public Health found consistent rates of high ACE exposure across the United States, Thailand, Vietnam, and the Philippines, with approximately one in five respondents

having exposure to four or more ACEs; the study found the prevalence and consequences of ACEs to be culturally invariant (Tran et al., 2015).

At just over twenty years old, the study of physiological and societal consequences of ACEs is in its infancy, and already offers a preview of the enormity of trauma's effect on modern society. In high exposures, ACEs have been strongly correlated to likelihood of experiencing domestic violence (Miller et al., 2011), substance abuse (Koskenvuo et al., 2015), incarceration (Jeske et al., 2016), and attempted suicide (Springe et al., 2016), with variations in the specific consequences of ACEs based on the type of adversity. Federal judge McShane of the District of Oregon noted the overrepresentation of individuals with traumatic pasts in his courtroom: "By and large, we're dealing with primarily fractured people."1 The average life expectancy of individuals with high ACE exposure (four or more events) is estimated to decrease by as much as twenty years (Bynum et al., 2010).

The Adverse Childhood Experience study initially studied only ten ACEs, known as conventional ACEs (Felitti et al., 1998). Recent studies have found that adversities not included in the original study also contribute to the toxic stress response and its long-term health consequences. In 2015, the American Journal of Preventative Medicine published a suggested expansion of ACEs to supplement conventional ACEs. These include witnessing violence, feeling discrimination, adverse neighborhood experiences, bullying, and living in foster care, which are all linked to long-term health consequences (Cronholm et al., 2015). As previous studies have reflected, non-white individuals from impoverished background in Cronholm's study had higher prevalence

1 McShane, Michael J. Interview. Conducted by Rose Kordahl, 5 May 2022.

of conventional ACEs. This study, conducted among diverse participants in Philadelphia, found that non-white impoverished males were also at the highest risk of experiencing expanded ACEs, and 14% of participants would have underreported levels of childhood adversity based on the conventional ACE model. When evaluating trauma exposure of different populations, different racial and socioeconomic backgrounds must be considered to understand the full extent of exposure. In U.S. major cities, Black populations have a 24% higher mortality rate than white populations (Benjamins et al., 2021). In the U.S., Europe, and Canada, socioeconomic minorities have higher mortality rates than those with higher socioeconomic status (Bosworth, 2018). To better understand the factors that contribute to disparate health outcomes, the original ACE survey is beginning to consider expanded ACEs.

Incarceration: The Trauma of Parental Separation

The United States' extensive data collection on the impact of ACEs offers insight into the explicit and implicit ways that policy facilitates the exposure of trauma. Policy plays an integral role in causing exposure to ACEs. Explicit facilitation of ACEs takes the form of policies and programs which create direct exposure to trauma. One example is the mass incarceration of Americans. Parental incarceration is classified as an ACE, and is directly correlated to physiological and social consequences later in life. As of 2010, 2.7 million children, approximately 1 in 28, had an incarcerated parent. Studies show 1 in 58 white children have an incarcerated parent, compared to 1 in 28 Hispanic children and 1 in 9 African American children (The Pew Charitable Trusts, 2010). Education, a socio-economic indicator, compounds with racial disparities in predicting parental incarceration; more young Black men without high school diplomas are incarcerated than employed (The Pew Charitable Trusts, 2010). Incarceration rates continue to increase and the number of children of incarcerated parents (CIPs) has risen sharply in recent years. A 2010 study found that individuals below the age of 55 had significantly higher rates of ACEs than their older counterparts, which is likely due in part to higher rates of parental incarceration and subsequent family dysfunction (Bynum et al., 2010). The systemic practice of mass incarceration contributes to the epidemic of trauma among children, disproportionately affecting children from minority backgrounds and low-socioeconomic status. Many incarcerated parents are non-violent offenders, many of whom in foreign criminal justice systems would not have served time. The CIPs experience disparate physiological health and socio-economic opportunities.

As the population of children affected by mass incarceration grows, more and more children are affected by the lasting consequences of parental-incarceration related trauma.

Substance Abuse: The Trauma of Poor Relational Health

Substance abuse is a major issue in the United States. Since 2000, there have been over 700,000 drug overdose deaths (National Center for Drug Abuse Statistics, 2022). As of 2022, an estimated 20 million Americans over the age of 12 have substance abuse disorders (SUDs) (National Center for Drug Abuse Statistics, 2022). Having a parent with a SUD is a conventional ACE, with 11% of the population experiencing parental SUDs (Gibbons, 2005).

The effects of substance abuse on developing fetuses is well-documented and highly detrimental to development. Prenatal drug use is estimated to be highly prevalent in the U.S. The 2012 national survey on drug use and health estimated that 5.9% of pregnant women in 2012 were illicit drug users, and about 8.5% of pregnant women surveyed reported alcohol use (Ross et al., 2015). Most illicit drugs reach developing fetuses directly through the placenta, causing a cascade of consequences during prenatal drug use. Each drug comes with its own harms to developing fetuses. Methamphetamine (meth) is associated with restricted growth and low birth weight, length, and head circumference (Ross et al., 2015). As the child develops, long-term effects of prenatal meth exposure include neurological development differences, such as lower caudate nucleus volume, which is associated with cognitive performance, (Derauf et al., 2012) and higher cortical thickness in orbital-frontal and perisylvian cortices, which are associated with deficits in attention (Zabaneh et al., 2012). The motor functions of meth-exposed fetuses are significantly reduced throughout childhood. Children aged three to sixteen consistently scored lower on attention, long-term spatial memory, verbal memory, and visual motor integration if they were exposed to meth

during pregnancy than children who were not (Chang et al., 2004). It is hard to determine the prevalence of meth use among pregnant women, but the largest study to date, the Infant Development, Environment, and Lifestyle (IDEAL) study, places the number of pregnant women in the U.S. who use meth at least once during pregnancy around 5% (Arria et al., 2006). Opioids are also rising in prevalence among women of childbearing age in the U.S., and prenatal exposure increases the risk of small head circumference and low weight at birth (Binder et al., 2008). There are also possible connections between prenatal opioid use and increased prevalence of autonomous dysregulation and heart defects (Paul et al., 2014). Once in school, children exposed to opioids prenatally are more likely to struggle with inattention (Hickey, 1995), hyperactivity (Ornoy et al., 1996) and cognitive and motor impairments (Bunikowski et al., 1998). The use of illicit drugs such as methamphetamines and opioids during pregnancy increase the risk of medical and psychological issues later in childhood and life, largely due to neurological abnormalities.

Apart from prenatal exposure, having a parent with a SUD has been linked with significantly higher risk of child abuse and neglect. A study published in the journal of Child Abuse and Neglect found that, among 206 reported cases of serious child abuse or neglect, 43% of the cases involved a parent with documented SUDs, with the figure increasing to 50% when including alleged SUDs (Murphy et al, 1991). A study conducted by the U.S. Department of Justice Office of Justice Programs claims that adult drug abuse has become the dominant-characteristic among American child-abuse caseloads (Harris, 1994). An analysis of family-treatment drug courts found that neglect is commonly associated with parental SUDs (Hughes, 2014). The correlation between

child abuse and neglect and parental SUDs creates additional danger of ACE exposure for those exposed to parental SUDs.

The stress of having a parent with a SUD creates short and long-term consequences for children. According to a study by the Journal of Social Work and Public Health, parents with SUDs are likely to struggle with communication and assertiveness, leading to reduced parenting skills (Lander et al., 2013). Children are likely to experience challenging feelings ranging loneliness, fear, depression, anxiety, and anger. Children of parents with SUDs are more likely to be diagnosed with every childhood disorder in the Diagnostic Statistical Manual of Mental Disorders, ranging from learning and conduct disorders to learning disorders and selective mutism (American Psychiatric Association, 2000). Among parents with SUDs, particularly mothers, developing healthy parent-child attachments can be very difficult. Parents using drugs or alcohol are less good at picking up on and responding to infants' signals (Porreca et al., 2018). A brain imaging study found reduced activation of reward regions of the brain among mothers with SUDs in response to their infants' cues (Kim et al., 2017). After drug or alcohol use ends, parent-child relationships are still likely to suffer from continuing effects of psychological and relational dynamics (Barrocas et al., 2016). Exposure to parental SUDs makes a child more likely to commit or attempt suicide later in life (Merrick et al., 2017).

Current policy tasks the child welfare system with addressing children's' needs regarding parental substance abuse disorders and any coexisting child abuse or neglect. Child welfare agencies are pressured to find permanent placements for children of parents with SUDS, while SUD treatment programs require large time commitments

that are incompatible with childcare, making parents choose between treatment or custody (Dauber et al., 2012). A study of 1,082,947 individuals admitted to state-funded SUD treatment programs found that the majority are parents, and 27.1% had a child removed from custody and 36.6% had their parental rights terminated (Brady et al., 2005). Removing children from parents' custody has profoundly negative impacts on the children's' wellbeing, causing trauma through relational losses, disenfranchised grief, and complex trauma (Mitchell, 2017). Research has found that removal of children from their parent's custody increases cortisol levels, sometimes causing damage to brain cells, even during short removals.2

Exposure to a parent's SUD is a complex trauma. Prenatal substance abuse causes severe neurological consequences for children exposed. Children are much more likely to be victims of child maltreatment, particularly neglect, with a substance abusing parent in the household. The general stress and reduced parent-child attachment resulting from parental SUDs increases the risk of childhood psychiatric disorders. With high prevalence of substance abuse amongst the U.S. population, the effects of parental SUDs are a significant contributor to the ACE epidemic.

2 Wan, W. (2018) What Separation from Parents Does to Children: 'The Effect Is Catastrophic,' WASH. POST, retrieved from https://www.washingtonpost.com/national/healthscience/what-separation-from-parents-does-to-children-the-effect-iscatastrophic/2018/06/18/cOOc3Oec-732c-1 le8-805c4b67019fcfe4_story.html?utmterm=.2731f2fd1d3

Child Maltreatment: The Trauma of Abuse and Neglect

Child maltreatment, including physical, psychological, and sexual abuse as well as neglect, are prevalent sources of toxic stress in the American population. The U.S. Center For Disease Control (CDC) estimates that at least one in seven American children experience child abuse or neglect, with those living in poverty five times more likely to experience child abuse than the general population.3 The World Health Organization (WHO) found that 20% of women and 5-10% of men reported being sexually abused in childhood, with 25-30% of both genders reporting physical abuse (Krug et al., 2002).

The impacts of child maltreatment and the associated stress are catastrophic for a growing brain. Dr. Deanna St. Germain of Kid's First Center, who has spent her career evaluating child victims of physical and sexual abuse, describes the impact of trauma on a child's mind with the following analogy:

> ""If you had a parent that had a crazy conspiracy theory, "the only way my child is going to be okay in the world is if they are left-handed, so I'm going to tie their right hand behind their back for most of their infancy," scientists know that that arm is going to be useless in a few months because it hasn't been stimulated and used, and if you don't use it you lose it. We would never let a parent do that to their child, but we let them do that to their brains."4

The long-term consequences of child abuse are well studied, with research dating back as early as 1962 when the term "battered child syndrome" was coined (Kempe et al., 1962). Decades of research have linked lifelong impairments in cognitive development and academic achievement, physical health, and emotional and behavioral

3 Centers for Disease Control and Prevention. (2022). Fast Facts: Preventing Child Abuse & Neglect. Violence Prevention Injury Center, Centers for Disease Control and Prevention. https://www.cdc.gov/violenceprevention/childabuseandneglect/fastfact.html

4 St. Germain, Deanna. Interview. Conducted by Rose Kordahl, May 5, 2022.

health in survivors of child abuse (Merrick et al., 2014). A study of adult gynecological patients found that survivors of childhood physical, sexual, or emotional abuse had higher incidences of hospitalizations and worse overall health scores than non-abused women, and that those who had experienced all three types of childhood abuse had the worst adult health outcomes (Moeller et al., 1993).

A meta-analysis of over one hundred studies found that childhood physical and emotional abuse significantly raised one's risk for obesity, and childhood physical abuse was predictive of arthritis, headaches/migraines, and ulcers in adulthood (Norman et al., 2012). Physical abuse has been found to predict higher instances of diabetes, malnutrition, and higher levels of C-reactive protein, a biomarker of inflammation (Widom et al., 2012).

One study of interest examined the methylation levels of maltreated and non-maltreated children. This study researched the genomes of 548 school-aged children from low-income backgrounds (Cicchetti et. al, 2016). This study found that the methylation levels of maltreated children were higher on several genes associated with various diseases such as cancer, alcoholism, cardiovascular health, and immune function. Three genes showed the most significant differences in methylation levels: ALDH2, an alcohol-metabolizing gene, ANKK1, a dopaminergic gene, and NRC31, a glucocorticoid receptor gene. Higher methylation levels of these genes have been associated with higher epigenetic risk of disease later in life (Wong et al., 2020). This study found different methylation rates of all three genes examined in maltreated children compared to non-maltreated children. Methylation levels varied among maltreated children; interestingly, maltreated African American children had less

affected methylation levels than maltreated children of other races. In general, the study found that the methylation levels of maltreated children varied significantly from nonmaltreated children, suggesting that the childhood maltreatment effects the very genes of its victims. The epigenetic role of childhood trauma is a promising area for future research into the long-term health consequences of ACEs.

In addition to the likelihood of developing a toxic stress response, child abuse survivors face long-term likelihoods of revictimization. One in two child sexual abuse survivors will be revictimized in adulthood (Walker et al., 2017). Around 72% of female child abuse victims will experience sexual or domestic violence as an adult (Mouzos et. al, 2004). Child abuse survivors are twelve times more likely to attempt suicide than the general population (Gilbert et al., 2009). Apart from physical health consequences, lifestyle and psychological consequences are prevalent among survivors of child maltreatment.

Child maltreatment is extremely common in the U.S. Child maltreatment is known to increase the risk of lifelong psychiatric and physical health issues, ranging from depression to diabetes. Recent research into epigenetics shows that the impact of maltreatment reaches all the way to a victim's genome, predisposing them to lifelong diseases. The impact on one's future crime victimization and suicide risk is significant. Child maltreatment is a pervasive ACE with consequences that we are just beginning to grasp.

Policy Responses to Emerging Research on Trauma

The emerging research into the biological consequences of trauma and the enormous impact on modern societies underscored the need for lawmakers to integrate research about ACE's and toxic stress into policy. In the United States, mass incarceration, child abuse, and parental SUDs contribute heavily to the exposure rates of ACEs and toxic stress. This relationship between governance and ACE exposure offers insight to the culturally invariant prevalence of ACEs and best practices for its mitigation.

Several major agencies have released reports and policy statements to address the need for trauma-informed policy in response to the toxic stress and ACE epidemic. The American Academy of Pediatrics released a policy statement in 2021 advising practitioners to transition towards addressing relational health as a remedy and prevention for childhood toxic stress (Garner et al., 2021). The policy statement concluded that "relational health, in the form of at least one SSNR, is a universal, biological imperative for children to fulfill their potential."

The National Scientific Council on the Developing Child released a 2007 report that identified the gap between science and policy relating to childhood adversity (National Scientific Council on the Developing Child, 2007). They argued that the science is more than sufficient to justify adopting evidence-based policies aimed at preventing and addressing childhood adversity. Specific policy implications outlined in this report include reevaluating the impacts and lack of resources in child welfare, specifically the foster care system. They also recommended investments into K-12 education and preschools, and an emphasis on neuroscience in informing education

policy. The report identified the most needed policy response as early intervention for children at risk of adversity and facing poor relational health.

The Economic Policy Institute in partnership with the Opportunity Institute published a 2019 report outlining policy recommendations to address the disparate impacts of toxic stress on African American children (Morsy et al., 2019). This report outlined ways that current outcomes could be improved for African American children: increased medical screening for toxic stress, parental support programs, trauma-informed training for school staff, and changes to racially disparate policies and practices in schools. This report helped to outline ways that American society can tackle disparate outcomes more immediately than waiting for societal change.

The emerging field of childhood trauma in medicine identifies the relationship between systemic policies and ACE exposure. In most modern nations, incarceration, child abuse, and parental SUDs are prevalent issues. The study of ACEs in the United States illuminates how these systemic issues directly cause bodily harm to children, and how policy has the potential to remedy this harm. The cultural invariance of childhood trauma and its impact allows for international collaboration in both scientific research and policy solutions. While the United States currently offers the most comprehensive collection of data regarding ACEs, nations in Asia, Europe, and the Americas are building significant databases. Nearly every nation has taken part to some extent in administering the World Health Organization's Adverse Childhood Experiences International Questionnaire.[5] As data accumulates, and research-to-policy solutions

5 World Health Organization (2018). Adverse Childhood Experiences International Questionnaire (ACE-IQ). World Health Organization, www.who.int/violence_injury_prevention/violence/activities/adverse_childhood_experiences/en/. Accessed 9 Dec. 2020.

progress, scientists will be able to advocate for better trauma-informed policy. An exploration of the correlation between ACE prevalence and U.S. policy will illuminate the integral role governments can play in causing exposure to ACEs and toxic stress, and how they can best prevent them.

Sigmund Freud observed that "What happens in childhood does not stay in childhood."6 New research has proven that this does not only apply to the child's psychology but their biology. Exposure to adversity, particularly when paired with poor relational health, can cause catastrophic consequences. From dysregulation of the HPA and cortisol excretions to abnormal methylation of the genome, ACEs have a profound effect on a child. ACEs are epidemic among the U.S., particularly child maltreatment and parental substance abuse and incarceration. There are many more significant adversities outside of conventional ACEs that science is only beginning to identify. By finding evidence-based policies to address the science of childhood adversity and by increasing relational health of affected children, U.S. policy can begin to fight the ACE and toxic stress pandemic.

6 Nemiah, J. C. (1996). Breuer, Josef and Freud, Sigmund (1895/1995), Studies on Hysteria. In James Strachey (Ed.) The Standard Edition of the Complete Psychological Works of Sigmund Freud. London: Hogarth Press, Vol. 2, xxxii, pp. 1–335.

Discussion

Policymakers should use the decades of research into the prevalence and consequences of ACEs and toxic stress to inform modern policy to address the epidemic of toxic stress in the American population. This discussion focuses on policy relating to mass incarceration of parents, parental substance abuse, and child abuse and neglect.

Mass Incarceration of Parents

Parental incarceration is an adverse childhood experience with well-studied health consequences. Mass-incarceration in the United States has caused a significant population to be exposed to parental incarceration. Given the research into the impacts of relational health on childhood adversity, policy should attempt to maintain parent-child bonds during incarceration to prevent long-term harm. The justice system is beginning to understand the scope of consequences of parental incarceration. The contribution of mass-incarceration to the toxic stress epidemic should encourage policymakers to explore how parental incarceration can be prevented when possible, and how programs can support CIPs.

Cash Bail and Pretrial Incarceration

One way to avoid parental incarceration suggested by The Future of Children center at Princeton University is by ending the cash bail system (Laub, 2018). Jail stays resulting from failure to pay bail for minor crimes contribute to the separation of families awaiting trial. A U.S. Commission on Civil Rights Report found the system of cash bail and pretrial incarceration unnecessary and possibly in violation of the

constitutional right to due process.7 A U.S. Office of Justice Report found that the likelihood of reoffending and failure to appear in court had no statistically significant difference with or without cash bonds (Jones, 2013). Unnecessary separation of children from SSNRs is known to cause long-term harm. Given the negative health consequences for children and the lack of effectiveness of cash bail, reducing the use of cash bail for minor and nonviolent crimes is a viable policy to address the childhood adversity of parental incarceration.

Individuals in the justice system are beginning to incorporate the research into trauma in sentencing practices. Federal Judge Michael J. McShane of the District of Oregon explained that "The goal now is to try to keep families unified if we can. Sending parents to treatment and putting kids in a foster home is usually considered now not only bad for the moms but traumatic for the children."8 As understandings of the science of trauma become more common in the justice system, sentencing practices are able to better prevent the harm of separating parents and children.

In-Person and Video Visitation

The Future of Children Center identifies increased visitation and video-visitation as potential remedies to the consequences of parental incarceration (Laub, 2018). The separation and alienation of children from caregivers is one of the main contributors of stress in cases of parental incarceration. Visitation can help maintain bonds between children and SSNRs. However, visitation programs must be careful to reduce the stress

7 U.S. Commission on Civil Rights (2021). The Civil Rights Implications of Cash Bail. U.S. Commission on Civil Rights, Retrieved from www.usccr.gov/reports/2021/civil-rights-implications-cash-bail.

8 McShane, Michael J. Interview. Conducted by Rose Kordahl, 5 May 2022.

of the prison environment for child visitors. This could be done through the construction of child-friendly waiting areas and reduced security checks, or through video visitation.

The organization Assisting Families of Inmates (AFOI) utilizes video-visitation to held connect inmates in Virginia with their loved ones.9 They utilize technology to provide video visitation at-home or through visitor centers, helping to relieve the stress of CIPs and their families by maintaining relationships with incarcerated parents. However, a lack of funding requires the organization to minimally charge families for the service. Video-visitation programs like the AFOI could be developed and funded on state levels to minimize the stress on CIPs from reduced parent-child interactions.

Trauma-Informed Training for Prison and Jail Employees

The Illinois Task Force on Children of Incarcerated Parents interviewed experts, incarcerated parents, and CIPs to determine best practices for reducing the trauma of parental incarceration (State of Illinois Office of the Lieutenant Governor, 2020). The taskforce determined that the best practices include training and supporting prison and jail employees on trauma-informed practices when dealing with children. Interviews found that many prison employees were unprepared to handle potentially traumatic situations involving children. This lack of training could also be improved by having a child welfare specialist present at times of arrest and parent-child interactions. Greater funding and resources could prepare prison and jail staff for interacting with CIPs and place welfare experts to assist in potentially traumatic situations. Prison and jail

9 Assisting Families of Inmates (2022). Video Visitation. AFOI, Retrieved from afoi.org/video-visitation.

employees are not equipped to act as social workers. Increasing support and training for these employees can reduce the stress exposure of CIPs.

The funding of trauma-informed programs for CIPs is promising for the development of evidence-based practices to reduce toxic stress exposure. The United States Office of Juvenile Justice and Delinquency Prevention Second Chance Act provides federal grants to state corrections departments and nonprofits which address the need for trauma-informed training in correctional institutions. The Oregon Department of Corrections was awarded $741,924 in 2018 to provide trauma informed training for staff to reduce the trauma and impact of CIPs.10 In total, the Second Chance Act Addressing the Needs of Incarcerated Parents with Minor Children issued $7,180,204 in federal grants in 2018, 11 and $4,467,389 in 2021.12 This funding remains minimal compared to the total cost of mass incarceration in the United States. The Bureau of Justice reports an annual cost of $81 billion, while the Prison Policy Initiative estimates it is closer to $182 billion.13 The promise of evidence-based programs for reducing trauma of CIPs suggests that federal funding for trauma-informed programs for CIPs could significantly reduce the toxic stress exposure caused by mass-incarceration.

10 Office of Juvenile Justice and Delinquency Prevention (2018). Parenting Inside Out Phase II: Enhanced Visitation Pilot Project. United States Department of Justice Office of Justice Programs, ojjdp.ojp.gov/funding/awards/2018-ig-bx-0005.

11 Office of Juvenile Justice and Delinquency Prevention (2021). OJJDP FY 2018 Second Chance Act Addressing the Needs of Incarcerated Parents and Their Minor Children. United States Department of Justice Office of Justice Programs. https://ojjdp.ojp.gov/funding/fy2018/O-OJJDP-2021-41001#:~:text

12 Office of Juvenile Justice and Delinquency Prevention (2021). OJJDP FY 2021 Second Chance Act Addressing the Needs of Incarcerated Parents and Their Minor Children. United States Department of Justice Office of Justice Programs. https://ojjdp.ojp.gov/funding/fy2021/O-OJJDP-2021-41001#:~:text

13 “Mass Incarceration Costs $182 Billion Every Year.” Equal Justice Initiative, 12 Nov. 2019, eji.org/news/mass-incarceration-costs-182-billion-annually/.

Parental Substance Abuse Disorders

Parental SUDs and coexisting child abuse and neglect require communication and cooperation between child welfare agencies and SUD treatment programs to preserve the child-parent relationship when possible and minimize trauma. Parental SUDs are harmful to parent-child relationships, and most SUD treatment programs create further isolation of children from SSNRs. Given the common comorbidity of child maltreatment, particularly neglect, SUD treatment programs for parents should also take a maltreatment-prevention approach.

Parenting-Targeted Approaches

Several studies have found promising programs for preventing child abuse by treating SUDs in a parenting-targeted approach. A study published to the Journal of Drug and Alcohol Dependence concluded that the Parents under Pressure (PuP) program significantly reduced the likelihood of child abuse for substance abusing parents with children under the age of three (Barlow et al., 2019). The PuP program utilizes one-on-one parenting education and reduces parental SUDs as well as child-abuse. Moreover, considering the high cost of child abuse, the program is extremely cost-effective. A study by the Children and Youth Services Review found that parents who received counseling at least once a week over twelve months had significantly reduced post-treatment SUDs (Marsh et al., 2005).

Family Treatment Drug Courts

A National Institute of Health policy review found that individualized parenting programs, like the Pup program, are most effective at reducing SUDs when paired with

Family Treatment Drug Courts (Oliveros et al., 2011). Family Treatment Drug Courts (FTDCs) are a voluntary alternative and addition to child welfare services and the legal system, specifically designed to support parents with SUDs in improving child-parent relationships. FTDCs use a collaboration between the justice system, child welfare, and SUD treatment practitioners to reunite families affected by SUDs. The significant decreases in child abuse and SUDs among parents who complete FTDCs and parenting training shows promise for the trauma-exposure of children. Children's toxic stress exposure can be limited by increasing funding and resources to FTDC and parenting-training initiatives in the U.S.

Child Maltreatment

Child abuse and neglect are major contributors to the ACE and toxic stress epidemic in the U.S. Current U.S. policy on child maltreatment largely relies on the Justice System and social services. The prevalence of child maltreatment and the long-term health consequences of survivors demonstrates a deficit in policy for prevention and treatment of maltreatment. The journal for the American Academy of Pediatrics has found that psychosocial interventions can reduce cortisol and HPA dysregulation in children who have faced adversity (Slopen et al., 2014). Evidence-based programs focusing on relational health can reduce the prevalence and long term-consequences of child maltreatment.

Family-Engaged Preschool

One method of preventing child abuse and neglect is through family-engaged preschools. These programs improve parent-child connections and prevent child abuse

by incorporating the family structure into childcare. The Child Parent Centers found that students in family engaged preschools experienced 52% reductions in child abuse and neglect (Reynolds et al., 2001). Programs utilizing early childhood home visitation have found promising reductions in subsequent child abuse and neglect.

In 2021, U.S. President Joe Biden proposed a $200 billion investment into creating high quality preschool for all three- and four-year-olds in the U.S. through the Build Back Better Act.[14] If passed by Congress, this act would make high-quality universal preschool a reality in the U.S. This program would also be financially beneficial. In the thirty-five-years following the initiation of universal preschool, each dollar put into the program would reap an estimated $4.93 in benefits (Lynch, 2021). When factoring in the long-term effects of reduced trauma exposure, the total financial benefit would be $10.20 per each dollar invested. This investment in preschool is a great opportunity for policymakers to create family-engaged preschool programs for preventing child maltreatment.

Parenting-Skills Training

To provide SSRNs to reduce the impact of adversity on children's health, parents need to be equipped with the necessary parenting skills to be strong and nurturing caregivers. The Video Interaction Project found that facilitating shared-reading and play between parents and children improved the mothers' psychosocial functioning and improved children's behavioral outcomes (Weisleder et al., 2019). The

14 Merrick, M. (2021). "A Message from Dr. Merrick on Investing in Children & Families through the Build Back Better Act." Prevent Child Abuse America, 16 Nov. 2021, Retrieved from preventchildabuse.org/latest-activity/message-on-investing-in-children-and-families-through-build-back-better-act/.

importance of shared reading is further evident by the positive results of the Reach Out and Read program, through which 30,000 primary care providers have begun to advocate for parent-child shared reading (Zuckerman et al., 2011).

Parenting skills programs like the Triple-P program have proven effective at reducing parental-risk factors in high-risk families (Sanders et al., 2007). Triple-P is a cost-effective behavioral family intervention program designed for families with young children. The improvement of psychological functioning of the parents and behavior of the children contributes to overall stability and function in the family unit.

Parenting training is also important for reeducating parents who experienced adversity in their own childhoods. The correlation between parental histories of abuse and victimhood of children is strong. Dr. Germain of Kid's First Center stated that her child patients rarely have parents without high ACE scores: ""We say [the parents'] pickers are broken. People who had a lot of adversity as children are not great at picking partners who are healthy and not going to hurt their children."15 In order to prevent the continuation of the cycle of abuse, it is important to provide parent training for parents with past adversities.

A policy brief by The Future of Children advocates for evidence-based parent training as child abuse prevention (Barth et al., 2009). The report stated that "It may be possible for the nation to reduce the huge financial costs and the disruptions in development caused by child maltreatment and to lower the parallel costs of problematic school behavior and other negative outcomes when children do not receive

15 St. Germain, Deanna. Interview. Conducted by Rose Kordahl, May 5, 2022.

the parenting they need." Parent training is a low-cost and highly effective way of reducing child maltreatment and improving children's' relational health.

Trauma-Focused Treatment

Specialized programs have shown promise in treating previously abused children and restoring normal developmental function. A specialized childcare program by the William Penn Foundation found significant reduction in preschooler's functioning deficits following abuse or neglect (McCurdy, 1992). A similar program found that maltreated children's developmental scores improved to normal levels after attending therapeutic day care (Culp et. al., 1987). In addition to regular preschool, funding specialized childcare programs for previously abused children can help treat the effects of abuse in early childhood and possibly prevent the long-term consequences of toxic stress exposure.

Trauma-focused cognitive behavioral therapy (TF-CBT) is an evidence-based treatment for post-traumatic stress disorder resulting from child abuse and neglect. TF-CBT has proven effective at reducing symptoms following a twelve-month treatment period (Cary et al., 2012), and at sustaining improvements at twelve months post-treatment (Mannarino et al., 2012). Incorporating evidence-based treatments for trauma can reduce the impacts of abuse and neglect on children.

Conclusion

High ACE prevalence and toxic stress are public health crises with extensive consequences. From mental health to physical illness to one's genome, trauma can affect every part of those exposed to it. ACE contributes to racial and socioeconomic health disparities, as well as financially burdening the U.S. economy. Science not only warns us of the scope of this issue but can point us towards evidence-based policies for fighting the toxic stress and ACE epidemic.

The identification of mass incarceration, drug abuse and child abuse as contributors to ACE exposure should encourage policymakers to reform these systems to lessen their impact. Reforms addressing the trauma of parental incarceration include alternatives to cash-bail pretrial release, parenting programs for incarcerated parents, and improvements in access to visitation and video visitation for CIPs. Parental SUDs can be treated through a combination of FDTCs and one-on-one SUD specific parenting training, while also reducing likelihood of child abuse and reducing impact on children. Research shows that child abuse can be prevented through specialized preschool and parent training, and the after-effects can be treated through specialized childcare programs for abuse survivors. Emerging research is informing policymakers that exposure to child abuse and parental incarceration and SUDs directly impacts the long-term health of children through exposure to toxic stress. The role of relational health in minimizing the impact of trauma is important in researching policy implications. Considering the findings of this study, the science of trauma and the effects of stress exposure on children needs to be applied much more in policymaking. Despite the extensive research supporting the significance of ACEs on adult behavior and health,

politicians are split on whether it should be addressed, particularly along Democratic/Republican lines. A survey of state legislators found that while 77% of legislators identify childhood sexual abuse as a major risk factor for adult behavioral health, only 39% consider witnessing domestic violence as a risk factor, and only 38% consider child neglect a risk factor (Purtle et al, 2019). Interestingly, legislators in this survey who identified ACEs as major risk factors for adult behavioral health were significantly more likely to be Democrats, liberal, and female. Dr. Deanna St. Germain of Kid's First Center emphasized the need for awareness of ACEs and toxic stress among politicians, stating "you have to have a majority of people in power who believe in this, who see this."16 This survey also found that many of the legislators surveyed were unaware of unpersuaded by the evidence of the effect of ACEs on adult behavioral health, particularly witnessing domestic violence and child neglect. The difficulty in persuading legislators to address ACEs is not surprising. ACEs affect most Americans, making acknowledging the impact personal and frightening for many. In addition, those who are most affected by ACEs are often socio-economic and racial minorities who are systematically overlooked as it is. Convincing legislators to confront the epidemic of childhood adversity requires painful self-inspection and acknowledgement of the individuals we have failed to support. The difficulty in gaining acknowledgement of science among politicians has proven difficult in efforts to stop global warming and the coronavirus pandemic as well. However, policies to address the ACE epidemic not only address systemic inequalities and mass public health; preventing childhood trauma is extremely cost-effective, saving the economy money

[16] St. Germain, Deanna. Interview. Conducted by Rose Kordahl, May 5, 2022.

over time. Biden's proposal to provide universal preschool would reap an estimated $10.20 per each dollar invested by preventing child abuse and neglect (Lynch, 2021). If the contributions to public health and equality are not persuasive enough to pass legislation, the economic benefits of preventing ACEs and toxic stress can help to encourage lawmakers. A study from Arizona State University found that the cost of Medicaid spending directly resulting from ACEs was $260 million in 2019, 16% of all Medicaid spending.17 A report by the California Surgeon General estimated that the total cost of ACEs in North America and Europe is $1.3 trillion, comprising 3.55% of North American Gross Domestic Product (GDP) and 2.67% of Europe's GDP.18 The financial cost of ACEs is enormous, and an opportunity exists to improve the economy through prevention.

Evidence-based policies should be further explored as a remedy to the epidemic of toxic stress among children in the U.S. By using biomarkers and long-term health studies of populations, policymakers and scientists can work together to identify policies which directly impact the development of toxic stress responses and the long-term issues they cause. With the incentive of economic gains, hopefully evidence-based policies addressing ACEs and toxic stress can overcome partisan politics. New research into ACEs gives the U.S. the opportunity to lead the way in trauma-informed policies and preventative programs. By educating and persuading politicians to address necessary policy reforms, the U.S. can lead the way in addressing the epidemic of ACEs and toxic stress.

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17 ASU Researchers Set Price Tag on Illness Linked to Childhood Trauma." Morrison Institute for Public Policy, 5 Jan. 2022, morrisoninstitute.asu.edu/content/asu-researchers-set-price-tag-illness-linked-childhood-trauma.

18California Surgeon General (2020). *Roadmap for Resilience: The California Surgeon General's Report on Adverse Childhood Experiences, Toxic Stress, and Health. Office of the California Surgeon General. Retireved from* osg.ca.gov/sg-report/.

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