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Adverse Childhood Experiences

Joan A. Reid

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Introduction

Substantial bodies of research from various fields have consistently documented the long-term, detrimental effects of childhood maltreatment and trauma. In the health science field, a body of research—known as Adverse Childhood Experiences (ACE) studies—has raised awareness among health-care providers of the cumulative or dose-response impact of childhood adversity on long-term health and well-being. Much of research on child maltreatment and trauma presents partitioned prevalence estimates for individual types of family violence and abuse, obscuring the reality that many children are victims of more than one type of abuse or violence. In contrast, ACE researchers designed a composite measure of childhood adversity, labeled an ACE score, calculated by summing eight to ten types of childhood adversities, each measured as either present or absent during childhood regardless of the duration or severity of the adversity. Researchers found that experiencing multiple types of childhood adversity was linked to the leading causes of death in the United States. The mechanisms facilitating the lifelong association between ACEs and poor health have been conceptualized in the ACE Pyramid Framework, which links childhood adversity to chronic health problems and early death by means of social, emotional, and cognitive impairments and health risk behaviors. In alignment with the ACE Pyramid, researchers have investigated the links between ACEs and (1) chronic health problems and early death, (2) mental health risk and suicide, (3) health risk behaviors, (4) violence and offending risk, and (5) risk for further victimization. ACE studies have explored the impacts of ACEs on various health and social outcomes using samples from differing population groups, including community samples, school samples, samples encompassing several birth cohorts, and samples of incarcerated populations. The ACE studies have provided greater understanding of the prevalence and impact of childhood maltreatment and trauma. The body of ACE research has the potential to guide policy aimed at preventing ACEs and to inform intervention strategies—encouraging trauma-informed care—for individuals who have experienced multiple types of childhood adversity. However, many questions remain. The mechanism of the association between ACEs and early death, which types of childhood adversities should be counted, the relative impact of various types of childhood adversities, and differences in ACE effects on men and women and across races or ethnicities have not yet been established.

General Overviews

Kaiser Permanente's Department of Preventive Medicine in San Diego, in collaboration with the US Centers for Disease Control and Prevention (CDC), conducted the foundational ACE Study. The Kaiser Permanente-CDC ACE Study was one of the largest investigations ever conducted on the impact of childhood adversity on later-life health and well-being. Results of the foundational ACE Study conducted by Kaiser Permanente-CDC are reported in Felitti, et al. 1998. As described in Felitti and Anda 2010, data used in the Kaiser Permanente-CDC Study were drawn from participants' medical histories completed by health-care providers, physical examinations, and results of laboratory tests. In addition, study participants completed confidential self-report surveys regarding their current health status; their childhood history, including experiences of child maltreatment; and their engagement in health-risk behaviors such as smoking, alcohol or illicit drug use, and driving under the influence. As displayed on the Centers for Disease Control and Prevention Adverse Childhood Experiences web page, the ACE Pyramid depicts a theoretical framework that explains the mechanisms facilitating the association between ACEs and chronic health problems and early death. Kalmakis and Chandler 2015 provides a comprehensive and systematic review of ACE research conducted between 2008 and 2013.

Centers for Disease Control and Prevention. Adverse Childhood Experiences.

The ACE Pyramid Framework sets forth the pathway or mechanisms by which ACEs are linked to chronic health problems and early death. The pyramid's foundational level is "Adverse Childhood Experiences." The next, subsequent level is "Disrupted Neurodevelopment." The third level is "Social, Emotional, and Cognitive Impairment." The fourth level of the pyramid is "Adaptation of Health-Risk Behaviors." The fifth level is "Disease, Disability, and Social Problems." The top level of the pyramid is "Early Death."

Felitti, Vincent J., and Robert F. Anda. 2010. The relationship of adverse childhood experiences to adult medical disease, psychiatric disorders and sexual behavior: Implications for healthcare. In *The impact of early life trauma on health and disease: The hidden epidemic*. Edited by Ruth A. Lanius, Eric Vermetten, and Clare Pain, 77–87. Cambridge, UK: Cambridge Univ. Press.

This chapter provides a detailed overview of the Kaiser Permanente-CDC ACE Study, including findings and health-care implications, and would be useful for undergraduate or graduate students.

Felitti, Vincent J., Robert F. Anda, Dale Nordenberg, et al. 1998. Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: The Adverse Childhood Experiences (ACE) Study. *American Journal of Preventive Medicine* 14.4: 245–258.

The first journal article to report results of the ACE Study conducted at Kaiser Permanente-CDC, based on the first wave of data collection from over 9,500 participants. Researchers found a strong, dose-response relationship between the number of childhood exposures and risk factors for leading causes of death, including heart disease, cancer, chronic bronchitis or emphysema, hepatitis, stroke, and diabetes.

Kalmakis, Karen A., and Genevieve E. Chandler. 2015. Health consequences of adverse childhood experiences: A systematic review. *Journal of the American Association of Nurse Practitioners* 27.8: 457–465.

This review article provides a systematic review of forty-two ACE studies conducted between 2008 and 2013, with specific implications for the nursing profession. Based on the review of studies, the researchers encourage nursing professionals in clinical practice to screen patients for a history of ACEs and craft individualized treatment plans to assist patients to cope more successfully with emotional and biological responses to childhood adversity, thereby minimizing negative health outcomes.

Chronic Health/Premature Mortality Risk

Adverse childhood experiences research has found associations between ACEs and chronic health problems. Many of the leading causes of death in the United States have been linked to ACEs, including heart disease, cancer, respiratory disease, and diabetes. Dong, et al. 2004 examines the link between ACEs and heart disease, finding that many psychosocial risk factors are stronger predictors of heart disease than more traditional risk factors such as smoking or lack of physical activity. Brown, et al. 2010 documents a link between lung cancer and ACEs that was only partially mediated by smoking. In a low-income minority sample, Lynch, et al. 2013 documents a link between ACEs and diabetes. Anda, et al. 2008 documents a link between ACEs and chronic obstructive pulmonary disease (COPD) that was only partially mediated by smoking. Anda and colleagues also note that ACEs predicted earlier hospitalization for COPD, suggesting that a higher number of adversities in childhood may be associated with earlier onset of poor health. Cunningham, et al. 2014 observes sex-specific differences in the associations between ACEs and COPD, suggesting key differences in the impact of ACEs on health outcomes for men and women. Dong, et al. 2003 considers the association between ACEs and liver disease mediated by health risk behaviors, suggesting a pathway between ACEs and health outcomes effected by health risk behaviors. Similarly, Dube, et al. 2009 explores the relationships between ACEs and autoimmune deficiency disorders. Anda, et al. 2010 notes a link between ACEs and frequency of headaches. Many of these studies found a dose-response relationship between ACEs and poor health, meaning that with each additional ACE, the likelihood of poor health outcomes increased. Several studies have noted the relationship between ACEs and age of onset of disease. Brown, et al. 2010 documents a link between ACEs and premature mortality that was almost completely mediated by health risk behavior and social problems, highlighting the critical impact of health risk behaviors in facilitating the link between ACEs and health outcomes.

Anda, Robert F., David W. Brown, Shanta R. Dube, J. Douglas Bremner, Vincent J. Felitti, and Wayne H. Giles. 2008. Adverse childhood experiences and chronic obstructive pulmonary disease in adults. *American Journal of Preventive Medicine* 34.5: 396–403.

Using the data from over fifteen thousand participants in the Kaiser Permanente-CDC ACE Study, researchers found that participants with ≥ 5 ACEs had 2.6 times the risk of chronic obstructive pulmonary disease (COPD). These associations were only modestly reduced when controlling for smoking—the traditional key risk factor for COPD. Additionally, researchers found that higher ACE scores were associated with hospitalization for COPD at a younger age.

Anda, Robert, Gretchen Tietjen, Elliott Schulman, Vincent Felitti, and Janet Croft. 2010. Adverse childhood experiences and frequent headaches in adults. *Headache: The Journal of Head and Face Pain* 50.9: 1473–1481.

Using the dataset from the Kaiser Permanente-CDC ACE Study, researchers found that all ACEs were associated with an increased prevalence and risk of frequent headaches. With each additional ACE score the likelihood of frequent headaches increased. Participants with ≥ 5 ACEs were at 2.0-fold risk compared to those with an ACE score of 0.

Brown, David W., Robert F. Anda, Vincent J. Felitti, et al. 2010. Adverse childhood experiences are associated with the risk of lung cancer: A prospective cohort study. *BMC Public Health* 10.1: 20.

Using the dataset from the Kaiser Permanente-CDC ACE Study along with 2005 follow-up data collected from hospital and mortality records, researchers found that, even when controlling for smoking, ACEs contributed to early mortality from lung cancer. Participants with ≥ 6 ACEs were roughly thirteen years younger on average at presentation of lung cancer than those without ACEs.

Brown, David W., Robert F. Anda, Henning Tiemeier, et al. 2009. Adverse childhood experiences and the risk of premature mortality. *American Journal of Preventive Medicine* 37.5: 389–396.

Using the dataset from the Kaiser Permanente-CDC ACE Study along with 2006 mortality records, researchers found participants with ≥ 6 ACEs died nearly twenty years earlier on average than those without ACEs (60.6 years versus 79.1 years). This association diminished almost completely when controlling for health and social problems previously associated with ACEs, suggesting that health and social problems may mediate the link between ACEs and premature mortality.

Cunningham, Timothy J., Earl S. Ford, Janet B. Croft, Melissa T. Merrick, Italia V. Rolle, and Wayne H. Giles. 2014. Sex-specific relationships between adverse childhood experiences and chronic obstructive pulmonary disease in five states. *International Journal of Chronic Obstructive Pulmonary Disease* 9:1033–1042.

Using data collected in 2011 via a random-digit-dialed telephone survey of 26,546 women and 19,015 men in five US states, researchers found sex-specific differences in the associations between ACEs and chronic obstructive pulmonary disease (COPD). These findings suggest that there may be key differences in the impact of ACEs on health outcomes for men and women.

Dong, M., S. R. Dube, V. J. Felitti, W. H. Giles, and R. F. Anda. 2003. Adverse childhood experiences and self-reported liver disease: New insights into the causal pathway. *Archives of Internal Medicine* 163.16: 1949–1956.

Using the dataset from the Kaiser Permanente-CDC ACE Study, researchers found that all ACEs increased risk for liver disease. Participants with ≥ 6 ACEs had a 2.6-fold risk for liver disease. This association diminished by 38 to 50 percent when controlling for eight health risk behaviors (use of street drugs, injected street drugs, etc.), indicating that health risk behaviors are mediators of the link between ACEs and liver disease.

Dong, Maxia, Wayne H. Giles, Vincent J. Felitti, et al. 2004. Insights into causal pathways for ischemic heart disease. *Circulation* 110.13: 1761–1766.

Using the dataset from the Kaiser Permanente-CDC ACE Study, researchers found that experiencing any one of nine types of ACEs increased the likelihood of heart disease 1.3- to 1.7-fold. Participants with seven or more ACEs were at a 3.6-fold risk. Interestingly, the association between ACE and heart disease was stronger for psychological risk factors (i.e., depressed affect, anger) than for more medically established risk factors (i.e., smoking, physical inactivity, diabetes, and hypertension).

Dube, Shanta R., DeLisa Fairweather, William S. Pearson, Vincent J. Felitti, Robert F. Anda, and Janet B. Croft. 2009. Cumulative childhood stress and autoimmune diseases in adults. *Psychosomatic medicine* 71.2: 243–250.

Using the data from over fifteen thousand participants in the Kaiser Permanente-CDC ACE Study, researchers examined the link between ACEs and hospitalizations for any of twenty-one selected autoimmune diseases and four immunopathology groupings. The study found that participants with ≥ 2 ACEs were at 1.7- to 2.0-fold risk for hospitalizations for various autoimmune diseases.

Lynch, Laura, Roberta Waite, and Maureen P. Davey. 2013. Adverse childhood experiences and diabetes in adulthood: Support for a collaborative approach to primary care. *Contemporary Family Therapy* 35.4: 639–655.

Replicating the Kaiser Permanente-CDC ACE Study using a low-income minority sample of primary care patients (N = 801) at a community-based health-care center, researchers found that participants with higher ACE scores were more likely to be diagnosed with type 2 diabetes in adulthood.

Mental Health Risk

The ACE studies fit within a larger body of childhood and developmental research that has consistently found that experiencing multiple or repeated adversities during childhood can produce lifelong psychological consequences, including depression, aggression, antisocial behavior, and suicide risk. Edwards, et al. 2003 documents a general association between ACEs and poor mental health during adulthood. Chapman, et al. 2004 considers the relationship between ACEs and both lifetime and recent depressive disorders, highlighting the lasting impact of ACEs across the life span. Schilling, et al. 2007 documents links between ACEs and depression, drug use, and antisocial behavior. Merrick, et al. 2017 uses an expanded version of the ACE measure and finds a dose-response relationship between ACEs and moderate to heavy drinking, drug use, depressed affect, and suicide attempts. Whitfield, et al. 2005 examines the link between ACEs and hallucinations, finding a link not mediated by substance use. Read, et al. 2008 is an extensive review of research on ACEs and psychosis, advocating for greater attention to ACEs in prevention and treatment of psychotic disorders. Dube, et al. 2001 finds that ACE scores are strongly associated with attempted suicide during both adolescence and adulthood. Brodsky and Stanley 2008 proposes a schematic model that incorporates research findings to explain the association between ACEs and suicide later in life. Chapman, et al. 2007 provides an overall review of the findings of the ACE studies related to psychiatric outcomes.

Brodsky, Beth S., and Barbara Stanley. 2008. Adverse childhood experiences and suicidal behavior. *Psychiatric Clinics of North America* 31.2: 223–235.

This article presents a theoretical model that incorporates empirical research to explain the relationship between ACEs and suicidal behavior later in life.

Chapman, Daniel P., Shanta R. Dube, and Robert F. Anda. 2007. Adverse childhood events as risk factors for negative mental health outcomes. *Psychiatric Annals* 37.5: 359–364.

This article reviews and describes research findings of the ACE studies regarding the association between ACEs and the development of psychiatric symptomatology across the life span.

Chapman, Daniel P., Charles L. Whitfield, Vincent J. Felitti, Shanta R. Dube, Valerie J. Edwards, and Robert F. Anda. 2004. Adverse childhood experiences and the risk of depressive disorders in adulthood. *Journal of Affective Disorders* 82.2: 217–225.

Using data drawn (N = 9,460) from the Kaiser Permanente-CDC ACE Study, researchers found a dose-response relationship between ACE scores and the likelihood of both lifetime and recent depressive disorders, validating once more the lasting impact of adverse childhood experiences.

Dube, S. R., R. F. Anda, V. J. Felitti, D. P. Chapman, D. F. Williamson, and W. H. Giles. 2001. Childhood abuse, household dysfunction, and the risk of attempted suicide throughout the life span: Findings from the Adverse Childhood Experiences Study. *JAMA* 286.24: 3089–3096.

Drawing upon data from the Kaiser Permanente-CDC ACE Study, researchers found that all ACEs increased risk of suicide attempts 2- to 5-fold. Additionally, higher ACE scores were associated with attempted suicide both during adolescence and adulthood. Participants with ≥ 7 ACEs had a 31-fold increase in the risk of attempted suicide. Illicit drug use, depressed affect, and alcoholism partially mediated this association.

Edwards, Valerie J., George W. Holden, Vincent J. Felitti, and Robert F. Anda. 2003. Relationship between multiple forms of childhood maltreatment and adult mental health in community respondents: Results from the Adverse Childhood Experiences Study. *American Journal of Psychiatry* 160.8: 1453–1460.

Using the data from 8,667 participants in the Kaiser Permanente-CDC ACE Study, researchers found that as the number of abuse types increased, there was an overall trend toward poorer mental health, indicating a dose-response relation between ACEs and poor mental health. Researchers concluded that the differences in mental health scores with each additional ACE represented a real effect in terms of social functioning.

Merrick, Melissa T., Katie A. Ports, Derek C. Ford, Tracie O. Afifi, Elizabeth T. Gershoff, and Andrew Grogan-Kaylor. 2017. Unpacking the impact of adverse childhood experiences on adult mental health. *Child Abuse & Neglect* 69:10–19.

Using data drawn from the second wave (N = 7,456) of the Kaiser Permanente-CDC ACE Study, researchers investigated the usefulness of the expanded ACE measure (including being spanked as a child). A dose-response relationship emerged between the expanded ACE score and moderate to heavy drinking, drug use, depressed affect, and suicide attempts. The study found that being spanked as a child was significantly associated with all mental health outcomes.

Read, John, Paul Fink, Thom Rudegeair, Vincent Felitti, and Charles Whitfield. 2008. Child maltreatment and psychosis: A return to a genuinely integrated bio-psycho-social model. *Clinical Schizophrenia & Related Psychoses* 2.3: 235–254.

Researchers provide a comprehensive review of studies demonstrating a link between child maltreatment and psychosis. Considering the reviewed studies, the researchers advocate for a return to the earlier stress-vulnerability model, which focused on the causal influence of life events on psychological disorders as opposed to the current tendency to consider psychosocial factors as mere triggers or exacerbators of an underlying genetic predisposition.

Schilling, Elizabeth A., Robert H. Aseltine, and Susan Gore. 2007. Adverse childhood experiences and mental health in young adults: A longitudinal survey. *BMC Public Health* 7.1: 30.

Using two waves of data collected from a representative sample of high school seniors (N = 1,093) followed into young adulthood, researchers found that all ACEs impacted at least one mental health outcome. Eight ACEs were linked to higher depressive symptoms, nine were linked to drug use, and eight were linked to antisocial behavior. Higher ACE scores were significantly associated with increases in depressive symptoms, drug use, and antisocial behavior.

Whitfield, Charles L., Shanta R. Dube, Vincent J. Felitti, and Robert F. Anda. 2005. Adverse childhood experiences and hallucinations. *Child Abuse & Neglect* 29.7: 797–810.

Using the dataset from the Kaiser Permanente-CDC ACE Study, researchers found a link between ACE scores and hallucinations affecting participants with and without a history of substance use. Risk of hallucination was increased 1.2- to 2.5-fold by any ACE. Participants with ≥ 7 ACEs had a 5-fold increase in the risk of reporting hallucinations.

Health Risk Behaviors

Behaviors linked to the leading causes of death and disability are known as “health risk behaviors.” These include alcohol and other illicit drug use, tobacco use, risky sexual behaviors (e.g., having unprotected sex, having a high number of sexual partners), behaviors that result in unintentional injuries or violence (e.g., carrying a weapon, getting into fights). Researchers have consistently documented links between ACEs and health risk behaviors.

Substance Use (Smoking, Alcohol, Illicit Drugs)

Two large studies found links between ACEs and smoking. Anda, et al. 1999 and Ford, et al. 2011 found that all types of ACEs were individually related to smoking. Anda, et al. 1999 also notes that depressed affect was more common among smokers than nonsmokers, suggesting that smoking may be a form of self-medicating or a way to cope with long-lasting negative affect among those who have experienced childhood adversity. Two ACE studies examined the links between childhood adversity and alcohol use. Dube, et al. 2002 and Anda, et al. 2002 document associations between ACEs and alcoholism for both those with and without histories of parental alcohol abuse. Dube, et al. 2006 examines this association across four birth cohorts and shows that ACE impact on early alcohol use is consistent across generations. Strine, et al. 2012 observes that different types of ACEs are related to alcohol use for men and for women. Lee and Chen 2017 examines similarities in the association between ACEs and alcohol use in men and women, noting differences across race and ethnicity. Dube, et al. 2003 notes links between high ACE scores and illicit drug use problems, addiction to illicit drugs, and parenteral drug use. These researchers advocated for more attention be given to potential forms of abuse and household dysfunction in pediatric practices to reduce later drug use.

Anda, Robert F., Janet B. Croft, Vincent J. Felitti, et al. 1999. Adverse childhood experiences and smoking during adolescence and adulthood. *JAMA* 282.17: 1652–1658.

Using data drawn (N = 9,215) from the Kaiser Permanente-CDC ACE Study, researchers found associations between each type of ACE and adolescent smoking initiation, ever smoking, and heavy smoking. Participants with ≥ 5 ACEs had a 2.8- to 5.1-fold increase in smoking behaviors. Researchers also found that depressed affect was more common among smokers than nonsmokers, suggesting that smoking may be a form of self-medication to deal with negative affect.

Anda, Robert F., Charles L. Whitfield, Vincent J. Felitti, et al. 2002. Adverse childhood experiences, alcoholic parents, and later risk of alcoholism and depression. *Psychiatric Services* 53.8: 1001–1009.

Using the data (N = 9,346) of the Kaiser Permanente-CDC ACE Study, researchers found ACE scores were associated with self-reported alcoholism and depression, regardless of parental alcohol use. The observed association between parental alcohol abuse and participant depression was mediated by ACE scores among those with histories of parental alcohol abuse, suggesting that alcohol use may be a form of self-medication to deal with negative affect related to ACEs.

Dube, Shanta R., Robert F. Anda, Vincent J. Felitti, Valerie J. Edwards, and Janet B. Croft. 2002. Adverse childhood experiences and personal alcohol abuse as an adult. *Addictive Behaviors* 27.5: 713–725.

Using the data from Wave 2 (N = 8,629) of the Kaiser Permanente-CDC ACE Study, researchers found a link between each ACE type and adult alcohol outcomes among participants both with and without a history of parental alcohol abuse. Risk of self-reported alcoholism,

heavy drinking, and marrying an alcoholic were increased 2- to 4-fold for participants with ≥ 4 ACEs, regardless of parental alcoholism.

Dube, Shanta R., Vincent J. Felitti, Maxia Dong, Daniel P. Chapman, Wayne H. Giles, and Robert F. Anda. 2003. Childhood abuse, neglect, and household dysfunction and the risk of illicit drug use: The Adverse Childhood Experiences Study. *Pediatrics* 111.3: 564–572.

Using Wave 2 data (N = 8,613) from four birth cohorts of the Kaiser Permanente–CDC ACE Study, researchers found that each type of ACE increased early drug initiation (by age fourteen) 2- to 4-fold. ACE scores were strongly related to all drug-related outcomes. Participants with >5 ACEs were 7 to 10 times more likely to report illicit drug use problems, addiction to illicit drugs, and parenteral drug use.

Dube, Shanta R., Jacqueline W. Miller, David W. Brown, et al. 2006. Adverse childhood experiences and the association with ever using alcohol and initiating alcohol use during adolescence. *Journal of Adolescent Health* 38.4: 444e1–444e10.

Using the data (N = 8,417) from four birth cohorts (1900–1931, 1932–1946, 1947–1961, and 1962–1978) of the Kaiser Permanente–CDC ACE Study, researchers found that all ACE types except physical neglect increased the likelihood of alcohol use. Among alcohol users, early onset of alcohol use (by age fourteen) increased 2- to 4-fold with each ACE type. Results suggest ACE impact on adolescent alcohol use is present across generations.

Ford, Earl S., Robert F. Anda, Valerie J. Edwards, et al. 2011. Adverse childhood experiences and smoking status in five states. *Preventive Medicine* 53.3: 188–193.

Using data collected in 2008 via a random-digit-dialed telephone survey of participants (N = 25,809) in five US states, researchers found that each type of ACE was associated with smoking. Participants with ≥ 5 ACEs had a 2.2-fold increase in the likelihood of being a current smoker and a 1.8-fold increase of having ever smoked.

Lee, Rosalyn D., and Jieru Chen. 2017. Adverse childhood experiences, mental health, and excessive alcohol use: Examination of race/ethnicity and sex differences. *Child Abuse & Neglect* 69:40–48.

Using data collected in 2010 via a random-digit-dialed telephone survey of participants (N = 60,598) in ten US states and the District of Columbia, researchers found that ACE types were associated with depression and excessive alcohol use, but that sex did not moderate any relationships. Race/ethnicity moderated the relationship between ACEs and heavy drinking.

Strine, Tara W., Shanta R. Dube, Valerie J. Edwards, et al. 2012. Associations between adverse childhood experiences, psychological distress, and adult alcohol problems. *American Journal of Health Behavior* 36.3: 408–423.

Using the data (N = 7,279) of the Kaiser Permanente–CDC ACE Study, researchers found that different types of ACEs were related to psychological distress that mediated the relationship between ACEs and alcohol use for men and for women.

Risky Sexual Behaviors

Risky sexual behaviors are those behaviors that increase the risk of contracting or transmitting sexual transmissible infections or heighten the likelihood of unplanned pregnancy. Having a high number of sexual partners, engaging in sexual contact without a condom, and inconsistent use of birth control are considered risky sexual behaviors. Hillis, et al. 2000 documents a high rate of sexually transmitted diseases among men and women linked to high ACE scores. Hillis, et al. 2001 finds associations between several risky sexual behaviors and ACEs in a large sample of adult women. Using a large sample of adult males, Anda, et al. 2001 connects childhood sexual and physical abuse and witnessing domestic violence with the likelihood of male participants impregnating an adolescent during adolescence or adulthood. Hillis, et al. 2004 examines the impact of ACEs on adolescent pregnancy and fetal death. The study findings confirmed a link between ACEs and adolescent pregnancy. In the absence of ACEs, adolescent pregnancy did not result in psychosocial consequences, suggesting that teenage pregnancy alone is not the cause of these detrimental outcomes. Naramore, et al. 2017 compares ACEs of youth

with history of arrests related to trading sex with other youth with histories of juvenile arrests and shows that those involved in trading sex had higher ACE scores.

Anda, R. F., V. J. Felitti, D. P. Chapman, et al. 2001. Abused boys, battered mothers, and male involvement in teen pregnancy. *Pediatrics* 107.2: e19.

Using the data from male participants (N = 4,127) of the Kaiser Permanente-CDC ACE Study, researchers examined links between three types of ACEs (physical abuse, sexual abuse, and domestic violence against their mother) and found that all three were associated with an increased risk of impregnating an adolescent girl when the male participants were adolescents and when they were adults.

Hillis, Susan D., Robert F. Anda, Shanta R. Dube, Vincent J. Felitti, Polly A. Marchbanks, and James S. Marks. 2004. The association between adverse childhood experiences and adolescent pregnancy, long-term psychosocial consequences, and fetal death. *Pediatrics* 113.2: 320–327.

Using the data from female participants (N = 9,159) of the Kaiser Permanente-CDC ACE Study, researchers found links between ACEs and adolescent pregnancy and fetal death. The link between ACEs and adolescent pregnancy was strong and increased with each additional ACE. However, in the absence of ACEs, adolescent pregnancy did not increase the likelihood of psychosocial sequelae (family, job, and financial problems; high stress; uncontrollable anger) commonly attributed to adolescent pregnancy.

Hillis, Susan D., Robert F. Anda, Vincent J. Felitti, Dale Nordenberg, and Polly A. Marchbanks. 2000. Adverse childhood experiences and sexually transmitted diseases in men and women: A retrospective study. *Pediatrics* 106.1: e11–e11.

Using the data (N = 9,323) of the Kaiser Permanente-CDC ACE Study, researchers found a strong dose-response relationship between ACEs and a self-reported history of sexually transmitted diseases. A similar pattern was observed for men. Participants reporting six or seven ACEs were five times more likely to report an STD than those reporting no ACEs.

Hillis, Susan D., Robert F. Anda, Vincent J. Felitti, and Polly A. Marchbanks. 2001. Adverse childhood experiences and sexual risk behaviors in women: A retrospective cohort study. *Family Planning Perspectives* 33.5: 206–211.

Using the data from female participants (N = 5,030) of the Kaiser Permanente-CDC ACE Study, researchers found a links between ACEs and sexual risk behaviors, including early onset of intercourse, thirty or more sexual partners, and self-perception as being at risk for AIDS.

Naramore, Rachel, Melissa A. Bright, Nathan Epps, and Nancy S. Hardt. 2017. Youth arrested for trading sex have the highest rates of childhood adversity: A statewide study of juvenile offenders. *Sexual Abuse: A Journal of Research and Treatment* 29.4: 396–410.

Researchers compared the ACEs of 102 offending youth who were arrested for offenses related to trading sex with ACEs of other youth detained by juvenile justice in Florida. ACE scores were higher among youth involved in trading sex. Notably, youth involved in trading sex reported high rates of sexual abuse and physical neglect in comparison to other youth. Article first published online 3 September 2015.

Violence/Delinquency/Criminality Risks

The outcomes of ACE studies consistently align with child development and criminology research by highlighting the association between experiencing multiple types of childhood adversity and exhibiting pronounced problems with interpersonal functioning, aggression, and offending behaviors. Miller, et al. 2011 finds a strong relationship between ACEs and being involved in dating violence as a victim, perpetrator, or both. Whitfield, et al. 2003 examines the association of childhood physical abuse, childhood sexual abuse, and witnessing domestic violence with later intimate partner violence. These researchers found that, for men, there was a strong relationship between these types of ACEs and perpetrating intimate partner violence later in life. Roberts, et al. 2011 explores differences in the types of ACEs that were associated with perpetration of intimate partner violence for men and women. The authors also found that recent stresses, when

combined with a history of high numbers of ACEs, increased the likelihood of perpetrating intimate partner violence. Using a large nationally representative sample of US high school students, Duke, et al. 2010 explores links between each ACE type and interpersonal violence. The strength of the associations of these outcomes differed among boys and girls. Among boys, a history of physical and/or sexual abuse was a strong risk factor for dating violence perpetration, weapon-carrying, and self-directed violence. Reavis, et al. 2013 compares ACEs among male offenders, including nonsexual child abusers, domestic violence offenders, sexual offenders, and stalkers, with ACEs of a normative group of male participants. The study found that male offenders were more likely to report a high number of ACEs than the normative group, with sexual offenders and child abusers reporting sexual abuse more often than domestic violence or stalking offenders. Stinson, et al. 2016 notes that higher ACE scores among hospitalized psychiatric patients were related to earlier psychiatric hospitalization, younger age at first arrest, and earlier incidents of aggression. However, when foster care placement was incorporated into the models, the impact of ACEs on outcomes was partially or fully mediated, indicating that ACEs alone may not be the best predictor of early onset of delinquency and psychiatric problems. Baglivio, et al. 2015 and Fox, et al. 2015 examine the association between ACEs and offending patterns among juvenile justice-involved youth, finding that ACEs are linked to chronic, serious, and violent offending patterns. Similarly, Levenson and Socia 2015 documents that ACEs are linked to arrest patterns of sex offenders.

Baglivio, Michael T., Kevin T. Wolff, Alex R. Piquero, and Nathan Epps. 2015. The relationship between adverse childhood experiences (ACE) and juvenile offending trajectories in a juvenile offender sample. *Journal of Criminal Justice* 43.3: 229–241.

Using data from a sample of juvenile justice-involved youth (N = 64,000), researchers examined the association between ACEs and offending trajectories. Experiencing multiple ACEs distinguished youth with early-onset and chronic offending from youth with less persistent patterns of offending. Results highlight the need to provide trauma-informed therapies to reduce the detrimental impact of multiple ACE exposures on risk for offending and violence.

Duke, Naomi N., Sandra L. Pettingell, Barbara J. McMorris, and Iris W. Borowsky. 2010. Adolescent violence perpetration: Associations with multiple types of adverse childhood experiences. *Pediatrics* 125.4: e778–e786.

Using survey data from 136,549 high school students, researchers found that each ACE type was associated with adolescent interpersonal violence perpetration (delinquency, bullying, physical fighting, dating violence, weapon-carrying on school property). Additionally, each ACE was linked to self-harming behavior and suicide ideation and attempts. The impact of ACEs on delinquency and violence increased with each additional ACE.

Fox, Bryanna Hahn, Nicholas Perez, Elizabeth Cass, Michael T. Baglivio, and Nathan Epps. 2015. Trauma changes everything: Examining the relationship between adverse childhood experiences and serious, violent and chronic juvenile offenders. *Child Abuse & Neglect* 46:163–173.

Using data from a sample of juvenile justice-involved youth (N = 22,575), researchers found that the prevalence of ACEs was higher among serious, violent, and chronically delinquent youth compared to youth with less serious involvement in delinquency. Researchers suggest that the ACE score may be a useful screening tool for identifying youth at greatest risk for serious, violent, and chronic delinquency.

Levenson, Jill S., and Kelly M. Socia. 2015. Adverse childhood experiences and arrest patterns in a sample of sexual offenders. *Journal of Interpersonal Violence* 31.10: 1883–1911.

Using data from a sample of sexual offenders (N = 740), researchers found that ACE scores were correlated with number of arrests. High ACE scores were most common among chronic rapists of adults. Certain types of ACEs—specifically child sexual abuse, emotional neglect, and domestic violence—were associated with a higher number of arrests for sex crimes. These findings highlight the importance of integrating trauma-informed models into sex offender treatment.

Miller, Elizabeth, Joshua Breslau, W. -J. Joanie Chung, Jennifer Greif Green, Katie A. McLaughlin, and Ronald C. Kessler. 2011. Adverse childhood experiences and risk of physical violence in adolescent dating relationships. *Journal of Epidemiology and*

Community Health 65.11: 1006–1013.

Using a representative sample of US English speakers (N = 5,030), researchers found that ACEs increased the risk of being in a dating relationship in which physical violence occurs, either as a perpetrator, victim, or both. Participants with >5 ACEs were 6 to 8 times more likely to report dating violence. Estimations of population attributable risk (PAR) proportions suggest that childhood adversities account for approximately half of all dating violence cases.

Reavis, James A., Jan Looman, Kristina A. Franco, and Briana Rojas. 2013. Adverse childhood experiences and adult criminality: How long must we live before we possess our own lives? *Permanente Journal* 17.2: 44–48.

Researchers compared ACEs reported by a normative group of adult male subjects (N = 7,970) with ACEs reported by four groups (nonsexual child abusers, domestic violence offenders, sexual offenders, and stalkers) of male offenders (N = 151) and found much higher rates of ACEs among offenders. Four times as many offender participants reported >3 ACEs in comparison to the normative group.

Roberts, Andrea L., Katie A. McLaughlin, Kerith J. Conron, and Karestan C. Koenen. 2011. Adulthood stressors, history of childhood adversity, and risk of perpetration of intimate partner violence. *American Journal of Preventive Medicine* 40.2: 128–138.

Using 2004–2005 survey data from US adults (N = 34,653) participating in the National Epidemiologic Survey, researchers found differences in ACEs associated with perpetration of intimate partner violence for men and women. Additionally, researchers found that recent stresses heightened the likelihood of perpetration of intimate partner violence for those with high ACE scores when compared to those with low ACE scores.

Stinson, Jill D., Megan A. Quinn, and Jill S. Levenson. 2016. The impact of trauma on the onset of mental health symptoms, aggression, and criminal behavior in an inpatient psychiatric sample. *Child Abuse & Neglect* 61:13–22.

Using data from a sample of adult residents (N = 381) of a forensic psychiatric hospital, researchers found that higher ACE scores were related to earlier psychiatric hospitalization, younger age at first arrest, and earlier incidents of aggression. When including foster care placement to the models, the impact of ACEs on outcomes was partially or fully mediated.

Whitfield, Charles L., Robert F. Anda, Shanta R. Dube, and Vincent J. Felitti. 2003. Violent childhood experiences and the risk of intimate partner violence in adults. *Journal of Interpersonal Violence* 18.2: 166–185.

Using the data from Wave 2 (N = 8,629) of the Kaiser Permanente-CDC ACE Study, researchers examined links between three types of ACEs related to childhood violence (physical abuse, sexual abuse, and domestic violence against their mother) and found that, for men, there was a strong graded relationship between the number of these types of experiences and the risk of subsequently perpetrating intimate partner violence.

Victimization Risk

The few ACE studies that have focused on the connections between ACEs and victimization collaborate a growing body of research documenting the disproportionate risk for further victimization among those who have experienced child maltreatment, particularly sexual abuse. Whitfield, et al. 2003 examines the association of childhood physical abuse, childhood sexual abuse, and witnessing domestic violence with later experiences of intimate partner violence. These researchers found that, for women, there was a strong relationship between these types of ACEs and later victimization in intimate partner violence. Ports, et al. 2016 finds a correlation between ACE scores and the likelihood of sexual victimization in adulthood. Reid, et al. 2017 observes that youth with official reports of abuse related to human trafficking had higher ACE scores than youth without such histories. Sexual abuse was a strong predictor of victimization in human trafficking for both boys and girls.

Ports, Katie A., Derek C. Ford, and Melissa T. Merrick. 2016. Adverse childhood experiences and sexual victimization in adulthood. *Child Abuse & Neglect* 51:313–322.

Using the data from Wave 2 (N = 7,272) of the Kaiser Permanente-CDC ACE Study, researchers examined the impact of ACEs on the likelihood of sexual victimization in adulthood. Findings showed that as the ACE score increased, so did the risk of experiencing sexual victimization in adulthood. With all ACEs in a regression model, sexual abuse was the strongest predictor of adult sexual victimization, followed by emotional abuse and physical abuse.

Reid, Joan A., Michael T. Baglivio, Alex R. Piquero, Mark A. Greenwald, and Nathan Epps. 2017. Human trafficking of minors and childhood adversity in Florida. *American Journal of Public Health* 107.2: 306–311.

Researchers compared ACEs reported by 913 male and female youth with histories of official abuse reports related to human trafficking to a matched sample. ACE scores were higher among youth with human trafficking abuse reports. Sexual abuse was the strongest predictor—sexually abused girls had a 2.5-fold risk and sexually abused boys had an 8.2-fold risk for human trafficking victimization when compared with youth without histories of sexual abuse.

Whitfield, Charles L., Robert F. Anda, Shanta R. Dube, and Vincent J. Felitti. 2003. Violent childhood experiences and the risk of intimate partner violence in adults. *Journal of Interpersonal Violence* 18.2: 166–185.

Using the data from Wave 2 (N = 8,629) of the Kaiser Permanente-CDC ACE Study, researchers examined links between three types of ACEs related to childhood violence (physical abuse, sexual abuse, and domestic violence against their mother) and found that, for women, there was a strong graded relationship between the number of these types of experiences and the risk of intimate partner violence victimization.

Measurement and Methodological Issues

As with all research, several limitations to ACE research have been observed. Several studies have addressed and attempted to mitigate these limitations. First, the term “adverse childhood experiences” overlaps with numerous other terms commonly used by researchers to describe similar constructs, such as “childhood trauma,” “juvenile victimization,” and “child maltreatment.” Kalmakis and Chandler 2014 systematically reviews 128 empirical studies and, based on the results of the literature review, operationalizes “adverse childhood experiences.” The term was operationalized as “childhood events, varying in severity and often chronic, occurring in a child’s family or social environment that cause harm or distress, thereby disrupting the child’s physical or psychological health and development” (p. 1489). This step of operationalizing the somewhat vague construct may prove beneficial for future researchers when measuring ACEs. Other commonly noted limitations of the Kaiser Permanente-CDC ACE Study and related articles involve the data collection procedures, the study sample, and the choice of ACE types to include in the ACE score. Finkelhor, et al. 2013 notes that the data were retrospectively collected from middle-age adults. The considerable passage of time between experiences that occurred in childhood and the collection of data could result in the omission of some critical types of ACEs. Finkelhor, et al. 2015 explored additional types of ACEs using data collected from a youth survey (collected when the youth were ten to seventeen years old) and found that peer victimization, peer isolation/rejection, community violence exposure, and low socioeconomic status improved the prediction of problematic mental health and physical health outcomes. Confirming the impact of community context on ACEs, Baglivio, et al. 2017 observes that community disadvantage is related to ACE scores in a sample of juvenile-justice youth. Similarly, Cronholm, et al. 2015 notes limitations in the Kaiser Permanente-CDC ACE Study sample. Data were predominantly collected from white, middle- and upper-middle-class participants, and ACE types focused on experiences within the home. Using data from a more representative sample, these researchers expanded the items included in the ACE measure to more accurately represent adversity experienced across various sociodemographic groups. Mersky, et al. 2016 utilizes more advanced quantitative analyses to explore interrelated ACE items and analytically identify an ACE measure associated with health risks. Relatedly, ACE studies have been largely limited to samples from developed countries. Anda, et al. 2010 points to studies conducted in developing African and Asian countries and calls for the building of a framework for global ACE research.

Anda, Robert F., Alexander Butchart, Vincent J. Felitti, and David W. Brown. 2010. Building a framework for global surveillance of the public health implications of adverse childhood experiences. *American Journal of Preventive Medicine* 39.1: 93–98.

These researchers summarize significant findings from ACE studies. However, they also observe that the majority of ACE studies have been conducted in developed countries. They reviewed findings from several ACE studies conducted in developing countries, noting the similarities across study findings in both developed and developing countries. In conclusion, they advocate for a framework for global surveillance of the prevalence and public health impact of ACEs that is feasible given the financial and structural limitations of developing countries.

Baglivio, Michael T., Kevin T. Wolff, Nathan Epps, and Randy Nelson. 2017. Predicting adverse childhood experiences: The importance of neighborhood context in youth trauma among delinquent youth. *Crime & Delinquency* 63.2: 166–188.

Using data from a sample of juvenile justice-involved youth (N = 59,342), researchers examined the effects of concentrated disadvantage and affluence on ACE scores. After controlling for demographics, family support, and parental employment, neighborhood context remained an important predictor of ACE scores, with youth living in poorer neighborhoods reporting higher ACE scores.

Cronholm, Peter F., Christine M. Forke, Roy Wade, et al. 2015. Adverse childhood experiences: Expanding the concept of adversity. *American Journal of Preventive Medicine* 49.3: 354–361.

The Kaiser Permanente-CDC ACE data were gathered predominantly from white, middle- and upper-middle-class participants and focused on experiences within the home. Using data collected from a large, representative, community-based health survey of adults in southeastern Pennsylvania (N = 1,784), researchers found that an expanded ACE measure more accurately represented the level of adversity experienced across various sociodemographic groups.

Finkelhor, David, Anne Shattuck, Heather Turner, and Sherry Hamby. 2013. Improving the Adverse Childhood Experiences Study scale. *JAMA Pediatrics* 167.1: 70–75.

Researchers noted limitations of the Kaiser Permanente-CDC ACE Study model. More specifically, data were gathered retrospectively from adults, many years after childhood, which may have resulted in the omission of important risk factors. Using data from telephone interviews with a nationally representative sample (N = 2,030) of youth, researchers found that the ACE scale was improved with the inclusion of some additional childhood adversities and the exclusion of others.

Finkelhor, David, Anne Shattuck, Heather Turner, and Sherry Hamby. 2015. A revised inventory of Adverse Childhood Experiences. *Child Abuse & Neglect* 48:13–21.

Using data from telephone interviews with a nationally representative sample (N = 1,949) of youth, researchers found that the ACE scale was more predictive of mental health and physical health outcomes with the inclusion some additional childhood adversities (peer victimization, peer isolation/rejection, community violence exposure, low socioeconomic status). Based on the study findings, the researchers propose a revised ACE measure.

Kalmakis, Karen A., and Genevieve E. Chandler. 2014. Adverse childhood experiences: Towards a clear conceptual meaning. *Journal of Advanced Nursing* 70.7: 1489–1501.

The researchers note that the concept of “adverse childhood experiences” has not been consistently labeled, operationalized, or measured across empirical studies. To systematically clarify the concept, researchers reviewed 128 articles published from 1970 to 2013. Based on the comprehensive literature review, adverse childhood experience was operationalized.

Mersky, Joshua P., Colleen E. Janczewski, and James Topitzes. 2016. Rethinking the measurement of adversity. *Child Maltreatment* 22.1: 58–68.

Using exploratory factor analysis, researchers analyzed 10 ACE items used in the Keiser Permanente-CDC Study plus 7 additional ACE items to advance to a more analytical, systematic approach to identifying types of ACEs associated with health risks. The 10 conventional ACE items and 6 out of 7 of the new ACE items were intercorrelated and related to health risks. This study provides a groundwork for future advancement in ACE measurement and analyses.

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