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Preventing Adverse Childhood Experiences: The Role of Etiological, Evaluation, and Implementation Research

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Abstract

Research on adverse childhood experiences is a vital part of the data-to-action link and the development of evidence-based public health and violence prevention practice. Etiological research helps to elucidate the key risk and protective factors for adverse childhood experiences and outcome research examines the consequences of exposure to them. Evaluation research is critical to building the evidence base for strategies that are likely to have a significant impact on preventing and reducing adverse experiences during childhood. Implementation research efforts inform the movement and scale-up of evidence-based findings to public health practice. The Centers for Disease Control and Prevention's Division of Violence Prevention located in the National Center for Injury Prevention and Control is investing in a number of research initiatives that are designed to advance what is known about the causes and consequences of adverse childhood experiences (i.e., etiological research), the strategies that are effective at reducing and preventing them (i.e., evaluation research), and how to best adapt and scale effective strategies (i.e., implementation research). This article complements the other articles in this Special Supplement by briefly providing a review of reviews for each of these areas and highlighting recent research investments and strategic directions by the Centers for Disease Control and Prevention in the area of child abuse and neglect and adverse childhood experience prevention.

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SUPPLEMENT NOTE

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Research investments are critical to advancing the evidence base on the prevention of adverse childhood experiences and to ensure safe, stable, and nurturing relationships and environments so that all children can live to their fullest potential.

INTRODUCTION

Adverse childhood experiences (ACEs) are a public health concern. ACEs are preventable, potentially traumatic events that occur in childhood (age 0–17 years) such as experiencing violence, including child abuse and neglect (CAN); witnessing violence in the home or community; and having a family member attempt or die by suicide.^{1,2} The aspects of a child’s environment that undermine their sense of safety, stability, and bonding, such as growing up in a household with substance misuse; mental health problems; or instability because of parental separation or incarceration of a parent, sibling, or other household members, have also been included.² These examples do not comprise an exhaustive list of ACEs because there are other stressors that can impact health and well-being (e.g., community violence).³ ACEs often occur together; can result in toxic stress; and are associated with a range of adverse behavioral, health, and social outcomes, including substance use, suicide, overweight/obesity, lower education and earnings potential, and chronic diseases such as heart disease.⁴ Prevention of ACEs is a public health imperative considering that an estimated 61% of adults surveyed across 25 states reported that they experienced 1 ACE, nearly 1 in 6 reported that they experienced 4 ACEs, and at least 5 of the top 10 leading causes of death are associated with ACEs.⁴ ACEs are also associated with substantial economic, health, and societal costs.⁵

The primary prevention of ACEs (i.e., preventing ACEs among children before they occur) and enhancing positive childhood experiences (PCEs) have the potential to promote lifelong health benefits so that all individuals can live to their fullest potential. PCEs increase the likelihood of successful and healthy development.⁶ They include a sense of connectedness with others, participating in community traditions, feeling a sense of belonging, and feeling safe and protected at home.⁶ PCEs also have the potential to mitigate the impact of ACEs on health and have been associated with better health in adulthood,⁶ cardiovascular health among adults,⁷ and reduced recidivism and rearrest among youth.⁸

Because ACEs are preventable, public health uses a systematic, scientific approach for understanding and preventing violence.⁹ The public health approach provides a roadmap for how to use data and research to drive and inform public health action (i.e., programs, policies, and practices designed to prevent and reduce violence) and includes 4 interconnected steps: (1) define the problem, (2) identify risk and protective factors, (3) develop and test prevention strategies, and (4) assure widespread adoption. To prevent ACEs, it is imperative to have accurate data to define the magnitude of the problem. Research on the risk and protective factors for ACEs informs the development of prevention strategies to address them. Next, prevention strategies are tested for effectiveness in preventing or reducing ACEs. Finally, effective strategies are disseminated broadly and are widely adopted at scale to produce population-level impacts.

Research is an integral part of public health efforts to prevent ACEs. This article defines the types of research that apply to the public health model, briefly summarizes recent systematic reviews and meta-analyses on the topic (i.e., a nonsystematic review of reviews), and describes U.S. Centers for Disease Control and Prevention (CDC) research investments to understand and prevent ACEs so that all children can live to their fullest potential.

TYPES OF PUBLIC HEALTH RESEARCH: DEFINITIONS

Research is critical to understanding the causes, characteristics, and consequences of ACEs as well as the effectiveness of strategies to inform the primary prevention of ACEs. Etiological, evaluation, and implementation research advance an understanding of how to best prevent disease and injury and promote health. Etiological research aims to uncover the causes of disease. Ideally, etiological research establishes causation using retrospective case-control or prospective cohort designs. In ACEs research, etiological studies investigate risk and protective factors at multiple levels of the social-ecologic model. This model organizes risk and protective factors at the individual, relational, community, and societal levels¹⁰ and provides a comprehensive understanding of the complex causes of ACEs. Etiological research also focuses on social determinants of health—the conditions in the places where people live, learn, work, and play—that can shape and impact individual, community, and population health and well-being across the life course.¹¹ Etiological research can also involve formative research to better understand the context of ACEs across multiple levels of the social ecology.

Evaluation research shows whether prevention strategies implemented across the SEM are effective at preventing ACEs among diverse groups and populations (Guinn et al. in this issue discusses more on program evaluation).¹² Evaluation research uses rigorous experimental or quasi-experimental designs so that changes in exposure to ACEs can be attributed to the prevention strategy (i.e., produce causal inference). It is also important to examine whether prevention strategies produce intended effects and not unintended ones. Once prevention strategies are deemed effective and replicated without harmful effects, they are ready for widespread adoption, implementation, and dissemination.

Implementation research complements evaluation research because “...the intent is to understand what, why, and how interventions work in ‘real-world’ settings and to test approaches to improve them.”¹³ The field of implementation research is broad and can consider how to best disseminate, translate, adapt, and sustain evidence-based strategies. Implementation research can also identify how to adapt prevention strategies so that they are effective at preventing ACEs among diverse groups, including racial/ethnic minorities who experience health disparities and bear a disproportionate burden of ACEs. In addition to engaging populations at increased risk through culturally acceptable approaches, interventions are needed to reduce health disparities and address the structural environments that drive the disproportionate exposure to ACEs.¹⁴ Although rigorous study designs are ideal with etiological and evaluation research, implementation research is typically conducted in real-world settings, making it critical to capture the context in which the strategies are operating (e.g., social, environmental, and economic).¹³ It is also important to use multimethod study designs, including a collection of quantitative and qualitative data,

to study implementation by capturing diverse perspectives to uncover how to best prevent ACEs within diverse communities.¹⁵

Appendix Figure 1 (available online) provides a framework depicting how implementation research is one component of the broader umbrella of implementation science. The framework links together research, evaluation, and dissemination to effectively translate research into practice and utilize knowledge gained from practice to inform research, which illustrates the linked and recursive nature of the public health model.

SUMMARY OF RESEARCH ON ADVERSE CHILDHOOD EXPERIENCES

The following sections provide a brief overview of the etiological, evaluation, and implementation research literature on ACEs. The authors provide a nonsystematic review of reviews, relying mainly on published systematic reviews and meta-analyses where possible. Currently, there is no existing review of reviews on ACEs prevention. For research areas without reviews and meta-analyses, a focused literature search was conducted to identify the research articles published within the last 10 years. Next, this paper describes examples of CDC's recent research activities in each of these areas and how findings can advance public health efforts to prevent ACEs. Information on CDC's investments in ACEs prevention, including research and programmatic initiatives, is reported elsewhere in this issue.

ETIOLOGICAL RESEARCH

Etiological research on ACEs shows that they have multiple causes, that their nature changes over time, and that there are short- and long-term consequences on violence and a range of health outcomes. Research on the risk and protective factors for individual ACEs are summarized in multiple systematic reviews and meta-analyses.¹⁶ Risk factors include parental trauma (i.e., intergenerational transmission of ACEs), families experiencing economic stress, families where corporal punishment is used, communities with easy access to drugs and alcohol, and communities with high rates of violence.¹⁷ Other potential risks for ACEs may include factors such as residential segregation, mass incarceration, and anti-immigrant policies.^{18,19} These factors may also be related to family stress—in the form of economic stress and parental stress—which is another risk factor for ACEs.²⁰ However, research on the risk and protective factors for multiple, cumulative ACEs (i.e., the ACE Score) is not well developed. The field does not have a clear understanding of the sequelae of ACEs leading to other ACE exposures, individual and synergistic impacts of multiple ACE exposures, impacts of community- and societal-level factors causing or ameliorating ACEs, impact of the complex drivers of health disparities, and sources of PCEs and how they interact with ACEs.^{21–23}

The impact of ACEs on short- and long-term health and behavioral outcomes has been widely studied. Multiple systematic reviews and meta-analyses summarize the relationship between ACEs and chronic disease outcomes, biomarkers, violence, physical health, mental health, and resilience. There are strong and consistent relationships between ACEs and chronic diseases in childhood and adulthood. For example, ACEs are related to asthma, cognitive development, infections, somatic complaints, and sleep disruption.^{24–26} The

mechanisms through which ACEs influence chronic disease outcomes include social disruption, health behaviors, and chronic stress.²⁷ ACEs are also related to several well-established risk behaviors, including illicit drug use, problematic alcohol use, physical inactivity, and sexual risk taking in adulthood.^{5,22,26}

Research also documents the relationship between ACEs and mental health and behavioral outcomes. One systematic review found that exposure to emotional abuse and neglect during childhood held the strongest associations with adult depression than sexual abuse, physical abuse, and domestic violence.²⁸ ACEs are associated with psychopathy, psychosis, bipolar disorder, and suicidality in adulthood,^{29–32} and there are strong associations between ACEs and violence throughout the lifespan. Women who report ACEs, especially sexual and physical abuse, are at a higher risk of experiencing intimate partner violence, lower self-esteem, and poor health outcomes.³³ There is some evidence for the intergenerational transmission of ACEs, with moderate effect sizes across studies.³⁴ Several reviews considered resilience. They found that positive emotionality and coping, empathy, self-reliance, cognitive processing, stable family environments, positive parenting, supportive relationships with adults/teachers, safe schools, and community cohesion were related to resilience after exposure to ACEs.^{35–38} Studies also suggest a dose–response relationship between PCEs and outcomes measured in adulthood.^{6,7,39}

Studies investigated the characteristics or nature of adversity to see whether the following factors are important drivers of short- and long-term health: type, severity, frequency, developmental timing, relationship to perpetrator, and proximity. One study proposed a topographical model that specifies the neurodevelopmental impacts of ACEs.⁴⁰ The model posits that negative outcomes depend on the nature of the ACE, individual factors, and positive/negative features of the social and physical environment and speaks to the importance of examining ACEs and PCEs in context.⁴⁰ Studies investigating the types of ACE exposure report distinct patterns among preschool children experiencing multiple forms of family violence and abuse and exposure to harsh and inconsistent parenting and others who experience low exposure to adversity.⁴¹ Children exposed to multiple forms of family violence tended to live in low-income families with parents who reported trauma during their own childhood and reported higher levels of mental distress.

The severity of ACEs is often measured according to the likelihood that an event will result in long-term physical or emotional harm.⁴² Both severity and frequency of child abuse are related to long-term psychological distress.⁴³ In terms of developmental timing, individuals who were exposed to CAN during early childhood were twice as likely to develop post-traumatic stress disorder symptoms as those exposed during other developmental periods.⁴⁴ Furthermore, both direct and indirect exposures to adversity and violence during childhood are related to externalizing behavior in adolescents.⁴⁵

EVALUATION RESEARCH

Rigorous evaluations examine the effectiveness of prevention strategies and approaches on the primary prevention of violence as well as on social, economic, and other outcomes among children, families, and their communities. CDC developed a suite of technical

packages⁴⁶ and other resources^{1,47} to summarize the best available evidence to prevent violence for use by states and communities. Strategies that have been rigorously evaluated for preventing or reducing ACEs include strengthening economic supports for families, promoting social norms to protect against violence, ensuring a strong start for children, teaching prosocial skills, connecting youth to caring adults, and intervening to lessen the harms of ACEs.¹ Examples of specific approaches under these strategies include legislation that reduces corporal punishment, preschool enrichment programs, safe dating and healthy relationship skills programs, mentoring programs, enhanced primary care, and victim-centered services that may be effective at preventing the intergenerational transmission of ACEs.¹

Despite the available evidence, research is still needed to expand the evidence base to prevent ACEs or mitigate their harms. Studies can address important gaps by identifying the potential mediators of evidence-based programs, policies, and practices, including the impact of health inequities on program effectiveness. It is also important to screen and recruit participants into longitudinal studies and include children aged 6 years who are most likely to experience ACEs. Future research might also assess biomarkers among children (e.g., cortisol levels) to assess the efficacy of interventions and link them to adult health outcomes. Research is also needed to determine the effectiveness of strategies on preventing the intergenerational transmission of ACEs.¹⁷ As with other areas of violence prevention, there continues to be a need to develop the evidence base for ACEs prevention at the community and societal levels that may reduce inequities in exposure to ACEs.¹⁰ This includes research on state, local, and organizational implementation of policies that improve conditions in which children and their families live,⁴⁹ research on the impact of comprehensive prevention strategies that work across the social ecology and include resilience building and traumainformed support,^{5,50} and examination of other immediate and long-term benefits of these prevention strategies (e.g., youth academic progress and substance use).¹

IMPLEMENTATION RESEARCH

Implementation research is a necessary component of ACEs research to inform the scale-up of effective prevention strategies.⁵¹ However, there is limited implementation research that focuses specifically on strategies to prevent ACEs. A review of diverse prevention programs for children and adolescents (e.g., physical health, academic performance, violence, bullying, and positive youth development) suggest that key implementation factors are associated with better outcomes in all types of programs.⁵¹ Important factors include fidelity monitoring and provider training and supervision, which are critical components to reducing CAN in evidence-based home visiting programs.⁵² Similarly, quality of implementation (i.e., low attendance) was found to reduce aggressive behavior in school-based prevention programs. Context is particularly important: research shows that what is possible in controlled conditions might not be possible when programs are implemented within complex systems that include families, schools, and communities. Thus, understanding these important drivers of real-world effects requires additional research.⁵³

To open the black box of evidence-based programs aimed to prevent ACEs, research has begun to identify the core components of interventions and determine how well they are implemented in practice.^{51,54,55} Research found that core components of evidence-based programs include delivery method (e.g., order of curriculum sessions) and implementer characteristics (e.g., neighborhood advocates committed to program success).⁵⁵ Research is needed on adaptations of current evidence-based programs, such as home visiting models, for various populations, cultural groups, contexts, and settings^{56–58} as well as on the implementation of new, evidence-driven interventions.⁵⁸ Similarly, research can help to expand approaches to implementing evidence-based policies, such as the Earned Income Tax Credit (EITC). Two CDC Essentials for Childhood recipients are raising awareness of the EITC.⁵⁹ Specifically, Utah improved the reach of EITCs to additional populations, such as qualified Spanish-speaking families who may not otherwise receive the tax credit. Massachusetts supported the implementation of the EITC through training of staff to link families who believe that they are eligible to local programs and other community services, including tax preparation (www.mystreetcred.org).

A cost-benefit analysis of 2 evidence-based strategies—Child-Parent Centers and Nurse-Family Partnerships—found that both were cost saving from a societal perspective and a return on investment because of averted costs associated with CAN.⁶⁰ Additional research is needed to identify the costs of other evidence-based strategies⁵⁷ and to evaluate cost-effectiveness, cost-benefits, and cost savings of strategies to inform adoption and scale-up.⁶⁰ At the outer levels of the social ecology, research is needed on organizational and societal factors that influence uptake and sustainability.⁵⁴ For example, research on Massachusetts' EITC model could identify whether additional services improved the uptake and reach of the tax credits.

CENTERS FOR DISEASE CONTROL AND PREVENTION INVESTMENTS IN RESEARCH TO PREVENT ADVERSE CHILDHOOD EXPERIENCES

Centers for Disease Control and Prevention Division of Violence Prevention supports both extramural and intramural research to enhance the understanding of the causes, characteristics, and consequences of ACEs (Appendix Table 1, available online) as well as evaluation and implementation research (Appendix Table 2, available online). The Division of Violence Prevention supports etiological research focused on the identification of the risk and protective factors for ACEs, which are based on analyses of retrospectively collected surveillance data, qualitative cohort studies, and analyses of data from longitudinal studies. For example, estimates of ACEs prevalence from the 2011–2014 Behavioral Risk Factor Surveillance System in 23 U.S. states found higher ACEs exposures among respondents of Black, Hispanic, or multiracial groups, among those with less than high school education, among those with <\$15,000 yearly income, among who are unemployed or unable to work, and among those identifying as gay/lesbian or bisexual.⁶¹ To identify the factors that can disrupt intergenerational transmission of ACEs, CDC supported data analyses of longitudinal studies with assessments across multiple generations, lifetime experiences of ACEs, and measures of caregiver ACEs/PCEs.⁶²

To prevent the impacts of violence and other behaviors that are detrimental to children's health and well-being, CDC supports research to characterize ACEs. In a mixed-methods study, a nationally representative opt-in Internet panel survey of parents of young children indicated that 63% of parents spanked their children, and focus groups revealed the common perceptions diverse groups of parents use to contextualize the use of corporal punishment (Appendix Table 1, available online).⁶³ CDC also supports studies on the consequences of ACEs. For example, a 2019 Vital Signs analyzed ACEs scores from the Behavioral Risk Factor Surveillance System in 25 states from 2015 to 2017 to estimate the potential percentage reductions in many leading causes of morbidity and mortality if ACEs were prevented.⁴

Evaluation research is also supported by CDC through rigorous evaluations of innovative programs, policies, and practices across the social ecology to prevent or mitigate violence outcomes (Gervin et al. in this issue).⁶⁴ Studies include individual-level (e.g., treatment for at-risk children), relationship- and familial-level (e.g., parent skill building), community-level (e.g., social norms campaigns), and structural-level (e.g., policies) approaches. Appendix Table 2 (available online) provides examples of CDC-funded studies. For instance, several investigated how policies can strengthen the socioeconomic conditions of families to have the greatest potential for population-level impact by reaching entire communities. Over the past several years, CDC supported studies showing how economic supports for families and the promotion of family-friendly work policies are effective in reducing or mitigating ACEs (Appendix Table 2, available online). In particular, studies found significant associations between state EITCs,^{65–68} federal child tax credits,⁶⁹ state Medicaid expansions,⁷⁰ maternal homeownership,⁷¹ and paid parental leave policies⁷² on decreases in CAN and other ACEs.

Appendix Table 2 (available online) also provides examples of evaluations of public education campaigns that shift social norms to reframe the way people view CAN and ACEs, bystander approaches altering social norms and context of violence and abusive relationships, and mobilization of men and boys as allies to prevent violence. Although there is a strong evidence base demonstrating the effectiveness of early childhood visitation, skill building for healthy relationships, and mentoring programs, CDC continues to support innovative approaches delivered to populations disproportionately at risk for violence. For example, the short-term perinatal home visiting program Enhanced First Connections is being evaluated among mothers with a history of adversity or trauma on several outcomes, including CAN, child exposure to adult intimate partner violence, and family engagement in longer-term home visiting programs and specialized support services. These studies are intended to identify gaps and advance the field of ACEs prevention.

Implementation research is also supported by CDC, which includes studies of program adaptations (e.g., Manhood 2.0; Appendix Table 2, available online),⁷³ barriers to recruitment and retention,⁷⁴ and essential implementation factors for uptake among parenting programs in both rural and urban areas.⁷⁴ CDC-funded implementation research also examined ways to maximize adoption, implementation, and maintenance while retaining core components of a comprehensive teen dating violence prevention model.⁷⁵ Cost studies estimated the economic burden of child maltreatment in the U.S.,⁷⁶ calculated

cost savings to avert violence outcomes,⁷⁷ estimated cost–benefits of CAN prevention programs,⁶⁰ and calculated program implementation costs from the payer perspective.⁷⁸ In addition, CDC’s Violence Prevention in Practice online resource helps communities to select, adapt, implement, and evaluate evidence-based violence prevention strategies—providing a direct link between research and practice.⁴⁷

Implementing evidence-based practices can be challenged by poor dissemination and lack of accessibility to research. The Division of Violence Prevention’s 5-Year Strategic Vision prioritizes increasing the number of people exposed to effective violence prevention strategies by collaborating to disseminate, implement, and scale-up proven strategies.⁷⁹ CDC is invested in developing and utilizing an implementation science agenda to create and sustain connections among implementation research, knowledge translation, implementation practice support, and program evaluation and to enhance collaboration among research and practice within CDC and the field of violence prevention.

DISCUSSION AND FUTURE RESEARCH DIRECTIONS

Research is a critical part of the public health approach. Etiological, evaluation, and implementation research are needed to inform and build the evidence base for the primary prevention of ACEs. Research on risk and protective factors informs the development of prevention strategies, which are tested for effectiveness in preventing or reducing short- or long-term health outcomes, and the implementation of strategies disseminated broadly and at scale is evaluated to inform strategy improvement and future research.⁸⁰ As shown in this novel review of reviews, research on ACEs prevention to date has informed both the research-to-practice and practice-to-research pipelines. Future researchers can continue to learn from innovative, promising practicebased research for the prevention of ACEs.

It is important to take stock of the field and forge a strategy to move research forward to better prevent and mitigate ACEs.⁸¹ New discoveries regarding ACEs and PCEs are needed to frame future research and address emerging priorities, including a consideration of social determinants of health and other health-related disparities. Research suggests that the cumulative burden of ACEs is strongly associated with short- and long-term physical and mental health outcomes, including several leading causes of death such as opioid overdose and suicide. Emerging evidence also suggests that PCEs contribute to outcomes and play a key role in ameliorating the effects of adversity.³⁹ Research is needed to identify the modifiable factors, including PCEs, that can protect against ACEs risk across the lifespan.

IMPLICATIONS FOR PUBLIC HEALTH PRACTICE

This review indicates the importance of informing and building the evidence base so that effective strategies can be implemented to better prevent ACEs. CDC’s technical packages summarize the best available evidence to prevent violence so that federal, state, territorial, and local agencies can move evidence into frontline practice. These packages also shed light on lingering gaps in the evidence base to inform research.^{1,46} CDC’s research investments to date are focused on achieving safe, stable, nurturing relationships and environments so that all children, families, and communities can thrive.

Effective implementation of evidence-based prevention strategies and approaches depends on uptake and adoption by states and local communities. CDC supports programmatic initiatives to prevent ACEs, including Essentials for Childhood that supports state health department implementation of comprehensive ACEs prevention strategies through economic supports and social norms change (Ottley et al. in this issue)⁸² and Preventing Adverse Childhood Experiences: Data to Action (<https://www.cdc.gov/injury/fundedprograms/preventing-adverse-childhood-experiences/index.html>) to build state-level ACEs surveillance infrastructure and to implement ACEs prevention strategies on the basis of data (Guinn et al. and Anderson et al. in this issue).^{12,83} Both initiatives inform how to effectively disseminate, translate, and apply ACEs prevention strategies at scale.

The field can benefit from additional implementation research to systematically examine the factors needed to accelerate the adoption of strategies, core components of strategies required for culturally appropriate adaptations, and external factors that impact implementation efforts. For example, recent studies suggest that the coronavirus disease 2019 (COVID-19) pandemic and its social and economic consequences increased the occurrence of ACEs and other negative sequelae (e.g., substance misuse) for families and communities.^{84,85} Research is needed to understand how emerging public health crises might influence the prevention strategy design, decision making, implementation, and short- and long-term outcomes related to ACEs.

CONCLUSIONS

Preventing ACEs is critical in improving health throughout the lifespan and across multiple generations, particularly among racial/ethnic minority populations. Continuing to invest in etiological, evaluation, and implementation research—including research that highlights the unique circumstances of ACEs and PCEs among populations disproportionately at risk and exposed to myriad health disparities—will help to better understand and respond to prevent ACEs and advance health equity.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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