

Inside the Adverse Childhood Experience Score:
Strengths, Limitations, and MisapplicationsRobert F. Anda, MD, MS,¹ Laura E. Porter, BA,² David W. Brown, DSc, MScPH, MSc³

INTRODUCTION

Despite its usefulness in research and surveillance studies, the Adverse Childhood Experience (ACE) score is a relatively crude measure of cumulative childhood stress exposure that can vary widely from person to person. Unlike recognized public health screening measures, such as blood pressure or lipid levels that use measurement reference standards and cut points or thresholds for clinical decision making, the ACE score is not a standardized measure of childhood exposure to the biology of stress. The authors are concerned that ACE scores are being misappropriated as a screening or diagnostic tool to infer individual client risk and misapplied in treatment algorithms that inappropriately assign population-based risk for health outcomes from epidemiologic studies to individuals. Such assumptions ignore the limitations of the ACE score. Programs that promote the use of ACE scores in screening and treating individuals should receive the same rigorous and systematic review of the evidence of their effectiveness according to the standards applied to other screening programs by the U.S. Preventive Services Task Force (USPSTF).

INSIDE THE ADVERSE CHILDHOOD
EXPERIENCE SCORE

The ACE study, a collaborative effort between the U.S. Centers for Disease Control and Prevention and Kaiser Permanente to examine the relationships among 10 childhood stressors and a variety of health and social problems, has demonstrated how abuse, neglect, witnessing domestic violence, and childhood exposure to household dysfunctions are common and highly inter-related.¹ This inter-relatedness led the investigators to develop the ACE score, an integer count of 10 adverse experiences during childhood (range, 0–10), which has repeatedly demonstrated a strong, graded, dose-response relationship to numerous health and social outcomes (e.g., mental illness, illicit drug use, suicide risk, and risk for chronic diseases).¹ As a result, the ACE study has attracted significant scientific and policy attention.^{2–5} More recently, the ACE score has

gained attention through lay press and websites,^{6,7} and the ACE score is increasingly being used and promoted as a screening tool for use at the individual level.^{8,9}

Because the ACE score has a powerful relationship to the risk of many public health problems, it is useful for research and public health surveillance. ACE score use has expanded to most states in the U.S. via the Centers for Disease Control and Prevention–supported Behavioral Risk Factor Surveillance System¹⁰ and internationally through the efforts of WHO.¹¹ The findings from these applications are similar to those of the ACE study and have raised awareness of the childhood origins of public health problems for policymakers and legislators.

However, the questions from the ACE study cannot fully assess the frequency, intensity, or chronicity of exposure to an ACE or account for sex differences or differences in the timing of exposure. For example, 2 people, each having an ACE score of 4, may have different lifetime exposures, timing of exposures (during sensitive developmental periods), or positive experiences or protective factors that affect the biology of stress. A person with an ACE score of 1 may have experienced intense, chronic, and unrelenting exposure to a single type of abuse, whereas another person who has experienced low-level exposure (intensity, frequency, and chronicity) to multiple adversities will have a higher ACE score. As a result, projecting the risk of health or social outcomes based on any individual's ACE score by applying grouped (or average) risk observed in epidemiologic studies can lead to significant underestimation or overestimation of actual risk; thus, the ACE score is not suitable for screening individuals and assigning risk for use in decision making about need for services or treatment. Researchers are actively working to modify, improve, and expand the set

From the ¹ACE Interface LLC, Peachtree City, Georgia; ²ACE Interface LLC, Shelton, Washington; and ³BCGI LLC/pivot-23.5°, Cornelius, North Carolina

Address correspondence to: David W. Brown, DSc, MScPH, MSc, BCGI LLC/pivot-23.5°, 19701 Bethel Church Road, Suite 103–168, Cornelius, NC 28031. E-mail: david.brown@pivot235.org.

0749-3797/\$36.00

<https://doi.org/10.1016/j.amepre.2020.01.009>

of questions developed for the ACE study in the 1990s,¹² and it is worth noting that as knowledge and methods expand, so may applications.

THE MOVEMENT TOWARD SCREENING FOR ADVERSE CHILDHOOD EXPERIENCES

Screening refers to the use of a procedure or test among outwardly healthy people to identify those who may be at increased risk for, or have early stages of, a specific disease or condition but who do not yet have symptoms. In the U.S., the USPSTF, an independent panel of national experts in disease prevention and evidence-based medicine, makes evidence-based recommendations about preventive care services, such as population screening for high blood pressure or high blood cholesterol. In doing so, USPSTF makes recommendations based on systematic reviews of available evidence of the benefits and harms and thorough assessments of the net benefit of the preventive care service.¹³

The authors are unaware of research assessing the conditions for appropriate administration of an ACE questionnaire or research assessing the ability of any given ACE score to accurately identify individuals at risk for negative health and social outcomes. Although increasing ACE scores are associated with increasing population risk of health and social problems,¹⁴ it is currently unclear how ACE scores make sense for decision making as part of a community screening program. Under the type of guidelines employed by the USPSTF, the extension of ACE-related risks from epidemiologic studies to individuals using their ACE score for the purposes of individual screening and clinical decision making is not appropriate.

Recently, lawmakers have proposed policies to screen children and adults for traumatic events that affect their health using an ACE questionnaire and the summation of ACEs using the ACE score.^{8,9} Though these and similar proposed policies are intended to improve health and social services, no body of peer-reviewed (vetted) evidence scaffolds it. The ACE questionnaire was designed to research—not screen—the relationship between childhood adversities and health and social outcomes. Therefore, the authors, along with other colleagues,^{15–18} are concerned about potential misapplication of ACE questionnaires and the ACE score for community-based screening and decision making about treatment or services.

ENCOURAGING APPROPRIATE USE OF THE ADVERSE CHILDHOOD EXPERIENCE SCORE

The ACE score is a powerful tool for describing the population impact of the cumulative effect of childhood stress and provides a framework for understanding how

prevention of ACEs can reduce the burden of many public health problems and concerns. However, the ACE score is neither a diagnostic tool nor is it predictive at the individual level. Thus, great care should be used when obtaining ACE scores for children and adults as a part of community-wide screening, service, or treatment.

Inferences about an individual's risk for health or social problems should not be made based upon an ACE score, and no arbitrary ACE score, or range of scores, should be designated as a cut point for decision making or used to infer knowledge about individual risk for health outcomes. California's recent release of statewide guidelines for Medi-Cal patients as part of the ACEs Aware initiative provides a useful example for consideration of these issues.⁸ The ACEs Aware initiative reimburses providers for screening children and adults using questions about ACEs and guides providers in administering ACE questions and applying ACE score cut points. Client ACE scores are combined with the presence or absence of a list of 35 health conditions using an algorithm to group clients into low-, medium-, and high-risk categories for what is termed toxic-stress physiology¹⁹ that informs counseling, follow-up, treatment planning, and support services. Many of the health conditions included in the list have complex etiologies rather than developing from a single cause, making the ACE and Toxic Stress Risk Assessment Algorithm²⁰ employed in the ACEs Aware initiative problematic. Attributable risks are relatively small for ACEs and health conditions such as cardiovascular disease, cancer, diabetes, kidney disease, and others on the list for adults. Although the health conditions listed within the algorithm have been associated with ACEs in epidemiologic studies, most occurrences of many listed conditions are caused by factors other than ACEs.

Given the limitations of the ACE score and its lack of standardization in combination with a list of health outcomes with widely varying etiologies, this algorithm will inherently lead to both over- and underestimation of individual risk. Although there are potential benefits for clients in the intent of this initiative, in its current form, the algorithm may stigmatize or lead to discrimination based upon an ACE score, generate client anxiety about toxic-stress physiology, or misclassify individual risk, which could result in the withholding of useful, necessary services or, alternatively, steer clients toward unnecessary services.

The understanding of childhood adversity and its long-term effects continues to evolve. More research is needed to explore innovative assessment approaches that address the limitations of the ACE score. Until the evidence base further develops, the authors caution against misapplications of ACE scores that assume an ACE score associated with risks derived from epidemiologic studies can sensibly be used to infer risk or make decisions about services, treatment, or care of individuals.

The authors encourage continued efforts by policy-makers and legislators to provide knowledge and resources for human service systems as part of the rapidly growing movement to provide trauma-informed care and promote accurate and compassionate public understanding of ACEs as an endemic public health problem. At the same time, providers and patients deserve the kind of rigor that would be provided by a USPSTF review before promulgating community-wide screening, service, or treatment recommendations that use ACE scores.

ACKNOWLEDGMENTS

The authors wish to thank Stacy Young for editorial comments and input in finalizing this work.

No financial disclosures are reported by the authors of this paper.

REFERENCES

1. Anda RF, Felitti VJ, Bremner JD, et al. The enduring effects of abuse and related adverse experiences in childhood. A convergence of evidence from neurobiology and epidemiology. *Eur Arch Psychiatry Clin Neurosci*. 2006;256(3):174–186. <https://doi.org/10.1007/s00406-005-0624-4>.
2. WHO. *World report on violence and health*. Geneva, Switzerland: WHO. www.who.int/violence_injury_prevention/violence/world_report. Published 2002. Accessed December 23, 2019.
3. UN. *UN study on violence against children*. New York, NY: United Nations. <https://violenceagainstchildren.un.org/content/un-study-violence-against-children>. Published 2006. Accessed December 23, 2019.
4. Garner AS, Shonkoff JP, Committee on Psychosocial Aspects of Child and Family Health, Committee on Early Childhood, Adoption, and Dependent Care, Section on Developmental and Behavioral Pediatrics. Early childhood adversity, toxic stress, and the role of the pediatrician: translating developmental science into lifelong health. *Pediatrics*. 2012;129(1):e224–e231. <https://doi.org/10.1542/peds.2011-2662>.
5. Government of Wales. Prosperity for All: the national strategy. <https://gov.wales/sites/default/files/publications/2017-10/prosperity-for-all-the-national-strategy.pdf>. Published 2017. Accessed December 23, 2019.
6. Stop Abuse Campaign. <https://stopabusecampaign.org/>. Accessed December 23, 2019.
7. Center on the Developing Child. ACEs and toxic stress: frequently asked questions. <https://developingchild.harvard.edu/resources/aces-and-toxic-stress-frequently-asked-questions/>. Accessed December 23, 2019.
8. Office of the California Surgeon General. ACEs aware. www.acesaware.org/. Accessed December 23, 2019.
9. Fiscal year 2020 recommended budget Mecklenburg County, North Carolina. www.mecknc.gov/CountyManagersOffice/OMB/Documents/FY2020-Recommended-Budget.pdf. Published 2019. Accessed December 23, 2019.
10. CDC. Behavioral Risk Factor Surveillance System ACE data. www.cdc.gov/violenceprevention/acestudy/ace_brfss.html. Accessed December 23, 2019.
11. WHO. Adverse Childhood Experiences International Questionnaire (ACE-IQ). www.who.int/violence_injury_prevention/violence/activities/adverse_childhood_experiences. Accessed December 23, 2019.
12. Finkelhor D, Shattuck A, Turner H, Hamby S. Improving the adverse childhood experiences study scale. *JAMA Pediatr*. 2013;167(1):70–75. <https://doi.org/10.1001/jamapediatrics.2013.420>.
13. U.S. Preventive Services Task Force. About the USPSTF. www.uspreventiveservicestaskforce.org. Accessed December 23, 2019.
14. Hughes K, Bellis MA, Hardcastle KA, et al. The effect of multiple adverse childhood experiences on health: a systematic review and meta-analysis. *Lancet Public Health*. 2017;2(8):e356–e366. [https://doi.org/10.1016/S2468-2667\(17\)30118-4](https://doi.org/10.1016/S2468-2667(17)30118-4).
15. Finkelhor D. Screening for adverse childhood experiences (ACEs): cautions and suggestions. *Child Abuse Negl*. 2018;85:174–179. <https://doi.org/10.1016/j.chiabu.2017.07.016>.
16. Dube SR. Continuing conversations about adverse childhood experiences (ACEs) screening: a public health perspective. *Child Abuse Negl*. 2018;85:180–184. <https://doi.org/10.1016/j.chiabu.2018.03.007>.
17. McLennan JD, MacMillan HL, Afifi TO, McTavish J, Gonzalez A, Waddell C. Routine ACEs screening is NOT recommended. *Paediatr Child Health*. 2019;24(4):272–273. <https://doi.org/10.1093/pch/pxz042>.
18. McLennan JD, McTavish JR, MacMillan HL. Routine screening of ACEs: should we or shouldn't we? In: Asmundson GJG, Afifi TO, eds. *Adverse Childhood Experiences. Using Evidence to Advance Research, Practice, Policy, and Prevention*. 1st ed. London, United Kingdom: Academic Press, 2020:145–159.
19. ACEs Aware. Clinical Assessment & Treatment Planning. www.acesaware.org/treat/clinical-assessment-treatment-planning/. Accessed December 23, 2019.
20. ACEs Aware. Clinical algorithms workflows and ACEs associated health conditions. www.acesaware.org/wp-content/uploads/2019/12/ACEs-Clinical-Algorithms-Workflows-and-ACEs-Associated-Health-Conditions.pdf. Published 2019. Accessed December 23, 2019.