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Development and Evaluation of a Short Adverse Childhood Experiences Measure

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Abstract

Introduction—Clinicians require tools to rapidly identify individuals with significant childhood adversity as part of routine primary care. The goal of this study was to shorten the 11-item Behavioral Risk Factor Surveillance System Adverse Childhood Experiences (ACEs) measure and evaluate the feasibility and validity of this shortened measure as a screener to identify adults who have experienced significant childhood adversity.

Methods—Statistical analysis was conducted in 2015. ACE item responses obtained from 2011–2012 Behavioral Risk Factor Surveillance System data were combined to form a sample of 71,413 adults aged 18 years. The 11-item Behavioral Risk Factor Surveillance System ACE measure was subsequently reduced to a two-item screener by maintaining the two dimensions of abuse and household stressors and selecting the most prevalent item within each dimension.

Results—The screener included household alcohol and childhood emotional abuse items. Overall, 42% of respondents and at least 75% of the individuals with four or more ACEs endorsed one or both of these experiences. Using the 11-item ACE measure as the standard, a cut off of one or more ACEs yielded a sensitivity of 99%, but specificity was low (66%). Specificity improved to 94% when using a cut off of two ACEs, but sensitivity diminished (70%). There was no substantive difference between the 11- and two-item ACE measures in their strength of association with an array of health outcomes.

Conclusions—A two-item ACE screener appropriate for rapid identification of adults who have experienced significant childhood adversity was developed.

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SUPPLEMENTAL MATERIAL

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INTRODUCTION

Capturing adverse childhood experiences (ACEs) as a part of patient clinical records is a potential strategy to improve patient health. ACE data could inform service allocation to high-risk populations, disease prevention strategies, or innovative approaches to mitigating childhood trauma. Though promising, ACE assessment is not ready for broad implementation. Recently, the Institute of Medicine did not recommend ACEs for inclusion in electronic health records, citing the lack of a brief, reliable, and valid measure to assess childhood adversity as one of several factors for this decision.¹

The original ACE study was a joint effort between the Centers for Disease Control and Prevention (CDC) and Kaiser Permanente in San Diego, California, and found a strong association between childhood stressors and poor adult health among more than 17,000 Kaiser Health Plan members.² Individuals endorsing four or more ACEs had a higher risk for chronic health problems as adults compared with respondents endorsing zero ACEs.² ACEs are highly prevalent across sociodemographic backgrounds and are associated with many of the leading causes of death in the U.S.^{2–6} Childhood adversity may influence the ways in which ACE-affected adults access and utilize healthcare resources,^{7–9} leading to fragmented, expensive, and poor-quality health care. As healthcare systems adopt approaches that improve quality using social determinants collected during clinical assessments, including ACEs will be an important factor to consider.

The CDC—Kaiser Permanente ACE study questionnaire assesses childhood experiences in two dimensions (abuse/neglect and household stressors). Concepts within these two dimensions include emotional, physical, and sexual abuse; physical and emotional neglect; and parental separation or divorce; and household substance abuse, mental illness, domestic violence, and criminal behavior, respectively.^{2,5} Using a long ACE questionnaire may be too burdensome for most practitioners and patients.

Brief psychosocial tools have improved the efficiency of screening in primary care, facilitating the early identification of patient needs, which improves the quality of patient care.^{10,11} Alcohol abuse assessment has historically been constrained by competing demands and insufficient time,^{12,13} despite effective interventions to address alcohol dependence.^{14,15} Substance abuse screeners have been important factors in promoting provider alcohol abuse assessment and improving patient health outcomes.¹⁶ Similarly, a two-item ACE screener that: (1) maintains the core ACE measure constructs of abuse and household stressors; (2) includes questions acceptable to patients and providers; and (3) accurately identifies individuals with four or more ACEs, could improve the efficiency of ACE assessment by reserving the more time consuming comprehensive ACE assessment for individuals who are more likely to endorse significant childhood adversity.

The purpose of the present study was to develop and evaluate a brief version of the ACE measure. Survey responses from a population-level ACE assessment conducted across seven states in 2011 and 2012 were used to construct a two-item ACE screener from an 11-item version of the original ACE measure. Finally, the sensitivity, specificity, and convergent validity of this two-item ACE measure were examined.

METHODS

Behavioral Risk Factor Surveillance System (BRFSS) 2011 and 2012 data were analyzed to improve the overall representation of the study sample by building on the inherent diversity of respondents across different years and states.^{17,18} BRFSS is an annual telephone-based survey, sponsored by CDC's Division of Population Health. State health departments collect health data on U.S. residents with assistance from CDC. Survey administrators identify potential respondents using random-digit-dialing methods, conducting surveys via landline and cell (adopted in 2011) telephone interviews. In 2011, CDC adopted iterative proportional fitting (raking) as the BRFSS method to adjust respondent data to known proportions of age, race, ethnicity, gender, and geographic region, replacing standard post-stratification techniques.¹⁹ The median response rates for 2011 and 2012 BRFSS surveys were 50% and 45%, respectively, calculated using the American Association for Public Opinion Research Response Rate formula.²⁰

Data Sample

In 2009, CDC incorporated an optional 11-question ACE measure (Table 2) into the BRFSS survey. A shortened and adapted version of the original ACE study questionnaire, this 11-item BRFSS ACE measure assesses exposure to eight types of childhood adversities, including abuse (sexual, physical, and emotional) and household stressors (parental separation/divorce; incarcerated family members; and household substance abuse, domestic violence, and mental illness) before age 18 years, comprising two dimensions, abuse and household stressors, assessed in the original ACE study (questions assessing emotional and physical neglect were not included in the BRFSS ACE measure).²¹

Not all states choose to administer the BRFSS ACE questionnaire each year. To develop the final data set, individuals from states that did not report ACE survey results or who did not answer all 11 ACE questions were excluded (Appendix Figure 1, available online).

Table 2 lists the item content and response set cut point for the BRFSS ACE questionnaire. Individuals with an affirmative response to one or more items within an ACE domain were designated as endorsing the respective childhood adversity. The ACE score is an index of the number of individual-endorsed ACEs. For sensitivity, specificity, and convergent validity analysis, dichotomized ACE scores divided into "high" and "low" ACE categories as follows: 11-item eight domain measure dichotomized at four or more ACEs, and two-item two domain measure dichotomized at two and one or more ACEs were used. Cut off for high ACEs was established at four or more ACEs for the 11-item ACE measure because this population has demonstrated the highest risk for chronic health problems in prior ACE studies.²

The BRFSS sociodemographic variables (Table 1) included in the analysis as covariates were selected based on literature review suggesting association with health outcomes used in this study.^{22,23}

Measures

Each health behavior and condition ($n=14$) included in the analysis has previously been shown to be associated with ACEs (Table 1).^{2,24,25} Respondent self-reported monthly alcoholic beverage consumption was used to construct a gender-specific alcohol consumption variable dichotomized as high or low alcohol consumption, designated based on CDC guidelines for men (15 drinks or more per week) and women (eight drinks or more per week).^{26,27} BMI cut off for obesity was based on CDC weight status guidelines. Separate composite index scores of total health behaviors and chronic health conditions for each respondent were constructed.

Statistical Analysis

All analyses were conducted in 2015 using Stata, version 13. Survey weights were employed to account for complex sampling utilized during the BRFSS survey. For regression analysis, a level of statistical significance set at $\alpha=0.01$ was employed. Univariate statistics were examined for each variable exploring item missingness, prevalence, and distribution. Bivariate relationships between ACEs and health outcomes were assessed using Pearson chi-square statistics.

Childhood adversity is measured by the total number of ACEs reported by the respondent; higher ACE scores are indicative of higher risk. Psychometric analysis of the 11 BRFSS ACE items demonstrates appreciable internal consistency. These 11 items map onto a higher order factor, lending credence to the practice of totaling ACE items into one composite childhood adversity score.²⁸

Maintaining the core conceptual framework of the original ACE questionnaire, a two-item measure was created. Because individuals with four or more ACEs demonstrate the highest risk for chronic medical conditions in previous ACE studies,² the items chosen were deemed most likely to be endorsed by individuals with four or more ACEs. Because ACEs are highly inter-related,²⁹ the most prevalent item from each dimension (childhood emotional and care provider substance abuse) was selected for inclusion into the two-item measure, hypothesizing that individuals with four or more ACEs would be most likely to endorse the most commonly cited ACEs in each dimension. Within the household stressor dimension, parental separation and divorce was the most prevalent item endorsed, but was not selected for inclusion into the two-item ACE measure because the negative impact of parental divorce or separation on health may be attenuated, as these experiences are protective for some children.^{30,31}

Sensitivity (screening measure ability to correctly identify individuals with four or more ACEs) and specificity (screening measure ability to correctly identify individuals with zero to three ACEs) were examined for the two-item ACE measure, with the 11-item dichotomized ACE measure as the standard. Convergent validity (correspondence between the screening measure and theoretically related variables) was evaluated using logistic (14 individual health outcomes) and Poisson (indices of health behavior and conditions) regression to examine the association between the 11- and two-item ACE measures and health outcomes. All regression models were adjusted for age, sex, race/ethnicity, education,

employment status, marital status, home ownership, health insurance status, and personal healthcare provider.

To assess the impact of excluding respondents that did not provide ACE information ($n=12,842$) but participated in BRFSS surveys in states that collected ACE data in 2011–2012, data were analyzed treating missing ACE information as no exposure. There was no significant difference in the relative prevalence of individual ACE items or direction or strength of the associations for outcomes.

RESULTS

Table 1 summarizes demographic and health outcome statistics for the 71,413 respondents included in the study sample. Respondents were predominantly white (85%), high school graduates (60%), employed (88%), and married (60%). The mean age of respondents was 55.0 (SD=17.3) years. Most respondents owned their home (74%), were insured (85%), and had a healthcare provider (80%). The majority of the respondents included in the study sample resided in North Carolina (22%) and Wisconsin (27%). Prevalence of health outcomes (Table 2) ranged from 2% to 46%. The most commonly endorsed health problems were history of smoking (46%), obesity (29%), and arthritis (25%), and binge drinking (18%). The prevalence of ACEs within the study population ranged from 4% to 34% (Table 2). The most commonly endorsed ACEs were emotional abuse (34%), parental separation or divorce (27%), and living with a problem drinker or alcoholic (24%).

Using the dichotomized 11-item ACE measure as the standard, the sensitivity/specificity (Table 3) and convergent validity (Table 4) of the shortened version of the BRFSS ACE measure were examined. Endorsing household alcohol abuse or emotional abuse alone provided a sensitivity of 76% or 92% and specificity 84% or 77%, respectively. The two-item ACE short form displayed sensitivity and specificity ranging between 70%–99% and 66%–94%, respectively. Establishing a cut point of one or two ACEs selected 42% of the individuals in the data set, whereas a cut point of both ACEs endorsed selected 13% of the respondents. The 11- and two-item ACE measures demonstrated near-equivalent AORs when regressed separately onto health outcomes.

DISCUSSION

The rich literature documenting the strong association between ACEs and lifetime risk for disease^{2,24,32} has spurred interest in using ACE assessment to improve health outcomes. To support further development of health care—based interventions addressing childhood adversity, clinical providers require more-efficient approaches to identify ACE-impacted individuals. Addressing this need, survey responses to the 11-item ACE measure from the 2011 and 2012 BRFSS assessment were used to develop a two-item ACE screener composed of childhood household alcohol and emotional abuse.

In constructing the two-item ACE measure, the most prevalent item from the household stressors and abuse dimensions comprising the ACE measure were included. Household alcohol (76%) and emotional abuse (92%) were also the most prevalent items within their respective dimensions (Table 2) among respondents within the study sample with four or

more ACEs ($n=8,457$). This approach was consistent with methods used in a similar study developing a two-item food insecurity screener from the Household Food Security Survey in which investigators selected the two most commonly endorsed items by food-insecure families.³³

The sensitive nature of ACEs such as physical abuse, sexual abuse, and domestic violence made these items poor candidates for inclusion in a rapid screening tool. Perceived intrusiveness, consequences of disclosure, or social disapproval may cause respondents to refuse to answer these questions or respond untruthfully.³⁴ Fewer than one third of adult practitioners report routinely screening patients for histories of child maltreatment,³⁵ expressing concerns that asking patients about past events of physical abuse, sexual abuse, or domestic violence will elicit an emotional response for which providers lack the training, sufficient time, or resources to manage appropriately.^{35–37}

Emotional and household substance abuse have strong face validity, as they are common exposures, particularly for traumatized children.³⁸ Although all ACEs are highly inter-related, emotional and household alcohol abuse, in particular, are strongly correlated with other ACEs. In the original ACE study, more than 60% of the respondents endorsing childhood emotional abuse had an ACE score of four or more, and nearly half of the respondents who cited household substance abuse growing up had an ACE score of three or more.²⁹ The face validity of care provider alcohol and emotional abuse is further supported by results from the regression analysis, which demonstrated near-equivalent AORs for the 11- and two-item measures when regressed on the health outcomes.

In contrast to the consistency of the convergent validity analysis, sensitivity and specificity of the two-item ACE screener varied depending upon the cut point used. Establishing a cut point at one or two ACEs maximized the sensitivity at 99%, but the specificity (66%) was not as strong. Specificity (94%) was improved, but sensitivity (70%) decreased when endorsement of both ACEs was required.

To decrease patient/provider assessment burden, a two-step screening strategy could be used, administering the nine remaining ACE items to individuals who screen positive to the two-item screener. Assessing 1,000 patients using this two-step approach would result in the correct identification of 118 of 120 individuals. In total, the practice would administer 5,220 items, reducing survey administration burden by 50% relative to the 11-item measure (Appendix Figure 2, available online). Similar two-step depression and alcohol screening approaches have improved the feasibility and reliability of psychosocial assessment in clinical settings.^{39–41}

Practices may also adopt approaches that improve the efficiency of assessment. Similar to the CAGE questionnaire,⁴² the two-item ACE screener questions are simple to recall and include a routine patient interview, bypassing the need for a formal paper and pencil survey. To further streamline assessment, practices could use mobile platforms, which are more efficient and patient-preferred psychosocial assessment approaches.^{43–45}

Information regarding ACEs may be used as part of a strategy to identify high-risk individuals for further screening, increased surveillance, or referral to community-based

organizations that address childhood trauma. Increasingly, healthcare systems are developing integrated delivery services using primary care—based screening, intervention, and referral to address behavioral and mental health problems.^{46–49} The current model involves screening followed by interventions in the primary care setting if substance use or mental health disorders are identified, reserving referral to intensive services for patients with more-severe disorders. Patients with significant childhood adversity may represent a population in need of more-intensive behavioral or mental health services. For example, trauma-focused cognitive behavior therapy is the standard treatment for patients with depression or anxiety and childhood trauma.⁵⁰ Several pediatric practices assess parent ACEs, recognizing the high risk for future adversity among the children of ACE-impacted parents.⁵¹ Practitioners could provide targeted anticipatory guidance or referrals to parent support programs for caregivers with significant childhood adversity. ACEs have been associated with higher and potentially inappropriate utilization of healthcare services.^{7,8,52} Consideration of ACE data in tandem with other clinical information could be used for early identification of patients in need of case management services to optimize their use of healthcare resources. On the population level, public health officials have used BRFSS ACE data to map ACE prevalence across geographic regions. In Washington, this approach has been used to target home visiting services to high ACE populations.⁵³

Limitations

This study has several limitations. First, the results of this study relied on retrospective self-report of ACEs. As a result, respondents could have under- or over-reported ACEs owing to poor recall or an unwillingness to disclose the true extent of their traumatic childhood experiences, potentially biasing study results. Current research supports the accuracy of self-reported retrospective recall in documenting ACEs among adult populations.⁵⁴ In addition, there may have been other traumatic childhood exposures not included in the ACE measure that are important in contributing to health outcomes. In a recent study investigating how urban, economically distressed young adults conceptualize childhood traumatic experiences, researchers found that study participants highlighted an array of different childhood traumatic experiences beyond the traditional ACE items and use culturally specific language to describe these experiences.⁵⁵ The study also was limited by the relatively low response rate of the BRFSS survey, which might have biased the study sample. Finally, the limited racial/ethnic and socioeconomic diversity of the study sample is a limitation. Recent studies of ACEs among more-diverse populations have demonstrated an increased risk for significant childhood adversity among more racially or economically diverse populations.⁵⁶ Variation in ACE prevalence may affect the positive/negative predictive value of the two-item ACE measure and performance of the screener.

Despite the aforementioned limitations, this study has important implications for researchers and clinicians. Practitioners have expressed interest in including formal childhood adversity assessments in routine care,⁵⁷ either alone or incorporated into comprehensive health appraisals assessing a broad array of patient health-related needs. Clinicians, already required to complete an array of health-related assessments, could utilize this two-item ACE measure to rapidly identify individuals endorsing significant childhood adversity, guiding

the allocation of clinical resources to prevent or delay the development of ACE-associated health conditions.

CONCLUSIONS

The authors constructed a two-item ACE measure composed of household alcohol and emotional abuse as a child that demonstrated good sensitivity and convergent validity ideal for the rapid identification of individuals with significant childhood adversity. Future work must be done to establish the feasibility of a two-step ACE assessment approach and develop clinical recommendations to guide medical decision making. In addition, effective approaches to implementing ACE assessment in clinical settings must be developed, and the application of this work across diverse sociodemographic populations must be examined.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1

Sample Characteristics

Characteristic	Unweighted <i>n</i>	Weighted <i>n</i> (%)
Total sample	71,412	28,122,798 (100)
Sociodemographics		
Age		
18–44 years	18,804	12,798,076 (45)
45–64 years	29,957	10,136,565 (36)
65 years or older	22,178	5,188,156 (19)
Sex		
Male	29,641	13,644,098 (50)
Ethnicity		
Hispanic	2,182	1,422,491 (5)
Race		
White	61,488	22,604,537 (85)
Black	3,690	2,417,141 (9)
Other	3,553	1,504,931 (6)
Education		
Less than high school	4,996	3,354,792 (11)
High school	20,448	8,344,781 (29)
College or more	45,862	16,384,833 (60)
Employment status		
Currently employed	63,150	24,433,689 (88)
Marital status		
Currently married or cohabitating	41,571	16,466,764 (60)
Home ownership		
Currently owns home	55,260	7,529,804 (74)
Current health insurance status		
Has current health insurance	63,740	23,812,389 (85)
Usual source of health care		
Currently has a usual source of health care	60,583	22,358,760 (80)
State of residence		
Iowa	6,038	1,960,643 (7)
Minnesota	12,966	3,416,925 (12)
Montana	8,748	650,254 (2)
North Carolina	10,215	6,360,416 (22)
Tennessee	5,330	3,749,705 (12)
Vermont	6,320	441,531 (2)
Washington	13,102	4,353,237 (16)
Wisconsin	8,693	7,190,087 (27)

Characteristic	Unweighted <i>n</i>	Weighted <i>n</i> (%)
Health behaviors		
Smoked at least 100 cigarettes in entire life	33,360	8,928,425 (46)
Currently smokes	24,992	8,928,425 (32)
Consumed at least 15 (men) or 8 (women) alcoholic beverages per week in the last 30 days	4,421	1,802,023 (6)
Binge drank at least once in the last 30 days	10,114	5,087,032 (18)
High-risk sexual behavior or IV drug use in the last year ^a	1,396	963,174 (3)
Health conditions		
Depression ^b	13,076	4,792,560 (17)
Cardiovascular disease ^c	7,254	2,276,970 (8)
Diabetes ^b	8,063	2,685,202 (9)
Obese ^d	19,618	7,888,122 (29)
Cancer ^b	6,925	1,912,493 (7)
Asthma ^b	8,454	3,311,748 (12)
Chronic obstructive pulmonary disease ^b	4,692	1,611,410 (6)
Arthritis ^b	23,202	7,184,059 (25)
Kidney disease ^b	2,033	633,625 (2)

^aHigh-risk sexual behavior includes being treated for a sexually transmitted disease, trading sex for money, or having anal sex without a condom.

^bA doctor, nurse, or other health professional told the respondent that they have any of the following: depressive disorder, diabetes, cancer, asthma, chronic obstructive pulmonary disease, some form of arthritis, kidney disease not including kidney stones, bladder infection, or incontinence.

^cA doctor, nurse, or other health professional told the respondent that they have any of the following: myocardial infarction, angina, coronary heart disease, or stroke.

^dBMI >30.0; BMI calculated from self-reported height and weight.

Table 2

Prevalence of Adverse Childhood Experiences in Study Sample^a

Adverse childhood experiences	Items	Entire sample		Respondents with four or more ACEs	
		Unweighted <i>n</i>	Weighted %	Unweighted <i>n</i>	Weighted %
Household stressors					
Parental separation/divorce	Parents were separated or divorced	14,713	27	5,396	71
Household alcoholism	Lived with anyone who was a problem drinker or alcoholic	16,744	24	6,467	76
Household mental illness	Lived with anyone who was depressed, mentally ill, or suicidal	10,924	16	3,152	61
Domestic violence in the home	Parents or adults in your home slapped, hit, kicked, punched, or beat each other up more than once	7,868	12	5,305	61
Household illicit or prescription drug use	Lived with anyone who used illegal street drugs or who abused prescription medications	5,392	10	3,050	44
Incarcerated household member	Lived with anyone who served time or was sentenced to serve time in a prison, jail, or other correctional facility	3,497	8	2,307	36
Abuse					
Emotionally abused	Parents or adults in your home swore at you, insulted you, or put you down more than once	22,492	34	7,797	92
Physically abused	Parents or adults in your home hit, beat, kicked, or physically hurt you in any way more than once (do not include spanking)	7,766	12	5,119	59
Touched sexually	Anyone at least 5 years older than you or an adult touched you sexually	7,079	9	3,509	37
Forced to touch sexually	Anyone at least 5 years older than you or an adult try to make you touch them sexually	5,016	7	2,697	29
Forced to have sex	Anyone at least 5 years older than you or an adult force you to have sex	2,823	4	1,815	20

^aSelf-reported experiences of household dysfunction and abuse that occurred before age 18 years.

Table 3Sensitivity, Specificity, and Positive/Negative Predictive Values for One- and Two-item ACE Screeners^a

ACE screeners	Prevalence	Sensitivity	Specificity	Positive predictive value	Negative predictive value
Household alcoholism	23.9 (23.2, 24.5)	76.2 (75.8, 76.5)	83.6 (83.3, 83.9)	38.5 (38.1, 38.9)	96.3 (96.2, 96.5)
Emotionally abused	34.3 (33.6, 35.0)	92.1 (91.9, 92.3)	76.6 (76.2, 76.9)	34.6 (34.2, 35.0)	98.6 (98.5, 98.7)
Either household alcoholism or emotionally abused	43.8 (43.1, 44.6)	99.8 (98.7, 98.9)	65.8 (65.4, 66.2)	28.0 (27.6, 28.4)	99.8 (99.7, 99.8)
Both household alcoholism and emotionally abused	14.2 (13.7, 14.8)	69.5 (69.1, 69.9)	94.4 (94.2, 94.6)	62.6 (62.2, 63.0)	95.8 (95.7, 96.0)

Note: Values are % (95% CI).^aEleven-item ACE measure dichotomized at four or more ACEs used as standard (prevalence of four or more ACEs, 12%).

ACE, adverse childhood experience.

Table 4Regression Analyses of Dichotomized ACE Measures^{a,b}

Health outcomes	11-item ACE measure dichotomized at four or more ACEs ^c	Either household alcoholism or emotionally abused ^d	Both household alcoholism and emotionally abused ^e
Health behaviors			
Smoked at least 100 cigarettes in entire life	2.2 (2.0, 2.5)	1.8 (1.6, 1.9)	2.1 (1.9, 2.4)
Currently smokes	1.5 (1.3, 1.6)	1.4 (1.3, 1.5)	1.5 (1.3, 1.6)
Consumed at least 15 (men) or 8 (women) alcoholic beverages per week in the last 30 days	1.4 (1.1, 1.7)	1.4 (1.2, 1.6)	1.4 (1.2, 1.8)
Binge drank at least once in the last 30 days	1.2 (1.1, 1.4)	1.4 (1.2, 1.5)	1.3 (1.1, 1.5)
High risk sexual behavior or IV drug use in the last year ^f	2.7 (2.1, 3.4)	2.3 (1.8, 2.9)	2.1 (1.6, 2.7)
Index of health behaviors	1.4 (1.3, 1.4)	1.3 (1.3, 1.4)	1.3 (1.3, 1.4)
Health conditions			
Depression ^g	3.1 (2.7, 3.5)	2.4 (2.2, 2.6)	2.4 (2.1, 2.7)
Cardiovascular disease ^h	1.5 (1.2, 1.8)	1.3 (1.2, 1.5)	1.4 (1.2, 1.7)
Diabetes ^g	1.2 (1.0, 1.4)	1.2 (1.1, 1.3)	1.1 (0.9, 1.2)
Obesity ⁱ	1.2 (1.1, 1.4)	1.2 (1.1, 1.3)	1.2 (1.0, 1.3)
Cancer ^g	1.4 (1.2, 1.7)	1.2 (1.1, 1.4)	1.3 (1.1, 1.5)
Asthma ^g	1.6 (1.4, 1.9)	1.4 (1.3, 1.6)	1.5 (1.3, 1.7)
COPD ^g	1.9 (1.6, 2.4)	1.6 (1.4, 1.8)	1.8 (1.5, 2.2)
Arthritis ^g	1.7 (1.5, 2.0)	1.5 (1.4, 1.6)	1.5 (1.4, 1.7)
Kidney disease ^g	1.5 (1.1, 2.0)	1.3 (1.0, 1.4)	1.5 (1.1, 1.9)
Index of chronic health conditions	1.5 (1.4, 1.5)	1.3 (1.3, 1.4)	1.3 (1.3, 1.4)

Note: Values are OR (99% CI).

^aSurvey weighted data.

^bAdjusted for age, sex, race/ethnicity, education, employment, marital status, home ownership, health insurance, and personal healthcare provider.

^cDichotomized at four or more ACEs.

^dComposed of household alcoholism and emotionally abused cut off at one ACE.

^eComposed of household alcoholism and emotionally abused cut off at two ACEs.

^fHigh-risk sexual behavior includes being treated for a sexually transmitted disease, trading sex for money, or having anal sex without a condom.

^gA doctor, nurse, or other health professional told the respondent that they had any of the following: depressive disorder, diabetes, cancer, asthma, COPD, some form of arthritis, kidney disease not including kidney stones, bladder infection, or incontinence.

^hA doctor, nurse, or other health professional told the respondent that they had any of the following: myocardial infarction, angina, coronary heart disease, or stroke.

ⁱBMI >30.0; BMI index calculated from self-reported height and weight.

ACE, adverse childhood experience; COPD, chronic obstructive pulmonary disease.