

# Adverse Childhood Experiences

## Expanding the Concept of Adversity



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**Introduction:** Current knowledge of Adverse Childhood Experiences (ACEs) relies on data predominantly collected from white, middle- / upper-middle-class participants and focuses on experiences within the home. Using a more socioeconomically and racially diverse urban population, Conventional and Expanded (community-level) ACEs were measured to help understand whether Conventional ACEs alone can sufficiently measure adversity, particularly among various subgroups.

**Methods:** Participants from a previous large, representative, community-based health survey in Southeast Pennsylvania who were aged  $\geq 18$  years were contacted between November 2012 and January 2013 to complete another phone survey measuring ACEs. Ordinal logistic regression models were used to test associations between Conventional and Expanded ACEs scores and demographic characteristics. Analysis was conducted in 2013 and 2014.

**Results:** Of 1,784 respondents, 72.9% had at least one Conventional ACE, 63.4% at least one Expanded ACE, and 49.3% experienced both. A total of 13.9% experienced only Expanded ACEs and would have gone unrecognized if only Conventional ACEs were assessed. Certain demographic characteristics were associated with higher risk for Conventional ACEs but were not predictive of Expanded ACEs, and vice versa. Few adversities were associated with both Conventional and Expanded ACEs.

**Conclusions:** To more accurately represent the level of adversity experienced across various sociodemographic groups, these data support extending the Conventional ACEs measure. (Am J Prev Med 2015;49(3):354–361) © 2015 American Journal of Preventive Medicine

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### Introduction

The Adverse Childhood Experiences (ACEs) Study<sup>1</sup> represented a landmark in medical research, linking childhood experiences of abuse, neglect, and household dysfunction with future health. Between 1995 and 1997, Felitti and colleagues developed the ACEs score concept, representing the burden of childhood adversity experienced by thousands of participants insured by Kaiser Permanente. “Conventional” ACEs scores (i.e., those based on the original Kaiser sample) sum a participant’s reports of exposure to abuse, neglect, and household dysfunction.<sup>1</sup> Conventional ACEs scores repeatedly have demonstrated a step-wise, dose-dependent relationship with developing at-risk behaviors, including substance abuse, multiple sexual partners, smoking, and early initiation of sexual activity and pregnancy.<sup>2</sup> Even after adjusting for demographics

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and health-related behaviors, Conventional ACEs scores have been independently associated with early mortality related to mental health and cardiovascular, pulmonary, and liver disease.<sup>3–7</sup>

Conventional ACEs studies have led to a conceptual model describing the natural history of childhood adversity, resulting in impairment and adoption of health risk behaviors that promote early disease, disability, social problems, and early death. Many states have integrated ACEs modules into their Behavioral Risk Factor Surveillance System (BRFSS), a telephone survey that gathers information on various health-related questions such as risk and preventive behaviors and disease prevalence. Emerging BRFSS reports confirm that ACEs lead to poor health outcomes.<sup>8–11</sup> Of note, Kaiser ACEs data have been limited to a sample of insured, primarily white, educated participants. Likewise, BRFSS participants who completed the ACEs module are predominantly white, and many have education levels higher than the U.S. average.<sup>12,13</sup> Given the current understanding of health disparities,<sup>14</sup> it may be presumed that other unmeasured ACEs also may impact health outcomes, particularly in more-diverse and minority populations. Qualitative data from African American and Latino youth support expanding the concept of childhood adversity to include community-level indicators such as: experiencing racism, witnessing community violence, living in an unsafe neighborhood, experiencing bullying, and a having a history with foster care.<sup>15,16</sup> A recent study by Finkelhor et al.<sup>17</sup> assessed Conventional ACEs occurring within the household and additional potential childhood adversities occurring outside the home, such as peer rejection, peer victimization, and community violence exposures. Previously unmeasured ACEs were correlated with mental health symptoms, in some cases more so than Conventional ACEs indicators.<sup>11</sup>

Though more diverse, the sample assessed by Finkelhor and colleagues<sup>17</sup> was still predominantly white and only had a 43% response rate. Second, their method of the prospective data collection from children and their parents may have reduced recall bias, but children's fear of repercussions from parents or social service workers might have impacted accurate assessments of violence exposures. Third, the Trauma Symptom Checklist for Children, used by Finkelhor et al., "may be better associated with the impact of some childhood events, such as violence exposure, than others and may not necessarily be reflective of what could best predict long-term health effects." This study expands on previous work by describing the prevalence and demographic variation of Conventional and Expanded ACEs in a more socioeconomically and racially diverse population, with the goal being to understand whether there are

unmeasured ACEs that might differentially impact specific demographic groups.

## Methods

### Study Sample

The Philadelphia (PHL) ACEs Survey was conducted as a follow-up to Philadelphia Health Management Corporation (PHMC)'s 2012 Southeastern Pennsylvania Household Health Survey (HHS). The HHS is a large-scale comprehensive health survey conducted with a representative sample of >13,000 child and adult residents from Southeastern Pennsylvania. Random-digit dialing of land and cell phones was employed to gather information on a wide range of health topics, conditions, and behaviors.

Between November 2012 and January 2013, a total of 1,784 Philadelphia residents (aged  $\geq 18$  years) who participated in the original HHS were recontacted to complete an additional interview containing questions about Conventional and Expanded ACEs. Interviews lasted 12 minutes on average and were conducted in English and Spanish by an experienced survey research firm. Interviewers were gender matched with interviewees.

An advance letter was sent to all eligible participants with an address (N=2,181) notifying them that they would be contacted to complete the PHL ACEs Survey. In an attempt to maximize response rates, two phone and mail contacts were initiated to participants who initially refused. In addition, US\$5 was paid upon request to participants in the cell phone sample who completed the survey after they previously refused. Eligible participants were considered "non-participants" after 14 contact attempts had been made. Respondents received information, referrals, and emergency contact information related to issues discussed during the interviews.

### Measures

The PHL ACEs Survey was designed by the Philadelphia ACEs Task Force, a team of local experts organized by the Institute for Safe Families and charged with the task of studying ACEs in Philadelphia. Measures in addition to Conventional ACEs indicators included questions about stressors manifesting outside the household (i.e., Expanded ACEs). Survey domains were identified through a review of the literature, including data describing community stressors previously identified by Philadelphia youth.<sup>15,16</sup> The resulting Expanded ACEs included experiencing racism, witnessing violence, living in an unsafe neighborhood, experiencing bullying, and a having a history of living in foster care. Discrete questions were adapted from items on the California Health Interview Survey (CHIS) Adult Survey,<sup>18</sup> Adverse Childhood Experiences International Questionnaire (ACEs-IQ),<sup>19</sup> National Survey on Children's Exposure to Violence,<sup>20</sup> CDC's Family Health History and Health Appraisal Questionnaire,<sup>21</sup> and Perceptions of Racism in Children and Youth (PRaCY)<sup>22</sup> instrument.

Appendix Table 1 illustrates the item wording, responses, and thresholds for adversity for both the PHL ACEs Survey and the Kaiser Survey. Item wording was kept similar between the two surveys with some exceptions. First, parental divorce during childhood was not assessed on the PHL ACEs Survey; local data suggested that the construct does not accurately represent the

complexities of partnered and separated relationships in the sampled communities.<sup>11</sup> Second, measures of physical neglect and emotional neglect were more detailed in content on the Kaiser Survey. To facilitate comparisons between the PHL ACEs Survey and Kaiser data, adversity was coded similarly between the two measures. When Kaiser used *often* or *ever* as the threshold for adversity on a particular item, an equivalent response option was used on the PHL ACEs Survey; corresponding response options for each survey are bolded in [Appendix Table 1](#).

## Statistical Analysis

Owing to over- and under-representation of particular demographic sectors, which is typical in random telephone-based survey samples, post-stratification survey weights based on multiple variables were calculated using the raking procedure in QBal, revision 04.1.27. Weights were computed using adult age, poverty status, gender, race, and Hispanic ethnicity distributions from the most recent Philadelphia census and American Community Survey.<sup>23</sup> All analyses used weighted data. Given that all variables used for this analysis had <3.5% missing values (range, 0.1%–3.5%), missing data were handled using pair-wise deletion.

Age was modeled as a continuous variable, though described categorically in the demographics table to compare across study populations. Respondents self-identified their race as *black or African American*, *Asian or Pacific Islander*, *Hispanic/Latino*, *white*, *biracial or multiracial*, or *other*. Because few participants identified as *biracial or multiracial*, this category was combined with *other*. Educational level was described as *less than high school*, *high school graduate*, *some college*, or *college graduate*. Having participated in or completed trade/vocational school was combined with the *high school graduate* category.

Univariate descriptive statistics were computed to assess prevalence rates for childhood adversity. The binomial test was used to compare prevalence rates for Conventional ACEs between the PHL ACEs Survey sample and Kaiser sample, where appropriate.

Separate Conventional and Expanded ACEs scores were computed by summing individual adversity items in each subscale. Using traditional Kaiser coding, the following categories were used to analyze the Conventional ACEs scores, which consisted of nine items: 0 Conventional ACEs, 1–3 Conventional ACEs, and  $\geq 4$  Conventional ACEs. For the Expanded ACEs score, consisting of five items, cut points were weighted similarly and the following categories were used to assess the Expanded ACEs score: 0 Expanded ACEs, 1–2 Expanded ACEs, and  $\geq 3$  Expanded ACEs.

Ordinal logistic regression was used to estimate associations between demographic variables and Conventional and Expanded ACEs scores using categories defined above. Adjusted ORs and 95% CIs are reported. Statistical significance was set at  $p < 0.05$ , recognizing that tests of significance are approximations that serve to aid interpretation and inference. Intercooled Stata, version 12, was used for analyses in 2013–2014. Study protocols were approved by the IRB of the involved institutions.

## Results

A total of 1,784 respondents aged  $\geq 18$  years participated, resulting in a response rate of 67.1% based on the American Association for Public Opinion Research's

RR3 formula.<sup>24</sup> [Table 1](#) provides demographics of the PHL ACEs Survey and Kaiser study populations. Of note, more participants in the PHL ACEs Survey sample reported being black/African American and younger; fewer PHL ACEs Survey respondents reported being white. PHL ACEs Survey participants achieved lower levels of education compared to those in the Kaiser study population, in which three quarters reported having some college experience or being college graduates.

Approximately one third (31.7%) of respondents reported no experience with Conventional ACEs while growing up. Almost half (47.6%) experienced 1–3 Conventional ACEs, and one fifth (20.7%) Experienced  $\geq 4$  Conventional ACEs. Compared to the original Kaiser findings, more people in this sample experienced Conventional ACEs ( $p < 0.001$ ), even though fewer adversity indicators were measured (e.g., parental divorce was excluded).

Little more than a third (36.6%) of respondents reported no experience with Expanded ACEs while growing up. Half (50.0%) of respondents experienced 1–2 Expanded ACEs, and 13.4% experienced  $\geq 3$  Expanded ACEs.

[Figure 1](#) illustrates the relationship between respondents having no adversity exposures, at least one Conventional ACEs, at least one Expanded ACEs, and the overlap between having at least one Conventional and Expanded ACE. Close to one half of respondents (49.3%) reported experience with both types of ACEs. There were 13.9% of respondents who had adversity experience(s) limited only to the expanded ACEs, and these would have gone unrecognized if only Conventional ACEs were assessed.

[Table 2](#) describes exposure rates for Conventional ACEs in the PHL ACEs Survey sample and in the Kaiser sample, as well as Expanded ACEs in the PHL ACEs Survey sample. Conventional ACEs most frequently reported in this sample included: experiencing physical abuse (38.1%), having a household member struggling with substance abuse (34.8%), and experiencing emotional abuse (33.2%). Compared with the original Kaiser sample, PHL ACEs Survey participants reported higher rates for all Conventional ACEs ( $p < 0.001$ ) except for sexual abuse, emotional neglect, and physical neglect, which were reported less frequently in the PHL ACEs Survey sample ( $p < 0.001$ ).

When exploring the prevalence of Expanded ACEs in this sample, participants described high rates of witnessing community violence (40.5%); racial discrimination (34.5%); and feeling that their neighborhood was unsafe (27.3%). Almost one in ten respondents (8.0%) was bullied while growing up; a smaller proportion of respondents (2.5%) had experience with the foster care system while growing up.

**Table 1.** Demographics of the Philadelphia Census, Philadelphia Sample, and the Original Kaiser Sample

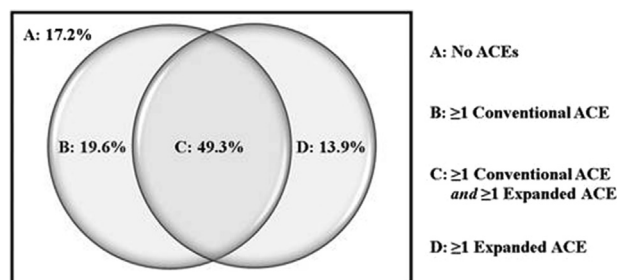
Demographics	Philadelphia census (n=1,201,541), %	Philadelphia sample (n=1,784), %	Kaiser sample <sup>a</sup> (n=8,056), %
Race			
White	38.8	45.2	79.8
Black	36.1	43.6	4.8
Latino	11.4	3.6	5.4
Asian	6.2	3.7	6.3
Other <sup>b</sup>	7.4	3.9	3.7
Education			
Less than high school	20.0	10.3	6.0
High school graduate <sup>c</sup>	35.7	35.0	19.1
Some college	21.8	19.0	31.5
College graduate	22.5	35.7	43.4
Male	46.3	41.7	47.9
Age			
18–34	36.8	29.7	10.0
35–64	46.7	52.2	57.6
≥65	16.4	18.1	32.4

<sup>a</sup>From Felitti V, Anda R, Nordenberg D, et al. Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults. The Adverse Childhood Experiences (ACEs) study. *Am J Prev Med.* 1998;14(4):245–258.

<sup>b</sup>Race “Other” category combined “other” with “biracial/multiracial” responses for Philadelphia (PHL) Sample.

<sup>c</sup>Education “High School graduate” is a combination of “High School Graduate” and “Technical/Vocational School” for the PHL Sample.

Using ordinal regression, certain demographic groups were at higher risk for Expanded ACEs whereas others were at risk for Conventional ACEs (Table 3). Male gender; non-white race; being divorced from one’s partner (versus married); working full time (versus part-time employment); and income level  $\leq 150\%$  below the established poverty line were all associated with having a higher Expanded ACEs score ( $p \leq 0.05$ ), but these same items were not significantly associated with

**Figure 1.** Overlapping exposure to Conventional and Expanded Adverse Childhood Experiences (ACEs).

the Conventional ACEs score. Similarly, certain demographic characteristics were associated with higher risk for Conventional ACEs but were not predictive of Expanded ACEs: those who reported a race of “other” (versus white); were living with a partner (versus married); and were disabled (versus working full time) had higher Conventional ACEs scores ( $p \leq 0.05$ ). The only variables that predicted both Expanded and Conventional ACEs included younger age and being separated from one’s partner (versus married).

## Discussion

This study is the first to describe the prevalence of Conventional ACEs scores in a more socioeconomically and racially diverse urban adult population and begins to explore whether Conventional ACEs suffi-

ciently measure adversity among less-affluent, non-white participants. Specifically, this study broadens the concept of childhood adversity by including newly defined adversities (Expanded ACEs) experienced at the community level along with the typical household adversities (Conventional ACEs) that often are used to measure adversity.

In a predominantly African American, urban community-based sample, higher rates for six of nine Conventional ACEs were found compared with reports from the predominantly white, fully insured original ACEs Study population. For two of the three items that differed (physical and emotional neglect), lower rates than the original sample were expected because the measured content for these items was more restrictive in this study. The levels of adversity in this sample are similar or higher to those recently reported by Finkelhor and colleagues,<sup>17</sup> whose sample had fewer minorities than ours but was more representative than the original Kaiser sample. Together, these findings support the long-standing notion that higher levels of adversity exist in minority and lower-income populations.<sup>25</sup>



**Table 2.** Prevalence of Conventional and Expanded ACEs in Philadelphia and Kaiser Samples

Adversity exposure	Philadelphia sample (N=1,784), %	Kaiser sample <sup>a,b</sup> (N=8,056), %	p-value
<b>Conventional ACEs</b>			
Physical abuse	38.1	10.8	<b>&lt;0.001</b>
Substance using household member	34.8	25.6	<b>&lt;0.001</b>
Emotional abuse	33.2	11.1	<b>&lt;0.001</b>
Mentally ill household member	24.1	18.8	<b>&lt;0.001</b>
Witnessed domestic violence	20.2	12.5	<b>&lt;0.001</b>
Sexual abuse	16.2	22.0	<b>&lt;0.001</b>
Incarcerated household member	12.9	3.4	<b>&lt;0.001</b>
Emotional neglect	7.7	14.8	<b>&lt;0.001</b>
Physical neglect	7.0	9.9	<b>&lt;0.001</b>
<b>Expanded ACEs</b>			
Witnessed violence	40.5	N/A	N/A
Felt discrimination	34.5	N/A	N/A
Unsafe neighborhood	27.3	N/A	N/A
Experienced bullying	8.0	N/A	N/A
Lived in foster care	2.5	N/A	N/A

Note: Boldface indicates statistical significance ( $p < 0.05$ ).

<sup>a</sup>With the exception of neglect data, all data are obtained from Felitti, V, Anda, R, Nordenberg, D, Williamson, D, Spitz, A, Edwards, V, Koss, M and Marks, J. Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults. The Adverse Childhood Experiences (ACEs) study. *Am J Prev Med.* 1998;14(4):245–258.

<sup>b</sup>Neglect questions were not assessed on the original Kaiser ACEs survey, but they were added in Wave 2 ( $n=8,667$ ). For comparison purposes, neglect data from the second wave Kaiser survey are provided. Data were obtained from the CDC website: [www.cdc.gov/violenceprevention/acestudy/prevalence.html](http://www.cdc.gov/violenceprevention/acestudy/prevalence.html).

These data suggest that certain demographic groups may be more prone to specific adversities than others. In this sample, gender, race, and poverty were associated with higher risk for Expanded ACEs, but not with higher risk for Conventional ACEs. Because Conventional ACEs indicators originally were developed for and measured in a predominantly middle/upper-middle class, white population, it stands to reason that the concept of adversity may need to be Expanded for other populations. This theory is supported by these data. Of note, without measuring Expanded ACEs in this sample, adversity (specifically, community-level indicators) would have been under-reported in about 14% of participants. Specifically, if only Conventional ACEs were relied on to measure adversity in this sample, the level of adversity experienced by men, blacks, Hispanics, Asian/Pacific Islanders, divorcees, and those at or below 150% poverty

would have been underestimated. These data must be considered as ACEs researchers contemplate how to elaborate upon the Conventional ACEs measure to enhance its ability to capture a broader range of adversities across demographic groups.

More than a quarter of respondents reported some combination of exposures to witnessing community violence, experiencing discrimination, or growing up in an unsafe neighborhood. As with Conventional ACEs, studies from different contexts have shown that witnessing or experiencing community violence or discrimination is associated with concurrent negative health effects and increased participation in risk behaviors.<sup>26–34</sup> Finkelhor et al.<sup>17</sup> also found high rates of adversity outside Conventional ACEs, including peer victimization, property victimization, exposure to community violence, someone close had a bad illness or accident, or someone close died by illness or acci-

dent. What remains for future study is the extent that childhood exposure to additional types of adversities impacts health and behaviors into adulthood.

A growing body of research is expanding the understanding of the physiologic pathways through which childhood adversity may result in physical and cognitive impairment when coupled with risk behaviors that result in poorer health-related outcomes.<sup>35,36</sup> However, to fully understand these pathways, childhood adversity must be accurately classified among various subgroups and within multiple contexts. This study helps push the envelope in identifying additional ACEs that expand Conventional measures to encompass the interplay among individual, household, and community factors that simultaneously shape future health.

Since John Snow traced the cholera epidemic to a public pump handle, social epidemiologists have

**Table 3.** Demographic Associations With Conventional and Expanded ACEs scores<sup>a</sup>

	Conventional ACEs <sup>b</sup> OR (95% CI)	Expanded ACE <sup>c</sup> OR (95% CI)
Age	0.99 (0.98, 1.00)	<b>0.97 (0.96, 0.99)</b>
Sex; ref: female		
Male	1.27 (0.97, 1.67)	<b>2.05 (1.53, 2.75)</b>
Race; ref: white		
Black or African American	0.89 (0.68, 1.16)	<b>3.07 (2.31, 4.08)</b>
Hispanic or Latino	1.21 (0.49, 2.96)	<b>5.93 (1.77, 19.90)</b>
Asian or Pacific Islander	0.83 (0.34, 2.02)	<b>3.93 (1.19, 12.94)</b>
Other	<b>2.69 (1.17, 6.23)</b>	<b>4.24 (1.90, 9.47)</b>
Marital status; ref: married		
Living with partner	<b>1.77 (1.12, 2.81)</b>	1.03 (0.60, 1.79)
Widowed	0.86 (0.58, 1.27)	1.27 (0.77, 2.11)
Divorced	1.40 (0.93, 2.12)	<b>1.54 (1.00, 2.39)</b>
Separated	<b>2.32 (1.25, 4.30)</b>	<b>2.32 (1.30, 4.13)</b>
Single	0.98 (0.71, 1.36)	1.39 (0.99, 1.97)
Other	<b>4.04 (1.01, 16.20)</b>	4.23 (0.75, 23.89)
Employment; ref: employed full-time		
Employed part-time	1.14 (0.73, 1.77)	<b>0.56 (0.32, 0.98)</b>
Unemployed	1.40 (0.89, 2.21)	1.28 (0.77, 2.12)
Retired	0.93 (0.62, 1.40)	1.21 (0.78, 1.87)
Disabled	<b>2.65 (1.70, 4.13)</b>	1.22 (0.74, 2.01)
Homemaker	1.68 (0.64, 4.37)	0.73 (0.36, 1.46)
Student/job training	0.50 (0.22, 1.15)	0.84 (0.33, 2.16)
Education; ref: college graduate		
Less than high school	0.86 (0.52, 1.42)	0.90 (0.56, 1.43)
High school graduate/trade-vocational school	0.98 (0.56, 1.72)	0.75 (0.42, 1.34)
Some college	0.70 (0.40, 1.22)	0.58 (0.33, 1.03)
150% poverty; ref: no		
Yes	1.20 (0.85, 1.69)	<b>1.51 (1.03, 2.20)</b>

Note: Boldface indicates statistical significance ( $p < 0.05$ ).

<sup>a</sup>Separate ordinal regression models were used to predict Conventional and Expanded ACE scores. In this analysis, Conventional and Expanded Adverse Childhood Experiences (ACEs) scores are not compared to each other.

<sup>b</sup>Dependent variable categories for the ordinal regression model for Conventional ACE are as follows: 0 Conventional ACE (reference group), 1–3 Conventional ACE, and  $\geq 4$  Conventional ACE.

<sup>c</sup>Dependent variable categories for the ordinal regression model for Expanded ACE are as follows: 0 Expanded ACE (reference group), 1–3 Expanded ACE, and  $\geq 4$  Expanded ACE.

described associations with community factors and health-related outcomes.<sup>37</sup> Large, enduring, macrosocial factors such as poverty, racism, and classism have been associated with poorer health and health disparities but have proven resistant to mitigation as economic gaps

and social desirability may result in biased underestimations of the prevalence of childhood adversity exposures. Second, potentially affecting comparisons, some survey items were adapted to better suit the PHL ACEs Survey population and address the practicality of

widen in the U.S.<sup>38–41</sup> Recognizing childhood adversity as a dominant driver of future health, clinicians and public health officials will need to move beyond existing measures of physical and mental health and embrace the model of trauma-informed care that attempts to understand how life events are tied to one's current clinical presentation.<sup>42</sup> These findings suggest that expanding the current Conventional ACEs measure is of paramount importance as the impacts of life events on future health across all genders, racial/ethnic groups, and social classes are uncovered. As new childhood adversities are uncovered, they should mindfully be incorporated into future studies, as well as new programs, interventions, and policies advocating for change.

### Limitations

When interpreting these results, some limitations are important to consider. First, results are based on cross-sectional, self-response data and should be used for assessing associations without assumptions of causation. Telescop-

survey administration. Two particular items showed differing rates, but they were in the expected direction, given the changes made. This along with the findings of Finkelhor and colleagues<sup>17</sup> lends credence to the notion that the level of adversity in non-white or less-educated samples is likely higher than originally expected and that the Conventional ACEs measure needs to be expanded. Finally, although the study had a favorable response rate (67.1%), the effect of non-responders is always a concern when interpreting the results of any study. Given the sensitivity of the collected data, it is plausible that non-responders may have experienced childhood adversities, resulting in an underestimation of actual ACEs in this sample.

## Conclusions

In summary, this study is the first to link measures of community-level adversity with conventional measures of household adversity in a diverse, urban population. High rates of adversity in this sample were identified, and the overall findings support the theory that Conventional ACEs may not sufficiently measure perceived adversity in samples different than Kaiser's. Specifically, community-level indicators (Expanded ACEs) used in this study seemed more capable than Conventional ACEs at identifying adversity in certain gender, race, marital, and socioeconomic subgroups. Relying only on Conventional ACEs in this study would have considerably underrepresented the prevalence of adversity experienced in this sample. Future work should continue to explore which additional adversity indicators are pertinent. Efforts should focus on prospective studies utilizing more nuanced measures of adversity and ongoing health designed to capture, describe, and model the contextual relationships addressing the complex interplay among individual, household, and community factors shaping health.<sup>43</sup>

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## Appendix

### Supplementary data

Supplementary data associated with this article can be found at, <http://dx.doi.org/10.1016/j.amepre.2015.02.001>.