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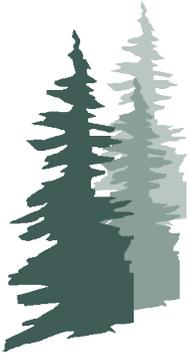


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Adverse Childhood Experiences in Rural and Urban Contexts

Jean A. Talbot, PhD, MPH • Donald Szlosek, MPH • Erika C. Ziller, PhD

BACKGROUND

Adverse childhood experiences (ACEs) are disturbances in family relationships that deprive children of the security and emotional support they need for healthy development.¹⁻⁵ In their seminal work on ACEs, researchers Felitti and Anda defined these experiences as occurring before age 18 and comprising multiple forms of family dysfunction, such as childhood verbal,¹⁻⁵ physical,¹⁻⁵ and sexual¹⁻⁵ abuse; having a mentally ill,¹⁻⁵ substance-abusing,¹⁻⁵ or incarcerated¹⁻⁵ family member; witnessing family violence;¹⁻⁵ and experiencing parental separation or divorce.²⁻⁵

When they are numerous, ACEs can disrupt children's body chemistry and alter brain structure.^{6,7} One effect of this disruption is to make people more vulnerable to serious, chronic health conditions in later life.^{1,2,8} Felitti and Anda's ACE research team found that the more ACEs an individual experiences, the greater his or her risk of chronic illnesses such as ischemic heart disease,¹ chronic obstructive pulmonary disease (COPD),² and depression.¹

ACEs-related disturbances in the body's responses to stress can also lead to long-term problems with emotion regulation, impulse control, and social judgment.⁷ These problems, in turn, can contribute to the development of harmful health habits: the original ACE study identified linkages between high ACE levels and adulthood behaviors such as smoking,³ alcoholism,⁴ and drug abuse.⁵ In addition, impairments in social and emotional functioning stemming from ACEs appear to pave the way for interpersonal difficulties across multiple domains.^{7,9-14} For example, adults who witnessed domestic violence as children may be more likely to perpetrate violence on their domestic partners in adulthood,¹³ and mothers who experienced childhood sexual abuse are more likely to have children who need interventions from child protective services.¹⁴ Moreover, adults with high ACE levels and chronic health conditions often struggle to collaborate productively with health care providers attempting to assist them with disease management.^{9,11,12,15}

Not only do ACEs damage the health of the individuals who lived through them: they can also have damaging consequences for the next generation. Because adults with extensive ACE histories are more likely to endure mental illness,^{1,16} substance abuse,³⁻⁵ and relationship disturbances,^{10,13,14} they are at elevated risk for exposing their own children to the same types of toxic stress that they themselves lived through in their early years.^{13,14}

Key Findings

Past research has shown that adverse childhood experiences (ACEs) have long-term, negative implications for health and well-being: as the number of ACEs increases, the risk for health problems in adulthood rises.

ACEs are a significant problem among rural adults. Over half of rural residents reported some ACE exposure, and over one in ten reported high levels of exposure (four or more ACEs).

After adjustment for demographics, rural and urban populations showed similar odds of experiencing high-level ACE exposure.

Rural primary care providers can play a leadership role in forging community partnerships to raise public awareness about ACEs, conduct ACE-focused community needs assessments, and launch initiatives to create new services geared toward building resilience in families.

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In light of this evidence documenting the negative implications of ACEs for population health,¹⁻¹⁶ clinicians^{11,17,18} and health systems^{19,20} are increasingly recognizing the importance of adapting health service delivery in ways that will help prevent ACEs and minimize their long-term effects. As a foundation for these efforts, departments of public health across the country are devoting more energy and resources to studying the epidemiology of ACEs.²¹⁻²³ However, basic, descriptive research on the prevalence and patterns of ACEs in rural American communities remains scarce. Although a recent report by the Health Resources and Services Administration (HRSA) indicated that rural children have higher rates of ACEs than their urban peers,²⁴ we know of no studies examining rural-urban differences in adults' exposure to ACEs. The present investigation was designed to address this research gap and to inform health system initiatives geared toward mitigating the impacts of ACEs on rural populations.

Some past research suggests that rural residence could be associated with elevated ACE levels in adults. Poverty and low educational attainment have long been concentrated in rural areas;²⁵ these types of socioeconomic disadvantage, in turn, place parents at heightened risk for experiencing behavioral health problems²⁶⁻²⁹ and engaging in child maltreatment.^{27,28} For these reasons, it might be expected that in comparison to their urban counterparts, rural adults of the present generation would report higher levels of ACE exposure in the families they grew up in. On the other hand, older cohorts tend to report fewer ACEs,^{5,30} and average age is higher in rural than in urban populations.³¹ In addition, older people with elevated ACE scores may have been less likely to participate in ACE surveys because they had higher rates of disability and death relative to their age peers with lower ACE scores. Although it has been suggested that older people may report fewer ACEs because they have more limited recall or are less willing to acknowledge potentially stigmatizing experiences, these explanations are less consistent with the finding that ACE scores show a graded relationship to health outcomes in older cohorts.³⁰ These factors might diminish any effects of rural residence on ACE prevalence.

APPROACH

In this study, we examined the rural prevalence of individual ACE categories and assessed overall levels of exposure to ACEs in rural settings. We also tested for rural-urban differences on each type of ACE and on overall ACE exposure.

Data Sources

The study was based on data from the Behavioral Risk Factor Surveillance System (BRFSS), a telephone survey designed by the Centers for Disease Control and Prevention (CDC) and conducted by state health departments in collaboration with the CDC.³² States select random survey samples from adults living in households with landline telephones and from adult users of cellular telephones.³² Sampling and weighting procedures ensure that each state's data are representative of its adult, non-institutionalized population.

Core BRFSS questions that must be administered to all survey participants each year include items on demographics, health insurance status, perceived overall health, chronic health conditions, and health behaviors.³³⁻³⁵ The BRFSS also includes an optional module on ACEs.³⁶ States can choose to administer this module to all their BRFSS participants or to subsets of their survey samples.³² All data are self-reported.³²

We obtained BRFSS data from 11 states that included the ACE module in their surveys for one or more years between 2011 and 2013. We received 2011 data from Maine,³⁷ Minnesota,³⁸ Montana,³⁹ Nebraska,⁴⁰ Nevada,⁴¹ Vermont,⁴² and Washington;⁴³ 2012 data from Connecticut,⁴⁴ Iowa,⁴⁵ and North Carolina;⁴⁶ and 2013 data from Iowa,⁴⁵ and Utah.⁴⁷ We combined these state data for both landline and cellular telephone respondents into a single analytic file according to guidelines published by the CDC.⁴⁸⁻⁵⁰

Variables

Dependent Variables

Our dependent variables included eight types of ACEs assessed in the original ACEs study by Felitti, Anda, and colleagues (see Background section above for list).^{1,51-52}

For analyses examining overall ACE exposure, we devised an ACE summary score with values ranging from zero to eight by counting the ACE types reported by each respondent.⁵³ Using this score, we created a three-level ACE summary variable that classified respondents as having no ACEs, one to three ACEs, or four to eight ACEs. We also constructed a dichotomous summary measure that distinguished respondents who reported four or more ACEs from those who reported fewer than four. In choosing this cut point, we followed the example of recent studies based on the ACE module of the BRFSS: these studies demonstrated that ACE scores of four or higher identified adults at elevated

risk for a range of negative health outcomes in adults.^{23,45,54,55}

Independent Variables

In bivariate and multivariate analyses, the primary independent variable of interest was rural residence. Our rural residence measure was based on the 2013 Rural-Urban Continuum Code (RUCC) system devised by the United States Department of Agriculture's Economic Research Service.⁵⁶ The RUCC system classifies metropolitan counties by the population size of their metropolitan areas, and non-metropolitan counties by their degree of urbanization and adjacency to metropolitan areas. Application of these criteria results in a 9-level continuum from large metropolitan (RUCC 1) to completely rural and non-adjacent to metropolitan areas (RUCC 9). Some states in our sample provided us with the RUCCs associated with their data, and others supplied us with county codes that we converted to RUCCs. RUCCs 1 through 3 designated metropolitan counties of varying population sizes, and RUCCs 4 through 9 reflected degrees of rurality within non-metropolitan counties. In order to achieve adequate cell sizes in our analyses, we collapsed RUCCs 4 through 9 into a single rural category. We also collapsed RUCCs 1 through 3 into one level representing urban areas. Thus, we created a dichotomous variable classifying counties as either rural or urban.

Covariates

For our adjusted analysis, we selected the following covariates with demonstrated or hypothesized associations with rural residence, level of ACE exposure, or both: age, gender, and race/ethnicity.

Analyses

We conducted chi-square analyses to test for bivariate differences by rural residence in individual ACEs and level of ACE exposure (i.e., summary score level). We used logistic regression analysis to assess the main effect of rural residence on overall ACE exposure, controlling for the covariates described above. Because of the complex sampling structure of the BRFSS, all analyses were conducted with weighted data in SUDAAN using Taylor series linearization techniques. None of the findings reported here are derived from calculations with unweighted denominators less than 50, unweighted numerators less than 30, or relative standard errors greater than 30%. Unless otherwise stated, all reported findings are statistically significant at the 0.01 level or lower. Ninety-five percent confidence intervals (CI) are indicated for each estimate.

FINDINGS

Sample Characteristics

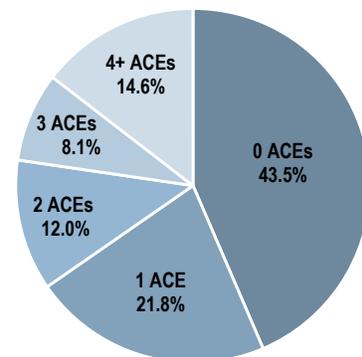
A total of 103,203 respondents were included in our analytic sample. Of these, 78.4% (CI = 77.9-78.9) were White, 7.9% (CI = 7.5-8.2) were African American, 7.4% (CI = 7.1-7.8) were Hispanic, and 6.4% (CI = 6.1-6.7) belonged to other ethnic groups. (Percentages given for White, African American, and other ethnic groups all refer to respondents who described themselves as non-Hispanic.)

Approximately one quarter of the sample (27.2%, CI = 26.8-27.6) lived in rural areas. More than one third (40.6%, CI = 40.0-41.1) reported no ACEs, 44.2% (CI = 43.7-44.8) reported one to three ACEs, and 15.2% (CI = 14.8-15.7) reported four or more ACEs.⁵⁷

Patterns of ACEs in Rural Populations

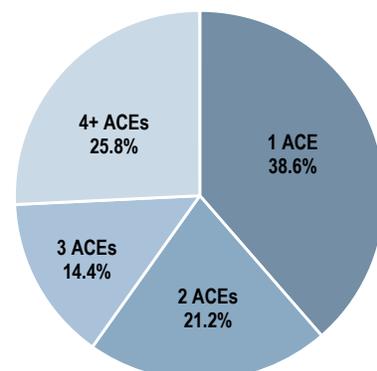
Results demonstrate that ACEs are common among rural residents. Over half (56.5%, CI = 55.6-57.3) of rural respondents indicated that they had been exposed to at least one ACE (see Figure 1). About one fifth (21.8%, CI = 21.1-22.6) reported only one ACE, 12.0% (CI = 7.7-8.7) reported two ACEs, 8.1% (CI = 7.7-8.7) reported three ACEs, and 14.6% (CI = 13.9-15.2) stated that they had experienced four or more ACEs.

Figure 1. Prevalence of Overall ACE Exposure among Rural Adults



Source: 2011-2013 Behavioral Risk Factor Surveillance System-11 states

Figure 2. Prevalence of Overall ACE Exposure among Rural Adults with One or More ACEs



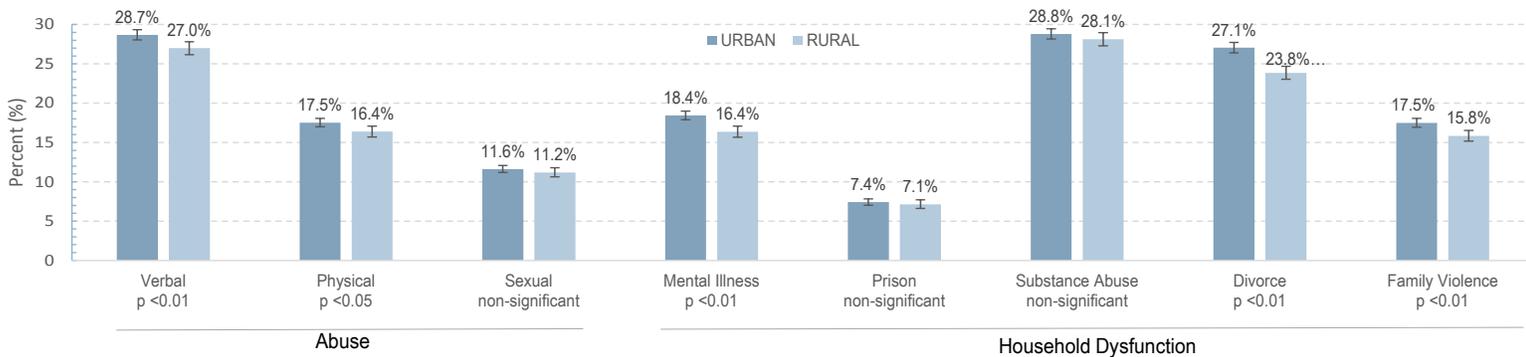
Source: 2011-2013 Behavioral Risk Factor Surveillance System-11 states

In addition, ACEs often occur together in rural populations. Figure 2 displays the distribution of overall ACE scores for rural residents who reported at least one ACE in their histories. As shown, 21.2% (CI = 20.2-22.3) of this group had two ACEs, 14.4% (CI = 13.6-15.3) had three ACEs, and over one quarter (25.8%, CI = 24.7-26.9) had four or more ACEs.

(rural 11.2%, CI = 10.6-11.8 versus urban 11.6%, CI = 11.2-12.1), incarceration of family members (rural 7.1%, CI = 6.6-7.7 versus urban 7.4%, CI = 7.0-7.8), or substance abuse in the household (rural 28.1%, CI = 26.4-27.7 versus urban 28.8%, CI = 28.1-29.5).

Further unadjusted chi-square tests demonstrated that relative to those in urban areas, rural residents

Figure 3. Prevalence of ACE Types in Rural and Urban Adults



Source: 2011-2013 Behavioral Risk Factors Surveillance System-11 states

Patterns of ACEs in Rural and Urban Populations: Similarities and Differences

The rank ordering of ACE types by prevalence appears to be similar across rural and urban respondents. The most common ACE in both rural and urban settings was childhood exposure to a household member's abuse of alcohol or drugs (see Figure 3). For both rural and urban groups, verbal abuse and parental separation/divorce were the second and third most prevalent ACE categories, respectively, whereas indirect exposure to family violence, direct experiences of sexual abuse, and the incarceration of a household member were the three least prevalent.

CChi-square tests unadjusted for demographic factors showed that rural residents were slightly but significantly less likely than their urban peers to report exposure to five types of ACEs (see Figure 3). These five categories included verbal abuse (27.0%, CI = 26.2-27.8 versus 28.7%, CI = 28.1-29.3), physical abuse (16.4%, CI = 15.7-17.1 versus 17.5%, CI = 17.0-18.1, p < 0.05), mental illness in the family (16.4%, CI = 15.7-17.1 versus 18.4%, CI = 17.9-19.0), witnessing family violence (15.8%, CI = 15.2-16.5 versus 17.5%, CI = 16.9-18.1), and parental separation/divorce (23.8%, CI = 23.1-24.7 versus 27.1%, CI = 26.4-27.7). There were no significant rural-urban differences on reported prevalence of childhood sexual abuse

were more likely to report that they had no ACEs in their history (43.5%, CI = 42.7-44.4 versus 39.4%, CI = 38.8-40.1), less likely to report one to three ACEs (42.0%, CI = 41.0-42.8 versus 45.1%, CI = 44.4-45.8), and less likely to report four or more ACEs (14.6%, CI = 13.9-15.2 versus 15.5%, CI = 15.0-16.0). The lower unadjusted levels of ACEs in rural settings appeared at least partially attributable to the fact that rural residents were more likely to be 45 years of age or older (57.8%, CI = 56.9-58.7 versus 51.3%, CI = 50.6-51.9). Age, in turn, was inversely related to overall ACE exposure. The proportion of respondents reporting zero ACEs was 34.7% (CI = 33.8-35.7) for those in the 18-to-44 age range, 39.7% (CI = 39.0-40.5) for those aged 45 to 64, and 57.1% (CI = 56.2-58.0) for those aged 65 and older.

A logistic regression model of main effects was constructed to assess the relationship between place of residence and overall ACE exposure after controlling for demographic characteristics including age, gender, and ethnicity. Results are presented in Table 1. The odds ratio of 0.98 indicated that the odds of exposure to four or more ACEs was 2% lower for rural than for urban residents. As indicated in the table, this finding was non-significant. In other words, after adjustment for demographics, the odds of high ACE exposure did not differ significantly across rural and urban groups (see Table 1).

Table 1: Adjusted Odds of Overall Exposure to Adverse Childhood Experiences (ACEs)

Characteristic (Referent)	Overall ACE Exposure	
	OR	95% CI
Residence (urban)		
Rural	0.98 ^{n.s.}	0.91-1.05
Age (45 -64)		
18-44	1.41 ^{****}	1.32-1.52
65+	0.34 ^{****}	0.31-0.38
Gender (male)		
Female	1.44 ^{****}	1.34-1.55
Ethnicity (White, non-Hispanic)		
Black, non-Hispanic	0.87 ^{n.s.}	0.74-1.03
American Indian/Alaskan Native/Other, non-Hispanic	1.25 ^{**}	1.09-1.44
Hispanic	0.92 ^{n.s.}	0.79-1.07
	N	93,328
	df	7

Data: 2011-2013 Behavioral Risk Factor Surveillance System, 11 states

* p < 0.05, ** p < 0.01, ***p < 0.001, **** p < 0.0001, ^{n.s.}non-significant

DISCUSSION

Results of this investigation suggest that ACEs are a significant problem among rural adults. Over half of rural residents described experiencing at least one ACE, and more than one in ten reported high overall ACE levels (four or more ACEs). Although unadjusted analyses indicated that rural residents reported lower levels of overall ACE exposure than their urban counterparts, this rural-urban difference did not persist after controlling for age, gender, and ethnicity. Moreover, the rank ordering of the eight ACE categories by prevalence was nearly identical for rural and urban populations, with exposure to a family member’s substance abuse being the most common type of ACE in each setting. Thus, in both its extent and its nature, the ACE burden borne by adults appears similar across rural and urban contexts.

Limitations

Characteristics of the data set used in this investigation limit its generalizability. To begin with, the states contributing data to our study had a higher proportion of White, non-Hispanic residents than the nation as a whole. Whereas non-Hispanic White respondents made up 64.6% of the national BRFSS sample in 2013,⁵⁸ they comprised over three quarters of the study sample. Therefore, our findings may not adequately reflect the experience

of non-White, ethnic minorities or Hispanic people. In addition, a relatively large proportion of participants—10.3% of the weighted sample—had missing data on four or more ACE categories,⁵⁹ and summary scores could not be calculated for these individuals.

Other limitations to the study include the fact that its cross-sectional design does not permit us to draw conclusions about temporal or causal associations between independent and dependent variables. Moreover, because it was necessary for us to combine geocodes reflecting gradations of rurality into a single rural category in order to ensure adequate cell sizes, our findings may underestimate the strength of relationships between rural residence and dependent variables.

Policy Implications

This investigation suggests that, relative to their urban peers, rural adults have experienced comparable exposure to ACEs. Thus, in rural and urban populations alike, ACEs may be an important factor increasing risk for poor health outcomes^{1,2,8,16} and disturbances in family relationships.^{10,13,14} In light of this finding, it appears that efforts to prevent ACEs and reduce ACE-related morbidity are warranted in rural as well as urban settings. However, ACE-focused initiatives in rural communities will need to account for the distinctive

features of local rural cultures and rural health delivery systems.

In the discussion that follows, we briefly describe promising practices for reducing the prevalence and impact of ACEs. Next, we note factors that could impede implementation of such practices in rural contexts. Finally, we suggest ways that stakeholders and policy makers can help craft effective rural responses to ACEs.

Recommended Practices for ACE Prevention

Secure, nurturing relationships within families are essential to ACE prevention. Positive family relationships can reduce the incidence of child maltreatment, while at the same time helping children to develop resilience,^{17,20} the constellation of social and self-regulation skills that have been shown to buffer people from the harmful effects of ACE-related stress.^{7,30,60,61}

Experts suggest that primary care providers play a key role in ACE prevention and resilience-building. In the context of well-child visits beginning in infancy, providers can offer families routine anticipatory guidance to promote positive parenting practices, caregiver well-being, and collaborative relationships among all caregivers in the family.¹⁷ The *Bright Futures* framework for pediatric health supervision is one widely recognized resource on how to provide such guidance.¹⁸ Providers can also screen families for ACE risk factors and facilitate referrals to appropriate services.¹⁸ These might include treatment for behavioral health issues in children or parents; community-based, empirically supported parent training such as the Triple P⁶² or Incredible Years⁶³ programs; and evidence-based home visiting models such as the Nurse-Family Partnership.²⁰ Physician practices can enhance referral impact by coordinating any services families receive.

Physician practices that deliver care to families according to the guidelines described above will be serving many of the core functions of the family-centered medical home (FCMH). The FCMH, which shares key features with the patient-centered medical home,⁶⁴ is a practice model in which patients receive readily accessible, comprehensive, continuous, and culturally competent care that empowers parents as decision-makers for their children.⁶⁵ Research has demonstrated that when families receive care consistent with the FCMH model, children have fewer ACEs and show greater resilience,⁶⁰ while parents report less caregiving stress.⁶⁶

Recommended Practices for Decreasing the Health Impacts of ACE Exposures

Primary care providers who identify ACE exposures in child or adult patients are advised to incorporate principles of trauma-informed care⁶⁷ into their work with these patients. Within the framework of trauma-informed care, providers recognize that ACEs can increase risk for health-harming behaviors while at the same time leading to difficulties with patient engagement in treatment.^{11,67} To mitigate these effects, providers who deliver trauma-informed care adopt measures to strengthen their therapeutic alliances with patients and, as appropriate, with their families. These measures may include educating patients about ACEs and health, collaborating with patients on clinical decision-making, explicitly respecting patient choices, and linking patients to trauma-specific services as needed.^{11,67} Trauma-informed approaches are believed to improve treatment adherence,¹⁹ experience of care,¹⁹ and outcomes⁶⁸ in patients with ACE histories

Rural Implementation Considerations

Rural health care environments are often characterized by inadequate funds,⁶⁹ primary care workforce shortages,^{69,70} and barriers to the implementation of electronic health records.⁷¹ Behavioral health treatment and evidence-based family supports may also be scarce, due to the limited supply of behavioral health professionals in rural areas.^{69,70} For all these reasons, rural pediatric and primary care practices may find it challenging to implement the screening, preventive interventions, referrals, and care coordination that are recommended as measures to address ACEs.⁷⁰⁻⁷² Moreover, because concerns about behavioral health-related stigma are prominent in rural areas,⁷³⁻⁷⁵ rural patients may be especially reluctant to engage with providers in discussing ACE risk factors, ACE exposures, or behavioral health needs stemming from ACEs. They may also hesitate to make use of treatment and supports.

Strategies for Strengthening Rural Capacity to Respond to ACEs

To overcome the lack of formal resources for combatting ACEs in rural regions, health care organizations serving rural areas could design delivery system improvement projects with ACE-focused components. Three new grant programs administered by the Federal Office of Rural Health Policy could serve as potential funding sources for such efforts: these include the Rural Health

Care Coordination,⁷⁶ Rural Health Network Development,⁷⁷ and Small Health Care Provider Quality Improvement⁷⁸ programs.

The federal Home Visiting Program (HVP)⁷⁹ represents another possible source of resources for enhancing rural ACE prevention. Administered by the Health Resources and Services Administration in partnership with Administration for Children and Families, the HVP awards grants to states to facilitate delivery of empirically supported, home-based services designed to prevent adverse child outcomes in vulnerable families.⁷⁹ In 2014, HVP services were provided in 30% of urban counties and in only 17% of rural counties.⁷⁹ Rural stakeholders and policy makers could consider advocating for increased rural access to HVP funding.

As a further measure for building capacity, rural primary care providers could forge ACE-focused interest groups with representatives from local community mental health centers, public health departments, schools, and other agencies. In rural environments where stigma strongly influences prevailing attitudes about behavioral health, the active involvement of trusted local organizations may be critical to the success of any ACE-focused initiatives. With the participation of such stakeholders, provider-led community partnerships would be well positioned to raise public awareness about ACEs, conduct ACE-related community needs assessments, and work toward creating new services, both in the community and in health care settings.¹⁷ Policy makers should devise mechanisms for funding these ACE-focused collaboratives. Activities along these lines could help form a basis for long-term, population-based approaches to preventing ACEs and decreasing their impact in rural America.

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The state agencies listed above bear no responsibility for our use of BRFSS data or for our interpretations and inferences based on such uses.

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