



Adverse Childhood Experiences in South Carolina:

Behavioral Risk Factors

Melanie Morse, MS¹, Melissa Stropolis, PhD², Mary Ann Priester, MSW³, & Nikki R. Wooten, PhD, LISW-CP³

Children's Trust of South Carolina has produced a series of research briefs on adverse childhood experiences (ACEs). The research brief topics include the data collection process, an overview of ACEs, the prevalence of ACEs in various populations, and the relationship between ACEs and health and social outcomes.

In 2014, Children's Trust partnered with South Carolina's Department of Health and Environmental Control (SC DHEC) to collect data from South Carolina adults on exposure to adverse childhood experiences (ACEs). This partnership developed because, as the state leader in prevention of child abuse and neglect, Children's Trust values data-driven decision-making to improve the environments of vulnerable children and families. Currently, ACE data is being collected annually via the Behavioral Risk Factor Surveillance System (BRFSS; Centers for Disease Control and Prevention [CDC], 2014a).

Children's Trust has developed a series of research briefs to outline the ACE data collection process (see Morse & Stropolis, 2016a) and to highlight important findings from the data collected. Seventh in the series, this brief reports the relationships between ACE and key behavioral risk factors. First, an overview of ACE and behavioral risk survey items is provided. Then, results for ACEs by behavioral risk items are presented for ACE prevalence (yes/no), cumulative ACE (i.e., 0, 1, 2, 3, 4+), and ACE type (abuse: physical, emotional, sexual; household dysfunction: household mental illness, substance use, domestic violence, incarceration, parental separation/divorce).

ACE Survey Items

In 2014-2016, the ACE Survey items were collected in South Carolina via the 2014-2016 BRFSS and modeled the original ACE Study survey questions (See CDC, 2014a and Morse & Stropolis, 2016a for additional information). Eight ACE types were assessed (abuse: physical sexual, emotional; household dysfunction: mental illness, substance use, incarceration, divorce, domestic violence).

Table 1 outlines each of the 11 survey items administered to South Carolina adults (18 and older). Two items assessed household substance use (alcohol, drugs), and three items assessed sexual abuse (i.e., inappropriate touch, involuntary sexual intercourse). Items in these categories were collapsed for analytic purposes and are consistent with previous ACE research (e.g., Anda et al., 2006; Felitti et al., 1998). Item responses only indicated whether a participant had experienced a particular ACE. Thus, the survey does not capture intensity or frequency of ACE exposure, but it does measure cumulative exposure to ACEs.

Table 1

ACE Types and Survey Items	
ACE TYPE	SURVEY ITEM(S)
Household Mental Illness	Did you live with anyone who was depressed, mentally ill, or suicidal?
Household Substance Use	Did you live with anyone who was a problem drinker or alcoholic? or Did you live with anyone who used illegal street drugs or abused prescription medications?
Household Incarceration	Did you live with anyone who served time or was sentenced to serve time in a prison, jail, or other correctional facility?
Parental Separation/Divorce	Were your parents separated or divorced?
Household Domestic Violence	How often did your parents or adults in your home ever slap, hit, kick, punch, or beat each other up?
Physical Abuse	How often did a parent or adult in your home ever hit, beat, kick, or physically hurt you in any way? Do not include spanking.
Emotional Abuse	How often did a parent or adult in your home ever swear at you, insult you, or put you down?
Sexual Abuse	How often did anyone at least 5 years older than you or an adult ever touch you sexually? or try to make you touch them sexually? or force you to have sex?

1. University of South Carolina, Department of Psychology

2. Children's Trust of South Carolina

3. University of South Carolina, College of Social Work



Behavioral Risk Factors: Background and Survey Items

Given that ACEs are associated with negative health outcomes in large clinical samples (e.g., Felitti et al., 1998) and in South Carolina (Priester, Wooten, Stropolis, & Morse, 2016), it is also important to consider behaviors that are associated with ACEs. Examining and understanding risk behaviors is helpful in identifying prevention and treatment targets that mitigate the impact of ACEs on health outcomes. In 2014-2016, the South Carolina BRFSS collected data on cigarette smoking status, alcohol use, and seatbelt use (see Table 2).

Risky health behaviors including cigarette smoking and excessive alcohol use are consistently linked to billions of dollars in public spending (e.g., medical care costs; Cawley & Ruhm, 2011; Zohrabian & Philipson, 2010). Globally, alcohol use is attributable to four percent of disease and disability, which is roughly equivalent to the global burden of disease accounted for by smoking (Room, Babor, & Rehm, 2005). Previous research has found that exposure to multiple ACEs increases risk for both heavy drinking and self-reported alcoholism among individuals with or without an alcoholic parent (Dube, Anda, Felitti, Edwards, & Croft, 2002). Individuals with four or more ACEs were twice as likely as individuals with three or less ACEs to report any occurrence of heavy drinking and three times as likely to report alcohol problems in adulthood (Dube et al., 2002).

Cigarette smoking is the leading cause of preventable death in the United States (U.S. Department of Health and Human Services, 2004, 2014). Specifically, within the southern U.S., smoking has been identified as a key contributor to all-cause mortality (Fenelon & Preston, 2012). Extant research indicates that ACEs are associated with ever smoking, heavy smoking, and smoking-related diseases (Anda et al., 1999; Brown, Lewinsohn, Seeley, & Wagner, 1996). Research has also demonstrated an exposure-response relationship between smoking and ACEs such that as the number of ACEs increases, smoking rates also increase (Ford et al., 2011).

Seat belt use may also be associated with ACEs. Motor vehicle crashes are a leading cause of death among Americans ages 1-54 years of age (CDC, 2010) and are the leading cause of injury and death for children (birth to age 18) in South Carolina (South Carolina Department of Health and Environmental Control, 2015). Seat belt use can reduce crash-related injuries and death by about half (National Highway Traffic Safety Administration, 2014). Seat belt use represents another important risk factor to consider because not wearing a seat belt puts drivers and passengers at risk of significant injury during motor vehicle crashes.

Given the theoretical and documented links among cigarette smoking, alcohol use, and seat belt use with negative health outcomes and injury, the current research brief focused on the variables presented below (Table 2). For smoking status, the current smoking variable was calculated based on reporting smoking either “every day” or “some days”. For the alcohol use variables, South Carolinians were first asked to identify the number of days in the past 30 that at least one alcoholic beverage was consumed. For individuals who reported drinking at least one beverage in the past 30 days, follow-up questions about binge drinking and heavy drinking were asked. For seat belt use, South Carolinians could select one of five options (*never, seldom, sometimes, nearly always, always*) to describe how often they wore a seat belt when either driving or riding in a car.

ACEs and other BRFSS data are weighted by the CDC so that the data is representative of the adult population of South Carolinians who have land line and cellular telephones. Weighting ensures that groups who are under-represented in the data can be accounted for during data analysis.

Table 2

Behavioral Risk Factors Survey Items	
BEHAVIORAL RISK TYPE	SURVEY ITEM
Smoking Status: Current Smoker	Do you now smoke cigarettes every day, some days, or not at all?
Alcohol Use	During the past 30 days, how many days did you have at least one drink of any alcoholic beverage?
Binge Drinking	How many times during the past 30 days did you have 5 or more drinks for men or 4 or more drinks for women on occasion?
Heavy Drinking	During the past 30 days, on the days when you drank, about how many drinks did you drink on average?
Seat Belt Use	How often do you use seat belts when you drive or ride in a car?



BRFSS data is weighted to ensure unbiased population estimates by accounting for complex sampling, nonresponse, and noncoverage (e.g., landline versus cell phone data collection; CDC, 2014b). Thus, a “weight” is assigned to every survey respondent. Under-represented respondents have a higher weight, whereas over-sampled or represented respondents have a lower weight (Kish, 1990). Modified Rao-Scott chi-square estimates (Rao & Scott, 1984) were used to interpret ACE findings. See *Weighting of BRFSS Data* (CDC, 2014b) for more information.

Prevalence of ACE Types

Overall ACE prevalence for South Carolina was 60% (Morse, Stropolis, Priester, & Wooten, 2016a). Prevalence of individual ACE types is presented in Table 3. The most frequently endorsed ACE was parental separation/divorce, while household incarceration was the least frequently endorsed. More detailed information regarding individual ACE prevalence has previously been documented (Morse, Stropolis, Priester, & Wooten, 2016b). Rates of cumulative ACEs are as follows: 0 ACEs: 40%, 1 ACE: 25%, 2 ACEs: 14%, 3 ACEs: 9%, 4+ ACEs: 12% (see Morse, Stropolis, Priester, & Wooten, 2016a for a detailed review).

Behavioral Risk Factor Prevalence

Table 4 presents the prevalence for each behavioral risk factor. Current smoking status was the most prevalent behavioral risk factor (20% of South Carolina adults reported this), while never wearing a seat belt was the least prevalent behavioral risk factor (1% of South Carolinians selected this answer).

ACE Prevalence and Behavioral Risk Factors

Smoking, alcohol consumption, and seat belt use were examined among South Carolina residents who reported any ACE exposure. Smoking and alcohol use are well-documented behavioral risk factors and have been associated with ACEs (e.g., Anda et al., 1999; Dube et al., 2002; Ford et al., 2011). Seat belt use is another important risk factor to examine given its association with significant injury and death (CDC, 2010; South Carolina Department of Health and Environmental Control, 2015).

Table 3

Prevalence of ACE Types	
ACE	PREVALENCE
Any ACE	60%
Parental Separation/Divorce	31%
Emotional Abuse	30%
Household Substance Use	28%
Household Domestic Violence	19%
Household Mental Illness	16%
Physical Abuse	14%
Sexual Abuse	12%
Household Incarceration	9%

Note. All percentages may not total 100% due to rounding.

Table 4

Prevalence of Behavioral Risk Factors	
ACE	PREVALENCE
Current Smoker	20%
Binge Drinker	15%
Seat Belt Use	
Never	1%
Seldom	1%
Sometimes	3%
Nearly always	7%
Always	88%

Note. All percentages may not total 100% due to rounding.



Cigarette smoking and ACEs. Seventy-five percent of current smokers residing in South Carolina had at least one ACE, whereas 57% of non-current smokers had at least one ACE. Examination of individual ACEs revealed a consistent discrepancy between ACE prevalence for smokers and non-smokers. Results are presented in Table 5. Similarly, rates of cumulative ACEs were much higher for smokers than non-smokers (see Table 6).

Alcohol use and ACEs. Binge drinking was defined for men as having five or more drinks in one sitting; for women, it was defined as having four or more drinks in one sitting. South Carolinians who are binge drinkers had a significantly higher percentage of overall ACE prevalence (71%) than non-binge drinkers (60%). Heavy drinking included men who reported more than two alcoholic beverages per day and women who reported consuming more than one alcoholic beverage per day. Results of individual ACEs and alcohol use are presented in Table 7; these findings show that ACE prevalence among South Carolina residents who are binge is much higher compared to those who are not binge drinkers. For example, 41% of binge drinkers report experiencing emotional abuse, whereas 29% of non-binge drinkers report emotional abuse. Results of cumulative ACEs and alcohol use are presented in Table 8, and highlight that South Carolinians who are binge drinkers have a higher percentage of multiple ACEs than South Carolinians who do not binge drink (e.g., 17% of binge drinkers had 4+ ACEs vs 11% of non-binge drinkers).

Seat belt use and ACEs. ACE prevalence across frequency of seat belt use varied. South Carolinians who never wear a seat belt when driving or riding in a car had a lower percentage of any ACE (60%) than South Carolinians who always wear a seat belt (68%). Residents who sometimes or nearly always wear a seat belt had the highest percentages of ACE prevalence—70% and 69%, respectively. There were some differences in prevalence of individual ACEs by seat belt use (see Table 9). Regarding cumulative ACEs, 16% of South Carolina adults who always wear a seat belt had 4+ ACEs and 11% those who never wear a seat belt had 4+ ACEs. These results are presented in Table 10.

Table 5

ACE and Smoking Status		
ACE TYPE	CURRENT SMOKER	NON-SMOKER
Any ACE Exposure	75%	57%
Household Mental Illness	25%	14%
Household Substance Use	42%	25%
Household Incarceration	17%	7%
Parental Divorce	44%	28%
Household Domestic Violence	28%	17%
Physical Abuse	22%	12%
Emotional Abuse	40%	28%
Sexual Abuse	19%	11%

Note. All percentages may not total 100% due to rounding.

Table 6

Cumulative ACEs and Smoking Status		
TOTAL ACEs	CURRENT SMOKER	NON-SMOKER
0	25%	43%
1	24%	26%
2	16%	14%
3	12%	8%
4 or more	23%	9%

Note. All percentages may not total 100% due to rounding.

Table 7

ACE and Alcohol Use		
ACE TYPE	BINGE DRINKER	NON-BINGE DRINKER
Any ACE Exposure	71%	59%
Household Mental Illness	21%	15%
Household Substance Use	36%	27%
Household Incarceration	13%	8%
Parental Divorce	39%	30%
Household Domestic Violence	23%	19%
Physical Abuse	17%	14%
Emotional Abuse	41%	29%
Sexual Abuse	13%	12%

Note. All percentages may not total 100% due to rounding.



Table 8

Cumulative ACEs and Alcohol Use		
TOTAL ACEs	BINGE DRINKER	NON-BINGE DRINKER
0	29%	41%
1	24%	26%
2	17%	14%
3	13%	8%
4+	17%	11%

Note. All percentages may not total 100% due to rounding.

Table 9

ACE and Seat Belt Use					
ACE TYPE	NEVER WEAR SEAT BELT	SELDOM WEAR SEAT BELT	SOMETIMES WEAR SEAT BELT	NEARLY ALWAYS WEAR SEAT BELT	ALWAYS WEAR SEAT BELT
Any ACE Exposure	60%	67%	70%	69%	68%
Household Mental Illness	16%	20%	20%	22%	19%
Household Substance Use	28%	32%	34%	38%	32%
Household Incarceration	8%	13%	18%	22%	16%
Parental Divorce	30%	35%	43%	40%	37%
Household Domestic Violence	19%	24%	25%	22%	21%
Physical Abuse	14%	15%	18%	23%	19%
Emotional Abuse	29%	38%	40%	39%	35%
Sexual Abuse	12%	13%	13%	16%	16%

Note. All percentages may not total 100% due to rounding.

Table 10

ACE and Seat Belt Use					
Total ACEs	NEVER WEAR SEAT BELT	SELDOM WEAR SEAT BELT	SOMETIMES WEAR SEAT BELT	NEARLY ALWAYS WEAR SEAT BELT	ALWAYS WEAR SEAT BELT
0	40%	33%	30%	31%	39%
1	26%	24%	26%	26%	24%
2	14%	15%	17%	8%	12%
3	9%	11%	8%	9%	9%
4+	11%	17%	19%	26%	16%

Note. All percentages may not total 100% due to rounding.



Conclusion

ACEs are common in South Carolina (Morse, Stropolis, Priestler, Wooten & Srivastav 2017b) and they appear to be associated with risk behaviors. Adults who are current smokers had higher ACE prevalence than non-smokers, and the same pattern was found for South Carolinians who are binge or heavy drinkers compared to those who are not binge or heavy drinkers. Regarding seat belt use, there were some differences in prevalence of overall ACE, individual ACE, and cumulative ACE by frequency of seat use (e.g., never wear seatbelt versus always wear seatbelt). Seat belt use is associated with household incarceration and the prevalence of 4+ ACEs is higher among South Carolinians who never wear a seatbelt compared to those who always wear a seatbelt.

Given the strong link between ACEs and risk behaviors, it is likely that even a small reduction in overall ACE prevalence would result in a significant decrease in cigarette smoking, problematic alcohol use and, perhaps, an increase in seat belt use. Changes in these three key risk behaviors could have significant impacts for public health, such that millions of dollars would be saved annually and rates of preventable injury, disease, and mortality would decrease.

Successful approaches to reducing ACEs should be multidisciplinary over time, and previous research has suggested that investing in community capacity is key to reducing ACEs (Hall, Porter, Longhi, Becker-Green, & Dreyfus, 2012). Building community capacity could include a number of small steps such as raising awareness of ACEs, adopting a trauma-informed approach to prevention, and supporting programs and activities that promote child well-being and strong families. For example, South Carolina's SAFE KIDS chapter works to prevent childhood injuries by educating adults and children, conducting research, and advocating for effective laws that keep children safe (see http://scchildren.org/about_us/programs/safe_kids_south_carolina/). The collaboration of organizations such as SAFE KIDS with a trauma-informed prevention efforts will further promote great childhoods and building strong families in South Carolina.

Future research briefs in this series will highlight the relationship between ACEs and quality of life as well as the interrelatedness of ACEs; the next briefs will continue to explore the meaning of the relationship between ACE and adult outcomes, as well as suggest approaches to mitigating the impact of ACEs.



References

- Anda, R. F., Croft, J. B., Felitti, V. J., Nordenberg, D., Giles, W. H., Williamson, D. F., Giovino, G. A. (1999). Adverse childhood experiences and smoking during adolescence and adulthood. *Journal of the American Medical Association*, 282(17), 1652-1658.
- Anda, R. F., Felitti, V. J., Bremner, J. D., Walker, J. D., Whitfield, C., Perry, B. D., Giles, W. H. (2006). The enduring effects of abuse and related adverse experiences in childhood: A convergence of evidence from neurobiology and epidemiology. *European Archives of Psychiatry and Clinical Neuroscience*, 256(3), 174-186.
- Brown, D. W., Lewinsohn, P. M., Seeley, J. R., & Wagner, E. F. (1996). Cigarette smoking, major depression, and other psychiatric disorders among adolescents. *Journal of the American Academy of Child & Adolescent Psychiatry*, 35(12), 1602-1610.
- Cawley, J., & Ruhm, C. J. (2011). The economics of risky health behaviors. In M. V. Pauly, T. G. Maguire, & P. P. Barros (Eds.), *Handbook of Health Economics* (pp. 95-199). Waltham, MA: Elsevier.
- Centers for Disease Control and Prevention (CDC). (2014a). About the Behavioral Risk Factor Surveillance System. Retrieved from http://www.cdc.gov/brfss/about/about_brfss.htm
- Centers for Disease Control and Prevention (CDC). (2014b). Behavioral Risk Factor Surveillance System: Weighting BRFSS data. Retrieved from http://www.cdc.gov/brfss/annual_data/2014/pdf/weighting-data.pdf
- Centers for Disease Control and Prevention (CDC). (2010). *WISQARS (Web-based Injury Statistics Query and Reporting System)*. Retrieved from <http://www.cdc.gov/injury/wisqars/>
- Dube, S. R., Anda, R. F., Felitti, V. J., Edwards, V. J., & Croft, J. B. (2002). Adverse childhood experiences and personal alcohol abuse as an adult. *Addictive Behaviors*, 27(5), 713-725.
- Felitti, V. J., Anda, R. F., Nordenberg, D., Williamson, D. F., Spitz, A. M., Edwards, V., Marks, J. S. (1998). Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: The Adverse Childhood Experiences (ACE) Study. *American Journal of Preventive Medicine*, 14(4), 245-258.
- Fenelon, A., & Preston, S. H. (2012). Estimating smoking-attributable mortality in the United States. *Demography*, 49(3), 797-818.
- Ford, E. S., Anda, R. F., Edwards, V. J., Perry, G. S., Zhao, G., Li, C., & Croft, J. B. (2011). Adverse childhood experiences and smoking status in five states. *Preventive Medicine*, 53(3), 188-193.
- Hall, J., Porter, L., Longhi, D., Becker-Green, J., & Dreyfus, S. (2012). Reducing Adverse Childhood Experiences (ACE) by building community capacity: A summary of Washington Family Policy Council Research Findings. *Journal of Prevention & Intervention in the Community*, 40(4), 325-334.
- Kish, L. (1990). Weighting: Why, when, and how? In *JSM Proceedings*, Survey Research Methods Section. Alexandria, VA: American Statistical Association. 121-130. Retrieved from https://www.amstat.org/sections/SRMS/Proceedings/papers/1990_018.pdf
- Morse, M., & Stropolis, M. (2016a). *Adverse childhood experiences data collection: An overview of the Behavioral Risk Factor Surveillance System (BRFSS)* (Research Brief No. 1). Retrieved from http://www.scchildren.org/public/files/docs/Prevention_Learning_Center/ACEs-Research-Brief-BRFSS.pdf
- Morse, M., & Stropolis, M. (2016b). *The adverse childhood experiences study: Lessons learned and future directions* (Research Brief No. 2). Retrieved from http://www.scchildren.org/public/files/docs/Prevention_Learning_Center/ACEs-Research-Brief-General.pdf
- Morse, M., Stropolis, M., Priester, M. A., & Wooten, N. R. (2016a). *Adverse childhood experiences in South Carolina: A summary of dichotomous and cumulative ACEs and demographic prevalence* (Research Brief No. 3). Retrieved from http://scchildren.org/public/files/docs/Prevention_Learning_Center/ACE-Research-Brief-3-SC-Summary-Demographics-Prevalence-Cumulative.pdf
- Morse, M., Stropolis, M., Priester, M. A., & Wooten, N. R. (2016b). *Adverse childhood experiences in South Carolina: A summary of individual ACEs and demographic prevalence* (Research Brief No. 4). Retrieved from http://scchildren.org/public/files/docs/Prevention_Learning_Center/ACE-Research-Brief-4-SC-Demographics-Individual-ACEs.pdf
- National Highway Traffic Safety Administration. (1984). *Final regulatory impact analysis: Amendment to Federal Motor Vehicle Safety Standard 208 Passenger Car Front Seat Occupant Protection*. Publication no. DOT-HS-806-572. Retrieved from <http://www.nrd.nhtsa.dot.gov/pubs/806572.pdf>
- Priester, M. A., Wooten, N. R., Stropolis, M., & Morse, M. (2016). *Adverse childhood experiences and adult chronic disease in South Carolina* (Research Brief No. 5). Retrieved from http://scchildren.org/public/files/docs/Prevention_Learning_Center/ACE-Research-Brief-SC-Chronic-Diseases.pdf
- Rao, J. N. K., & Scott, A. J. (1984). On chi-squared tests for multiway contingency tables with cell proportions estimated from survey data. *The Annals of Statistics*, 12, 46-60.
- Room, R., Babor, T., & Rehm, J. (2005). Alcohol and public health. *The Lancet*, 365(9458), 519-530.
- South Carolina Department of Health and Environmental Control. (2015). *Child passenger safety program*. Retrieved from <http://www.scdhec.gov/Health/ChildTeenHealth/EarlyChildhood/ChildPassengerSafety/>
- U.S. Department of Health and Human Services. *The health consequences of smoking: A report of the Surgeon General*. Atlanta, GA: Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health. Retrieved from http://www.cdc.gov/tobacco/data_statistics/sgr/2004/complete_report/index.htm.
- U.S. Department of Health and Human Services. (2014). *The health consequences of smoking—50 years of progress. A report of the Surgeon General*. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health. Retrieved from <http://www.surgeongeneral.gov/library/reports/50-years-of-progress/full-report.pdf>
- Zohrabian, A., & Philipson, T. J. (2010). External costs of risky health behaviors associated with leading actual causes of death in the U.S.: A review of the evidence and implications for future research. *International Journal of Environmental Research and Public Health*, 7(6), 2460-2472.