



Adverse Childhood Experiences in South Carolina:

Preventable Chronic Diseases

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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 of South Carolina (herein Children's Trust) partnered with South Carolina's Department of Health and Environmental Control (SC DHEC) to collect data from SC 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. Fifth in the series, this brief utilized 2014-2016 ACE survey results from South Carolina to examine the association between ACEs and preventable chronic diseases. First, an overview of ACE and chronic disease survey items is provided. Then, results for ACEs by chronic disease type are presented for ACE prevalence (yes/no) and ACE type (abuse: physical, emotional, sexual; household dysfunction: household mental illness, substance use, domestic violence, incarceration, parental separation/divorce). Finally, we examined chronic disease prevalence by cumulative ACEs and discuss recommendations for prevention, policy, and practice.

ACE Survey Items

In 2014-2016, ACE survey items were collected via the BRFSS in South Carolina and modeled the original ACE Study survey questions (see Morse & Stropolis, 2016a, 2016b

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 the 11 survey items administered to South Carolina adults (18 or older). Two items assessed household substance use (alcohol, drugs), and three items assessed sexual abuse (inappropriate touch, involuntary sexual intercourse).

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? <i>or</i> 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? <i>or</i> try to make you touch them sexually? <i>or</i> force you to have sex?

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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 experienced a particular ACE. The survey does not capture intensity or frequency of ACE exposure, but does measure cumulative exposure to ACEs.

Chronic Disease Survey Items

According to the Centers for Disease Control and Prevention (CDC), heart disease, stroke, some cancers, diabetes, arthritis, pulmonary conditions (asthma, chronic obstructive pulmonary disorder [COPD]), and kidney disease are the most common, costly, and chronic diseases (CDC, 2014b, 2015, 2016). In 2014, the South Carolina BRFSS collected data on 10 chronic diseases (see Table 2). Survey items assessed lifetime prevalence of chronic diseases. Extant research suggests both household dysfunction ACEs (household mental illness, substance use, incarceration, domestic violence and parental separation/divorce) and abuse ACEs (physical, emotional, sexual) may contribute to intergenerational risk for both ACE and chronic disease (Dube et al., 2001; Oliver, 1993). Because multiple family members are likely to be exposed to household dysfunction, there is an increased likelihood that multiple people are exposed to the same type(s) of ACE. Health risks associated with household dysfunction may impact household members currently and across generations (Anda et al., 2009). Given intergenerational influences of both ACE and chronic diseases, we examined the prevalence of chronic disease by ACE type.

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 ensured that groups who are underrepresented in the data can be accounted for during data analysis. BRFSS data is weighted to ensure unbiased population estimates by accounting for complex sampling, nonresponse, and non-coverage (e.g., landline versus cell phone data collection; CDC, 2014a). 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, 2014c) for more information.

Prevalence of ACE Types

Overall, ACE prevalence for South Carolina was 60% (Morse, Strompolis, Priester, Wooten & Srivastav, 2017). Table 3 presents the prevalence for ACE types. Parental separation/divorce was the most frequently reported, while household incarceration was the least frequently reported.

Table 2

Chronic Disease Survey Items	
CHRONIC DISEASE TYPE	SURVEY ITEM(S) Have you ever been told...
Angina or Coronary Heart Disease	You had angina or coronary heart disease?
Arthritis	You have some form of arthritis, rheumatoid arthritis, gout, lupus, or fibromyalgia?
Asthma	You had asthma?
COPD	You have Chronic Obstructive Pulmonary Disease or COPD, emphysema, or chronic bronchitis?
Diabetes	You have diabetes?
Heart Attack	You had a heart attack, called a myocardial infarction?
Kidney Disease	You have kidney disease? (not including kidney stones, bladder infection, or incontinence.)
Skin Cancer	You had skin cancer?
Other Types of Cancer	You had any other types of cancer?
Stroke	You had a stroke?

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%



Prevalence of Chronic Disease Types

Table 4 presents the prevalence for chronic disease types. In South Carolina, arthritis (30%) was the most prevalent chronic disease, while kidney disease (3%) was least prevalent.

ACE Prevalence and Chronic Disease

Fifty-two percent of South Carolinians reported experiencing at least one chronic disease. Examining ACE prevalence by chronic disease revealed that ACEs were highly prevalent among South Carolina adults reporting chronic diseases. For all chronic diseases except skin cancer, the majority of South Carolina adults reporting a chronic disease also reported an ACE (see Table 5). For three chronic diseases (asthma, COPD, and kidney disease), almost 70% of individuals who reported any one of these chronic diseases also reported an ACE. Sixty percent of South Carolinians who reported arthritis also reported an ACE. Individuals with any ACE exposure reported lifetime prevalence of asthma at higher rates than the state prevalence (14% vs. 13%).

ACE Type and Chronic Disease

Household mental illness. Table 6 presents the prevalence of chronic disease type by household mental illness. Individuals who reported pulmonary conditions had the highest prevalence of household mental illness (COPD, 22%; asthma, 23%). Those who reported skin cancer (12%) had the lowest prevalence. In addition to COPD and asthma, those who reported arthritis (17%) and kidney disease (17%) reported household mental illness at higher rates than the state prevalence for South Carolina (16%).

Table 4

Prevalence of Chronic Disease Types	
CHRONIC DISEASE (YES)	PREVALENCE
Angina or Coronary Heart Disease	5%
Arthritis	30%
Asthma	13%
COPD	8%
Diabetes	13%
Heart Attack	5%
Kidney Disease	3%
Skin Cancer	7%
Other Types of Cancer	7%
Stroke	4%

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

Table 5

ACE Prevalence BY Chronic Disease Type		
CHRONIC DISEASE (YES)	ACE	NO ACE
Angina or Coronary Heart Disease	55%	45%
Arthritis	60%	40%
Asthma	68%	32%
COPD	67%	33%
Diabetes	56%	44%
Heart Attack	55%	45%
Kidney Disease	62%	38%
Skin Cancer	49%	51%
Other Types of Cancer	54%	46%
Stroke	57%	43%

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

Table 6

Chronic Disease Type by Household Mental Illness		
CHRONIC DISEASE (YES)	HOUSEHOLD MENTAL ILLNESS	NO HOUSEHOLD MENTAL ILLNESS
Angina or Coronary Heart Disease	14%	86%
Arthritis	17%	83%
Asthma	23%	77%
COPD	22%	78%
Diabetes	14%	86%
Heart Attack	15%	85%
Kidney Disease	17%	83%
Skin Cancer	12%	88%
Other Types of Cancer	15%	85%
Stroke	14%	86%

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



Household substance use. South Carolina adults who reported COPD (39%) reported the highest prevalence of household substance use. For all chronic diseases except skin cancer (25%), South Carolinians who reported a chronic disease had higher or equal to prevalence of household substance use compared to the prevalence in South Carolina (28%). Table 7 reports chronic disease type by household substance use.

Household incarceration. Table 8 presents prevalence of chronic disease type by household incarceration. South Carolina adults who reported asthma (14%) and COPD (12%) reported the highest prevalence of household incarceration. Those with skin cancer (3%) had the lowest prevalence.

Household domestic violence. Table 9 reports the prevalence of chronic disease type by household domestic violence. South Carolinians who reported COPD (27%) reported the highest prevalence of household domestic violence whereas those who reported skin (14%) and other types of cancer (18%) had the lowest prevalence. For all of the other chronic diseases, prevalence for household domestic violence was higher than or equal to the prevalence in South Carolina (20%).

Table 7

Chronic Disease Type by Household Substance Use		
CHRONIC DISEASE (YES)	HOUSEHOLD SUBSTANCE USE	NO HOUSEHOLD SUBSTANCE USE
Angina or Coronary Heart Disease	30%	70%
Arthritis	32%	68%
Asthma	36%	64%
COPD	39%	61%
Diabetes	29%	71%
Heart Attack	28%	72%
Kidney Disease	34%	68%
Skin Cancer	25%	75%
Other Types of Cancer	28%	72%
Stroke	30%	70%

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

Table 8

Chronic Disease Type by Household Incarceration		
CHRONIC DISEASE (YES)	HOUSEHOLD INCARCERATION	NO HOUSEHOLD INCARCERATION
Angina or Coronary Heart Disease	8%	92%
Arthritis	8%	92%
Asthma	14%	86%
COPD	12%	88%
Diabetes	8%	92%
Heart Attack	8%	92%
Kidney Disease	10%	90%
Skin Cancer	3%	97%
Other Types of Cancer	6%	94%
Stroke	10%	90%

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

Table 9

Chronic Disease Type by Household Domestic Violence		
CHRONIC DISEASE (YES)	HOUSEHOLD DOMESTIC VIOLENCE	NO HOUSEHOLD DOMESTIC VIOLENCE
Angina or Coronary Heart Disease	21%	79%
Arthritis	22%	78%
Asthma	24%	76%
COPD	27%	73%
Diabetes	21%	79%
Heart Attack	20%	80%
Kidney Disease	24%	76%
Skin Cancer	14%	86%
Other Types of Cancer	18%	82%
Stroke	24%	76%

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



Parental separation/divorce. South Carolinians who reported asthma (36%) and COPD (30%) reported the highest prevalence of parental separation/divorce. Those who reported skin cancer (16%) reported the lowest prevalence of separation/divorce (see Table 10).

Physical abuse. Table 11 reports prevalence for chronic disease type by physical abuse. South Carolina adults who reported COPD (22%) reported physical abuse most frequently, whereas those who reported skin cancer (13%) reported physical abuse the least. For all chronic diseases except skin cancer, South Carolinians reported physical abuse prevalence higher than the overall prevalence in South Carolina (14%).

Emotional abuse. Table 12 presents prevalence of chronic disease type by emotional abuse. South Carolinians who reported COPD (38%), reported the highest prevalence of emotional abuse. Among South Carolina adults who reported any one of these chronic diseases, emotional abuse was reported more frequently than the state prevalence of 30%.

Table 10

Chronic Disease Type by Parental Separation/Divorce		
CHRONIC DISEASE (YES)	PARENTAL SERARATION/DIVORCE	NO PARENTAL SERARATION/DIVORCE
Angina or Coronary Heart Disease	21%	79%
Arthritis	27%	73%
Asthma	36%	64%
COPD	30%	70%
Diabetes	25%	75%
Heart Attack	22%	78%
Kidney Disease	29%	71%
Skin Cancer	16%	84%
Other Types of Cancer	22%	78%
Stroke	27%	73%

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

Table 11

Chronic Disease Type by Physical Abuse		
CHRONIC DISEASE (YES)	PHYSICAL ABUSE	NO PHYSICAL ABUSE
Angina or Coronary Heart Disease	15%	85%
Arthritis	17%	83%
Asthma	19%	81%
COPD	22%	78%
Diabetes	15%	85%
Heart Attack	15%	85%
Kidney Disease	18%	82%
Skin Cancer	13%	87%
Other Types of Cancer	16%	84%
Stroke	17%	83%

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

Table 12

Chronic Disease Type by Emotional Abuse		
CHRONIC DISEASE (YES)	EMOTIONAL ABUSE	NO EMOTIONAL ABUSE
Angina or Coronary Heart Disease	27%	73%
Arthritis	32%	68%
Asthma	36%	64%
COPD	38%	62%
Diabetes	28%	72%
Heart Attack	26%	74%
Kidney Disease	31%	69%
Skin Cancer	25%	75%
Other Types of Cancer	28%	72%
Stroke	29%	71%

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



Sexual abuse. South Carolinians who reported COPD reported the highest prevalence of sexual abuse (21%). See Table 13 for chronic disease type by sexual abuse prevalence.

Cumulative ACEs and Chronic Disease

Research has shown that there is a dose-response relationship between ACEs and health and social outcomes, such that as the number of ACEs increases, the number of negative outcomes experienced also increases (Felitti et al., 1998). Given this dose-response relationship, we examined cumulative ACE exposure in relation to chronic disease to examine chronic disease prevalence and cumulative number of ACEs.

Individuals with COPD had the highest prevalence of 4+ ACEs (19%), whereas those who reported skin cancer had the lowest prevalence of 4+ ACEs (8%). South Carolinians with respiratory diseases (asthma, COPD) had the highest prevalence of 4+ ACEs (18% and 19% respectively). Table 14 presents cumulative ACEs by chronic disease type.

Conclusions

There is high prevalence of preventable chronic diseases among South Carolina adults. In 2014, six of the chronic diseases examined (heart disease, stroke, cancer, diabetes, pulmonary conditions, and kidney disease) were among the top 10 leading causes of death and were estimated to have an economic burden of \$1.3 trillion annually in lost productivity and health care costs (Chatterjee, Kubendran, King, & DeVol, 2014; National Center for Health Statistics, 2015). By 2023, these costs are projected to increase to \$4.2 trillion annually (Chatterjee et al., 2014). The association between ACEs and negative health outcomes later in life has been well-documented, and emergent research suggests the intergenerational transmission of risk for those with ACE exposure (e.g., Anda, Tietjen, Schulman, Felitti, & Croft, 2010; Brown et al., 2009; Dube et al., 2001; 2009). Two-thirds of South Carolina adults with any ACE exposure report chronic diseases at higher rates than those with no ACE exposure. Given the high prevalence of both ACEs and chronic disease in South Carolina, it is important for South Carolinians to better understand the effects of childhood adversity. South Carolina health policymakers and service providers should consider innovative strategies for both ACE and chronic disease prevention and early identification for treatment.

Currently, there is a national trend to incorporate ACE-informed programs into schools, mental health providers, correctional facilities, and other settings (www.aceresponse.org). However, key researchers have

argued that the most advantageous approach to addressing ACEs is to simultaneously target them across multiple domains and settings (e.g., Larkin, Shields, & Anda, 2012). The findings presented here suggest that settings treating South Carolina adults with chronic diseases may be potential venues for ACE-informed programming. Findings also highlight types of ACEs that may be risk factors for preventable chronic diseases and can inform targeted prevention efforts for both ACEs and chronic diseases in South Carolina. Children’s Trust will continue to work with community partners across the state to identify strategies to prevent ACEs and mitigate the effects of ACE exposure across generations. The next research brief in the series will examine ACEs and healthcare utilization, and make recommendations about the role of health service delivery systems in preventing and mitigating the effects of ACEs among South Carolinians.

Table 13

Chronic Disease Type by Sexual Abuse		
CHRONIC DISEASE (YES)	SEXUAL ABUSE	NO SEXUAL ABUSE
Angina or Coronary Heart Disease	12%	88%
Arthritis	16%	84%
Asthma	18%	82%
COPD	21%	79%
Diabetes	12%	88%
Heart Attack	11%	89%
Kidney Disease	18%	82%
Skin Cancer	11%	89%
Other Types of Cancer	14%	86%
Stroke	14%	86%

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

Table 14

Chronic Diseases by Cumulative ACEs					
CHRONIC DISEASE (YES)	0 ACEs	1 ACE	2 ACEs	3 ACEs	4+ ACEs
Angina or Coronary Heart Disease	45%	24%	12%	8%	11%
Arthritis	40%	24%	14%	9%	14%
Asthma	32%	24%	16%	10%	18%
COPD	33%	21%	15%	11%	19%
Diabetes	44%	24%	14%	7%	11%
Heart Attack	45%	24%	11%	8%	11%
Kidney Disease	38%	25%	15%	9%	14%
Skin Cancer	51%	23%	11%	7%	8%
Other Types of Cancer	46%	22%	12%	9%	11%
Stroke	43%	24%	12%	8%	13%

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



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