

Adverse Childhood Experiences and Long-Term Health among Adults in Rhode Island

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Adverse Childhood Experiences (ACEs) are stressful or traumatic events in childhood that can undermine a child's sense of safety and well-being.¹ Examples of ACEs include, being a victim of or witnessing abuse, living in a home with someone with a substance abuse problem, and living with someone who was incarcerated. According to national estimates from the 2010 Behavioral Risk Factor Surveillance System, more than 60% of adults have experienced at least one type of ACE.¹ Prior research has found that the toxic stress that results from ACEs not only impacts the health of children, but has long lasting effects into adulthood as well, negatively influencing factors such as employment, mental health, chronic disease, substance use, and other aspects of health.^{1,2,3} The aim of this study was to examine the prevalence and impact of ACEs among Rhode Island adults.

METHODS

Data were from the 2020 Rhode Island Behavioral Risk Factor Surveillance System (BRFSS). The BRFSS is a telephone survey of non-institutionalized adults ≥ 18 years that is administered by the RI Department of Health (RIDOH) with support from the Centers for Disease Control and Prevention (CDC) and is used to measure risk behaviors and health. Data obtained from the survey sample are weighted to obtain statewide population estimates.

The 2020 RI BRFSS contained an eleven-item module on ACEs. These items were classified into one of eight categories:

- 1) Household mental illness
 - Did you live with anyone who was depressed, mentally ill, or suicidal?
- 2) Household substance abuse
 - Did you live with anyone who was a problem drinker or alcoholic?
 - Did you live with anyone who used illegal street drugs or who abused prescription medications?
- 3) Household incarceration
 - Did you live with anyone who served time or was sentenced to serve time in a prison, jail, or other correctional facility?
- 4) Parental divorce/separation
 - Were your parents separated or divorced?

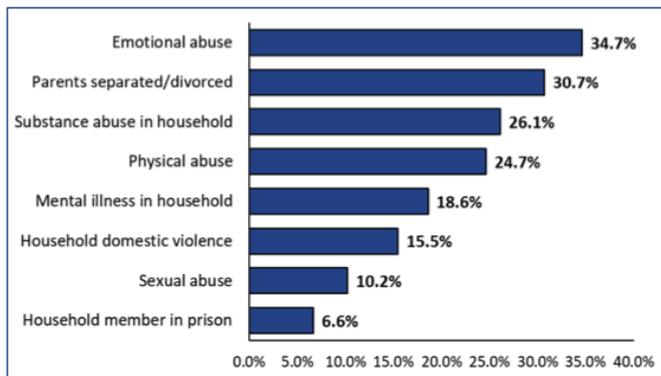
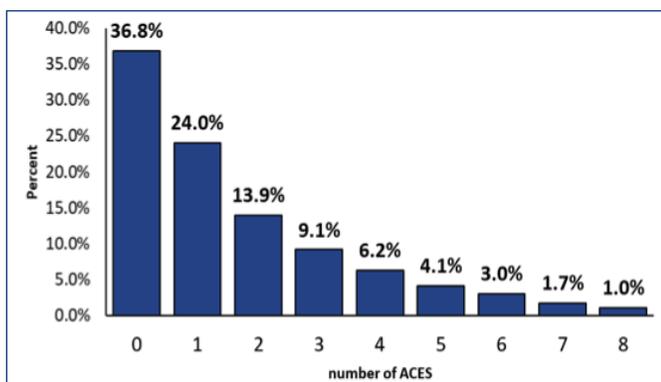
- 5) Household domestic violence
 - How often did your parents or adults in your home ever slap, hit, kick, punch or beat each other up?
- 6) Emotional abuse
 - How often did a parent or adult in your home ever swear at you, insult you, or put you down?
- 7) Physical abuse
 - Not including spanking, how often did a parent or adult in your home ever hit, beat, kick, or physically hurt you in any way?
- 8) Sexual abuse
 - How often did anyone at least 5 years older than you or an adult, ever touch you sexually?
 - How often did anyone at least 5 years older than you or an adult, try to make you touch them sexually?
 - How often did anyone at least 5 years older than you or an adult, force you to have sex?

Similar to methods of previous studies from Kaiser-Permanente² and the Colorado Department of Public Health,³ responses were summarized into an overall ACE score where respondents received one point for each type of ACE they experienced prior to the age of 18. Those missing responses to any ACE question were excluded from the total score calculations. Possible scores ranged from 0–8. Scores were then categorized into 3 groups: No ACEs, Low ACEs (1–3 ACEs), and High ACEs (4 or more ACEs).

Descriptive analyses were conducted to examine the distribution of ACE scores in the population and the prevalence of each ACE type. Next, we examined the demographic characteristics and prevalence of selected health outcomes and behaviors by the three-level ACE measure. All health outcomes were then separately assessed in multivariable logistic regression models examining the association between the three-level ACE measure and health, adjusting for sex, sexual orientation, age group, race/ethnicity, and educational attainment.

RESULTS

Overall 5,378 respondents completed the 2020 BRFSS, representing a weighted sample of 857,269 adults. The most common type of ACE was emotional abuse (34.7%), followed by having divorced or separated parents (30.7%), household substance use (26.1%), and physical abuse (24.7%) (**Figure 1**).

Figure 1. Prevalence of ACEs, by type**Figure 2.** Distribution of ACE Scores among Rhode Island Adults

ACE scores ranged from 0-8, with a mean of 1.63. Overall 63.2% reported at least one type of ACE with 24.0% reporting only one ACE and 1% reporting all 8 ACEs (Figure 2).

When categorized into the three-level ACE measure, 36.8% had 0 ACEs, 47.1% had Low ACEs, and 16.1% had High ACEs (Table 1). Younger age groups, gay/lesbian/bisexual/others, and those of lower socioeconomic status (SES) were more likely to have higher ACE scores than comparison groups.

Descriptive analysis revealed significant differences in prevalence of health outcomes by ACE level for all health measures assessed except diabetes, kidney disease, and cancer. For example, 45.1% of those with a high ACEs score reported a history of depression, compared to 24.3% of those with low ACE scores, and 8.6% of those with no ACEs (Table 2). Nearly one-third (30.0%) of those with a high ACE score were cigarette smokers compared to 13.4% of those with a low ACE score, and 6.7% of those with no ACEs.

In multivariable models adjusting for age, race/ethnicity, sex, sexual orientation, and educational attainment individuals with High ACE scores were significantly more likely than those with no ACEs to experience all health and behavioral outcomes assessed except obesity (Table 3). Notably, individuals with a high ACE score had more than seven times the odds of having a depression diagnosis (Adjusted

Table 1. ACE scores in Rhode Island, by selected demographics

	No ACEs N=240,345; 36.8%		Low ACEs N=306,956; 47.1%		High ACEs 104,946; 16.1%	
	N	%	N	%	N	%
Sex						
Male	119,446	38.6	142,072	45.9	47,719	15.4
Female	120,898	35.2	164,884	48.1	57,227	16.7
Sexual orientation						
Lesbian/gay/bisexual/ other	7,338	20.9	12,539	35.8	15,186	43.3
Straight	217,463	37.3	281,388	48.2	84,938	14.5
Age Group						
18-29 years	39,742	30.5	66,574	51.2	23,807	18.3
30-44 years	49,679	32.3	69,326	45.1	34,859	22.7
45-64 years	74,389	34.9	103,531	48.6	35,052	16.5
65+ years	70,979	48.2	65,782	4.7	10,440	7.1
Race/ethnicity						
White, non-Hispanic	182,987	38.1	221,601	46.3	74,463	15.5
Black, non-Hispanic	10,213	36.6	13,741	49.3	3,945	14.1
Other, non-Hispanic	12,134	31.8	18,452	48.0	7,827	20.4
Hispanic	29,926	32.5	45,903	49.9	16,191	17.6
Household income						
Less than \$25,000	34,919	31.4	51,925	46.7	24,263	21.8
\$25,000-49,999	37,802	32.4	57,018	48.9	21,717	18.6
\$50,000-74,999	33,394	37.0	39,477	43.7	17,439	19.3
\$75,000+	85,589	38.6	107,205	48.4	28,921	13.0
Education level						
Less than high school	21,964	32.0	32,086	46.7	14,685	21.4
High school	64,655	34.8	86,177	46.4	34,705	18.7
More than high school	152,497	38.5	188,110	47.5	55,019	13.9

Odds Ratio [aOR]=7.37, 95% Confidence Interval [CI]:5.09-10.69) and six times the odds of experiencing frequent mental distress (FMD; aOR=6.08, 95% CI: 3.88-9.52) compared to those with no ACEs. Those with a low ACE score were significantly more likely than those with no ACEs to experience a number of health outcomes including fair or poor health, FMD, frequent physical distress, arthritis, COPD, depression, disability, cigarette smoking, and heavy drinking.

DISCUSSION

A majority of Rhode Island adults (63.2%) have experienced at least one type of ACE and approximately 1 in 6 reported four or more ACEs. There was a dose response between ACEs and poor health outcomes as those who experienced greater numbers of ACEs were more likely to engage in risk

Table 2. Prevalence of health and behavioral outcomes, by ACE level

	No ACEs		Low ACE Score		High ACE Score	
	%	95% Confidence Interval	%	95% Confidence Interval	%	95% Confidence Interval
General Health						
Fair or Poor Health*	8.2	6.5–9.9	12.0	10.1–14.0	20.9	16.1–25.7
Frequent ^a mental distress*	5.8	4.3–7.4	13.5	10.8–16.3	32.9	26.9–38.9
Frequent ^a physical distress*	6.9	5.1–8.6	10.0	8.0–12.1	17.5	13.2–21.9
Frequent ^a activity limitations*	10.2	6.8–13.6	14.7	12.2–18.1	28.5	22.0–35.0
Chronic Conditions^b						
Current asthma*	9.2	7.0–11.3	11.1	8.9–13.2	24.9	19.4–30.4
Arthritis*	23.8	21.1–26.4	23.9	21.4–26.4	32.4	26.9–38.0
Cancer	13.5	11.5–15.4	12.5	10.7–14.2	11.4	7.9–15.0
Cardiovascular disease ^{c*}	7.8	6.3–9.3	7.8	6.4–9.2	8.1	5.4–10.7
COPD*	4.7	3.5–5.8	7.0	5.5–8.4	12.2	8.0–16.3
Depression*	8.6	6.7–10.5	23.7	20.7–26.8	45.1	39.1–51.1
Diabetes	11.2	9.2–13.2	9.8	8.1–11.5	12.2	8.7–15.7
Disability ^{d*}	17.3	14.9–19.7	24.3	21.5–27.1	42.2	36.2–38.2
Kidney disease	2.3	1.3–3.3	2.5	1.6–3.5	3.5	0.8–6.2
Health risk factors/behaviors						
Cigarette smoking*	6.7	5.1–8.4	13.4	11.1–15.8	30.0	24.2–35.8
Binge drinking ^{e*}	11.0	8.5–13.5	14.9	12.3–17.4	22.8	17.4–28.2
Heavy drinking ^{f*}	2.7	1.8–3.6	6.6	5.1–8.2	10.0	6.7–13.3
Obesity ^{g*}	30.1	26.3–33.8	30.6	27.5–33.8	38.3	32.3–44.2

Notes: *indicates statistical significance ($p < .05$); Frequent defined as ≥ 14 days in the last 30; ^aindicates ever diagnosed with condition unless otherwise specified; ^cCOPD=Chronic Obstructive Pulmonary Disorder; ^dproblems with hearing, vision, cognition, mobility, self-care, or independent living; ^e ≥ 4 drinks for females or ≥ 5 drinks for males, in one sitting in the last 30 days; ^f ≥ 8 more drinks for females or ≥ 15 for males, per week in the last 30 days; ^gBody Mass Index ≥ 30 based on height and weight.

behaviors and have health problems, findings similar to studies conducted among other populations.^{2,3,4}

ACEs can be prevented. Prior research has identified a number of family and neighborhood level risk factors for ACEs including low SES, isolation from friends/family, and living in communities with high rates of violence, and lack of activities for young people.¹ The CDC recommends six main evidence-based strategies to reduce the risk of ACEs. These strategies include: strengthening economic support for families (e.g., improving financial security, family-friendly work policies), promoting social norms that protect against violence (e.g., public education campaigns, legislation to reduce corporal punishment), ensuring strong

Table 3. Adjusted odd ratio of selected health outcomes, comparing low ACE scores and high ACE scores to those with no ACEs

	Low ACE Score		High ACE Score	
	Adjusted Odds ratio	95% Confidence Interval	Adjusted Odds ratio	95% Confidence Interval
General Health				
Fair or Poor Health	1.67	1.22–2.29	3.55	2.41–5.20
Frequent mental distress	2.28	1.55–3.37	6.08	3.88–9.52
Frequent physical distress	1.53	1.05–2.23	2.77	1.76–4.38
Frequent activity limitations	1.50	0.91–2.50	2.92	1.73–4.93
Chronic Conditions				
Asthma	1.17	0.82–1.68	2.89	1.86–4.51
Arthritis	1.31	1.06–1.62	3.47	2.44–4.93
Cancer	1.25	0.98–1.60	1.74	1.14–2.66
Cardiovascular disease	1.27	0.94–1.71	2.07	1.33–3.25
COPD	1.80	1.24–2.61	4.78	2.88–7.93
Depression	3.14	2.33–4.23	7.37	5.09–10.69
Diabetes	0.97	0.72–1.30	1.70	1.10–2.62
Disability	1.71	1.34–2.17	4.35	3.12–6.08
Kidney disease	1.34	0.71–2.54	2.37	1.06–5.31
Health risk factors/behaviors				
Cigarette smoking	2.21	1.55–3.15	4.97	3.28–7.53
Binge drinking	1.35	0.96–1.90	2.19	1.43–3.36
Heavy drinking	2.40	1.56–3.69	3.72	2.16–6.38
Obesity	1.02	0.79–1.31	1.38	0.98–1.94

starts for children (e.g., home visitation programs, high-quality childcare), teaching coping and relationship skills (e.g., social-emotional learning programs, parenting skills), connecting youth to caring adults and activities (e.g., mentoring and after school programs), and intervening to lessen harms (e.g., enhanced screening in primary care, access to mental health and substance use treatment).⁵

This study had several limitations. First, data were self-reported and may be prone to recall or reporting bias, particularly the underreporting of ACEs. Additionally, our definition of ACEs was limited to the 11 measures assessed in the module – there may be other adverse experiences not measured in our study – and there may be different aspects of ACEs, such as severity and age of onset – that can have different implications on health. Also, the relationship between ACEs and SES and health is nuanced and was difficult to fully assess in our study. We controlled for adult SES in our models due to the strong association between

childhood SES and ACEs and childhood SES and adult SES, but prior research has shown ACEs can directly impact adult SES – a factor which, in turn, can impact health. We did not have measures of childhood SES so we could not fully disentangle the relationship between these factors in our study.

Overall results of this study indicate a strong association between ACEs and poor health outcomes and risky health behaviors among adults in Rhode Island. While more research is needed to fully understand the intricacy of the relationship, health professionals and community advocates should incorporate evidence-based strategies to reduce ACEs and mitigate their harmful effects.

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