
How does childhood trauma relate to depression and anxiety later in life?

Independent research report by Amanda Metskas

Abstract

Several large population studies have reported a strong relationship between childhood trauma and mental health challenges in adulthood, including strong links with depression and anxiety. This article revisits that relationship. We conducted a study of 419 participants who completed the ACEs questionnaire alongside depression (PHQ-9), anxiety (GAD-7), and trait neuroticism-anxiety measures. We ran single-variable regression models, looking at the relationship between ACE score and the three different measures of depression or anxiety. The models replicated the population-level pattern found in larger studies, but also showed that ACEs scores explain only 7 to 10 percent of the variance in individual depression and anxiety scores. This article explains the apparent tension between these findings by distinguishing between population-level associations and individual-level predictive power: childhood trauma appears to be meaningfully linked to worse average mental health outcomes at the population level but, on an individual level, explains only a small amount of who experiences depression or anxiety in adulthood. The discussion considers implications for prevention and treatment, and highlights limitations of the ACEs questionnaire itself.

Keywords

Adverse Childhood Experiences, childhood trauma, depression, anxiety, population-level effects, individual variation, ACEs questionnaire, mental health treatment

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Several large studies have reported a strong relationship between childhood trauma and mental health challenges in adulthood, including strong links with depression and anxiety. Due in part to this research, trauma has become a major focus in medical settings and in popular discussion of mental health. Popular books, like *The Body Keeps the Score*,¹ argue that trauma is at the root of most mental health challenges. As part of our

¹van der Kolk, Bessel. *The Body Keeps the Score: Brain, Mind, and Body in the Healing of Trauma*. New York: Viking, 2014.

efforts to understand depression and anxiety we wanted to understand its relationship with childhood trauma. Is trauma the key to understanding mental illness?

What we found really surprised us.

- People with more traumatic experiences in childhood are more likely to have mental health challenges in adulthood when you look at the overall population.
- However, the relationship between childhood trauma and adult mental health varies a huge amount from person to person.
- This means that despite the strong population-level relationship, for an individual, experiences of childhood trauma are only weakly related to their mental health outcomes later in life.

To understand why this is, we'll first explain what the existing research finds, and then share the results of our recent study which tells a more nuanced story about childhood trauma and adult mental illness.

What does the research show?

The first major study² on childhood trauma and adult health outcomes was conducted by the CDC and Kaiser on more than 17,000 participants between 1995-1997. It found that adults who had experienced 4 or more Adverse Childhood Experiences (ACEs) had a 50.7% chance of experiencing 2 or more weeks of depressed mood in the past year, compared to only a 14.2% chance for adults who hadn't had any Adverse Childhood Experiences. People's odds of experiencing depressed mood in the past year as adults were 4.6 times higher if they had 4 or more ACEs in childhood, after accounting for age, gender, race, and educational attainment.

The study surveyed adults using the ACEs questionnaire, which asks people to answer yes or no questions about whether 10 adverse experiences occurred during their childhood. There are several versions of the ACEs questionnaire with slight variations, but experiences covered by each version are the same. The questionnaire asks about:

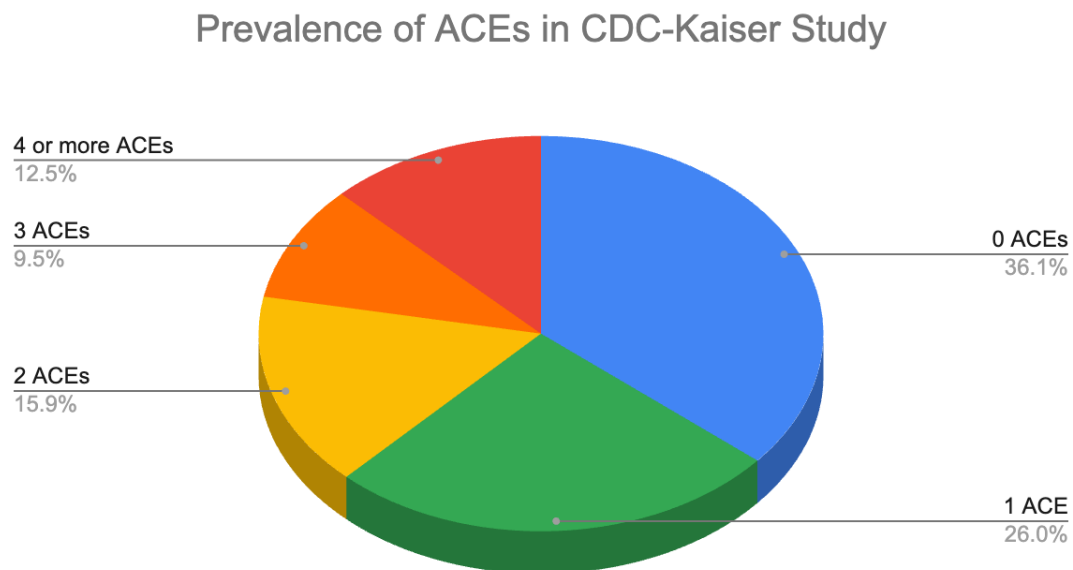
- abuse (physical, sexual, and emotional),
- neglect (physical and emotional),
- as well as factors that create an unstable home environment (domestic violence, addiction, mental illness, incarceration, and loss of a caregiver).

For example, the ACEs questionnaire asks about emotional abuse by asking: "Did a parent or adult in your home often swear at you, insult you, or put you down?" The questionnaire asks about domestic violence by asking: "Did your parents or adults in your home ever hit, punch, beat, or threaten to harm each other?" (You can see the full set of questions in the Appendix section, at the bottom of this article.)

The ACEs score calculated from this questionnaire is the number of questions from 0 to 10 that a person answered with a "yes." It is a count of the different types of ACEs the person experienced. Typically a score of 4 or more is considered high.

²Felitti, Vincent J., Robert F. Anda, Dale Nordenberg, David F. Williamson, Alison M. Spitz, Valerie Edwards, Mary P. Koss, and James S. Marks. "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, no. 4 (1998): 245-258. [https://doi.org/10.1016/s0749-3797\(98\)00017-8](https://doi.org/10.1016/s0749-3797(98)00017-8).

The chart below shows the percentage of the 17,337 participants in the CDC-Kaiser study reporting 0, 1, 2, 3, or 4 or more ACEs:



Notice (in blue) that only 36% of people had 0 ACEs, meaning that nearly two-thirds of people experienced at least one of the ACEs in childhood - so it's uncommon that people make it through childhood without at least one potentially traumatic type of event. Also notice (in red) that 12.5% of people reported experiencing 4 or more ACEs. The high percentage of the population experiencing ACEs, coupled with the relationship between ACEs and depression in adulthood found in this study, suggests that childhood trauma may be one of the most important factors underlying depression in adulthood. But is that how these results should be understood?

To answer that, it's important to understand how the CDC-Kaiser study analysis worked. The study used a model to compare the rate of depression among people in the sample who had different ACE scores. The depression measure used was whether people reported experiencing two or more weeks of depressed mood in the last year. The model also included age, gender, race, and educational attainment as control variables. This means that the relationship the model finds between depression and ACEs scores cannot be explained by differences in age, gender, race, and educational attainment because the model is taking those variables into account.

The primary results of the model are the "odds ratios" reported in the table below. The odds ratio compares the depression rate between the people with an ACE score of 0 (the reference group with the odds set at 1.0), and people who experienced different numbers of ACEs. For example, the table below shows that people with an ACE score of 3 were 2.6 times more likely than those with an ACE score of 0 to report two or more weeks of depressed mood in the last year. See the full results table [here](#)³. They found increased rates of depressed mood,

³Felitti, Vincent J., Robert F. Anda, Dale Nordenberg, David F. Williamson, Alison M. Spitz, Valerie Edwards, Mary P. Koss, and James S. Marks. "Relationship of Childhood Abuse and Household Dysfunction to Many of the Leading Causes of Death in Adults: The Adverse Childhood Experiences (ACE) Study" (table 4). *American Journal of Preventive Medicine* 14, no. 4 (1998): 245–258. [https://doi.org/10.1016/s0749-3797\(98\)00017-8](https://doi.org/10.1016/s0749-3797(98)00017-8).

suicide attempts, smoking, and obesity among those who experienced more ACEs. Here are the results they found for depression:

ACEs Score	% of people at this ACE score w/ depressed mood	Odds Ratio	95% Confidence Intervals
0 (comparison group)	14.2	n/a	n/a
1	21.4	1.5	(1.3–1.7)
2	31.5	2.4	(2.0–2.8)
3	36.2	2.6	(2.1–3.2)
4 or more	50.7	4.6	(3.8–5.6)
All ACE scores (total for all participants)	22.0		

Table 1: Relationship between ACE score and “Two or more weeks of depressed mood in the past year” from CDC-Kaiser study

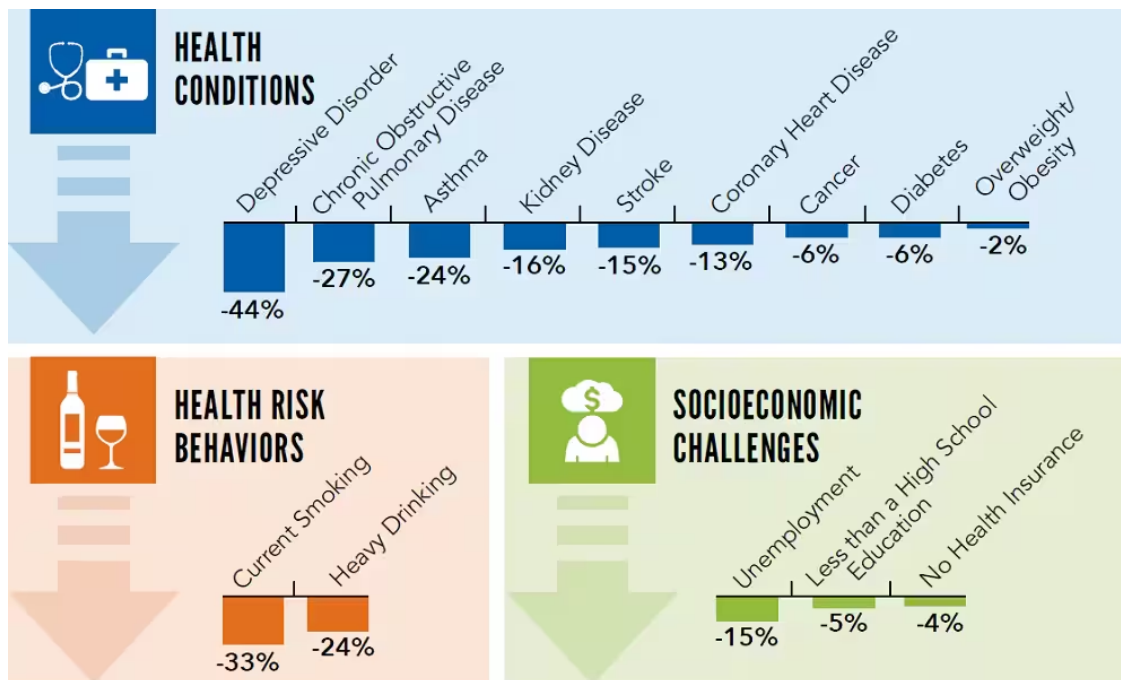
Looking at these odds ratios, you can see that the higher the ACE score, the higher the odds ratio for depression, suggesting that the risk of depression increases the more ACEs a person has experienced. There’s a small increase in the odds of depression for 1 ACE compared to 0, somewhat higher odds ratios for 2-3 ACEs compared to 0, and a much higher odds ratio for 4 or more ACEs compared to 0.

Since that initial study, a great deal of additional research has been conducted reporting similar findings, suggesting that there are serious consequences of ACEs for health outcomes in adulthood. The CDC has a list of research on ACEs [here](#)⁴.

Based on their research the CDC claims⁵ that preventing ACEs would lead to improvements in the rates of the following conditions across the U.S. population:

⁴Centers for Disease Control and Prevention. “Resources: Adverse Childhood Experiences (ACEs).” <https://www.cdc.gov/aces/communication-resources/>.

⁵Centers for Disease Control and Prevention. “Adverse Childhood Experiences (ACEs): Preventing Early Trauma to Improve Adult Health.” *CDC Vital Signs*, November 2019. <https://www.cdc.gov/vitalsigns/aces/>.



SOURCE: BRFSS 2015-2017, 25 states, CDC Vital Signs, November 2019.⁶

Although the original CDC-Kaiser study did not assess anxiety disorders, more recent studies have found similar odds ratios for anxiety disorders. Whitaker et al (2021)⁷ (full results table here⁸) found that the odds of experiencing an anxiety disorder in the last year were 3 times higher for adults with 3-5 ACEs after controlling for age, gender, race, childhood socioeconomic disadvantage, and current socioeconomic disadvantage compared to those with 0 ACEs. Another large study estimated that anxiety disorders would decline by 31% worldwide if Adverse Childhood Experiences were eradicated (Kessler et al., 2010⁹).

What We Found

We included the ACEs questionnaire in our study examining stressful life events¹⁰, which allowed us to attempt to replicate some of these previously mentioned effects, as well as to probe the topic further. We wanted to

⁶McGuire, Lisa C. "Data for Action: CDC's Behavioral Risk Factor Surveillance System (BRFSS) Cognitive Decline and Caregiving Data." *Innovation in Aging* 3, suppl. 1 (2019): S366–S367. <https://doi.org/10.1093/geroni/igz038.1339>.

⁷Whitaker, Robert C., Tracy Dearth-Wesley, Allison N. Herman, Amy E. Block, Mary Howard Holderness, Nicholas A. Waring, and J. Michael Oakes. "The Interaction of Adverse Childhood Experiences and Gender as Risk Factors for Depression and Anxiety Disorders in US Adults: A Cross-Sectional Study." *BMC Public Health* 21, art. 2078 (2021). <https://doi.org/10.1186/s12889-021-12058-z>.

⁸Whitaker, Robert C., Tracy Dearth-Wesley, Allison N. Herman, Amy E. Block, Mary Howard Holderness, Nicholas A. Waring, and J. Michael Oakes. "The Interaction of Adverse Childhood Experiences and Gender as Risk Factors for Depression and Anxiety Disorders in US Adults: A Cross-Sectional Study" (table 2). *BMC Public Health* 21, art. 2078 (2021). <https://link.springer.com/article/10.1186/s12889-021-12058-z/tables/2>.

⁹Kessler, Ronald C., Katie A. McLaughlin, Jennifer Greif Green, et al. "Childhood Adversities and Adult Psychopathology in the WHO World Mental Health Surveys." *The British Journal of Psychiatry* 197, no. 5 (2010): 378–385. <https://doi.org/10.1192/bjp.bp.110.080499>.

¹⁰Metskas, Amanda. "Study Report: How Much Is Your Anxiety Level Driven by Your Traits, and How Much Is It Driven by Your Life Circumstances?" *Clearer Thinking*, July 30, 2024 (updated June 11, 2025). <https://www.clearerthinking.org/post/life-stressors-and-anxiety>.

understand what percent of the variation in a person's depression or anxiety in adulthood can be predicted by childhood trauma.

We ran single-variable regression models looking at the relationship between ACE score and three different measures of depression or anxiety. Those models would allow us to see to what extent differences between people's ACEs scores matched up (covaried) with differences in their scores on the measures of depression or anxiety. The results were not what we expected!

The table below shows the three models. In the first model we used the PHQ-9 as a depression measure (it asks about the frequency of depression symptoms over the last two weeks). In the second model, we used the GAD-7 as a measure of generalized anxiety (it asks about the frequency of anxiety symptoms, like worry, over the last two weeks). In our third model, we looked at a Neuroticism-Anxiety measure which includes questions from the Big Five personality trait neuroticism measure that focus on anxiety, and asks people about their traits rather than focusing on the current time period.

In each model, the coefficient can be interpreted as the rise in the total score (PHQ-9, GAD-7, or Neuroticism-Anxiety) for each point the total ACE score is increased. The R^2 value is a measure of how well the model explains the data; it tells you how much variability in the dependent variable (in this case the measure of depression or anxiety) can be explained by looking at the values of the independent variables (in this case the ACE score).

	Coefficient	R-squared
PHQ-9 (depression measure)	0.80	0.10
GAD-7 (anxiety measure)	0.62	0.07
Neuroticism-Anxiety	1.0	0.05

For the depression model, only 10% of the variance in current depression symptoms measured by PHQ-9 score is explained by differences in ACE score. For the two anxiety models the amount of the variance the model explains is even smaller - 7% or 5% depending on whether the measure used is anxiety symptoms over the last two weeks or more lasting trait neuroticism-anxiety.

Given the strong relationship between rates of depression and anxiety in the population and ACEs found in several large studies, and the emphasis being placed on the role of childhood trauma in adult mental health, it was strange to find that only 10% of a person's current depression score is explained by variation in the ACEs score. Given that the odds of experiencing depression over the last year is 4.6 times higher for those with 4 or more ACEs compared to those with 0, we expected to see a larger portion of the variation in a person's current level of depression to be explained by their ACE score.

Similarly we found that only 7% of a person's current generalized anxiety score is explained by variation in their ACEs score, which was surprising given that the odds ratio for experiencing an anxiety disorder in the last year was 3.05 for those with an ACE score of 3-5 compared to those with an ACE score of 0.

The Puzzle

We set out to determine why we were finding such a small amount of depression and anxiety being explained by ACEs, when so many larger studies found such a strong difference in rates of health and mental health outcomes among people with low vs. high ACEs scores.

One possible explanation would be if our study sample ($n = 419$) was very different from the sample of people in the larger studies, but we checked and our study had similar results in terms of the prevalence of ACEs as the CDC-Kaiser study (see “Comparing Study Samples” in the Appendix for the detailed results).

We also found that rates of people experiencing depression broken down by their ACEs score was fairly similar in our study and the CDC-Kaiser study, which means that we were seeing a similar relationship between rates of depression and ACE scores in our data (see “Comparing Depression Rates” in the Appendix for the detailed results).

Given that, why do we find that ACEs scores account for so little of the variability in people's depression? And if it's the case that ACEs only explain 10% of the variation in a person's depression score, is it really the case that reducing ACEs in the population would have the large effect on reducing the rate of depression that the CDC claims? Isn't that contradictory to their finding?

Two different questions

Our research was essentially asking the question “on average, how much of a person's current anxiety or depression is explained by the amount of childhood trauma they experienced.”

This is a different question from the question being investigated by the large-scale research on ACEs because those studies are asking the question “how much difference is there in a person's odds of experiencing depression if they have a high ACEs score rather than a lower one?”

These questions seem similar, and like the answers to them should look the same, but they are importantly different.

The main reason these results appear so different is due to variation between individuals. Looking at the scatterplot below, you can see two main things. First, you can see that higher ACE scores do, on average, predict higher PHQ-9 scores (the blue line and the red line). The blue line is a linear model of the relationship between the two variables. The red line is a flexible fit model of the relationship between the variables. They both show that depression scores increase as ACE scores increase.

Second, you can see that, although this relationship exists, there is a lot of variety in the combinations of ACE score and PHQ-9 score that people have (the pattern of the black dots). If the ACE score was an extremely accurate predictor of PHQ-9 score, the black dots would be much more closely clustered around the path of the red or blue line. What this means is that when looking at a population of people, the relationship between ACE score and depression will be clearly present, but when looking at any individual person the ability to predict their depression from their ACE score will be quite limited because there is so much individual variation.

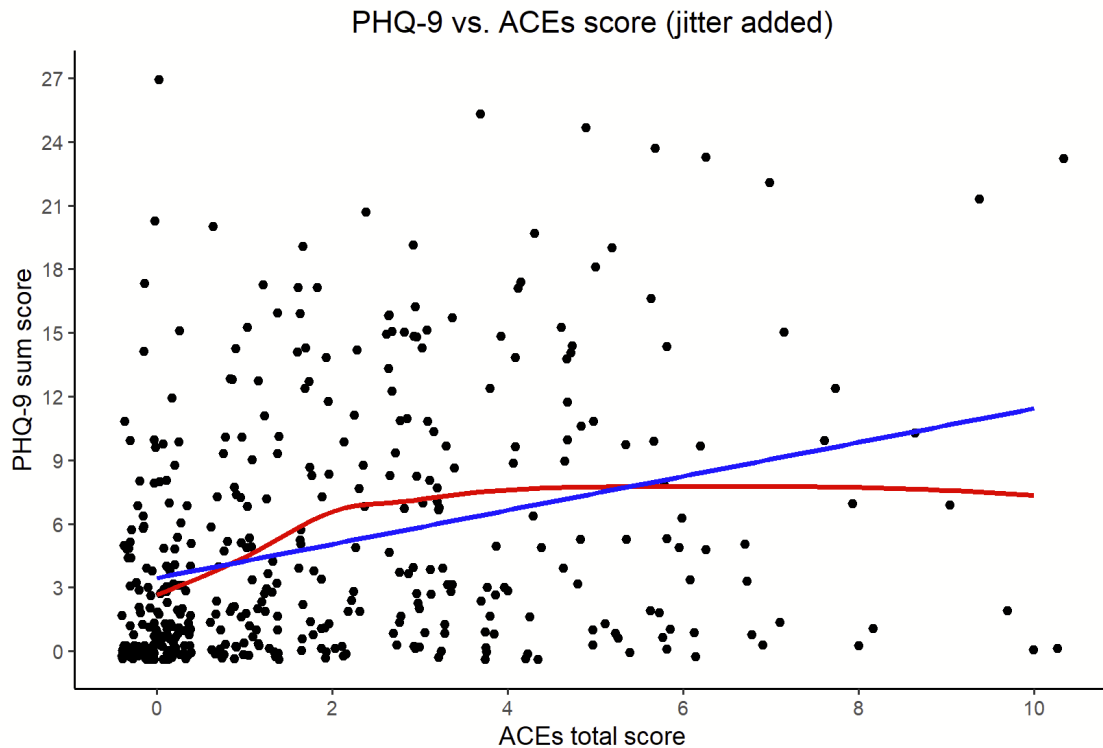


Figure 1: This figure shows a data point for each participant in the study representing their ACE score and PHQ-9 depression score. The blue line shows the linear model that best fits these data points, showing an increase in PHQ-9 depression score as ACE score increases. The red line shows what a flexible model fit to these data points looks like, showing an increase in PHQ-9 depression score mostly occurring as ACE scores increase from 0 to 2, and flattening out after that.

The pattern in this graph shows why our data replicate the results of the original CDC-Kaiser study, while also seeming to say something different when looked at another way. Our research findings do not contradict the claim that reducing ACEs would reduce rates of depression or anxiety in the population. However, they do shed light on the limitations of applying those claims to making predictions about the causes of depression or anxiety for any given individual.

Something that has a large average effect (across a whole population) may not explain that much of what is going on for each individual. In this case, there is a strong (average) association between ACEs and worse mental health at a population level, but ACEs scores don't do a very good job predicting which individual people struggle with mental health challenges in adulthood.

To understand intuitively how it could be that something could be a strong predictor at population level while being a weak predictor at an individual level, consider the example of education and income. It is well known that more educated people make more money, on average, than people with less education. But knowing someone's education you still wouldn't do a very good job of predicting their income, because there is a ton of variability due to other factors. For instance, some people with no college degree work in lucrative trade jobs, whereas some people with the highest level of education take on low paid positions at nonprofits. Similarly, ACEs are quite strongly linked to mental health challenges across the population, but don't let you predict very well who has mental health challenges at the individual level.

What our research suggests is that when treating an individual with depression or anxiety, it's important to remember that many factors contribute to the severity of symptoms in an individual. The evidence from the

large scale ACEs studies shouldn't be understood to mean that most of people's current anxiety or depression can be explained by childhood trauma - nor that processing childhood trauma is necessarily the most effective way to treat depression or anxiety in adulthood. There is a tremendous amount of variation in how any particular individual is affected by childhood trauma. For some people it may be closely connected to their mental health, whereas for others there may not be much of a link.

Why might the ACEs not be such great predictors at the individual level? Well, there are many factors that aren't captured by the ACEs questionnaire. The ACE score is a count of types of adverse experiences, but it doesn't capture differences in frequency, duration, or severity of any of those experiences. What's more, the same event might be more traumatic for one person than it is for another, based on differences in their personalities or past experiences. How ACEs impact a child later in life could vary due to these factors, and others including their age at the time the ACEs occurred, whether they have protective factors that increase resilience, and other traits that aren't captured in these studies. If ACEs were redesigned to take into account the frequency, duration and severity of symptoms, it's possible that studies would find an even greater link between ACEs and mental health.

It is also important to point out though that it's possible that the correlation between childhood trauma and anxiety and depression rates in adulthood is due at least in part to other variables. While studies typically control for some demographic factors, there may be other factors that are related to both higher ACEs and higher risk of depression or anxiety in adulthood that aren't being controlled in these studies. For example, the CDC-Kaiser study doesn't control for childhood poverty. It's possible that poverty during childhood may be related to both a higher ACE score and increased risk of depression or anxiety in adulthood. This would mean that some of the relationship that we identified in our data may be better explained by other factors. This is a good reminder of the old adage that "correlation doesn't imply causation." If not all of the relationship between ACEs and mental health is due to ACEs causing poor mental health, then the real causal relationship may be even smaller than the relationship we measured.

There are a number of factors other than childhood experiences that contribute to the severity of depression or anxiety - e.g. current life stressors, personality traits, coping mechanisms and skills, genetics, current treatments being used, etc. Given this multitude of factors, it's not obvious how much we should expect any one factor to contribute. Looked at in this way, the ACE score accounting for 10% of the variation in depression scores of adults at a point-in-time snapshot, may be quite substantial - yet, many people now speak of childhood trauma as being the primary source of adult depression or anxiety, which seems fairly unlikely given our data.

Implications

In terms of prevention of later mental health issues, reducing ACEs may reduce the risk of many serious problems in adulthood on a population level. Which means that from a societal standpoint, reducing potentially traumatic events in childhood may well be very important - not only do these events cause immediate suffering, they may also lead to poor mental health later in life. Our data (though it is on a much smaller number of participants) support the claims of the larger studies on this point, showing a similar pattern of more people experiencing anxiety or depression at higher ACE scores.

In contrast, when focusing on treatment of adults with depression and/or anxiety, our study suggests that the role of childhood trauma may be overemphasized. We think this may be due in part to misinterpretation of what the population-level data mean for individuals. Our study suggests that only 7-10% of the variability in

people's individual anxiety or depression levels can be predicted from their ACE score. The other 90%-93% of variance in depression or anxiety is not explained by ACEs score, meaning that there are a number of other factors that shape how much anxiety or depression someone is experiencing (or, that ACEs scores are simply not taking into account enough factors to accurately model the experiences of individuals).

This means that although the impact of childhood trauma at the population level is clear, at the individual level there is a lot of variation in how it relates to adult mental health. While childhood trauma may be the key to some people's mental health challenges, thankfully, is very far from a guarantee of adult mental health struggles.

Appendix

ACEs Questionnaire

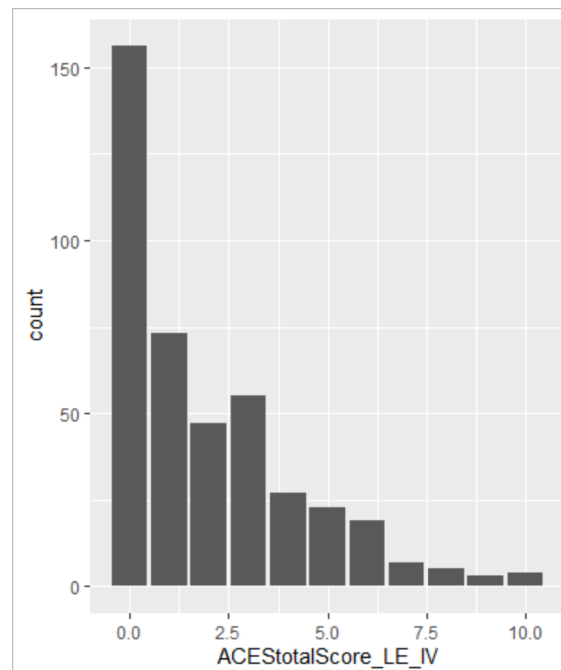
Here is the version of the questionnaire we used in our research, which is slightly updated from the original version used in the CDC study:

Instructions: This section includes yes/no questions about whether you had certain difficult experiences in your childhood (**prior to your 18th birthday**). Some of the questions ask about events that may be upsetting, but each question only requires a simple yes or no answer before moving on.

- Did a parent or adult in your home often swear at you, insult you, or put you down?
- Did a parent or adult in your home ever hit, beat, kick, or physically hurt you in any way?
- Did you experience unwanted sexual contact (such as fondling or oral/anal/vaginal intercourse/penetration)?
- Did you feel that no one in your family loved you or thought you were special?
- Did you feel that you didn't have enough to eat, had to wear dirty clothes, or had no one to protect or take care of you?
- Did you lose a parent through divorce, abandonment, death, or other reason?
- Did your parents or adults in your home ever hit, punch, beat, or threaten to harm each other?
- Did you live with anyone who had a problem with drinking or using drugs, including prescription drugs?
- Did you live with anyone who was depressed, mentally ill, or attempted suicide?
- Did you live with anyone who went to jail or prison?

Comparing Study Samples

ACEs score distribution in our study sample:



ACEs Score	Count in our sample (n = 419)	% in our sample (n = 419)	% in CDC sample (N = 17,337)
0	156	37.2%	36.1%
1	73	17.4%	26.0%
2	47	11.2%	15.9%
3	55	13.1%	9.5%
4 or more	88	21.0%	12.5%

Comparing the percentages, you can see that this distribution of ACEs scores is fairly similar between our study and the CDC study.

Comparing Depression Rates

When we did some simple analyses on our sample, we found similar patterns in the percentages of people experiencing depression, despite some differences in our measures. The CDC-Kaiser study looked at whether people experienced at least 2 weeks of depressed mood anytime over the course of the year prior. Our measure was a snapshot of how people were doing at the time they took our survey.

If we look at the percentage of people with a PHQ-9 score of at least 10, which is the threshold typically used for “moderate” depression, we find a similar pattern of results to the original study, although the pattern is somewhat less pronounced in our data. Given that our measure is a two-week snapshot of depressive mood, rather than reflecting the chance of experiencing at least one episode over an entire year, it’s not surprising that this pattern is weaker in our data.

ACEs Score	PHQ-9 ≥ 10	Odds Ratio*	95% Confidence Intervals
0	7.7%	1.0	Referent
1	16.4%	2.2	(0.9–5.3)

ACEs Score	PHQ-9 ≥ 10	Odds Ratio*	95% Confidence Intervals
2	29.8%	4.6	(1.9–11.2)
3	34.5%	5.4	(2.4–12.8)
4 or more	37.5%	6.4	(3.0–14.2)

* Odds ratios from logistic regression for PHQ-9 of at least 10, adjusting for age, education, and gender

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