

*ADVERSE  
CHILDHOOD  
EXPERIENCES*

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Introduction

Methods

Results

Discussion

Then the statistically enlightened Dr. Chan takes  
us all to school with further insights



# *THE STUDY*

Original Articles

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## **Relationship of Childhood Abuse and Household Dysfunction to Many of the Leading Causes of Death in Adults**

### **The Adverse Childhood Experiences (ACE) Study**

Vincent J. Felitti, MD, FACP, Robert F. Anda, MD, MS, Dale Nordenberg, MD, David F. Williamson, MS, PhD, Alison M. Spitz, MS, MPH, Valerie Edwards, BA, Mary P. Koss, PhD, James S. Marks, MD, MPH



# *INTRODUCTION*

THE “ACTUAL” CAUSES OF DEATH

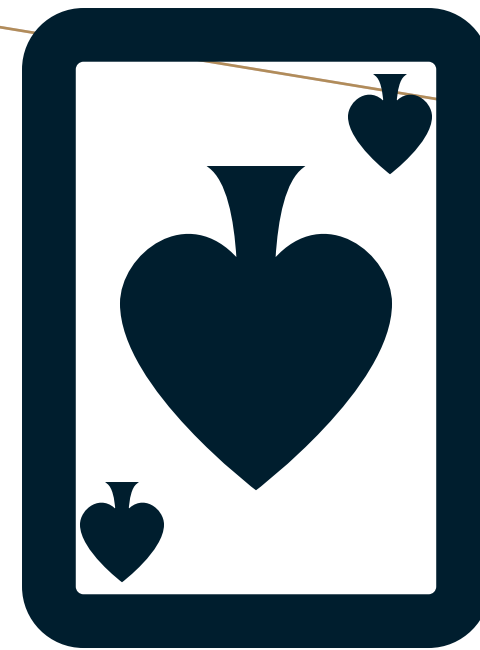
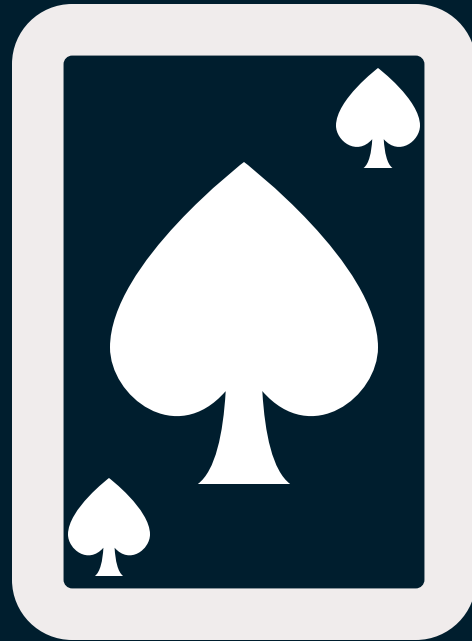




# *MORBIDITY AND MORTALITY*

- In the USA, lifestyle factors and health behaviors have the highest correlation with morbidity and mortality
- Adverse childhood experience (ACE) frequency and consequences have been explored by sociologists and psychologists for a long time, however...
- This report puts a finer point on the correlation between ACEs and adult health outcomes, with lifestyle factors and health behaviors as the “middleman”
- One aim is to increase relevance to primary care physicians, as the extant ACE data findings generally pertain to adolescent health, mental health in adults, or symptoms in patients in other specialty clinics
- Another is to incorporate more household factors than one type of abuse, which is what previous studies tended to focus on

"The ACE Study is assessing, retrospectively and prospectively, the long-term **impact of abuse and household dysfunction during childhood** on the following outcomes in adults: disease risk factors and incidence, quality of life, health care utilization, and mortality."



"In this initial paper we use baseline data from the study to provide an overview of the prevalence and interrelation of exposures to childhood abuse and household dysfunction

We then describe the relationship between the **number of categories** of these deleterious childhood exposures and risk factors and those **diseases that underlie many of the leading causes of death** in adults."

# *METHODS*

Study based in Kaiser Permanente San Diego  
Health Appraisal Clinic:

- ~45,000 patients annually
- Mostly self-referred, ~20% referred by provider
- ~81% of patients 25 and older enrolled in services between 1992 – 1995 were seen in the Health Appraisal Clinic

Health appraisal components:

- Standardized medical questionnaire that requests demographic and biopsychosocial information
- Review of organ systems
- Previous medical diagnoses
- Family medical history
- A health care provider completes the medical history, performs a physical examination, and reviews the results of laboratory tests with the patient

# *METHODS: ETHICAL BONA FIDES*

Review boards:

- Institutional Review Boards of the Southern California Permanente Medical Group (Kaiser Permanente)
- Emory University School of Medicine
- Office of Protection from Research Risks, National Institutes of Health



# *HOW IT'S MADE*

In the week after the health appraisal, ACE study questionnaires were mailed out.

Response rate: 70.5% ( 9,508 / 13,494 )\*

\*After exclusions: 59.7% (8,056/13,494) included in wave I analysis.



# *SEVEN DEADLY SINS?*

Survey split ACEs into 7 categories: 3 for childhood abuse and 4 for exposure to household dysfunction

- Psychological abuse
- Physical Abuse
- Contact sexual abuse
- Substance abuse exposure
- Mental illness exposure
- Violent treatment of mother or stepmother
- Criminal behavior exposure

Measure used was simply 0-7 scale for sum of positive response categories



**Survey Wave I--complete**  
**71% response (9,508/13,494)\***

***All medical evaluations  
abstracted***

***Follow-up***

***(Cohort n=19,000)***

**Survey Wave II--completed,  
n=15,000 under evaluation**

***All medical evaluations  
abstracted***

**Mortality**

**National Death Index**

**Morbidity**

**Hospital Discharge**

**Outpatient Visits**

**Emergency Room Visits**

**Pharmacy Utilization**

## *RESPONDENTS*

## *NONRESPONDENTS*

- n = 9,508
- Older ( mean = 56.1 years )
- Whiter ( 83.9% )

- n = 3,986
- Younger ( mean 49.3 years )
- Less white ( 75.3% )

% female and mean years of education similar between groups:

About 52% female and 13.8 years of education, respectively



# *RESULTS*

PREPARE TO BE SAD





**Table 1.** Prevalence of childhood exposure to abuse and household dysfunction

Category of childhood exposure <sup>a</sup>	Prevalence (%)	Prevalence (%)
<b>Abuse by category</b>		
<b>Psychological</b>		<b>11.1</b>
<i>(Did a parent or other adult in the household . . .)</i>		
Often or very often swear at, insult, or put you down?	10.0	
Often or very often act in a way that made you afraid that you would be physically hurt?	4.8	
<b>Physical</b>		<b>10.8</b>
<i>(Did a parent or other adult in the household . . .)</i>		
Often or very often push, grab, shove, or slap you?	4.9	
Often or very often hit you so hard that you had marks or were injured?	9.6	
<b>Sexual</b>		<b>22.0</b>
<i>(Did an adult or person at least 5 years older ever . . .)</i>		
Touch or fondle you in a sexual way?	19.3	
Have you touch their body in a sexual way?	8.7	
Attempt oral, anal, or vaginal intercourse with you?	8.9	
Actually have oral, anal, or vaginal intercourse with you?	6.9	
<b>Household dysfunction by category</b>		
<b>Substance abuse</b>		<b>25.6</b>
Live with anyone who was a problem drinker or alcoholic?	23.5	
Live with anyone who used street drugs?	4.9	
<b>Mental illness</b>		<b>18.8</b>
Was a household member depressed or mentally ill?	17.5	
Did a household member attempt suicide?	4.0	
<b>Mother treated violently</b>		<b>12.5</b>
<i>Was your mother (or stepmother)</i>		
Sometimes, often, or very often pushed, grabbed, slapped, or had something thrown at her?	11.9	
Sometimes, often, or very often kicked, bitten, hit with a fist, or hit with something hard?	6.3	
Ever repeatedly hit over at least a few minutes?	6.6	
Ever threatened with, or hurt by, a knife or gun?	3.0	
<b>Criminal behavior in household</b>		
Did a household member go to prison?	3.4	<b>3.4</b>
<b>Any category reported</b>		<b>52.1%</b>

<sup>a</sup>An exposure to one or more items listed under the set of questions for each category.

**Table 2.** Relationships between categories of adverse childhood exposure

Percent (%) Exposed to Another Category										
First Category of Childhood Exposure	Sample Size*	Psychological Abuse	Physical Abuse	Sexual Abuse	Substance Abuse	Mental Illness	Treated Violently	Imprisoned Member	Any One Additional Category	Any Two Additional Categories
Childhood Abuse:										
Psychological	898	—	52*	47	51	50	39	9	93	74
Physical abuse	874	54	—	44	45	38	35	9	86	64
Sexual abuse	1770	24	22	—	39	31	23	6	65	41
Household dysfunction:										
Substance abuse	2064	22	19	34	—	34	29	8	69	40
Mental illness	1512	30	22	37	46	—	26	7	74	47
Mother treated violently	1010	34	31	41	59	38	—	10	86	62
Member imprisoned	271	29	29	40	62	42	37	—	86	64
	median	29.5	25.4	40.5	48.5	38	32	8.5	80	54.5
	range	(22–54)	(19–52)	(34–47)	(39–62)	(31–50)	(23–39)	(6–10)	(65–93)	(40–74)

\*Number exposed to first category. For example, among persons who were psychologically abused, 52% were also physically abused. More persons were a second category than would be expected by chance ( $P < .001$ ; chi-square).

**Table 3.** Prevalence of categories of adverse childhood exposures by demographic characteristics

Characteristic	Sample size (N)	Number of categories (%) <sup>a</sup>				
		0	1	2	3	4
Age group (years)						
19–34	807	35.4	25.4	17.2	11.0	10.9
35–49	2,063	39.3	25.1	15.6	9.1	10.9
50–64	2,577	46.5	25.2	13.9	7.9	6.6
≥65	2,610	60.0	24.5	8.9	4.2	2.4
Gender <sup>b</sup>						
Women	4,197	45.4	24.0	13.4	8.7	8.5
Men	3,859	53.7	25.8	11.6	5.0	3.9
Race <sup>b</sup>						
White	6,432	49.7	25.3	12.4	6.7	6.0
Black	385	38.8	25.7	16.3	12.3	7.0
Hispanic	431	42.9	24.9	13.7	7.4	11.2
Asian	508	66.0	19.0	9.9	3.4	1.7
Other	300	41.0	23.5	13.9	9.5	12.1
Education <sup>b</sup>						
No HS diploma	480	56.5	21.5	8.4	6.5	7.2
HS graduate	1,536	51.6	24.5	11.3	7.4	5.2
Any college	2,541	44.1	25.5	14.8	7.8	7.8
College graduate	3,499	51.4	25.1	12.1	6.1	5.3
<b>All participants</b>	<b>8,056</b>	<b>49.5</b>	<b>24.9</b>	<b>12.5</b>	<b>6.9</b>	<b>6.2</b>

<sup>a</sup>The number of categories of exposure was simply the sum of each of the seven individual categories that were assessed (see Table 1).

<sup>b</sup>Prevalence estimates adjusted for age.

**Table 4.** Number of categories of adverse childhood exposure and the adjusted odds of risk factors including current smoking, severe obesity, physical inactivity, depressed mood, and suicide attempt

Health problem	Number of categories	Sample size (N) <sup>a</sup>	Prevalence (%) <sup>b</sup>	Adjusted odds ratio <sup>c</sup>	95% confidence interval
Current smoker <sup>d</sup>	0	3,836	6.8	1.0	Referent
	1	2,005	7.9	1.1	( 0.9–1.4)
	2	1,046	10.3	1.5	( 1.1–1.8)
	3	587	13.9	2.0	( 1.5–2.6)
	4 or more	544	16.5	2.2	( 1.7–2.9)
	Total	8,018	8.6	—	—
Severe obesity <sup>d</sup> (BMI ≥ 35)	0	3,850	5.4	1.0	Referent
	1	2,004	7.0	1.1	( 0.9–1.4)
	2	1,041	9.5	1.4	( 1.1–1.9)
	3	590	10.3	1.4	( 1.0–1.9)
	4 or more	543	12.0	1.6	( 1.2–2.1)
	Total	8,028	7.1	—	—
No leisure-time physical activity	0	3,634	18.4	1.0	Referent
	1	1,917	22.8	1.2	( 1.1–1.4)
	2	1,006	22.0	1.2	( 1.0–1.4)
	3	559	26.6	1.4	( 1.1–1.7)
	4 or more	523	26.6	1.3	( 1.1–1.6)
	Total	7,639	21.0	—	—
Two or more weeks of depressed mood in the past year	0	3,799	14.2	1.0	Referent
	1	1,984	21.4	1.5	( 1.3–1.7)
	2	1,036	31.5	2.4	( 2.0–2.8)
	3	584	36.2	2.6	( 2.1–3.2)
	4 or more	542	50.7	4.6	( 3.8–5.6)
	Total	7,945	22.0	—	—
Ever attempted suicide	0	3,852	1.2	1.0	Referent
	1	1,997	2.4	1.8	( 1.2–2.6)
	2	1,048	4.3	3.0	( 2.0–4.6)
	3	587	9.5	6.6	( 4.5–9.8)
	4 or more	544	18.3	12.2	(8.5–17.5)
	Total	8,028	3.5	—	—

<sup>a</sup>Sample sizes will vary due to incomplete or missing information about health problems.

<sup>b</sup>Prevalence estimates are adjusted for age.

<sup>c</sup>Odds ratios adjusted for age, gender, race, and educational attainment.

<sup>d</sup>Indicates information recorded in the patient's chart before the study questionnaire was mailed.

**Table 5.** Number of categories of adverse childhood exposure and the prevalence and risk (adjusted odds ratio) of health risk factors including alcohol or drug abuse, high lifetime number of sexual partners, or history of sexually transmitted disease

Health problem	Number of categories	Sample size (N) <sup>a</sup>	Prevalence (%) <sup>b</sup>	Adjusted odds ratio <sup>c</sup>	95% confidence interval
Considers self an alcoholic	0	3,841	2.9	1.0	Referent
	1	1,993	5.7	2.0	(1.6–2.7)
	2	1,042	10.3	4.0	(3.0–5.3)
	3	586	11.3	4.9	(3.5–6.8)
	4 or more	540	16.1	7.4	(5.4–10.2)
	Total	8,002	5.9	—	—
Ever used illicit drugs	0	3,856	6.4	1.0	Referent
	1	1,998	11.4	1.7	(1.4–2.0)
	2	1,045	19.2	2.9	(2.4–3.6)
	3	589	21.5	3.6	(2.8–4.6)
	4 or more	541	28.4	4.7	(3.7–6.0)
	Total	8,029	11.6	—	—
Ever injected drugs	0	3,855	0.3	1.0	Referent
	1	1,996	0.5	1.3	(0.6–3.1)
	2	1,044	1.4	3.8	(1.8–8.2)
	3	587	2.3	7.1	(3.3–15.5)
	4 or more	540	3.4	10.3	(4.9–21.4)
	Total	8,022	0.8	—	—
Had 50 or more intercourse partners	0	3,400	3.0	1.0	Referent
	1	1,812	5.1	1.7	(1.3–2.3)
	2	926	6.1	2.3	(1.6–3.2)
	3	526	6.3	3.1	(2.0–4.7)
	4 or more	474	6.8	3.2	(2.1–5.1)
	Total	7,138	4.4	—	—
Ever had a sexually transmitted disease <sup>d</sup>	0	3,848	5.6	1.0	Referent
	1	2,001	8.6	1.4	(1.1–1.7)
	2	1,044	10.4	1.5	(1.2–1.9)
	3	588	13.1	1.9	(1.4–2.5)
	4 or more	542	16.7	2.5	(1.9–3.2)
	Total	8023	8.2	—	—

<sup>a</sup>Sample sizes will vary due to incomplete or missing information about health problems.

<sup>b</sup>Prevalence estimates are adjusted for age.

<sup>c</sup>Odds ratios adjusted for age, gender, race, and educational attainment.

<sup>d</sup>Indicates information recorded in the patient's chart before the study questionnaire was mailed.



**Table 6.** Relationship between number of categories of childhood exposure and number of risk factors for the leading causes of death<sup>a</sup>

Number of categories	Sample size	% with number of risk factors				
		0	1	2	3	4
0	3,861	56	29	10	4	1
1	2,009	42	33	16	6	2
2	1,051	31	33	20	10	4
3	590	24	33	20	13	7
≥4	545	14	26	28	17	7
Total	8,056	44	31	15	7	3

<sup>a</sup>Risk factors include: smoking, severe obesity, physical inactivity, depressed mood, suicide attempt, alcoholism, any drug use, injected drug use, ≥50 lifetime sexual partners, and history of a sexually transmitted disease.

**Table 7.** Number of categories of adverse childhood exposure and the prevalence and risk (adjusted odds ratio) of heart attack, cancer, stroke, COPD, and diabetes

Disease condition <sup>d</sup>	Number of categories	Sample size (N) <sup>a</sup>	Prevalence (%) <sup>b</sup>	Adjusted odds ratio <sup>c</sup>	95% confidence interval
Ischemic heart disease	0	3,859	3.7	1.0	Referent
	1	2,009	3.5	0.9	(0.7–1.3)
	2	1,050	3.4	0.9	(0.6–1.4)
	3	590	4.6	1.4	(0.8–2.4)
	4 or more	545	5.6	2.2	(1.3–3.7)
	Total	8,022	3.8	—	—
Any cancer	0	3,842	1.9	1.0	Referent
	1	1,995	1.9	1.2	(1.0–1.5)
	2	1,043	1.9	1.2	(1.0–1.5)
	3	588	1.9	1.0	(0.7–1.5)
	4 or more	543	1.9	1.9	(1.3–2.7)
	Total	8,011	1.9	—	—
Stroke	0	3,832	2.6	1.0	Referent
	1	1,993	2.4	0.9	(0.7–1.3)
	2	1,042	2.0	0.7	(0.4–1.3)
	3	588	2.9	1.3	(0.7–2.4)
	4 or more	543	4.1	2.4	(1.3–4.3)
	Total	7,998	2.6	—	—
Chronic bronchitis or emphysema	0	3,758	2.8	1.0	Referent
	1	1,939	4.4	1.6	(1.2–2.1)
	2	1,009	4.4	1.6	(1.1–2.3)
	3	565	5.7	2.2	(1.4–3.3)
	4 or more	512	8.7	3.9	(2.6–5.8)
	Total	7,783	4.0	—	—
Diabetes	0	3,850	4.3	1.0	Referent
	1	2,002	4.1	1.0	(0.7–1.3)
	2	1,046	3.9	0.9	(0.6–1.3)
	3	587	5.0	1.2	(0.8–1.9)
	4 or more	542	5.8	1.6	(1.0–2.5)
	Total	8,027	4.3	—	—

<sup>a</sup>Sample sizes will vary due to incomplete or missing information about health problems.

<sup>b</sup>Prevalence estimates are adjusted for age.

<sup>c</sup>Odds ratios adjusted for age, gender, race, and educational attainment.

<sup>d</sup>Indicates information recorded in the patient's chart before the study questionnaire was mailed.

**Table 8.** Number of categories of adverse childhood exposure and the prevalence and risk (adjusted odds ratio) of skeletal fracture, hepatitis or jaundice, and poor self-rated health

Disease condition	Number of categories	Sample size (N) <sup>a</sup>	Prevalence (%) <sup>b</sup>	Adjusted odds ratio <sup>c</sup>	95% confidence interval
Ever had a skeletal fracture	0	3,843	3.6	1.0	Referent
	1	1,998	4.0	1.1	(1.0–1.2)
	2	1,048	4.5	1.4	(1.2–1.6)
	3	587	4.0	1.2	(1.0–1.4)
	4 or more	544	4.8	1.6	(1.3–2.0)
	Total	8,020	3.9	—	—
Ever had hepatitis or jaundice	0	3,846	5.3	1.0	Referent
	1	2,006	5.5	1.1	(0.9–1.4)
	2	1,045	7.7	1.8	(1.4–2.3)
	3	590	10.2	1.6	(1.2–2.3)
	4 or more	543	10.7	2.4	(1.8–3.3)
	Total	8,030	6.5	—	—
Fair or poor self-rated health	0	3,762	16.3	1.0	Referent
	1	1,957	17.8	1.2	(1.0–1.4)
	2	1,029	19.9	1.4	(1.2–1.7)
	3	584	20.3	1.4	(1.1–1.7)
	4 or more	527	28.7	2.2	(1.8–2.7)
	Total	7,859	18.2	—	—

<sup>a</sup>Sample sizes will vary due to incomplete or missing information about health problems.

<sup>b</sup>Prevalence estimates are adjusted for age and gender.

<sup>c</sup>Odds ratios adjusted for age, gender, race, and educational attainment.

<sup>d</sup>Indicates information recorded in the patient's chart before the study questionnaire was mailed.



# DISCUSSION

## *“DOSE” AND RESPONSE*

Strong dose-response correlation between number of ACEs and each of the **10 leading causes of death** studied was found in logistical regression models using age, gender, race, and education as covariates (  $P < 0.001$  )

- Those 10: smoking, severe obesity, physical inactivity, depressed mood, suicide attempts, alcoholism, any drug abuse, parenteral drug abuse, a high lifetime number of sexual partners (50+), and a history of having a sexually transmitted disease ( **tables 4 and 5** )

They also found a significant (  $P < 0.05$  ) dose-response relationship between the number of childhood exposures and the following disease conditions: ischemic heart disease, cancer, chronic bronchitis or emphysema, history of hepatitis or jaundice, skeletal fractures, and poor self-rated health

No significant dose-response relationship for diabetes or stroke, though



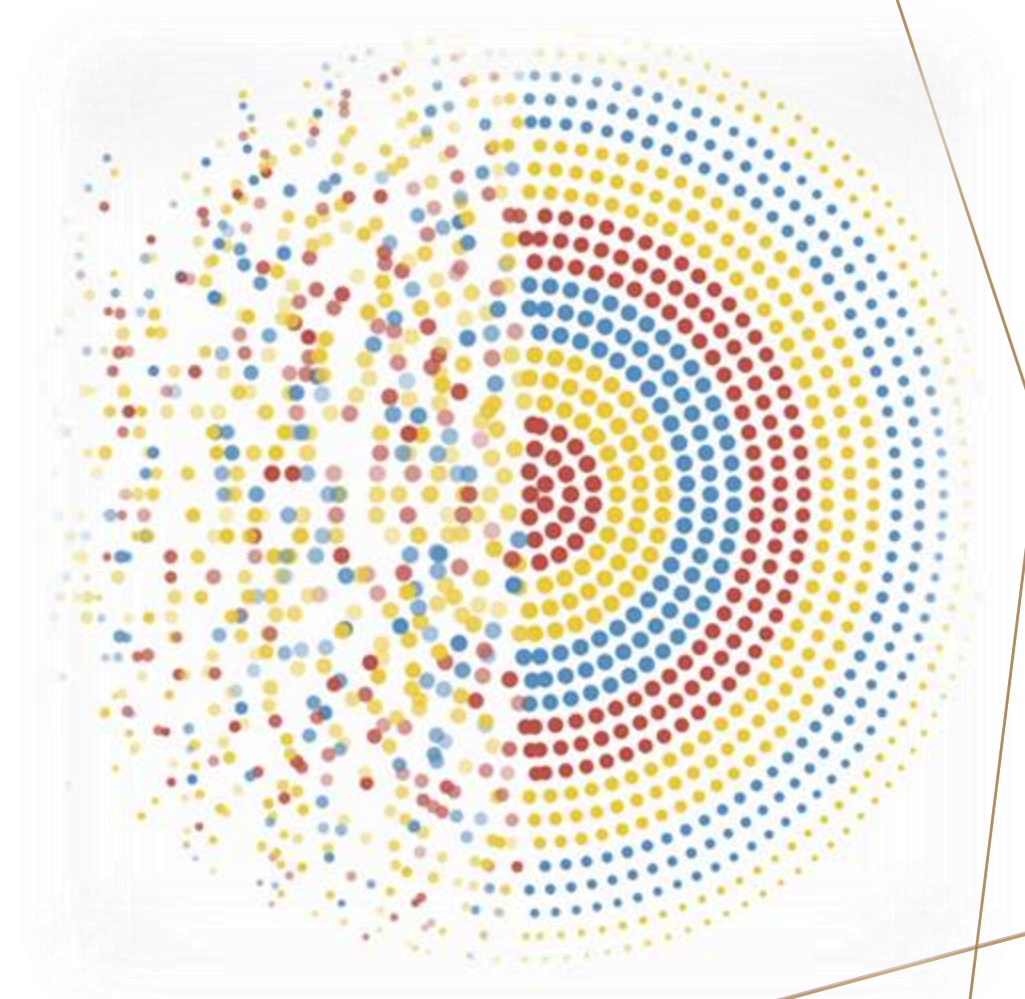
# *LIMITATIONS*

- Old
- Retrospective, self-reported data
- Differential likelihood of reporting, overreporting, underreporting
- Mediating factors besides those in the survey (ex. attitudes towards healthcare, different interoception)



# *ELABORATION*

- Data gathered are in line with nationally representative surveys:
  - Sexual abuse in this study was ~22%, national phone survey in 1990 showed similar rates
  - 23.5% of study participants exposed to ethanol abuse, compared to 18.1% in 1988 NHIS survey
- Retrospective underreporting is supported by historical data with well-documented ACEs
- Lower number of ACEs in older participants... greater number of ACEs didn't let them make it that far?



# *HOW???*

- How does the influence occur?
  - Example: smoking for regulating mood



# *WHAT TO DO???*

- Primary prevention
  - Societal change...
  - Early home visits / birth-to-3
- Secondary prevention
  - Screening and recognition of symptoms and behavioral coping strategies
- Tertiary
  - Getting adults to talk about longstanding emotionally sensitive topics is tough, so practice empathy to get good histories







*THANK YOU*