



# Adverse Childhood Experiences & Population Health in Washington:

## The Face of a Chronic Public Health Disaster

Results from the 2009 Behavioral Risk Factor  
Surveillance System

July 2, 2010

Prepared for the Washington State Family Policy  
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Adverse Childhood Experiences (ACE) Study

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**and**

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## Preface

Kai Erikson has defined both the threat and challenge posed by a chronic disaster: “..it gathers force slowly and insidiously, creeping around one’s defenses rather than smashing through them. People are unable to mobilize their normal defenses against the threat, sometimes because they have elected consciously or unconsciously to ignore it, sometimes because they have been misinformed about it, and sometimes they believe they cannot do anything to avoid it.”<sup>1</sup> Chronic disasters are easily ignored, overlooked, or placed on the back burner.

As this report is being written our nation is riveted by an *acute disaster* in the Gulf of Mexico—a ruptured oil well spewing toxic oil into fragile ecosystems. This is newsworthy; our national, state and local leaders are scrambling to respond. Many billions of dollars will be spent in attempts to treat it and fix what has been destroyed. We are saddened and outraged. Place the blame, hold court in Washington, DC. Write new regulations, reconfigure agencies, and compensate the injured. Clean it up, plug the hole and move on. We’ll prevent the next disaster and get better at cleaning up after ourselves the next time.

I had already concluded that Adverse Childhood Experiences (ACEs) have created a “*chronic public health disaster*.” This conclusion *was* based on epidemiologic data from members of the Kaiser Health Plan in California by the ACE Study—in laborious and ongoing detail. *Now* this conclusion is based on population-based data from in the State of Washington. ACEs are poisonous to the fragile human ecosystem. The chronic disaster is real. It is *alive in your state*.

For an epidemic of influenza, a hurricane, earthquake, or tornado the worst is quickly over; treatment and recovery efforts can begin. In contrast, the chronic disaster that results from ACEs is insidious, constantly rolling out from generation to generation. As evidenced in this report, ACEs are endemic and have strong and myriad effects on the health, quality of life, and functioning of the people of the State of Washington.

Although the consequences of ACEs are often challenging and provocative, these results should not be surprising. But many who read this report will be surprised. Your state is the first to take a comprehensive, population-based look at ACEs and health. I have visited Washington many times to teach and learn about the public health impact of ACEs. Your state is pushing forward thanks to the efforts of the Washington Family Policy Council, and is contributing to the exponential growth of empirical evidence that has fueled markedly increased awareness and understanding of the lifelong consequences of ACEs. However, there will be disbelief, denial, and doubts about believing what the people of the State of Washington tell you about their childhoods and their lives.

During my training as a medical student I learned that 90% of diagnoses come from asking patients good questions and listening carefully to their responses... the same truth holds for understanding population health. People who tell you about their ACEs are not liars or looking for secondary gain; rather, they bravely provide you the privilege of bearing witness to their lives. Challenge the critics of your Washington BRFSS for a viable alternative explanation for the findings. If there is one, what are they going to do about the alternative cause?

Some will say that the problem is too big to address or ask for simple, immediate solutions—a silver bullet. You will hear that budgets are too small. We are in an economic recession. We’ll have to wait on this one. Are those reasons to turn the other way? Ask if you want the same report, or maybe worse, for your children, your grandchildren, or anyone else’s children when they grow up and respond to the survey in the decades to come.

Your results are consistent with what we have learned about the biology of childhood. Excessive stress and adversity has a cumulative and predictable negative effect on human development. These effects are most pronounced for infants, children, and adolescents. The developing brains (and other body systems) of your young ones are negatively impacted by the inherent biochemistry of stress. More is worse, adversity is cumulative; it can affect any human function.

As you read this report and review the data, you can decide for yourself whether “public health disaster” is a grandstanding term or an attempt to spin data into a catchy report. Then look at the current health and social priorities of your state, where the resources are going, and how much progress has been made as a result. Challenge yourself to find a problem that compares in magnitude and scope to the preventable human wreckage and suffering described in this report.

Until very recently, this public health disaster has been hidden from view. Our society has treated the abuse, maltreatment, violence, and chaotic experiences of our children as an oddity that is adequately dealt with by *emergency* response systems—child protective services, criminal justice, foster care, and alternative schools—to name a few. These services are needed and are worthy of support—but they are a dressing on a greater wound.

Our society has bought into a set of misconceptions. Here are a few: *ACEs are rare and they happen somewhere else. They are perpetrated by monsters. Some, or maybe most, children can escape unscathed, or if not, they can be rescued and healed by emergency response systems. Then these children vanish from view... and randomly reappear—as if they are new entities—in all of your service systems later in childhood, adolescence, and adulthood as clients with behavioral, learning, social, criminal, and chronic health problems.*

Take the time to review the prevalence of ACEs in your state—they are common—they are endemic. ACEs pile up to burden the lives of the people of Washington. The ACE score demonstrates their cumulative *biologic* impact. This biologic impact transcends the traditional boundaries of your health and human service systems. The impact is enormous.

The public health impact of ACEs can now only be ignored as a matter of conscious choice. Thus, with this information comes *the responsibility to use it.*<sup>2</sup>

The chronic public health disaster of adverse childhood experiences and their effects on human development are real. Data from your BRFSS properly informs about it. The first step toward healing comes with understanding the problem. The face of the disaster is in full view.

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**Fayetteville, GA**  
**July 2, 2010**

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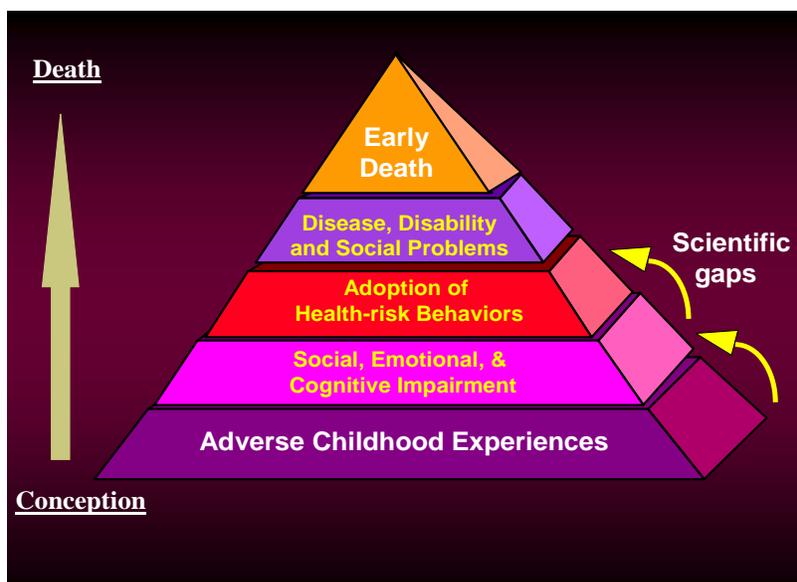
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## Executive Summary

The Adverse Childhood Experiences (ACE) Study is now in its 15<sup>th</sup> year and is ongoing. The Study is designed to examine the childhood origins of many of our Nation's leading health and social problems. The Study represents collaboration between the Nation's leading prevention agency, the Centers for Disease Control and Prevention (CDC) and the Kaiser Health Plan's Department of Preventive Medicine in San Diego, CA. The ACE data in the 2009 Washington ACE BRFSS module are available because the strength of the ACE Study findings led to numerous activities by the Washington Family Policy Council, which in turn, resulted in grants from the *Bill and Melinda Gates Foundation*, *Committee for Children and Families of Incarcerated Parents*, and the *Mental Health Transformation Grant Prevention Advisory Group* to support the data collection and analysis. ***The purpose of this data collection in the Washington BRFSS is to document the public health and social burden of ACEs on a population scale.***

The key concept underlying the ACE Study is that stressful or traumatic childhood experiences such as abuse, neglect, witnessing domestic violence, or growing up with alcohol or other substance abuse, mental illness, parental discord, or crime in the home (which we termed adverse childhood experiences—or ACEs) are a common pathway to social, emotional, and cognitive impairments that lead to increased risk of unhealthy behaviors, risk of violence or re-victimization, disease, disability and premature mortality (Figure A). We now know from breakthroughs in neurobiology that ACEs disrupt neurodevelopment and can have lasting effects on brain structure and function—the biologic pathways that likely explain the strength of the findings from the ACE Study.

**Figure A. Conceptual Framework for Understanding the Public Health Impact of ACEs**



The ACE Study showed that these experiences are highly interrelated. This is also the case for the population of the State of Washington. In order to assess the relationship of the ACEs to health and social problems in this report we used the ACE score. This score is a count of the number of ACEs to assess their *cumulative* impact on childhood development and therefore, their impact on a variety of

health and social priorities. In this report you will find that the ACE score has a strong, graded relationship to a wide array of health and social problems in Washington.

### **ACEs in the State of Washington**

As in the ACE Study, the Washington BRFSS ACE data shows that:

#### **ACEs are common—they are endemic in Washington**

- 17% of adults report exposure to physical abuse
- 17% of women and 7% of men report sexual abuse during childhood
- One in four adults report having dealt with parental separation or divorce during childhood
- A third of adults grew up with substance abuse in the household
- 62% of adults have at least one ACE

#### **ACEs tend to co-occur or cluster in the lives of your children**

- Among adults exposed to physical abuse, 84% reported at least 2 additional ACEs
- Among adults exposed to sexual abuse, 72% reported at least 2 additional ACEs

#### **ACEs add up—more is worse—as captured by the ACE score**

- One in four adults report three or more ACEs
- 5% of adults have six or more ACEs

#### **As the ACE score increases the risk of numerous health and social problems increase dramatically**

- Compared to adults without exposure to ACEs, the risk of smoking – a risk factor for many chronic diseases – was increased 1.2 times for those with 1 ACE, 1.5 times with 2 ACEs, 1.9 times with 3 ACEs, 2.8 times with 4 or 5 ACEs, and 4.6 times with 6 or more ACEs
- The likelihood of life dissatisfaction – a risk factor for suicide – increased with increasing ACE score such that adults with 6 or more ACEs are 9 times more likely to report life dissatisfaction compared to those with an ACE score of zero

These ACE-related problems in Washington are a “Who’s Who?” list that encompasses the priorities of many agencies, public and private, that are working to prevent and treat a vast array of problems.

**Detailed Listing of Health and Social Problems Shown to Have a Graded Relationship to the ACE score in the 2009 Washington BRFSS**

<b>Type of Problem</b>	<b>Outcomes Associated with Adverse Childhood Experiences</b>
Prevalent Diseases	Cardiovascular disease, cancer, asthma
Risk Factors for Common Diseases/Poor Health	Smoking, heavy drinking, binge drinking, obesity, marijuana use, high perceived risk of HIV
Poor Mental Health	Sleep disturbances, frequent mental distress, anxiety, hopelessness, disruptions in work or activity due to mental health, treatment for mental health condition(s)
General Health and Social Problems	Fair or poor health, life dissatisfaction, poor health-related quality of life, separation or divorce, physical disability, health problems requiring special equipment

This array of problems that arise from ACEs calls for an integrated, rather than a separate or categorical perspective of the origins of health and social problems in Washington. This approach to growing up with ACEs, and to the consequences of exposure to them, may unify and improve understanding of many seemingly unrelated health and social problems that tend to be identified and treated as categorically separate issues.

*The Washington ACE data call for integrated approaches to prevent ACEs, and intervene early on children growing up being abused, neglected, witnessing domestic violence, or with substance abusing, mentally ill, or criminal household members. All of these childhood stressors are interrelated and usually co-occur. Prevention and treatment of one ACE frequently can mean that similar efforts are needed to treat multiple persons in affected households and other social systems. Better identification and treatment of the effects of ACEs among persons and systems interacting with children is necessary to minimize the impact of their intergenerational transmission.*

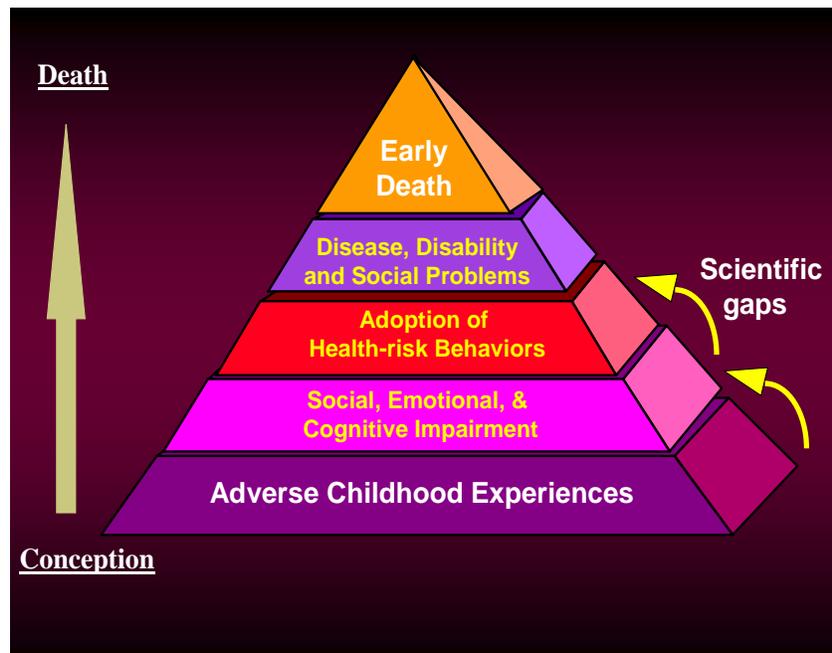
*Development of more integrated approaches will likely contribute to improved treatment of affected persons, and better integration of research priorities, preventive, social and educational services, and legal venues.*

## Chapter 1

### Background—The ACE Study

The key concept behind the design of the ACE Study<sup>1-42</sup> is that risk factors for health and social problems are not randomly distributed in human populations. The Study hypothesized that the experiences of childhood—specifically stressful or traumatic experiences that can negatively affect childhood development were fundamental underpinnings of the occurrence of these problems. We sought to fill the “scientific gaps” using a whole life model as depicted in Figure 1, below.<sup>36,38</sup>

**Figure 1. Conceptual Framework for the ACE Study**



It is important to recognize that:

- Adverse childhood experiences (ACEs) are common.
- ACEs tend to occur in clusters, rather than single experiences.
- The cumulative impact of multiple exposures can be captured in an “ACE score”.
- The ACE score likely captures the cumulative (neuro)developmental consequences of adversity and traumatic stress.
- The ACE score has a strong, graded relationship to numerous health, social, and behavioral problems throughout a person’s lifespan
- These ACE-related problems tend to be co-morbid or co-occurring

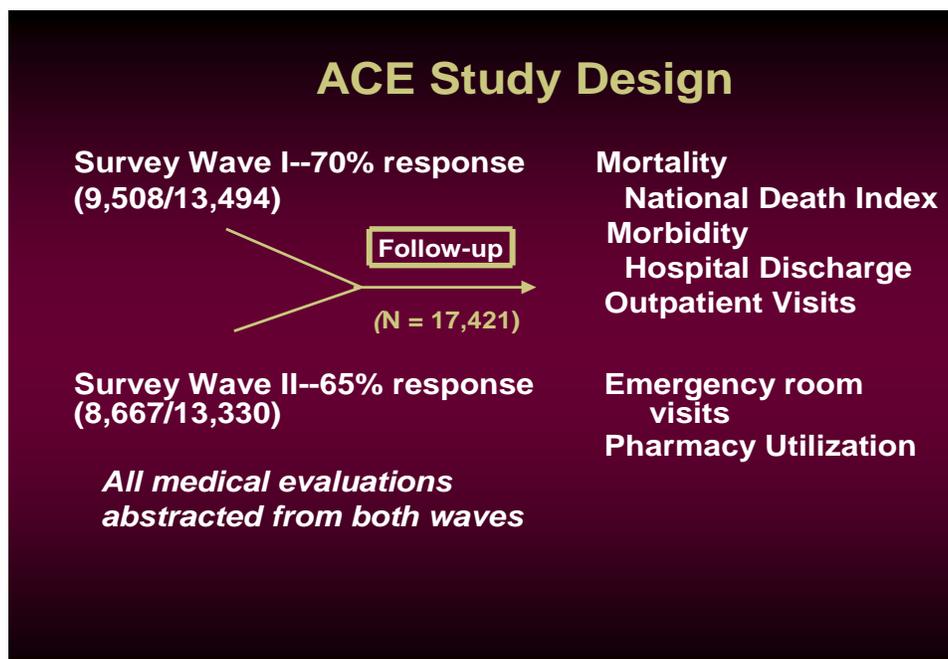
These points will be highlighted in the course of this review.

## Design of the ACE Study

The Adverse Childhood Experiences (ACE) Study is the largest of its kind ever conducted both in size and scope of information collected. It examines the health and social effects of adverse childhood experiences throughout the lifespan and is an ongoing, decade-long collaboration between the Division of Adult and Community Health at the Centers for Disease Control and Prevention (CDC) and Kaiser Permanente's Department of Preventive Medicine in San Diego. The relationship of these experiences to a wide range of health and social problems throughout the lifespan has been, and continues to be, described by the ACE Study team.<sup>1,36,38</sup>

During two survey "waves" conducted during 1995 to 1997, 17,337 predominantly well educated, middle-class members of the Kaiser Permanente Medical Care Program in San Diego, California agreed to participate in the Study, as part of a comprehensive medical evaluation.<sup>38</sup> Prospective assessment of the relationships of ACEs to health care utilization, rates of pharmaceuticals prescribed, disease incidence, and causes of death is an ongoing focus of the Study (Figure 2).

**Figure 2. Design of the ACE Study**



The ACE study population included 9,367 (54%) women and 7,970 (46%) men (total sample=17,337). Their mean age was 56 years. Seventy-five percent were white, 39% were college graduates, 36% had some college education, and 18% were high school graduates. Only 7% had not graduated from high school.<sup>1,13</sup>

The Study assessed 10 categories of stressful or traumatic childhood experiences.<sup>13</sup> The experiences chosen for study were based upon prior research that has shown them to have significant adverse health or social implications, and for which efforts in the public and private sector exist to reduce the frequency and consequences of their occurrence.

Prior research into the effects of childhood maltreatment and related experiences (including witnessing domestic violence) has tended to focus on only one or two categories of experience, such as physical or sexual abuse or domestic violence, and has generally focused on a limited range of outcomes. The ACE Study is unique not only because of its size, but because it was also designed to assess the relationships of a *broad range* of adverse childhood experiences (ACEs) to a *wide range* of health and social consequences.

The 10 ACEs studied are as follows:

- Childhood abuse
  - Emotional
  - Physical
  - Sexual
- Neglect
  - Emotional
  - Physical
- Growing up in a seriously dysfunctional household as evidenced by:
  - Witnessing domestic violence
  - Alcohol or other substance abuse in the home
  - Mentally ill or suicidal household members
  - Parental marital discord (as evidenced by separation or divorce)
  - Crime in the home (as evidenced by having a household member imprisoned)

### ACEs Are Common

The first important conclusion to be drawn is that adverse childhood experiences are very common, even in this well-educated, predominantly middle-class study sample (Figure 3, below).<sup>1,13,36,38</sup> Moreover, ACE Study estimates of the prevalence of childhood exposures to physical and sexual abuse are similar to population-based surveys. A national telephone survey of adults conducted by Finkelhor et al.<sup>43</sup> used similar criteria for childhood sexual abuse and determined that 16% of men and 27% of women had been sexually abused; in the ACE Study cohort 16% of men and 25% of women in our sample had experienced contact childhood sexual abuse. In our study, 30% of the men had been physically abused as boys; this closely parallels the 31% prevalence recently found in a similarly structured population-based study of Canadian men.<sup>44</sup> The similarity of the estimates from the ACE Study to those of population-based studies suggests that our findings would be applicable in other settings.

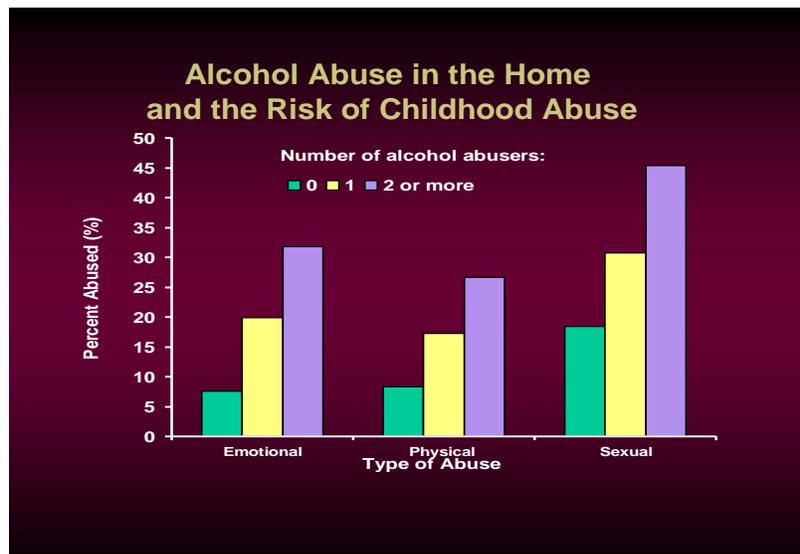
**Figure 3. Prevalence of Adverse Childhood Experiences<sup>1,13</sup>**

<b>Adverse Childhood Experiences Are Common</b>	
<b><u>Household dysfunction:</u></b>	
Substance abuse	27%
Parental sep/divorce	23%
Mental illness	17%
Battered mother	13%
Criminal behavior	6%
<b><u>Abuse:</u></b>	
Psychological	11%
Physical	28%
Sexual	21%
<b><u>Neglect:</u></b>	
Emotional	15%
Physical	10%

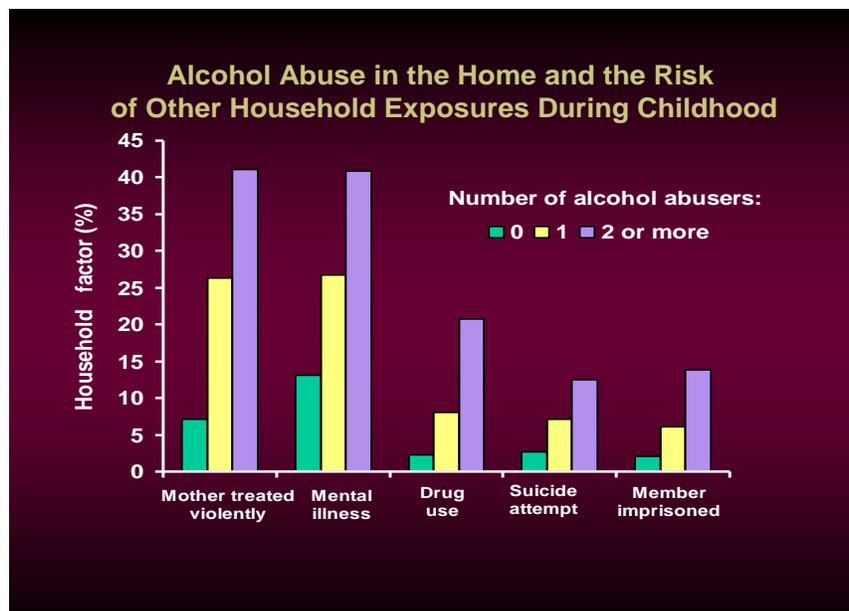
### ACEs are Highly Interrelated

Probably as a result of the categorical approaches to the various ACEs, at the time that the ACE Study was designed relatively little was known about the co-occurrence of the 10 ACE categories chosen for study. Even less was known about the cumulative impact of multiple different exposures. Because initial analyses of the data showed that ACEs tended to be highly interrelated,<sup>13,36,38</sup> we described their co-occurrence in detail.<sup>13</sup> Figures 4 and 5 illustrate how growing up with alcohol abusing parents is strongly related to the risk of experiencing other categories of ACEs.<sup>13</sup>

**Figure 4. Alcohol Abuse and the Risk of Childhood Abuse**



**Figure 5. Alcohol Abuse in the Home and the Risk of Other ACEs**



### The Occurrence of One ACE Should Evoke a Search for Others

Table 1 shows the probability (%) of experiencing additional ACEs based upon the occurrence of each individual category of ACE.<sup>13</sup> In the case of persons who had grown up with household substance abuse, 81% reported at least one additional ACE and the majority had experienced 2 or more ACEs. In the entire study population, 81%-98% of respondents who had experienced one ACE reported at least one additional category of ACE (median: 87%).<sup>13</sup>

**Table 1. Prevalence of Each Category of Adverse Childhood Experience and Likelihood of Other ACEs<sup>13</sup>**

ACE category	Additional ACEs (%)						
	0	≥ 1	≥ 2	≥ 3	≥ 4	≥ 5	≥ 6
Abuse							
Emotional	2	98	90	77	62	42	25
Physical	17	83	64	46	32	20	12
Sexual	22	78	58	42	29	19	12
Neglect							
Emotional	7	93	79	63	47	32	19
Physical	11	89	75	61	50	37	24
Household dysfunction							
Parental separation or divorce	18	82	61	43	30	19	12
Household substance abuse	19	81	60	41	29	18	11
Household mental illness	16	84	65	48	34	21	13
Battered Mother	5	95	82	64	48	32	20
Crime	10	90	74	56	43	30	23
Median	13.5	86.5	69.5	52.0	38.5	25.0	16.0
Range	2-22	78-98	58-90	41-77	29-62	18-42	11-25

Thus, ACEs are highly interrelated; the occurrence of one should evoke a search for others. In addition, this interrelatedness made assessment of the effects of *single ACEs* on health and social well-being illogical.

### The ACE Score

Because adverse childhood experiences are highly interrelated, we developed the ACE score as a measure of the cumulative exposure to abuse, neglect, alcohol and other substance abuse, domestic violence and other forms of serious household dysfunction.<sup>1,13,36,38</sup> Exposure to any ACE category (Table 1, above) counted as one “point” on the score; the number of *categories* of adverse experience were then summed. The ACE score therefore ranged from 0 to 10. The ACE score indicates, in summary form, the amount of exposure to the ten categories of adverse experience in childhood and adolescence. There was no further scoring within a category. Statistical analysis has confirmed that the observed number of

respondents with high ACE scores was notably higher than the expected number under the assumption of independence of ACEs ( $p < .0001$ ).<sup>13</sup> The prevalence of the ACE scores by gender is presented in Table 2.<sup>13</sup> Two-thirds of participants reported at least one category of ACE. One in ten people had an ACE score of 5 or more; higher ACE scores are somewhat more common in women. Even in this well educated population of HMO patients, less than one-third had an ACE score of 0! Or from the perspective of a provider of health or social services in this population 1 or 2 out of every ten adults seen have an ACE score of 5 or more!

**Table 2. Prevalence of the ACE Score by Gender: ACE Study**

ACE score	Prevalence (%)		
	Women	Men	Total
0	31.3	34.2	32.7
1	24.2	27.3	25.6
2	14.8	16.4	15.5
3	10.4	9.3	9.9
4	6.8	4.8	5.9
≥5	12.5	8.0	10.5

### **The ACE Score Has a Graded Relationship to Numerous Health and Social Outcomes:**

#### **An Indicator of the Effects of Cumulative Stress on (Neuro)Development**

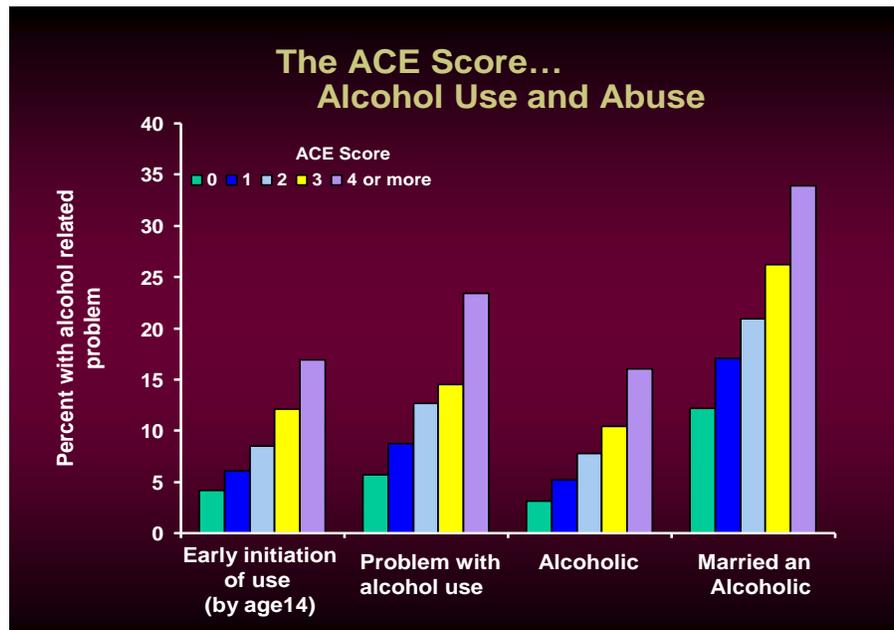
The relationship of the ACE score to a wide range of health, emotional, and social outcomes has been described.<sup>1-42</sup> It is noteworthy that the use of the ACE score as a measure of the cumulative exposure to traumatic stress during childhood is consistent with more recent understanding, from the neurosciences<sup>1,45</sup> of the effects of traumatic stress on neurodevelopment. Neuroscientists have linked childhood maltreatment – using experimental animal models as well as case-control studies in humans – to long-term changes in brain structure and function, involving several inter-connected brain regions including the prefrontal cortex, hippocampus, amygdala, corpus callosum, and cerebellum.<sup>46-51</sup> Early stress is also associated with lasting alterations in stress-responsive neurobiological systems, including the hypothalamic-pituitary-adrenal axis and monoamine neurotransmitter systems; these lasting effects on the developing brain would be expected to affect numerous human functions into adulthood including (but not limited to) emotional regulation, somatic signal processing (body sensations), substance abuse, sexuality, memory, arousal, and aggression.<sup>52-57</sup>

Numerous publications have documented a graded or “dose-response” relationship between the number of categories of ACEs (ACE score) and a wide variety of health and social problems of national importance.<sup>1-41</sup> I consider the “dose-response” findings quite literally; the ACE score appears to capture cumulative exposure of the developing brain to the activated stress response, which is the pathway by which ACEs exert their neurobiological impact. This “dose response” relationship is evident in the figures that follow in the next section; as the ACE score goes up, so does the risk of problems from adolescence to adulthood.

### Relationship of the ACE Score to Alcohol Use and Abuse

One of the strongest relationships seen was between the ACE score and alcohol use and abuse (Figure 6).<sup>2,25</sup> Given recent research indicating the negative impact of alcohol use on neurodevelopment of adolescents, the relationship of ACEs to early initiation of alcohol use is particularly worrisome. The negative health and social consequences of alcohol abuse and alcoholism constitute a major public health problem—and ACEs have a particularly strong association with alcohol abuse. In addition, it is notable that the perpetuation of the cycle of alcohol abuse appears to be tightly interwoven with the number of ACEs, including marriage to an alcoholic.

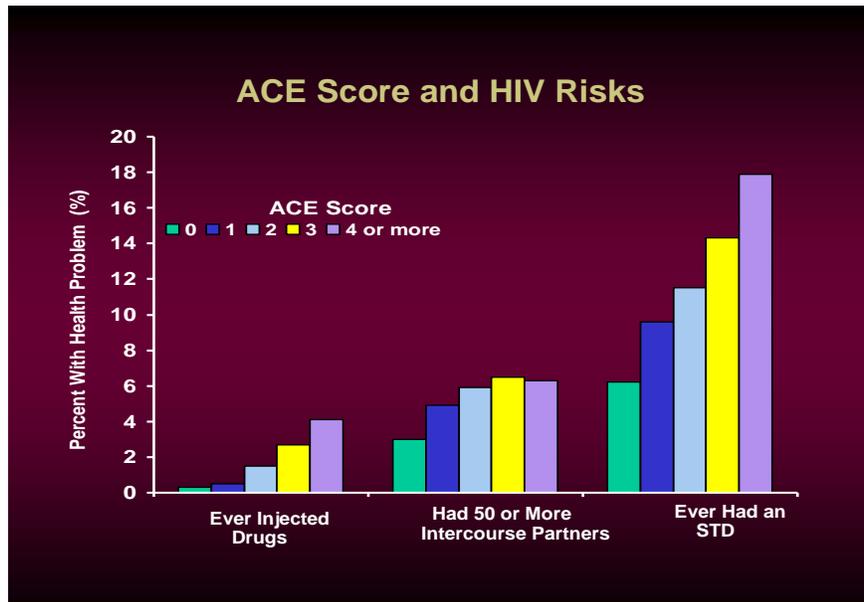
**Figure 6. Relationship of the ACE Score to Alcohol Use and Abuse**



### The ACE Score and Risk Factors for HIV/AIDS

The risk factors for transmission of the Human Immunodeficiency Virus (HIV), the causative agent of the AIDS epidemic are now well known. What appears to be less well known is that ACEs are a major hidden “engine” underlying these preventable risk factors for the transmission of HIV (Figure 7). Injected drug use, promiscuity (defined as having had 50 or more lifetime intercourse partners), and ever having a sexually transmitted disease (including AIDS), all increase dramatically as the ACE score increases.<sup>11,16,29,35,38</sup>

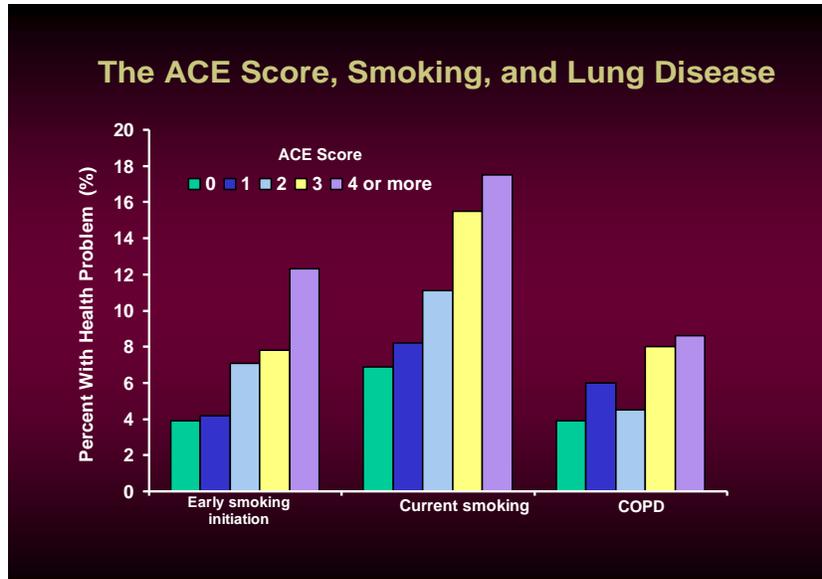
**Figure 7. The ACE Score and Risk Factors for HIV/AIDS**



### The ACE Score, Smoking, and Chronic Obstructive Pulmonary Disease

Cigarette smoking is the leading cause of preventable morbidity and mortality in the United States. Unfortunately, as with initiation of alcohol use, ACEs increase the likelihood of early smoking initiation.<sup>36</sup> Moreover, ACEs lead to continued smoking and the risk of Chronic Obstructive Pulmonary Disease (COPD; one of the 10 leading causes of death in the US) (Figure 8).<sup>36,38</sup>

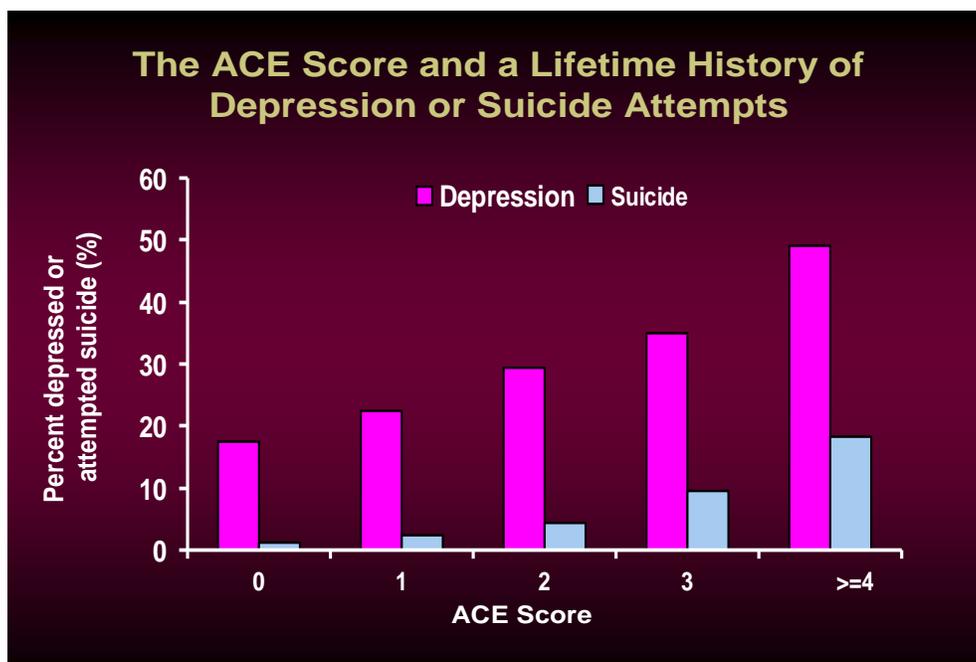
**Figure 8. Relationship of the ACE Score to Smoking and COPD**



### ACEs, Depression, and Suicide Attempts

Depression is now recognized to be a leading cause of disability worldwide, and ACEs bear a strong relationship to this common mental health problem; the relationship is equally strong for both men and women.<sup>15</sup> Suicide is a leading cause of death in the US with a “bimodal” age pattern of attempts—one peak in adolescence and one in middle age. Here also, ACEs have a powerful graded relationship to the risk of suicide attempts; this holds for attempts by men and women and attempts during adolescence or adulthood (Figure 9).<sup>34</sup>

**Figure 9. Relationship of the ACE Score to Depression and Suicide Attempts**



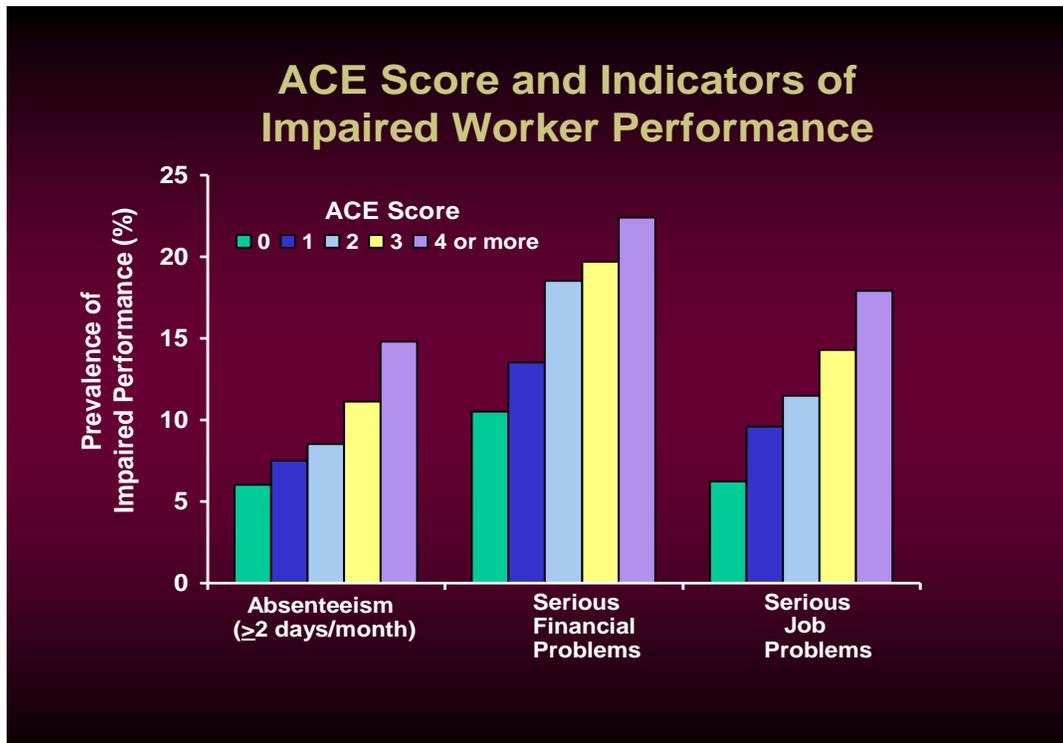
By now it should be obvious that the long term human costs of ACEs are enormous and that the problems associated with these problems also translate into costs of health care, disability, and social services. Now, let’s turn to two examples where the costs—in economic terms—are most obvious.

### ACEs Affect Worker Performance

In as much as ACEs affect the health and well-being of the workforce, they are a hidden drain on profitability for corporate America. The human and economic costs of the long-term effects of adverse childhood experiences on the workforce are likely major and merit attention by the business community in concert with the modern practice of medicine and public health. Recent studies estimated annual costs as high as \$28 billion for chronic back pain for US businesses,<sup>58</sup> \$30-\$44 billion for depression and related absenteeism, reduced productivity, and medical expenses,<sup>59</sup> and \$246 billion for chemical dependency in the workforce.<sup>60</sup> These massive losses occur despite safety programs and the most expensive medical care system in the world.<sup>61</sup> If these areas are indeed related to the performance of the workforce, profitability of businesses and even national productivity are likely to be affected as well.

Absenteeism, financial problems, and self-reported problems on the job are all indicators of impaired productivity that are expensive and are also indicators of ACE related problems such as alcohol abuse, chronic pain, mental health disorders, and others. Figure 10 displays the relationship of ACEs to these indicators of reduced worker productivity.<sup>10</sup>

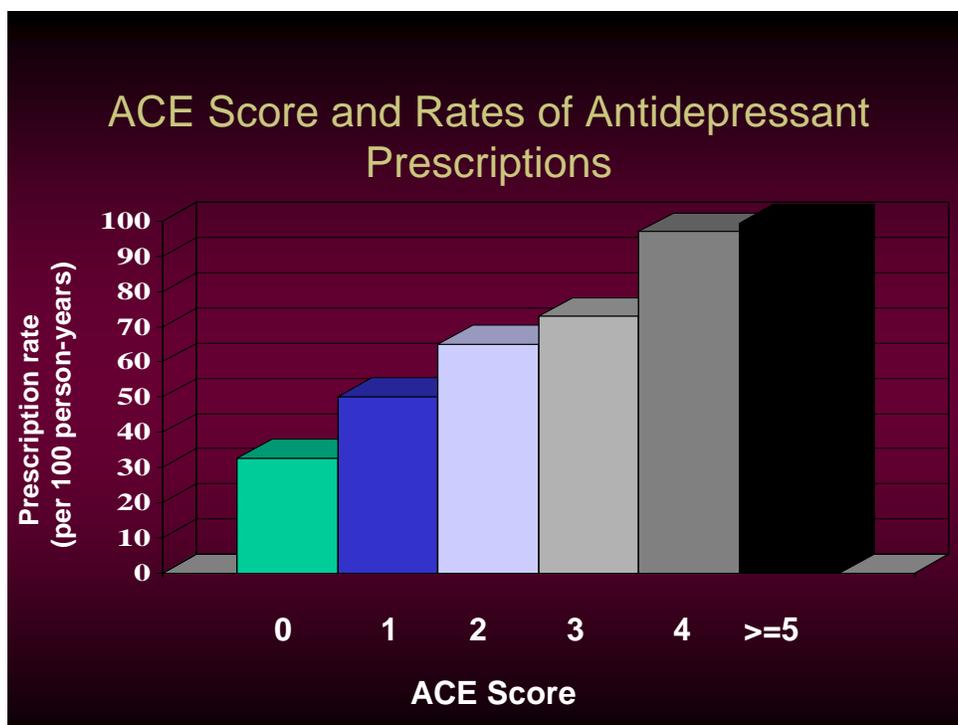
**Figure 10. ACEs and Indicators of Impaired Worker Performance**



### ACEs and Direct Health Care Costs—Prescription Pharmaceuticals

Nearly \$180 billion were spent on prescription drugs in the United States in 2003. This represents approximately 11% of total national health expenditures and was more than four times the amount spent in 1990.<sup>62</sup> One of the most rapidly rising set of prescribed drugs is antidepressants; how do ACEs affect their use?

**Figure 11. The ACE Score and Rates of Antidepressant Prescriptions<sup>4</sup>**



### ACEs and Premature Mortality

Recall that the first ACE Study findings described relationships with risk factors for several of the leading causes of death in the United States. Recent findings from the ACE Study suggest people exposed to multiple (6 or more) childhood traumatic stressors captured in the ACE score are at increased risk of premature death (before 65 years: relative risk=2.39, 95% CI=1.30-4.39; before 75 years: relative risk=1.73, 95% CI=1.06-2.83) from all-causes compared to people without ACEs.<sup>63</sup>

Given the results of the ACE Study, what are the human, social, and economic costs of the high prevalence, interrelatedness, and long-term consequences of Adverse Childhood Experiences? Table 3 summarizes the findings from the ACE Study that have been published in peer-reviewed articles.

**Table 3. Health and Social Problems and the ACE Score in the Kaiser Health Plan, San Diego, California**

<b>Problems from the baseline data</b>	<b>Outcomes associated with the ACE Score</b>
Prevalent diseases	Ischemic heart disease, cancer, chronic lung disease, skeletal fractures, sexually transmitted diseases, liver disease
Risk factors for common diseases/poor health	Smoking, alcohol abuse, promiscuity, obesity, illicit drug use, injection drug use, multiple somatic symptoms, poor self-rated health, high perceived risk of AIDS
Mental health	Depressive disorders, anxiety, hallucinations, panic reactions, sleep disturbances, memory disturbances, poor anger control,
Sexual and reproductive health	Early age at first intercourse, sexual dissatisfaction, teen pregnancy, unintended pregnancy, teen paternity, fetal death
General health and social problems	High perceived stress, impaired job performance, relationship problems, marriage to an alcoholic, risk of perpetrating or being a victim of domestic violence, premature mortality in family members
<b>Problems from the longitudinal follow-up of the study cohort</b>	
Prescribed medications	Total prescriptions, prescribed multiple classes of drugs, psychotropics, bronchodilators
Diseases	Chronic obstructive pulmonary, autoimmune, lung cancer
Mortality	Premature mortality, lung cancer

A complete bibliography of ACE Study publications listed by topic area is available online at <http://www.cdc.gov/nccdphp/ace/>

## Implications

The effects of ACEs are long-term, powerful, cumulative, and likely to be invisible to health care providers, educators, social service organizations, judges, and policy makers because the linkage between cause and effect is concealed by time, the inability to “see” the process of neurodevelopment, and because effects of the original traumatic insults may not become manifest until much later in life.<sup>1,3,36,38</sup> When a child is wounded, the pain and negative long-term effects reverberate as an echo of the lives of people they grew up with—and then they grow up, at risk for taking on the same characteristics and behaviors—thereby sustaining the cycle of abuse, neglect, violence and substance abuse, and mental illness. For example, ACEs greatly increase the risk of adult alcohol abuse or marriage to an alcoholic,<sup>25</sup> perpetuating the adversities and their consequences.<sup>28</sup> Thus, growing up with ACEs contributes to many of the leading chronic health and social problems in the United States.

Information from the ACE Study suggests that traumatic stressors during childhood and adolescence represent a common pathway to a variety of important long-term behavioral, health, and social problems (Table 3, above). Thus, an integrated rather than a separate or categorical, perspective on the origins of health and social problems throughout the lifespan is needed. This approach to ACEs, and to the consequences of exposure to them, may unify and improve our understanding of many seemingly unrelated health and social problems that tend to be identified and treated as categorically separate issues in Western culture.

The ACE score appears to be a robust measure of the cumulative, lifetime impact of traumatic stress on neurodevelopment in childhood. Stressful and traumatic childhood and adolescent experiences literally become “biology” affecting brain structure and function (as well as endocrine, immune, and other biologic functions) thus leading to persistent effects. Until now, these persistent effects were “hidden” from the view of both neuroscientists and public health researchers. This is no longer the case. In fact, with this information comes *the responsibility to use it*.<sup>40</sup>

These links between childhood experience and adult health and social function have significant implications for health and social services. We found that adults who reported any single category of adverse childhood experience were likely to have suffered multiple other categories during childhood. Therefore, assessment of exposure to other ACEs is important when working with children or adults identified as having had any single type of ACE. Children experiencing alcohol abuse in the home should be screened for other types of maltreatment and traumatic stressors—and vice versa! This information, if routinely gathered will likely contribute to more meaningful diagnoses, earlier and improved treatment of exposed *children and their caretakers*, and better integration of prevention, social services, and legal venues.

Facing the high prevalence and interrelatedness of ACEs is going to be tough. Categorical approaches to the individual ACEs as well as the health and social problems strongly related to them tend to be “siloesd”. However, the professions, research priorities, organizations, and resources that are necessary for healing frequently exist in “silos”—separate, often competitive rather than collaborative, entities, each preserving and advancing the resources and work that is historically “theirs”. While this is understandable, to succeed, we must make this “ours”, a team effort that reaches beyond traditional boundaries and borders.

Prevention and remediation of our leading health and social problems are likely to benefit from integrated approaches that incorporate information about their common origins in the enduring neurodevelopmental consequences of adverse childhood experiences.

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## Chapter 2

### The Transition from the ACE Study to Behavioral Risk Factor Surveillance

#### in the State of Washington

##### ACEs as a Public Health Concept

Viewing child maltreatment and related experiences as a set of exposures that have broad implications for human development and prevention of public health problems is a new concept. Only since 2004 has child sexual abuse been included in the global burden of disease estimates of death and disability attributable to particular avoidable risk factors,<sup>1</sup> and medical journals have recently begun to acknowledge the concept of abuse and related as a major public health issue by raising awareness of the body of literature that supports this concept.<sup>2,3</sup>

The choice of terminology and measures of childhood experience used in the ACE BRFSS work is largely based on the findings from the ACE Study.<sup>4-8</sup> This study combines retrospective reports of ACEs at baseline and prospective follow-up of the study cohort to examine the prevalence and incidence of health risk factors, diseases, health care utilization, premature mortality, and causes of death.

In 2008 CDC developed questions similar to those used in the ACE Study for incorporation into the Behavioral Risk Factor Surveillance System (BRFSS). The BRFSS is the largest ongoing health survey in the world and has proved useful to define the prevalence of health behaviors and other determinants of health the United States.<sup>9</sup> In 2009 the ACE questions (ACE module) were added to the Washington BRFSS. Other state health departments are now using these questions ([www.cdc.gov/brfss/questionnaires/pdf-ques/2009brfss.pdf](http://www.cdc.gov/brfss/questionnaires/pdf-ques/2009brfss.pdf))

##### The ACE Concept and Primary Prevention

The identification of biological and behavioral causes of diseases and ill health has been a central concern of epidemiology for the past half century.<sup>10</sup> This has led to the development of increasingly sophisticated conceptual and analytical approaches focused on the isolation of single causes of disease states. However, the growing recognition that (i) factors at multiple levels, including biological, behavioral and community levels, may influence health and disease, and (ii) that the interrelation among these factors often includes dynamic feedback and changes over time challenges this dominant epidemiological paradigm.<sup>10</sup>

McGinnis and Foege quantified the contribution of alcohol, smoking, and other health risk behaviors to mortality in the United States and called these behaviors “actual causes of death”.<sup>11</sup> The BRFSS has become a popular public health tool to monitor the prevalence of health-related behaviors. However, simply measuring the prevalence of behaviors does not explain *why* the behaviors are present.

The prevalence of smoking declined in the decades after the publication of the U.S. Surgeon General’s Report on Smoking and Health in the 1960’s.<sup>12</sup> Since virtually every American understands the health consequences of smoking, why do so many continue to smoke?<sup>13</sup> If the “addictive” properties of nicotine are the major determinant of continued smoking, why can some smokers quit while others cannot? Depression—a common noncognitive factor in many persons’ lives—has been convincingly linked to smoking. Persons who are depressed are more likely to be smokers, and are less likely to quit.<sup>14-15</sup> Nicotine has powerful psychoactive properties reduce anxiety and depressed affect, which probably leads to unconscious reinforcement of the use cigarettes as an *adaptive response* to depression and other unpleasant affective states. Thus, for many smokers, their “negative behavior” is really a powerful and

effective adaption that “self-medicates”—thereby overriding conscious awareness of long-term health consequences.<sup>16</sup>

Thus, purely cognitive approaches to understanding health behaviors are limited. If ACEs cause depression and anxiety, and persons struggling to cope with these uncomfortable emotions use smoking to cope, what is the *actual* cause of death for depressed smokers dying from lung cancer? This question represented the scientific gap that measurement of ACEs and their consequences is meant to address. Thus, we have termed ACEs the “root” origins of common health risk factors.<sup>17</sup> These “root” origins represent a developmental sequence of events that requires understanding the impact of ACEs from conception to death... using a life course perspective.<sup>18</sup>

Historically, research in the field of child maltreatment focused on single types of childhood abuse, such as sexual or physical abuse, and their association with a small number of health or social problems. The ACE Study and the ACE Study Module in the Washington BRFSS provides information on a broad range of childhood adversities and their relationship to numerous health and social problems throughout the lifespan. Measuring this wide array of childhood adversities and a wide array of negative outcomes using the BRFSS is suited to the broad public health approaches to health and social problems being fostered by the Washington Family Policy Council.

Use of retrospective self-reports of ACEs versus reports validated by child protection services for studying-effects of exposure to childhood maltreatment has been an area of health debate.<sup>19-20</sup> However, both methods have shown significant effects in multiple areas and are frequently concordant in finding negative effects of maltreatment.<sup>4</sup>

Child protection reports greatly underestimate exposure to maltreatment, and self-reports or parent reports are probably closer to the true (unobserved and unreported) rate of maltreatment, *although they might still be underestimates*.<sup>4</sup> As a result self-reports of ACEs are suited to population-based sampling to estimate their prevalence and public health burden.<sup>21</sup>

## Defining Exposure and Outcomes

An important historical obstacle to understanding the broad public health impact of ACEs arises from the use of reported maltreatment “events” as the health outcome. These occurrences of maltreatment deserve the attention and support for services provided; however, only a small fraction have acute consequences of sufficient severity to bring them to the attention of public authorities. And we now know that these reported events usually represent an array of other unidentified adversities that have been and will be faced by the children who are fortunate enough to have their maltreatment identified. Thus, the largest public health burden due to ACEs arises from the cumulative effect of chronic exposure to multiple adversities.

*The vast majority of ACEs are never reported.* In addition, the effects of ACEs may not become apparent many years after exposure. These conditions require a public health approach to the broader implications of ACEs that includes consideration of their lifetime consequences. By using this approach, the need to invest in primary prevention programs aimed at reducing ACEs becomes obvious. A public health approach would also include programs to treat the short-term consequences of ACEs (death, injury, emotional, social) as well as medium and long-term emotional, behavioral, social and health problems that can occur up to decades later.<sup>22</sup>

## The ACE Score

The co-occurring nature of ACEs led to the use of an “ACE score,” which is an integer count of the number of categories of ACEs.<sup>23</sup> The ACE score is used in this report and shows a positive graded relationship to a wide variety of health and social problems in Washington.

## Biologic Plausibility

The ACE score provides a strong conceptual and empirically valid framework for measuring the cumulative exposure to toxic stress during childhood. Recent understanding of the effects of traumatic stress on neurodevelopment provide strong biologic plausibility for this approach.<sup>18,24</sup> Experimental animal models and case-control studies in humans, have linked childhood maltreatment to long-term changes in brain structure and function involving multiple brain structures and functions.<sup>25-30</sup> Childhood adversity also leads to lasting alterations in central nervous system stress response, and these lasting effects on the brain affect numerous human functions into adulthood, including emotional regulation, somatic signal processing, substance abuse, sexuality, memory, arousal, and aggression.<sup>31-36</sup> The ACE score likely captures cumulative exposure of the developing brain to the stress response, which a key pathway by which ACEs exert their health impact.

## Childhood Adversity—The Role of Epigenetics and Inflammation

Understanding the effects of adverse childhood experiences and their intergenerational transmission requires consideration of genetic and biological evidence.<sup>37</sup> Increasing evidence suggests that genotypes affect to experiences of adversity. Research about gene-experience interaction,<sup>38</sup> the influence of early life experience on genomic expression (epigenetics),<sup>39</sup> and the effects of childhood adversity on inflammation<sup>40</sup> hold promise.

Rutter, et al<sup>41</sup> have reviewed the topic of gene-experience interactions. The effects of genes and experience are not as separate; epigenetic effects which involve the influences of experience on *gene expression*, can have important and measurable effects. For example, Caspi et al, reported that the impact of life stress on depression is moderated by a polymorphism in the 5-HTT gene.<sup>38</sup> Kendler, et al also reported that adversity interacts with a serotonin transmitter polymorphism to alter the risk of experiencing depression.<sup>42</sup> Well designed studies show how the effects of the rearing behavior of maternal rats on the subsequent behavior of their pups operates via epigenetic mechanisms involving a promoter gene for a glucocorticoid receptor in the hippocampus of the pups.<sup>39,41</sup>

Understanding of the intergenerational transmission of ACEs is likely to come from studies of the genetic, epigenetic and biological pathways which they lead to negative health and social outcomes. Studies of gene-adversity interaction and epigenetic mechanisms by which life experience can modify behavior and physiologic responses to early life stressors are promising. However, these mechanisms are complex<sup>41</sup> and, *care is needed to avoid oversimplifying findings about the interaction of adversity with the genome that lead to conclusions that "X is a gene for Y."*<sup>43</sup> We believe that it is currently speculative that nascent research about genetic polymorphisms, genetic expression and adversity will soon lead to more effective methods to prevent and treat the effects of ACEs.<sup>44</sup>

## Conclusion

The practice of public health surveillance of ACEs and their wide array of health and social consequences is just beginning in Washington and other states around the country. The strength of the findings from the Washington BRFSS will lead to rapid recognition of ACEs as a public health problem. ACE-related problems affect virtually every human service system requiring development of practical

language and conceptual frameworks that incorporate the enduring biologic impact of adverse childhood experiences. *These frameworks will need to be inclusive of the lay population and human service systems and the professionals who work within them.*

**Table 1. Health and Social Problems and the ACE Score**

<b>Problems from the baseline data</b>	<b>Outcomes associated with the ACE Score</b>
Prevalent diseases	Ischemic heart disease, cancer, chronic lung disease, skeletal fractures, sexually transmitted diseases, liver disease
Risk factors for common diseases/poor health	Smoking, alcohol abuse, promiscuity, obesity, illicit drug use, injection drug use, multiple somatic symptoms, poor self-rated health, high perceived risk of AIDS
Mental health	Depressive disorders, anxiety, hallucinations, panic reactions, sleep disturbances, memory disturbances, poor anger control,
Sexual and reproductive health	Early age at first intercourse, sexual dissatisfaction, teen pregnancy, unintended pregnancy, teen paternity, fetal death
General health and social problems	High perceived stress, impaired job performance, relationship problems, marriage to an alcoholic, risk of perpetrating or being a victim of domestic violence, premature mortality in family members
<b>Problems from the longitudinal follow-up of the study cohort</b>	
Prescribed medications	Total prescriptions, prescribed multiple classes of drugs, psychotropics, bronchodilators
Diseases	Chronic obstructive pulmonary, autoimmune, lung cancer
Mortality	Premature mortality, lung cancer

A complete bibliography of ACE Study publications listed by topic area is available online at <http://www.cdc.gov/nccdphp/ace/>

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## Chapter 3

### BRFSS Background

The Behavioral Risk Factor Surveillance System (BRFSS) is a state-based system of health surveys that collects information on many of the health risk behaviors, preventive health practices, and health care access primarily related to chronic disease and injury. For many states, the BRFSS is the only available source of timely, accurate data on health-related behaviors.

BRFSS was established in 1984 by the Centers for Disease Control and Prevention (CDC); currently data are collected monthly in all 50 states, the District of Columbia, Puerto Rico, the U.S. Virgin Islands, and Guam. More than 350,000 adults are interviewed each year, making the BRFSS the largest telephone health survey in the world. States use BRFSS data to identify emerging health problems, establish and track health objectives, and develop and evaluate public health policies and programs. Many states also use BRFSS data to support health-related legislative efforts.

By the early 1980s, scientific research clearly showed that personal health behaviors played a major role in premature morbidity and mortality. Although national estimates of health risk behaviors among U.S. adult populations had been periodically obtained through surveys conducted by the National Center for Health Statistics (NCHS), these data were not available on a state-specific basis. This deficiency was viewed as critical for state health agencies that have the primary role of targeting resources to reduce behavioral risks and their consequent illnesses. National data may not be appropriate for any given state; however, state and local agency participation was critical to achieve national health goals.

About the same time as personal health behaviors received wider recognition in relation to chronic disease morbidity and mortality, telephone surveys emerged as an acceptable method for determining the prevalence of many health risk behaviors among populations. In addition to their cost advantages, telephone surveys were especially desirable at the state and local level, where the necessary expertise and resources for conducting area probability sampling for in-person household interviews were not likely to be available.

As a result, surveys were developed and conducted to monitor state-level prevalence of the major behavioral risks among adults associated with premature morbidity and mortality. The basic philosophy was to collect data on actual behaviors, rather than on attitudes or knowledge, that would be especially useful for planning, initiating, supporting, and evaluating health promotion and disease prevention programs.

To determine feasibility of behavioral surveillance, initial point-in-time state surveys were conducted in 29 states from 1981–1983. In 1984, The Centers for Disease Control and Prevention (CDC) established the Behavioral Risk Factor Surveillance System (BRFSS), and 15 states participated in monthly data collection. Although the BRFSS was designed to collect state-level data, a number of states from the outset stratified their samples to allow them to estimate prevalence for regions within their respective states.

CDC developed standard core questionnaire for states to use to provide data that could be compared across states. The BRFSS, administered and supported by the Division of Adult and Community Health, National Center for Chronic Disease Prevention and Health Promotion, CDC, is an ongoing data collection program. By 1994, all states, the District of Columbia, and three territories were participating in the BRFSS.

A few examples of how the BRFSS has been used in the state of Washington include:

- Provide data for *The Health of Washington State*, a statewide assessment of health that includes measures of 50 health indicators, adapted from Washington State's 1994 Public Health Improvement Plan.
- Provide model questions, procedures, analyses, and consultation to support statewide health assessment activities in all 33 local health jurisdictions.
- Document the need for and monitor the progress of a prevention program targeting tobacco use.
- Develop state-specific estimates of costs attributed to smoking.

## Chapter 4

### Washington State BRFSS Methods

This report uses data from the 2009 Behavioral Risk Factor Surveillance System (BRFSS) survey conducted in Washington State. The BRFSS is conducted in all 50 states, the District of Columbia, and three territories. State health departments selected for interview an independent probability sample from noninstitutionalized adults aged  $\geq 18$  years with telephones by using disproportionate stratified sampling. All states use an identical core questionnaire administered over the telephone by trained interviewers. However, states may select different sets of optional modules of questions about emerging public health issues.

Adverse childhood experiences (ACEs) have recently emerged as a set of exposures that were determined to be suitable for inclusion as an optional module of questions in the BRFSS beginning in 2009. Their suitability is based upon findings from the Kaiser-CDC Adverse Childhood Experiences (ACE) Study (CDC) (see [www.cdc.gov/nccdphp/ace](http://www.cdc.gov/nccdphp/ace)), an ongoing study being conducted among 17,337 adult members of the Kaiser Health Plan in San Diego, California that has demonstrated a strong impact of ACEs on a wide array of public health and social problems<sup>1</sup> including strong relationships with smoking status<sup>2</sup>, incidence of chronic obstructive pulmonary disease,<sup>3</sup> morbidity and mortality from lung cancer,<sup>4,5</sup> and premature mortality.<sup>6</sup>

The choice of terminology and questions used in the BRFSS ACE module are based on the methods of the ACE Study. In the Kaiser-CDC ACE Study, all questions about ACEs pertained to the respondents' first 18 years of life ( $\leq 18$  years of age). Questions used to define exposure to childhood emotional or physical abuse were adapted from the Conflict Tactics Scale,<sup>7</sup> and sexual abuse was assessed using questions from Wyatt.<sup>8</sup> In addition, 5 exposures to household dysfunction during childhood were: witnessing domestic violence,<sup>7</sup> exposure to substance abusing<sup>7</sup> or mentally ill household members, parental separation or divorce or having an incarcerated household member.<sup>2</sup>

In the Kaiser-CDC ACE Study, each individual ACE has been shown to be significantly associated with the occurrence of each of the others such that it is unusual for ACEs to occur singly, rather they tend to occur as groups ACEs.<sup>9</sup> Thus, in analyses of ACE Study data, the total number of ACEs was summed to create the ACE score. The observed distribution of the ACE score shows a higher percentage of persons with higher scores than expected by chance alone,<sup>9</sup> and the ACE score has been shown to have a positive graded relationship to the prevalence and risk of a variety of health problems.<sup>1</sup>

The ACE module included 11 questions are shown in Table 1. Although largely similar to questions in the original ACE study, there are some differences. These differences derive from the required BRFSS review process during which time questions go through a process of cognitive testing, focus groups, and field testing to tailor them for telephone survey use. As a result, the wording of some of the questions differs somewhat from those used in the ACE Study but accurately reflect their origins in the Kaiser-CDC ACE Study.

For each ACE variable, observations with a response of "Don't Know" or a missing response were coded as "No" (Table 2). This approach is conservative in as much as the coding of an unknown response to "No" increases the number of observations in the denominator of the prevalence computation, thereby lowering the prevalence for a given number of "Yes" responses.

Because the ACE score is highly associated with age, prevalences have been age standardized to the 2000 census population for the State of Washington. To assess the independent association between each ACE category and the ACE score to a wide range of health behaviors and health outcomes, we used

multivariable-adjusted logistic regression. Covariates in statistical models were age, sex, race/ethnicity, educational status, and income. All statistical analyses were completed using STATA statistical software (College Station, Texas) and account for the complex sampling design of the BRFSS survey.

**Table 1. Adverse Childhood Experiences Module Questions in Washington BRFSS, 2009**

**All questions refer to the time period before you were 18 years of age. Now, looking back before you were 18 years of age--**

1. Did you live with anyone who was depressed, mentally ill, or suicidal?
  - 1 Yes
  - 2 No
  - 7 Don't know / Not sure
  - 9 Refused
2. Did you live with anyone who was a problem drinker or alcoholic?
  - 1 Yes
  - 2 No
  - 7 Don't know / Not sure
  - 9 Refused
3. Did you live with anyone who used illegal street drugs or who abused prescription medications?
  - 1 Yes
  - 2 No
  - 7 Don't know / Not sure
  - 9 Refused
4. Did you live with anyone who served time or was sentenced to serve time in a prison, jail, or other correctional facility?
  - 1 Yes
  - 2 No
  - 7 Don't know / Not sure
  - 9 Refused
5. Were your parents separated or divorced?
  - 1 Yes
  - 2 No
  - 7 Don't know / Not sure
  - 8 Parents not married
  - 9 Refused
6. How often did your parents or adults in your home ever slap, hit, kick, punch or beat each other up?
  - 1 Never
  - 2 Once
  - 3 More than once
  - Do not read:
  - 7 Don't know / Not sure
  - 9 Refused
7. Before age 18, 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. Would you say--
  - 1 Never
  - 2 Once
  - 3 More than once
  - Do not read:
  - 7 Don't know / Not sure

9 Refused

8. How often did a parent or adult in your home ever swear at you, insult you, or put you down?

1 Never

2 Once

3 More than once

Do not read:

7 Don't know / Not sure

9 Refused

9. How often did anyone at least 5 years older than you or an adult, ever touch you sexually?

1 Never

2 Once

3 More than once

Do not read:

7 Don't know / Not sure

9 Refused

10. How often did anyone at least 5 years older than you or an adult, try to make you touch them sexually?

1 Never

2 Once

3 More than once

Do not read:

7 Don't know / Not sure

9 Refused

11. How often did anyone at least 5 years older than you or an adult, force you to have sex?

1 Never

2 Once

3 More than once

Do not read:

7 Don't know / Not sure

9 Refused

**Table 2. Definition of ACE Categories in Washington BRFSS, 2009****Physical Abuse**

- = 1 (Yes) if response of "Once" or "More than once" to *Before age 18, 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.*
- = 0 (No) otherwise

**Sexual Abuse**

- = 1 (Yes) if response of "Once" or "More than once" to *How often did anyone at least 5 years older than you or an adult, ever touch you sexually? or response of "Once" or "More than once" to How often did anyone at least 5 years older than you or an adult, try to make you touch them sexually? or response of "Once" or "More than once" to How often did anyone at least 5 years older than you or an adult, force you to have sex?*
- = 0 (No) otherwise

**Verbal Abuse**

- = 1 (Yes) if response of "More than once" to *How often did a parent or adult in your home ever swear at you, insult you, or put you down?*
- = 0 (No) otherwise

**Household Mental Illness**

- = 1 (Yes) if positive response to *Did you live with anyone who was depressed, mentally ill, or suicidal?*
- = 0 (No) otherwise

**Household Substance Abuse**

- = 1 (Yes) if positive response to *Did you live with anyone who was a problem drinker or alcoholic? or Did you live with anyone who used illegal street drugs or who abused prescription medications?*
- = 0 (No) otherwise

**Parental Separation or Divorce**

- = 1 (Yes) if positive response to *Were your parents separated or divorced?*
- = 0 (No) otherwise

**Mother/Father Treated Violently**

- = 1 (Yes) if response of "Once" or "More than once" to *How often did your parents or adults in your home ever slap, hit, kick, punch or beat each other up?*
- = 0 (No) otherwise

**Incarcerated Household Member**

- = 1 (Yes) if positive response to *Did you live with anyone who served time or was sentenced to serve time in a prison, jail, or other correctional facility?*
- = 0 (No) otherwise

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## Chapter 5

### Descriptive Statistics of the Washington BRFSS Sample

Table 1 describes select characteristics of respondents to the Washington BRFSS. Roughly a third of participants were less than 35 years of age and about 15% were 65 years or older. A majority of respondents were white, non-Hispanic (83%) and nearly three quarters of respondents had some college education or were college graduates. More than half of respondents were employed or self-employed, and more than a third of respondents had an annual household income of \$75,000 or more.

**Table 1. Sociodemographic characteristics of respondents, Washington BRFSS, 2009**

	<b>Men (n=2999)</b>	<b>Women (n=4472)</b>	<b>Total (n=7471)</b>
Age (years)			
18-24	12.8% (1.2)	11.5% (1.1)	12.1% (0.8)
25-34	18.6 (1.2)	17.5 (0.9)	18.0 (0.8)
35-44	19.0 (0.9)	18.1 (0.8)	18.6 (0.6)
45-54	19.8 (0.8)	19.5 (0.7)	19.7 (0.5)
55-64	15.6 (0.7)	15.8 (0.6)	15.7 (0.4)
65-74	8.3 (0.4)	8.8 (0.4)	8.6 (0.3)
≥75	5.9 (0.4)	8.7 (0.4)	7.3 (0.3)
Race/ethnicity			
White only, non-Hispanic	83.6 (1.0)	81.7 (0.9)	82.7 (0.7)
Black only, non-Hispanic	1.9 (0.3)	1.6 (0.3)	1.7 (0.2)
Other only, non-Hispanic	6.4 (0.7)	6.9 (0.7)	6.6 (0.5)
Multiracial, non-Hispanic	2.9 (0.5)	2.4 (0.3)	2.6 (0.3)
Hispanic	5.2 (0.6)	7.5 (0.6)	6.4 (0.4)
Education			
Less than high school	6.8 (0.7)	6.7 (0.6)	6.8 (0.5)
High school graduate	20.7 (1.1)	21.3 (0.9)	21.0 (0.7)
Some college	29.7 (1.2)	32.3 (1.0)	31.0 (0.8)
College graduate	42.7 (1.2)	39.7 (1.0)	41.2 (0.8)

**Table 1 continued.**

	<b>Men (n=2999)</b>	<b>Women (n=4472)</b>	<b>Total (n=7471)</b>
<b>Marital status</b>			
Married	63.8 (1.3)	57.9 (1.1)	60.8 (0.8)
Divorced/separated	7.7 (0.5)	12.4 (0.6)	10.1 (0.4)
Widowed	2.2 (0.2)	7.7 (0.4)	5.0 (0.2)
Never married	22.0 (1.3)	16.7 (1.1)	19.3 (0.9)
Unmarried couple	4.3 (0.5)	5.3 (0.5)	4.8 (0.4)
<b>Employment</b>			
Employed	55.6 (1.3)	44.9 (1.1)	50.2 (0.8)
Self employed	9.1 (0.7)	6.7 (0.4)	7.9 (0.4)
Out of work	9.9 (0.8)	6.5 (0.6)	8.1 (0.5)
Homemaker	NA	14.3 (0.7)	7.4 (0.4)
Student	5.4 (0.9)	5.8 (0.8)	5.6 (0.6)
Retired	15.7 (0.6)	16.9 (0.6)	16.3 (0.4)
Unable to work	4.0 (0.4)	5.0 (0.4)	4.5 (0.3)
<b>Household income</b>			
<\$10,000	2.3 (0.4)	3.4 (0.4)	2.9 (0.3)
\$10,000-14,999	3.0 (0.5)	3.1 (0.4)	3.1 (0.3)
\$15,000-19,999	3.7 (0.5)	4.6 (0.5)	4.1 (0.4)
\$20,000-24,999	8.0 (0.7)	9.3 (0.7)	8.6 (0.5)
\$25,000-34,999	8.6 (0.7)	10.3 (0.6)	9.5 (0.5)
\$35,000-49,999	12.8 (0.8)	16.1 (0.9)	14.5 (0.6)
\$50,000-74,999	19.9 (1.1)	18.2 (0.8)	19.1 (0.6)
≥\$75,000	41.7 (1.3)	35.1 (1.1)	38.3 (0.8)

## Chapter 6

### Prevalence of ACEs

The crude prevalence of each ACE category and the ACE score is described in Table 1 for men and women. The age-adjusted prevalence of each ACE category and the ACE score is displayed in Table 2 by select demographic characteristics.

Table 3 provides a side-by-side comparison of the prevalence of each ACE category for the Washington BRFSS with that from the Kaiser-CDC ACE Study. <<Insert note on differences to keep in mind when comparing the prevalences between the 2 studies including question differences and survey mode (self-administered vs telephone-based)>>

**Table 1. Crude prevalence of eight categories of ACEs and ACE score by sex, Washington BRFSS, 2009**

Categories of ACEs	Men (n=2999)	Women (n=4472)	Total (n=7471)
<b>Abuse</b>			
Physical	17.3% (1.0)	16.9% (0.8)	17.1% (0.6)
Sexual	7.0 (0.6)	17.5 (0.8)	12.3 (0.5)
Verbal	32.4 (1.2)	33.8 (1.0)	33.1 (0.8)
<b>Household dysfunction</b>			
Household mental illness	19.6 (1.1)	26.7 (1.0)	23.2 (0.7)
Household substance abuse	29.9 (1.2)	32.6 (1.0)	31.2 (0.8)
Parental divorce/separation	24.0 (1.1)	26.4 (1.0)	25.2 (0.7)
Witnessed domestic violence	15.6 (1.0)	15.9 (0.8)	15.8 (0.6)
Incarcerated household member	6.8 (0.7)	6.7 (0.7)	6.7 (0.5)
<b>ACE score*</b>			
0	39.8 (1.2)	36.4 (1.0)	38.1 (0.8)
1	21.7 (1.0)	21.1 (0.9)	21.4 (0.7)
2	14.2 (0.9)	13.5 (0.8)	13.8 (0.6)
3	9.5 (0.7)	9.8 (0.6)	9.7 (0.5)
4 or 5	10.2 (0.8)	12.8 (0.7)	11.5 (0.5)
6, 7, or 8	4.5 (0.6)	6.3 (0.6)	5.5 (0.4)

\* The ACE score is the simple summation of the number of ACE categories to which each respondent reported exposure during the first 18 years of life.

**Table 2. Prevalence of each adverse childhood experience category by select demographic variables, Washington BRFSS, 2009**

	Physical Abuse	Sexual Abuse	Verbal Abuse	Household mental illness	Household substance abuse	Parents separated or divorced	Witnessed domestic violence	Incarcerated household member
<b>Overall**</b>	17.2 (0.7)	12.3 (0.5)	33.2 (0.8)	23.7 (0.8)	31.5 (0.8)	25.9 (0.8)	16.0 (0.7)	7.1 (0.5)
<b>Age (years)</b>								
18-34	18.4 (1.6)	9.9 (1.2)	36.2 (2.1)	29.1 (1.9)	33.3 (2.0)	32.8 (2.0)	18.7 (1.7)	12.5 (1.4)
35-44	18.7 (1.4)	15.1 (1.3)	34.6 (1.7)	26.7 (1.6)	34.8 (1.7)	30.2 (1.6)	17.3 (1.3)	7.4 (1.0)
45-54	19.1 (1.1)	14.4 (1.0)	38.0 (1.4)	23.4 (1.2)	35.8 (1.7)	23.6 (1.2)	16.8 (1.0)	3.9 (0.5)
55-64	16.1 (1.0)	12.7 (0.9)	34.1 (1.3)	20.5 (1.1)	30.1 (1.2)	17.2 (1.0)	14.7 (0.9)	3.4 (0.5)
65-74	13.9 (1.1)	12.0 (1.0)	24.7 (1.4)	13.5 (1.1)	21.5 (1.3)	14.1 (1.1)	10.0 (0.9)	1.8 (0.4)
≥75	8.3 (1.0)	9.1 (1.1)	11.2 (1.2)	7.3 (1.0)	15.5 (1.3)	14.6 (1.3)	6.6 (0.9)	1.5 (0.4)
<b>Sex**</b>								
Men	17.3 (1.0)	7.1 (0.6)	32.1 (1.2)	19.7 (1.1)	29.9 (1.2)	24.3 (1.1)	15.7 (1.0)	6.9 (0.7)
Women	17.1 (0.8)	17.6 (0.8)	34.3 (1.1)	27.7 (1.1)	33.2 (1.1)	27.6 (1.1)	16.4 (0.9)	7.2 (0.7)
<b>Race/ethnicity**</b>								
White, nonHispanic	17.3 (0.8)	12.1 (0.6)	34.6 (0.9)	25.1 (0.9)	32.3 (0.9)	26.6 (0.9)	15.3 (0.7)	6.8 (0.6)
Black, nonHispanic	12.7 (3.9)	15.2 (3.9)	21.2 (4.7)	12.0 (3.8)	25.9 (4.7)	38.9 (5.3)	17.8 (4.1)	16.0 (3.5)
Asian, nonHispanic	11.1 (2.8)	11.0 (2.8)	20.4 (3.3)	9.4 (2.6)	10.5 (2.9)	5.2 (1.7)	14.0 (2.9)	1.1 (0.9)
AI/AN, nonHispanic	26.9 (6.6)	12.4 (3.8)*	39.9 (5.5)	32.8 (7.0)	31.7 (7.0)	34.5 (7.8)	27.9 (7.6)	9.4 (4.2)*
Other, nonHispanic	32.2 (6.5)	25.7 (6.0)	43.7 (6.7)	39.9 (5.5)	51.7 (6.5)	41.5 (5.6)	33.7 (6.4)	23.1 (4.0)
Multiracial, nonHisp	28.6 (4.1)	17.5 (3.0)	48.9 (4.6)	40.0 (4.6)	41.5 (4.4)	37.2 (4.4)	27.8 (4.1)	8.3 (2.4)
Hispanic	13.6 (2.0)	11.3 (1.8)	26.1 (2.7)	13.1 (2.1)	30.9 (2.9)	22.8 (2.5)	15.1 (2.2)	8.1 (1.8)
<b>Education**</b>								
Less than high school	20.3 (2.5)	13.3 (2.0)	29.1 (2.8)	16.4 (2.2)	30.6 (2.9)	29.1 (2.7)	16.1 (2.1)	11.3 (2.0)
High school graduate	19.3 (1.5)	11.6 (1.1)	31.3 (1.7)	21.9 (1.6)	34.9 (1.7)	31.6 (1.7)	18.5 (1.4)	10.5 (1.3)
Some college	20.8 (1.3)	16.2 (1.1)	38.1 (1.6)	27.1 (1.5)	36.7 (1.5)	31.0 (1.5)	19.1 (1.3)	7.7 (0.9)
College graduate	14.1 (1.5)	11.2 (1.4)	31.3 (1.7)	22.8 (1.6)	26.9 (1.7)	21.0 (1.7)	13.6 (1.5)	4.6 (1.3)
<b>Employment**</b>								
Unemployed	24.3 (2.6)	16.6 (2.3)	37.4 (2.8)	24.1 (2.6)	33.2 (3.0)	29.4 (2.8)	17.5 (2.2)	11.4 (2.3)
Employed	16.6 (0.9)	12.1 (0.8)	32.0 (1.1)	22.3 (1.0)	32.0 (1.2)	26.0 (1.2)	15.7 (0.9)	5.6 (0.6)
<b>Income**</b>								
<\$25,000	24.0 (1.7)	16.5 (1.4)	35.4 (1.9)	27.0 (1.8)	35.2 (1.9)	33.1 (1.9)	20.4 (1.6)	10.8 (1.4)
≥\$25,000	16.4 (0.9)	12.1 (0.7)	34.6 (1.1)	25.1 (1.0)	32.6 (1.0)	25.0 (1.0)	16.4 (0.9)	6.5 (0.7)

\* Unstable estimate, relative standard error &gt; 30%

\*\* Age-adjusted

**Table 3. Prevalence (%) of categories of ACEs by sex in the Washington Behavioral Risk Factor Survey (2009) and the Kaiser-CDC ACE Study in San Diego, California (1995-1997)**

Categories of ACEs	Washington BRFSS 2009			San Diego, CA ACE Study 1995-1997		
	Men (n=2999)	Women (n=4472)	Total (n=7471)	Men (n=7970)	Women (n=9367)	Total (17,337)
<b><i>Abuse</i></b>						
Physical*	17.3	16.9	17.1	29.9	27.0	28.3
Sexual	7.0	17.5	12.3	16.0	24.7	20.7
Verbal*	32.4	33.8	33.1	7.6	13.1	10.6
<b><i>Household dysfunction</i></b>						
Household mental illness	19.6	26.7	23.2	14.8	23.3	19.4
Household substance abuse*	29.9	32.6	31.2	23.8	29.5	26.9
Parental divorce/separation	24.0	26.4	25.2	21.8	21.8	23.3
Witnessed domestic violence*	15.6	15.9	15.8	11.5	13.7	12.7
Incarcerated household member	6.8	6.7	6.7	4.1	5.2	4.7

\* Differences in underlying question or response set as well as survey mode (self-administered vs. telephone-based) between the ACE Study and Washington BRFSS make direct comparisons difficult.

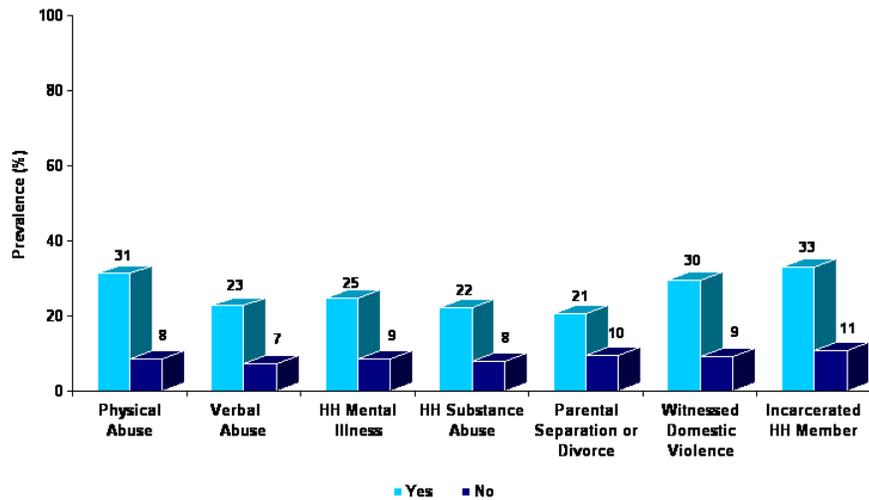
## Chapter 7

### Interrelatedness of ACEs

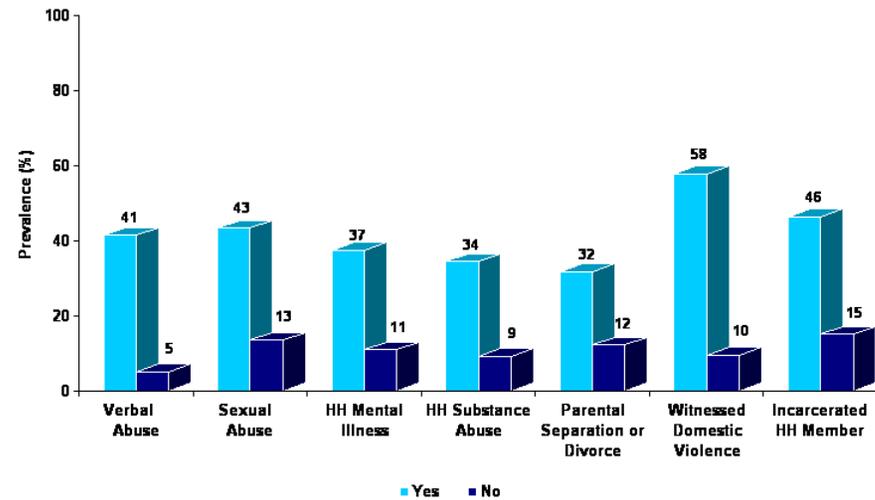
Similar to data from the CDC-Kaiser ACE Study, data from Washington demonstrate that ACEs are highly interrelated, and as such the occurrence of one ACE should evoke a search for others. For example, Figure 1 shows that Washington adults who were sexually abused during childhood also reported exposure to physical abuse more often than those who were not sexually abused (43% vs. 13%). Similarly, the prevalence of growing up in the presence of household substance abuse was increased among those reporting physical abuse (53% vs 25%), sexual abuse (56% vs 28%), witness domestic violence (71% vs 24%) and so forth. As noted above, this interrelatedness makes assessment of the effects of single ACEs on health and social well-being illogical leading to an examination of the cumulative impact through the ACE score.

Figure 1. ACEs are inter-related, Washington BRFSS, 2009

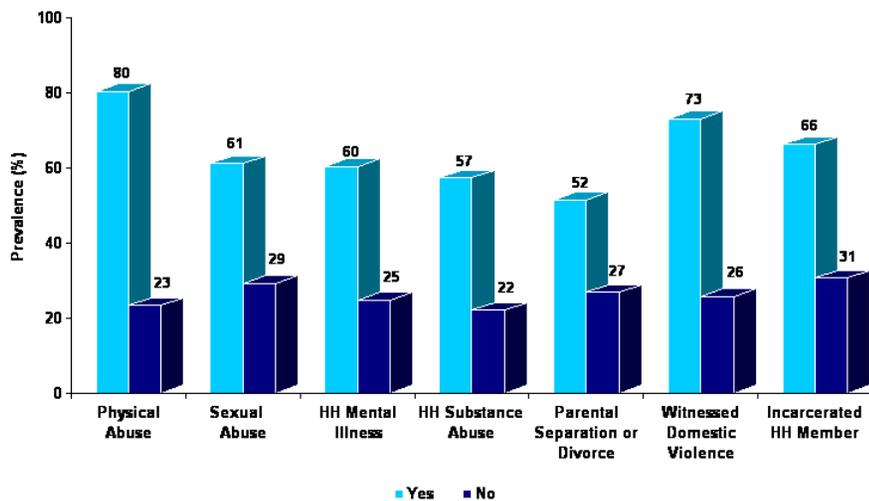
Crude prevalence of sexual abuse by presence or absence of other ACEs



Crude prevalence of physical abuse by presence or absence of other ACEs



Crude prevalence of verbal abuse by presence or absence of other ACEs



Crude prevalence of household mental illness by presence or absence of other ACEs

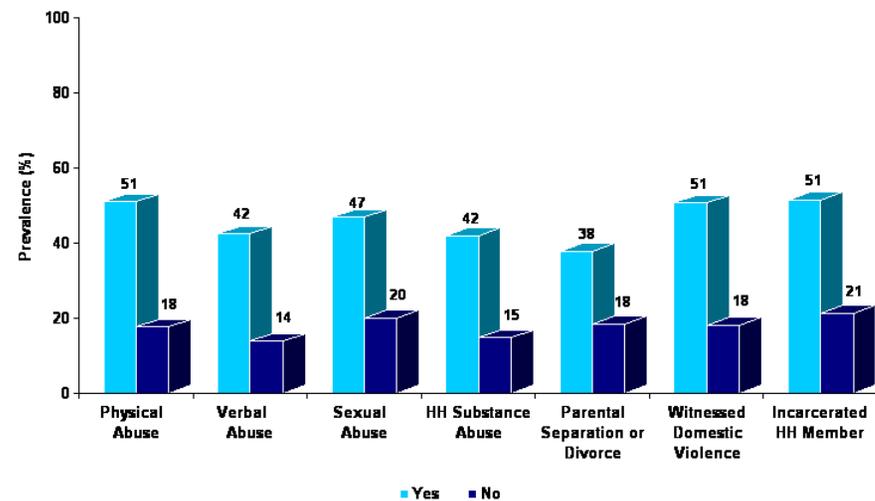
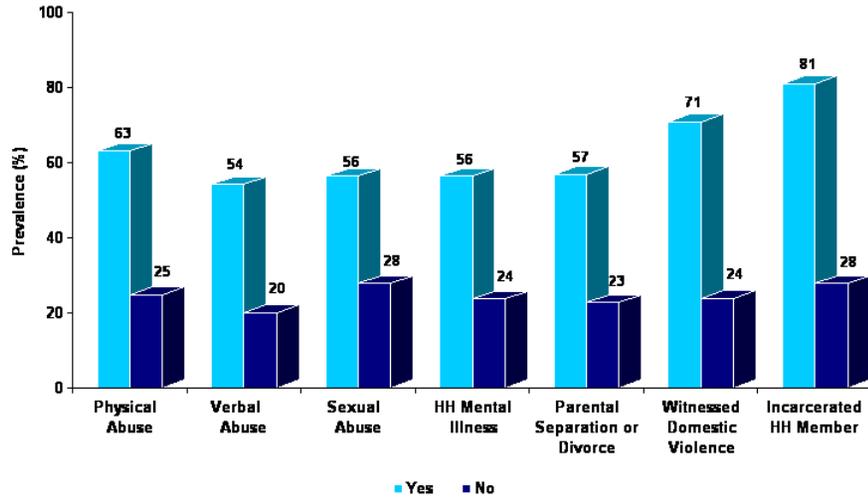
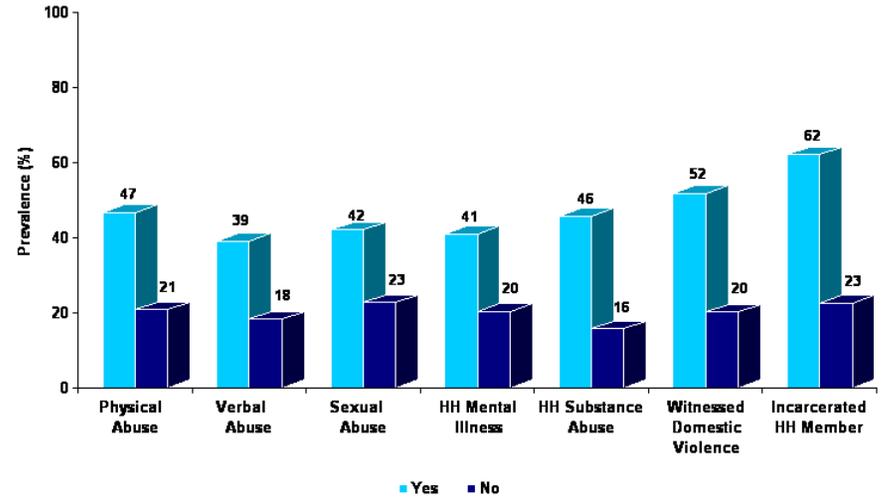


Figure 1. continued

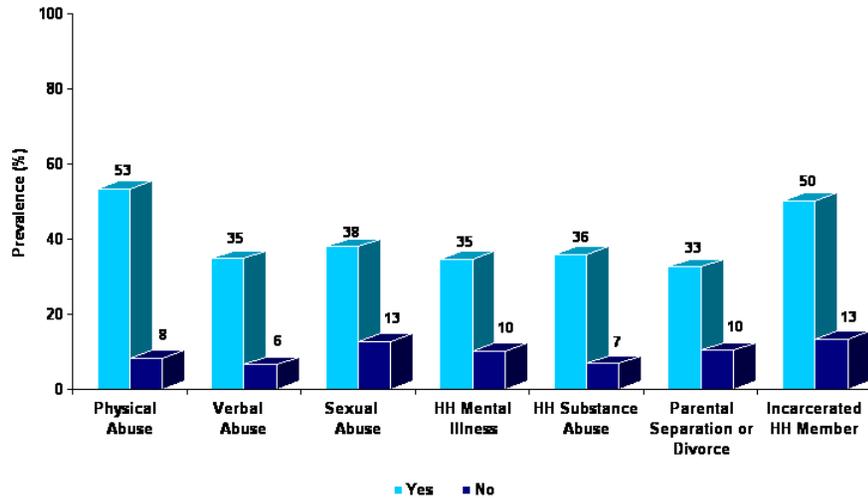
Crude prevalence of household substance abuse by presence or absence of other ACEs



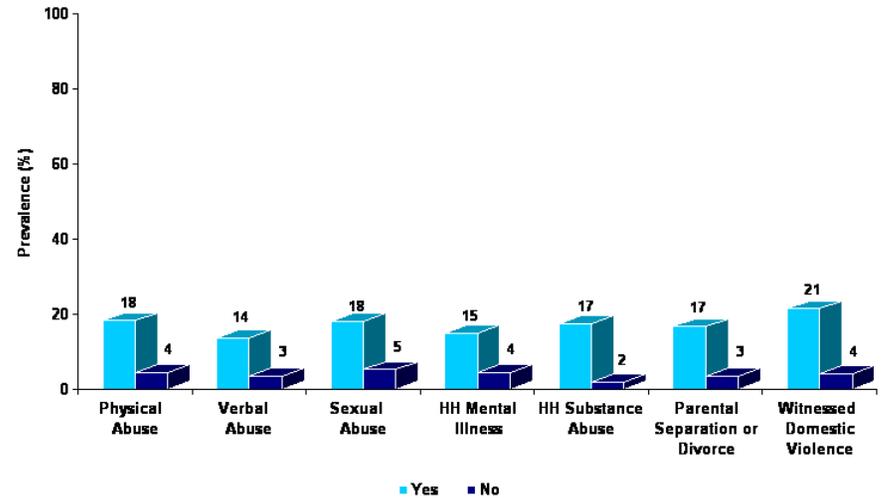
Crude prevalence of parental separation or divorce by presence or absence of other ACEs



Crude prevalence of witnessing domestic violence by presence or absence of other ACEs



Crude prevalence of incarcerated household member by presence or absence of other ACEs



## Chapter 8

### The ACE Score

The prevalence of the ACE score by age, sex, race/ethnicity, education, employment and household income is shown below in Table 1. As can be readily observed, high ACE scores are more prevalent among younger adults, and higher scores are slightly more common among women than men after adjusting for age. The ACE score distribution differs slightly by age, but some caution should be exercised due to small sample sizes for some racial/ethnic groups. Although a similar proportion of adults with less than a high school education or college degree had ACE scores of zero (about 41%), ACE scores of 4 or more were more common among those with less than a high school degree than those with a college degree. Similarly, ACE scores of 4 or more were more prevalent among persons who were unemployed at the time of the survey as well as those with a household income <\$25,000 compared to employed adults or those with incomes  $\geq$ \$25,000, respectively.

**Table 1. Prevalence of ACE score by select demographic variables, Washington BRFSS, 2009**

	ACE score					
	0	1	2	3	4 or 5	6, 7 or 8
<b>Overall**</b>	37.8 (0.8)	21.3 (0.7)	13.8 (0.6)	9.7 (0.5)	11.7 (0.6)	5.6 (0.5)
<b>Age (years)</b>						
18-34	35.4 (2.0)	19.4 (1.6)	14.9 (1.6)	8.1 (1.0)	13.5 (1.4)	8.7 (1.2)
35-44	33.3 (1.7)	21.8 (1.5)	14.0 (1.3)	11.7 (1.1)	12.9 (1.2)	6.3 (0.9)
45-54	34.4 (1.4)	21.4 (1.2)	14.1 (1.0)	12.2 (0.9)	12.8 (0.9)	5.1 (0.7)
55-64	38.8 (1.3)	22.4 (1.1)	14.5 (0.9)	10.7 (0.9)	10.8 (0.8)	2.8 (0.4)
65-74	48.7 (1.6)	22.8 (1.3)	12.5 (1.1)	6.9 (0.8)	6.9 (0.8)	2.2 (0.4)
$\geq$ 75	57.9 (1.8)	24.8 (1.6)	8.3 (1.0)	5.2 (0.8)	3.5 (0.7)	0.4 (0.2)*
<b>Sex**</b>						
Men	39.8 (1.3)	21.7 (1.0)	14.1 (0.9)	9.5 (0.7)	10.2 (0.8)	4.7 (0.6)
Women	35.7 (1.0)	21.0 (0.9)	13.5 (0.8)	9.9 (0.6)	13.2 (0.8)	6.7 (0.6)
<b>Race/ethnicity**</b>						
White, nonHispanic	36.5 (0.9)	21.5 (0.8)	14.3 (0.7)	10.3 (0.5)	11.6 (0.7)	5.9 (0.5)
Black, nonHispanic	38.6 (5.2)	20.8 (3.9)	15.7 (4.6)	9.4 (2.9)	11.0 (3.3)	4.5 (2.8)
Asian, nonHispanic	61.3 (4.0)	17.3 (3.0)	10.1 (2.6)	5.2 (1.8)	5.3 (2.3)	0.9 (0.6)*
AI/AN, nonHispanic	33.6 (5.7)	14.7 (4.5)	8.8 (3.7)	16.3 (6.8)	20.9 (6.7)	5.8 (3.5)
Other, nonHispanic	15.1 (3.8)	23.4 (6.3)	18.1 (5.1)	7.9 (3.3)	18.5 (5.5)	16.9 (4.8)
Multiracial, nonHisp	23.7 (3.8)	18.3 (3.8)	16.6 (3.3)	6.2 (1.7)	25.3 (3.3)	9.8 (3.1)
Hispanic	44.0 (3.0)	21.4 (2.6)	13.5 (2.1)	7.2 (1.4)	9.6 (1.8)	4.3 (1.3)
<b>Education**</b>						
Less than high school	41.8 (3.0)	19.1 (2.4)	12.6 (2.1)	8.0 (1.5)	11.2 (1.8)	7.3 (1.7)
High school graduate	36.1 (1.7)	21.1 (1.5)	13.2 (1.3)	9.7 (1.0)	13.2 (1.3)	6.7 (1.0)
Some college	32.4 (1.4)	19.6 (1.2)	15.9 (1.2)	10.1 (0.9)	13.9 (1.1)	7.9 (0.9)
College graduate	41.7 (1.7)	22.7 (1.3)	13.0 (1.4)	9.3 (0.8)	8.6 (0.8)	4.7 (1.3)
<b>Employment**</b>						
Unemployed	36.3 (3.0)	18.5 (2.6)	12.5 (2.2)	9.0 (1.7)	15.0 (2.1)	8.6 (1.8)
Employed	37.1 (1.2)	22.0 (1.1)	14.4 (0.9)	10.6 (0.7)	11.2 (0.8)	4.7 (0.4)
<b>Income**</b>						
<\$25,000	34.3 (1.9)	20.2 (1.7)	12.3 (1.3)	8.4 (1.0)	15.0 (1.3)	9.7 (1.3)
$\geq$ \$25,000	35.9 (1.0)	21.7 (0.9)	15.1 (0.9)	10.3 (0.6)	11.9 (0.8)	5.1 (0.6)

\* Unstable estimate, relative standard error > 30%

\*\* Age-adjusted

## Chapter 9

### The ACE Score and Health and Social Outcomes

Relationships between the accumulation of ACEs and a wide range of health and social outcomes are presented below and are organized as follows:

#### Risk Factors

- Tobacco (lifetime / current smoking)
- Alcohol (heavy / binge drinking)
- Drugs (lifetime / childhood initiation of marijuana use)
- High risk for HIV

#### Prevalence Chronic Disease

- Cardiovascular Disease / Hypertension / Hypercholesterolemia / Diabetes / Obesity
- Cancer
- Asthma (lifetime / current asthma)

#### Poor Mental Health

- Insufficient Sleep (all days /  $\geq 21$  days with insufficient sleep during the past 30 days)
- Frequent Mental Distress ( $\geq 14$  unhealthy mental days during past 30 days)
- Frequent Disruption from Work/Activity due to Mental Health Condition or Emotional Problems
- Received Medical Treatment or Pharmacotherapy for Mental Health Condition or Emotional Problems
- Anxiety
- Hopelessness

#### General Health Status and Social Problems

- Health Related Quality of Life
  - Fair or Poor Health
  - $\geq 14$  Unhealthy Physical Days
  - $\geq 14$  Unhealthy Physical/Mental Days
  - $\geq 14$  Poor Health Days
- Disability
  - Activity Limitation due to Health Problem
  - Health Problem Requiring Special Medical Equipment
- Social Problems
  - Lacking Emotional/Social Support
  - Separation or Divorce

## ACEs and Smoking: Washington BRFSS, 2009

The negative health consequences of smoking and second hand smoke exposure are well documented. Smoking is responsible for at least 30% of all cancer deaths, for nearly 80% of deaths from chronic obstructive pulmonary disease as well as early cardiovascular disease and deaths [1]. An estimated 443,000 Americans die from diseases directly related to cigarette smoking each year [2], and smoking is estimated to be responsible for more than 5 million deaths per year worldwide [3].

Overall, the age-adjusted prevalence of smoking (ever) was 39.5% (std err, 0.8) and 14.1% (std err, 0.6) for current smoking in Washington during 2009. For each of the component ACE categories, adults reporting exposure to the ACE had a higher smoking prevalence than those who did not report exposure. Similarly, the relative risk of smoking was increased among those reporting exposure to each of the component ACEs categories. For example, the risk of smoking (ever) among persons exposed to physical abuse was twice that of persons who were not exposed.

Consistent with the findings of ACE Study data [4,5], strong, graded relationships are observed between the ACE score and smoking. For example, the age-adjusted prevalence of smoking (ever) increased with increasing ACE score such that nearly two-thirds of persons with 6 or more ACEs reported ever smoking compared to 31% among adults reporting no ACEs. Moreover, compared to adults with an ACE score of 0, those with a ACE score of 6 or more had more than a 4-fold increased risk of ever smoking.

### **Variable definitions**

**Ever smoking** was defined by a positive response to the question “Have you smoked at least 100 cigarettes in your entire life?” 100 cigarettes = 5 packs of cigarettes

**Current smoker** was defined by a positive response to the question “Have you smoked at least 100 cigarettes in your entire life?” and a response of “every day” or “some days” to the question “Do you now smoke cigarettes every day, some days, or not at all?”

### **References**

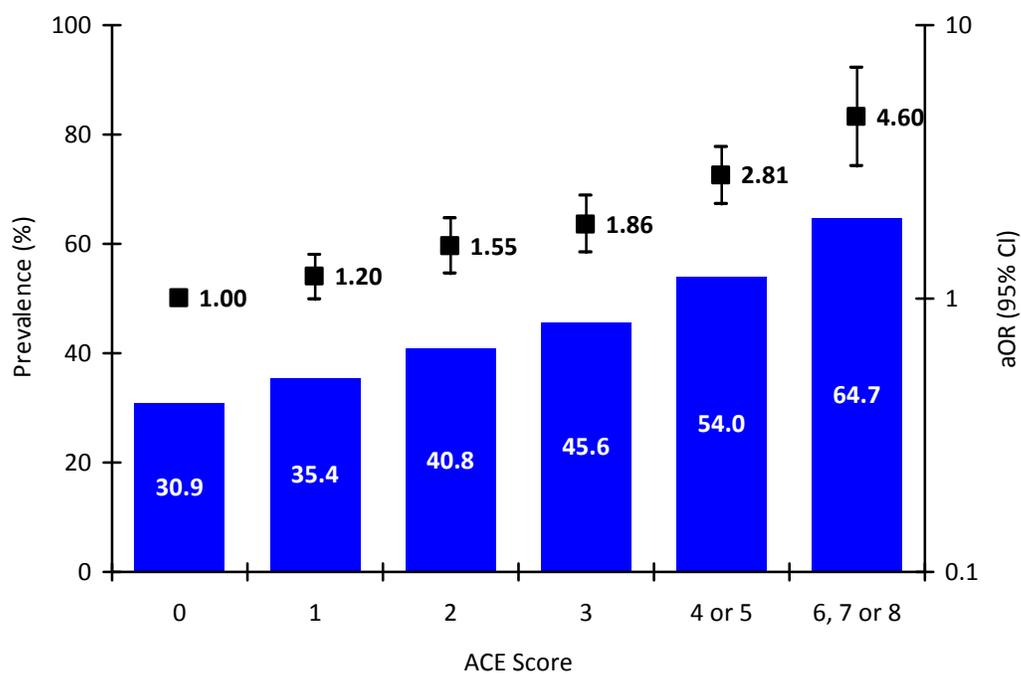
1. CDC. The Health Consequences of Smoking: A Report of the Surgeon General. Atlanta, GA: OSH; 2004.
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**Age-adjusted prevalence (%) and multivariable-adjusted relative odds of smoking (ever) by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life**

ACE Category		N	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)
Physical abuse	Yes	1227	55.0 (2.1)	2.18 (1.79, 2.65)
	No	6244	36.1 (0.9)	
Sexual abuse	Yes	1024	54.5 (2.7)	2.12 (1.71, 2.63)
	No	6447	37.5 (0.9)	
Verbal abuse	Yes	2329	48.8 (1.5)	1.83 (1.57, 2.14)
	No	5142	34.9 (0.9)	
Household mental illness	Yes	1510	46.1 (1.7)	1.63 (1.36, 1.95)
	No	5961	37.1 (0.9)	
Household substance abuse	Yes	2228	50.0 (1.5)	1.94 (1.66, 2.27)
	No	5243	34.5 (0.9)	
Parents separated / divorced	Yes	1648	51.7 (1.6)	1.92 (1.62, 2.29)
	No	5823	34.9 (0.9)	
Witnessed domestic violence	Yes	1103	52.6 (2.1)	1.83 (1.49, 2.25)
	No	6368	37.0 (0.9)	
Incarcerated household member	Yes	360	54.5 (3.2)	1.89 (1.33, 2.70)
	No	7111	38.1 (0.8)	

Note: Model adjusted for age, sex, race/ethnicity, education, income.

**Age-adjusted prevalence and multivariable-adjusted relative odds of smoking (ever) by ACE score**

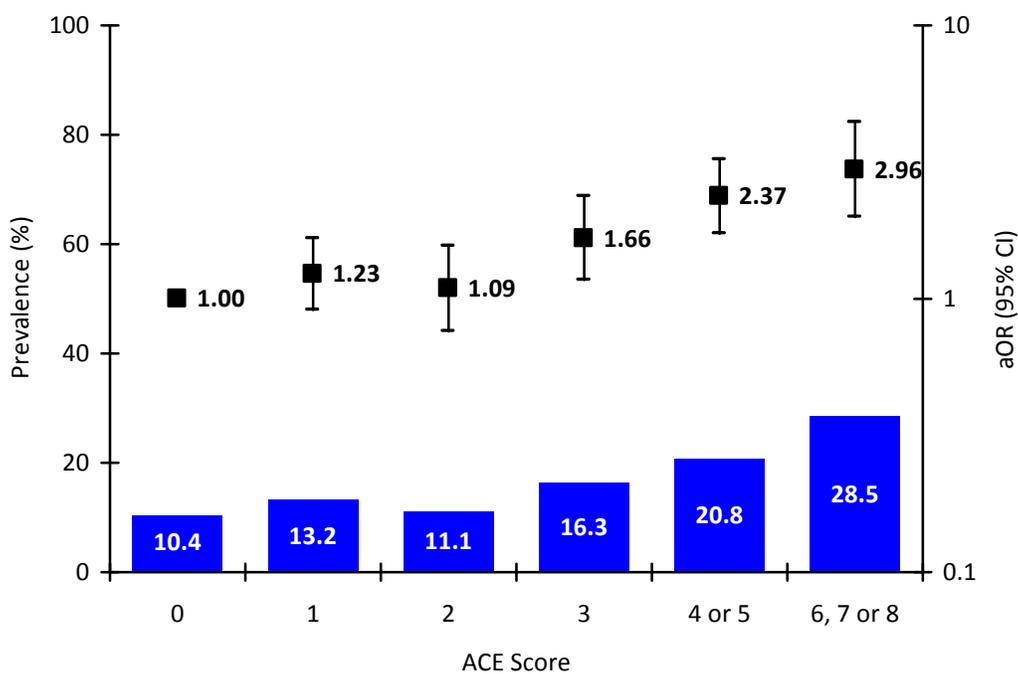


**Age-adjusted prevalence (%) and multivariable-adjusted relative odds of smoking (current) by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life**

ACE Category		N	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)
Physical abuse	Yes	1227	22.5 (1.8)	1.86 (1.47, 2.35)
	No	6244	12.2 (0.7)	
Sexual abuse	Yes	1024	18.9 (1.9)	1.71 (1.32, 2.20)
	No	6447	13.3 (0.7)	
Verbal abuse	Yes	2329	17.7 (1.2)	1.69 (1.37, 2.10)
	No	5142	12.1 (0.7)	
Household mental illness	Yes	1510	17.1 (1.3)	1.57 (1.23, 2.00)
	No	5961	13.0 (0.7)	
Household substance abuse	Yes	2228	18.7 (1.2)	1.82 (1.47, 2.24)
	No	5243	11.7 (0.7)	
Parents separated / divorced	Yes	1648	19.1 (1.2)	1.52 (1.22, 1.90)
	No	5823	12.0 (0.7)	
Witnessed domestic violence	Yes	1103	20.4 (1.6)	1.63 (1.27, 2.08)
	No	6368	12.7 (0.7)	
Incarcerated household member	Yes	360	22.7 (2.6)	1.62 (1.11, 2.37)
	No	7111	13.1 (0.7)	

Note: Model adjusted for age, sex, race/ethnicity, education, income.

**Age-adjusted prevalence and multivariable-adjusted relative odds of smoking (current) by ACE score**



**Crude and age-adjusted prevalence (%) and multivariable-adjusted relative odds of smoking (ever) by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life, Washington BRFSS, 2009**

ACE Category	N	Prevalence of Smoking (current)		Multivariable-adjusted OR (95% CI)
		Crude % (std err)	Age-adjusted % (std err)	
Overall	7471	40.4 (0.8)	39.5 (0.8)	
Physical abuse	Yes	1227	55.7 (2.1)	2.18 (1.79, 2.65)
	No	6244	37.2 (0.8)	1.00 (referent)
Sexual abuse	Yes	1024	55.1 (2.2)	2.12 (1.71, 2.63)
	No	6447	38.3 (0.8)	1.00
Verbal abuse	Yes	2329	48.5 (1.5)	1.83 (1.57, 2.14)
	No	5142	36.4 (0.9)	1.00
Household mental illness	Yes	1510	46.1 (1.8)	1.63 (1.36, 1.95)
	No	5961	38.7 (0.9)	1.00
Household substance abuse	Yes	2228	50.2 (1.5)	1.94 (1.66, 2.27)
	No	5243	36.0 (0.9)	1.00
Parents separated / divorced	Yes	1648	50.7 (1.7)	1.92 (1.62, 2.29)
	No	5823	37.0 (0.9)	1.00
Witnessed domestic violence	Yes	1103	52.0 (2.2)	1.83 (1.49, 2.25)
	No	6368	38.2 (0.8)	1.00
Incarcerated household member	Yes	360	54.2 (3.8)	1.89 (1.33, 2.70)
	No	7111	39.4 (0.8)	1.00
ACE score				
0	3004	33.3 (1.1)	30.9 (1.2)	1.00 (referent)
1	1632	36.9 (1.6)	35.4 (1.7)	1.20 (0.99, 1.44)
2	992	41.1 (2.3)	40.8 (2.3)	1.55 (1.23, 1.96)
3	718	46.1 (2.4)	45.6 (2.5)	1.86 (1.47, 2.37)
4 or 5	796	53.8 (2.5)	54.0 (2.4)	2.81 (2.21, 3.57)
6, 7, 8	329	64.3 (4.0)	64.7 (3.7)	4.60 (3.04, 6.96)

Note: Model adjusted for age, sex, race/ethnicity, education, income.

p-for-trend < 0.001

**Crude and age-adjusted prevalence (%) and multivariable-adjusted relative odds of smoking (current) by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life, Washington BRFSS, 2009**

ACE Category	N	Prevalence of Smoking (current)		Multivariable-adjusted OR (95% CI)
		Crude % (std err)	Age-adjusted % (std err)	
Overall	7471	13.8 (0.6)	14.1 (0.6)	
Physical abuse	Yes	1227	23.0 (1.7)	1.86 (1.47, 2.35)
	No	6244	11.9 (0.6)	1.00 (referent)
Sexual abuse	Yes	1024	19.0 (1.6)	1.71 (1.32, 2.20)
	No	6447	13.1 (0.6)	1.00
Verbal abuse	Yes	2329	18.2 (1.2)	1.69 (1.37, 2.10)
	No	5142	11.7 (0.7)	1.00
Household mental illness	Yes	1510	18.1 (1.4)	1.57 (1.23, 2.00)
	No	5961	12.5 (0.6)	1.00
Household substance abuse	Yes	2228	19.3 (1.2)	1.82 (1.47, 2.24)
	No	5243	11.3 (0.7)	1.00
Parents separated / divorced	Yes	1648	20.1 (1.4)	1.52 (1.22, 1.90)
	No	5823	11.7 (0.6)	1.00
Witnessed domestic violence	Yes	1103	21.2 (1.7)	1.63 (1.27, 2.08)
	No	6368	12.5 (0.6)	1.00
Incarcerated household member	Yes	360	27.7 (3.6)	1.62 (1.11, 2.37)
	No	7111	12.8 (0.6)	1.00
ACE score				
0	3004	9.9 (0.8)	10.4 (0.9)	1.00 (referent)
1	1632	12.7 (1.3)	13.2 (1.4)	1.23 (0.91, 1.66)
2	992	11.5 (1.5)	11.1 (1.5)	1.09 (0.76, 1.56)
3	718	16.3 (1.9)	16.3 (2.0)	1.66 (1.17, 2.37)
4 or 5	796	22.0 (2.0)	20.8 (1.9)	2.37 (1.73, 3.23)
6, 7, 8	329	30.1 (3.7)	28.5 (3.5)	2.96 (1.99, 4.42)

p-for-trend < 0.001

Note: Model adjusted for age, sex, race/ethnicity, education, income.

## ACEs and Drinking Behavior: Washington BRFSS, 2009

Drinking alcohol has immediate effects that can increase the risk of many harmful health conditions. Excessive alcohol use, either in the form of heavy drinking (drinking more than two drinks per day on average for men or more than one drink per day on average for women), or binge drinking (drinking 5 or more drinks during a single occasion for men or 4 or more drinks during a single occasion for women), can lead to increased risk of health problems such as liver disease or unintentional injuries [1]. In fact, excessive alcohol use is the 3rd leading lifestyle-related cause of death for people in the United States each year [1].

Overall, the age-adjusted prevalence of heavy drinking was 5.4% (std err, 0.4) and 16.3% (std err, 0.7) for binge drinking among Washington adults. The relative frequency of heavy drinking was increased for many, although not all, of the component ACEs. A modest increase in heavy drinking was observed across the ACE score, such that persons with 6 or more ACEs had a two-fold increased risk of being a heavy drinker compared to adults reporting zero ACEs (aOR=2.25; 95%CI=1.21, 4.17). Similar results were observed for binge drinking with an increased risk of binge drinking associated with each of the component ACEs as well as across the ACE score.

### Variable definitions

**Heavy drinking** was defined as having more than two drinks per day for adult men and having more than one drink per day for adult women.

**Binge drinking** was defined as having five or more drinks on one occasion for men and having four or more drinks on one occasion for women.

### References

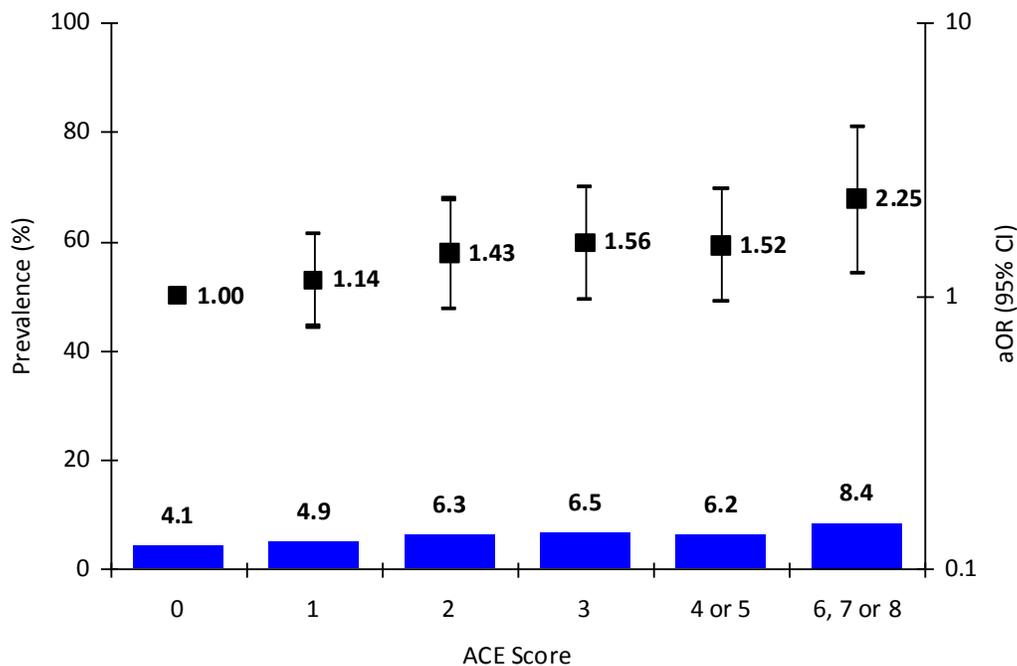
1. CDC. Alcohol Fact Sheet. Available at [www.cdc.gov/alcohol](http://www.cdc.gov/alcohol).

**Age-adjusted prevalence (%) and multivariable-adjusted relative odds of heavy drinking by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life**

ACE Category		N	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)
Physical abuse	Yes	1227	6.7 (1.0)	1.37 (0.95, 1.98)
	No	6244	5.0 (0.4)	
Sexual abuse	Yes	1024	7.5 (1.3)	1.51 (1.03, 2.21)
	No	6447	5.0 (0.4)	
Verbal abuse	Yes	2329	6.6 (0.8)	1.45 (1.07, 1.95)
	No	5142	4.7 (0.4)	
Household mental illness	Yes	1510	6.3 (0.8)	1.15 (0.80, 1.64)
	No	5961	5.0 (0.4)	
Household substance abuse	Yes	2228	7.6 (0.8)	1.72 (1.27, 2.33)
	No	5243	4.3 (0.4)	
Parents separated / divorced	Yes	1648	5.3 (0.7)	0.93 (0.65, 1.33)
	No	5823	5.4 (0.5)	
Witnessed domestic violence	Yes	1103	7.7 (1.1)	1.66 (1.15, 2.39)
	No	6368	4.9 (0.4)	
Incarcerated household member	Yes	360	8.1 (1.8)	1.60 (0.89, 2.87)
	No	7111	5.2 (0.4)	

Note: Model adjusted for age, sex, race/ethnicity, education, income.

**Age-adjusted prevalence and multivariable-adjusted relative odds of heavy drinking by ACE score**

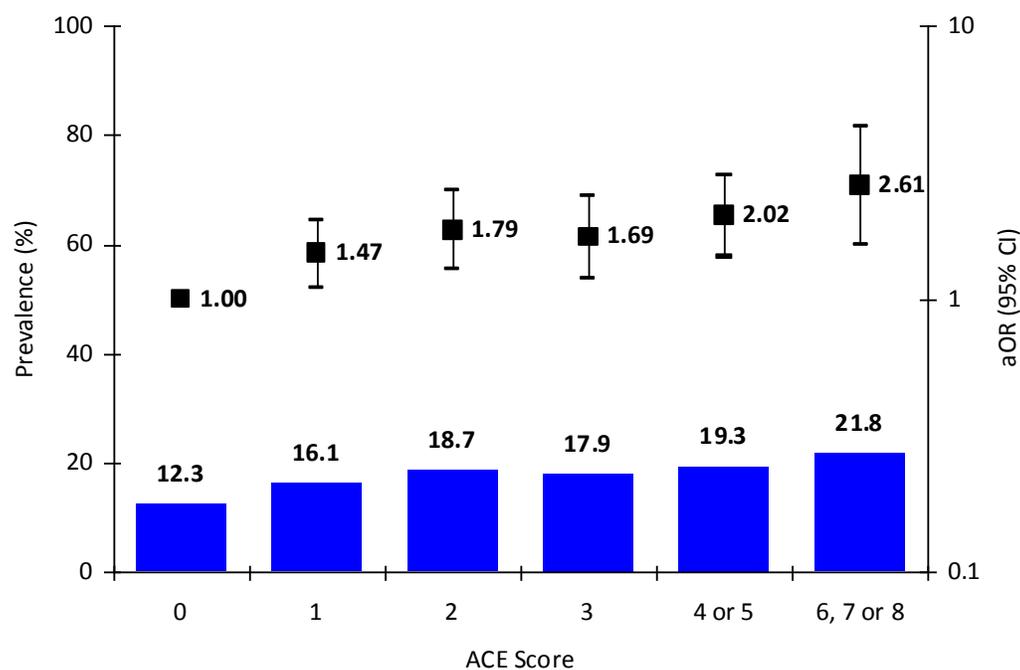


**Age-adjusted prevalence (%) and multivariable-adjusted relative odds of binge drinking by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life**

ACE Category		N	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)
Physical abuse	Yes	1227	21.6 (1.9)	1.65 (1.26, 2.15)
	No	6244	15.0 (0.7)	
Sexual abuse	Yes	1024	18.0 (2.3)	1.38 (1.01, 1.88)
	No	6447	16.2 (0.7)	
Verbal abuse	Yes	2329	21.2 (1.3)	1.63 (1.31, 2.03)
	No	5142	13.5 (0.8)	
Household mental illness	Yes	1510	17.7 (1.4)	1.21 (0.93, 1.56)
	No	5961	15.7 (0.8)	
Household substance abuse	Yes	2228	19.9 (1.3)	1.63 (1.31, 2.02)
	No	5243	14.4 (0.8)	
Parents separated / divorced	Yes	1648	17.5 (1.3)	1.34 (1.05, 1.71)
	No	5823	15.6 (0.9)	
Witnessed domestic violence	Yes	1103	19.4 (1.8)	1.46 (1.10, 1.94)
	No	6368	15.5 (0.8)	
Incarcerated household member	Yes	360	16.9 (2.4)	1.50 (0.96, 2.344)
	No	7111	16.3 (0.7)	

Note: Model adjusted for age, sex, race/ethnicity, education, income.

**Age-adjusted prevalence and multivariable-adjusted relative odds of binge drinking by ACE score**



**Crude and age-adjusted prevalence (%) and multivariable-adjusted relative odds of heavy drinking by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life, Washington BRFSS, 2009**

ACE Category	N	Prevalence of Heavy Drinking			
		Crude % (std err)	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)	
Overall	7471	5.5 (0.4)	5.4 (0.4)		
Physical abuse	Yes	1227	6.9 (1.1)	6.7 (1.0)	1.37 (0.95, 1.98)
	No	6244	5.2 (0.4)	5.0 (0.4)	1.00 (referent)
Sexual abuse	Yes	1024	8.0 (1.1)	7.5 (1.3)	1.51 (1.03, 2.21)
	No	6447	5.1 (0.4)	5.0 (0.4)	1.00
Verbal abuse	Yes	2329	7.9 (0.8)	6.6 (0.8)	1.45 (1.07, 1.95)
	No	5142	4.8 (0.4)	4.7 (0.4)	1.00
Household mental illness	Yes	1510	6.5 (0.9)	6.3 (0.8)	1.15 (0.80, 1.64)
	No	5961	5.2 (0.4)	5.0 (0.4)	1.00
Household substance abuse	Yes	2228	7.7 (0.8)	7.6 (0.8)	1.72 (1.27, 2.33)
	No	5243	4.5 (0.4)	4.3 (0.4)	1.00
Parents separated / divorced	Yes	1648	5.3 (0.7)	5.3 (0.7)	0.93 (0.65, 1.33)
	No	5823	5.5 (0.4)	5.4 (0.5)	1.00
Witnessed domestic violence	Yes	1103	7.9 (1.2)	7.7 (1.1)	1.66 (1.15, 2.39)
	No	6368	5.1 (0.4)	4.9 (0.4)	1.00
Incarcerated household member	Yes	360	7.5 (1.9)	8.1 (1.8)	1.60 (0.89, 2.87)
	No	7111	5.4 (0.4)	5.2 (0.4)	1.00
ACE score					
0	3004	4.3 (0.5)	4.1 (0.5)	1.00 (referent)	
1	1632	5.0 (0.8)	4.9 (0.8)	1.14 (0.77, 1.70)	
2	992	6.4 (1.1)	6.3 (1.1)	1.43 (0.90, 2.26)	
3	718	6.6 (1.3)	6.5 (1.4)	1.56 (0.97, 2.50)	
4 or 5	796	6.6 (1.2)	6.2 (1.1)	1.52 (0.95, 2.45)	
6, 7, 8	329	9.1 (2.3)	8.4 (2.0)	2.25 (1.21, 4.17)	
					p-for-trend = 0.003

Note: Model adjusted for age, sex, race/ethnicity, education, income.

**Crude and age-adjusted prevalence (%) and multivariable-adjusted relative odds of binge drinking by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life, Washington, 2009**

ACE Category	N	Prevalence of Binge Drinking			
		Crude % (std err)	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)	
Overall	7471	15.7 (0.7)	16.3 (0.7)		
Physical abuse	Yes	1227	22.1 (1.9)	21.6 (1.9)	1.65 (1.26, 2.15)
	No	6244	14.3 (0.7)	15.0 (0.7)	1.00 (referent)
Sexual abuse	Yes	1024	16.1 (1.9)	18.0 (2.3)	1.38 (1.01, 1.88)
	No	6447	15.6 (0.7)	16.2 (0.7)	1.00
Verbal abuse	Yes	2329	21.7 (1.4)	21.2 (1.3)	1.63 (1.31, 2.03)
	No	5142	12.7 (0.7)	13.5 (0.8)	1.00
Household mental illness	Yes	1510	19.3 (1.6)	17.7 (1.4)	1.21 (0.93, 1.56)
	No	5961	14.6 (0.7)	15.7 (0.8)	1.00
Household substance abuse	Yes	2228	20.3 (1.4)	19.9 (1.3)	1.63 (1.31, 2.02)
	No	5243	13.5 (0.8)	14.4 (0.8)	1.00
Parents separated / divorced	Yes	1648	19.2 (1.5)	17.5 (1.3)	1.34 (1.05, 1.71)
	No	5823	14.5 (0.7)	15.6 (0.9)	1.00
Witnessed domestic violence	Yes	1103	20.6 (2.0)	19.4 (1.8)	1.46 (1.10, 1.94)
	No	6368	14.8 (0.7)	15.5 (0.8)	1.00
Incarcerated household member	Yes	360	22.5 (3.5)	16.9 (2.4)	1.50 (0.96, 2.344)
	No	7111	15.2 (0.7)	16.3 (0.7)	1.00
ACE score					
0	3004	11.2 (0.9)	12.3 (1.1)	1.00 (referent)	
1	1632	15.1 (1.4)	16.1 (1.6)	1.47 (1.10, 1.96)	
2	992	19.1 (2.1)	18.7 (2.0)	1.79 (1.28, 2.51)	
3	718	17.6 (2.0)	17.9 (2.2)	1.69 (1.19, 2.39)	
4 or 5	796	20.6 (2.1)	19.3 (1.9)	2.02 (1.43, 2.84)	
6, 7, 8	329	26.0 (4.3)	21.8 (3.3)	2.61 (1.59, 4.29)	
					p-for-trend < 0.001

Note: Model adjusted for age, sex, race/ethnicity, education, income.

## ACEs and Drug Use: Washington BRFSS, 2009

Marijuana is the most commonly abused illicit drug in the US [1]. Biologically, when smoked, marijuana's active ingredient, delta-9-tetrahydrocannabinol (THC) rapidly passes from lungs into the blood stream and thereby into the brain and other organs to produce its many effects including distorted perceptions, impaired coordination, as well as problems with thought processes and memory [1]. Studies have shown an association between chronic marijuana use and anxiety, depression, suicidal ideation and schizophrenia [1]. In addition, some studies have shown early age at first use to be a marker of vulnerability to later problems [1].

Overall, four in ten (44.6% [std err, 0.9]), adults reported lifetime marijuana use. The relative frequency of marijuana use was increased 2-fold for each of the component ACEs and a strong, graded relationship was observed across the ACE score such that persons with 6 or more ACEs had a 6-fold increased risk of using marijuana compared to adults reporting zero ACEs (aOR=6.46; 95%CI=4.33, 9.64). Similar results were observed for initiation of marijuana use before age 18 years. Compared to adults with an ACE score of zero, the relative risk of early marijuana use was 1.37 for those with 1 ACE, 2.28 for 2 ACEs, 3.32 for 3 ACEs, 3.74 for 4 or 5 ACEs, and 5.64 for 6 or more ACEs (p-for trend < 0.001).

### Variable definitions

**Lifetime marijuana use** was defined as a positive response to the question, "Have you ever smoked marijuana? If YES, how old were you the first time you smoked marijuana?"

**Childhood initiation of marijuana use** was defined by a response of an age < 18 years to the question, "Have you ever smoked marijuana? If YES, how old were you the first time you smoked marijuana?"

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### References

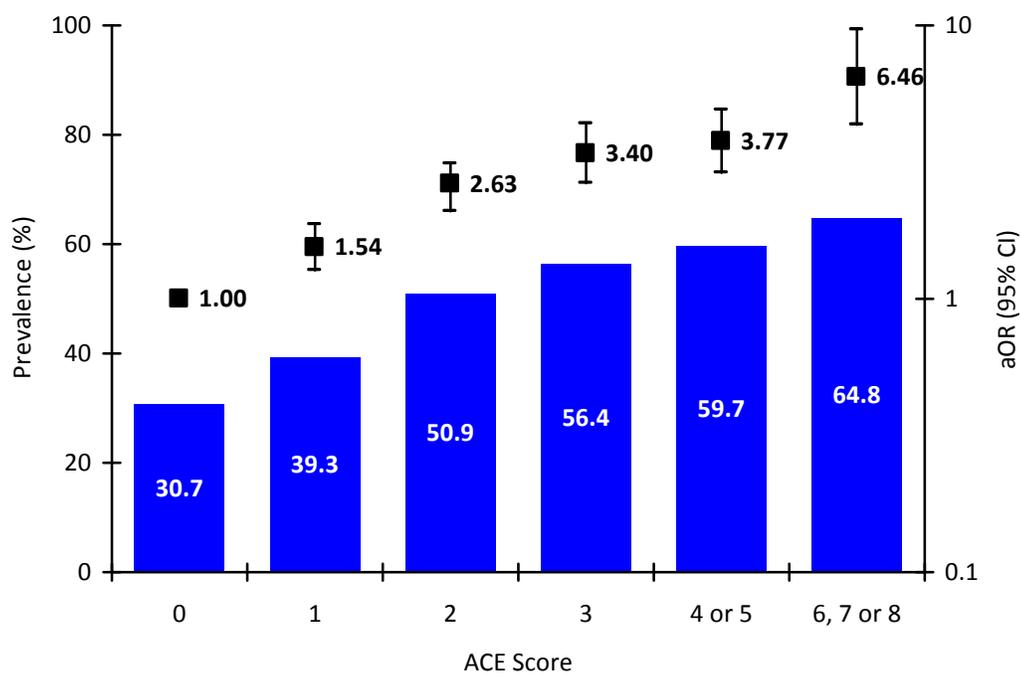
1. National Institute on Drug Abuse (NIDA). NIDA InfoFacts: Marijuana. Available at [www.nida.nih.gov](http://www.nida.nih.gov).

**Age-adjusted prevalence (%) and multivariable-adjusted relative odds of lifetime marijuana use by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life**

ACE Category		N	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)
Physical abuse	Yes	1227	59.7 (2.0)	2.32 (1.91, 2.883)
	No	6244	41.0 (1.0)	
Sexual abuse	Yes	1024	58.3 (2.5)	2.17 (1.77, 2.65)
	No	6447	42.6 (0.9)	
Verbal abuse	Yes	2329	55.7 (1.4)	2.23 (1.91, 2.61)
	No	5142	38.3 (1.1)	
Household mental illness	Yes	1510	55.8 (1.6)	1.92 (1.60, 2.30)
	No	5961	40.6 (1.0)	
Household substance abuse	Yes	2228	56.6 (1.5)	2.35 (2.01, 2.76)
	No	5243	38.1 (1.1)	
Parents separated / divorced	Yes	1648	55.8 (1.5)	2.15 (1.81, 2.55)
	No	5823	39.6 (1.0)	
Witnessed domestic violence	Yes	1103	57.4 (2.0)	2.00 (1.62, 2.45)
	No	6368	41.8 (1.0)	
Incarcerated household member	Yes	360	59.3 (2.8)	2.16 (1.51, 3.08)
	No	7111	43.2 (0.9)	

Note: Model adjusted for age, sex, race/ethnicity, education, income.

**Age-adjusted prevalence and multivariable-adjusted relative odds of lifetime marijuana use by ACE score**



**Crude and age-adjusted prevalence (%) and multivariable-adjusted relative odds of lifetime marijuana use by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life, Washington BRFSS, 2009**

ACE Category	N	Prevalence of Lifetime Marijuana Use			
		Crude % (std err)	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)	
Overall	7471	44.6 (0.8)	44.6 (0.9)		
Physical abuse	Yes	1227	62.4 (2.0)	59.7 (2.0)	2.32 (1.91, 2.883)
	No	6244	40.7 (0.9)	41.0 (1.0)	1.00 (referent)
Sexual abuse	Yes	1024	60.0 (2.1)	58.3 (2.5)	2.17 (1.77, 2.65)
	No	6447	42.3 (0.9)	42.6 (0.9)	1.00
Verbal abuse	Yes	2329	58.9 (1.5)	55.7 (1.4)	2.23 (1.91, 2.61)
	No	5142	37.0 (1.0)	38.3 (1.1)	1.00
Household mental illness	Yes	1510	58.9 (1.8)	55.8 (1.6)	1.92 (1.60, 2.30)
	No	5961	40.0 (0.9)	40.6 (1.0)	1.00
Household substance abuse	Yes	2228	59.7 (1.5)	56.6 (1.5)	2.35 (2.01, 2.76)
	No	5243	37.2 (1.0)	38.1 (1.1)	1.00
Parents separated / divorced	Yes	1648	58.3 (1.7)	55.8 (1.5)	2.15 (1.81, 2.55)
	No	5823	39.7 (0.9)	39.6 (1.0)	1.00
Witnessed domestic violence	Yes	1103	60.4 (2.1)	57.4 (2.0)	2.00 (1.62, 2.45)
	No	6368	41.5 (0.9)	41.8 (1.0)	1.00
Incarcerated household member	Yes	360	63.1 (3.6)	59.3 (2.8)	2.16 (1.51, 3.08)
	No	7111	43.2 (0.9)	43.2 (0.9)	1.00
ACE score					
0	3004	29.1 (1.3)	30.7 (1.5)	1.00 (referent)	
1	1632	39.4 (1.7)	39.3 (1.8)	1.54 (1.27, 1.87)	
2	992	53.2 (2.3)	50.9 (2.2)	2.63 (2.09, 3.12)	
3	718	59.7 (2.4)	56.4 (2.5)	3.40 (2.65, 4.37)	
4 or 5	796	63.1 (2.5)	59.7 (2.4)	3.77 (2.89, 4.91)	
6, 7, 8	329	71.5 (3.4)	64.8 (3.0)	6.46 (4.33, 9.64)	
					p-for-trend < 0.001

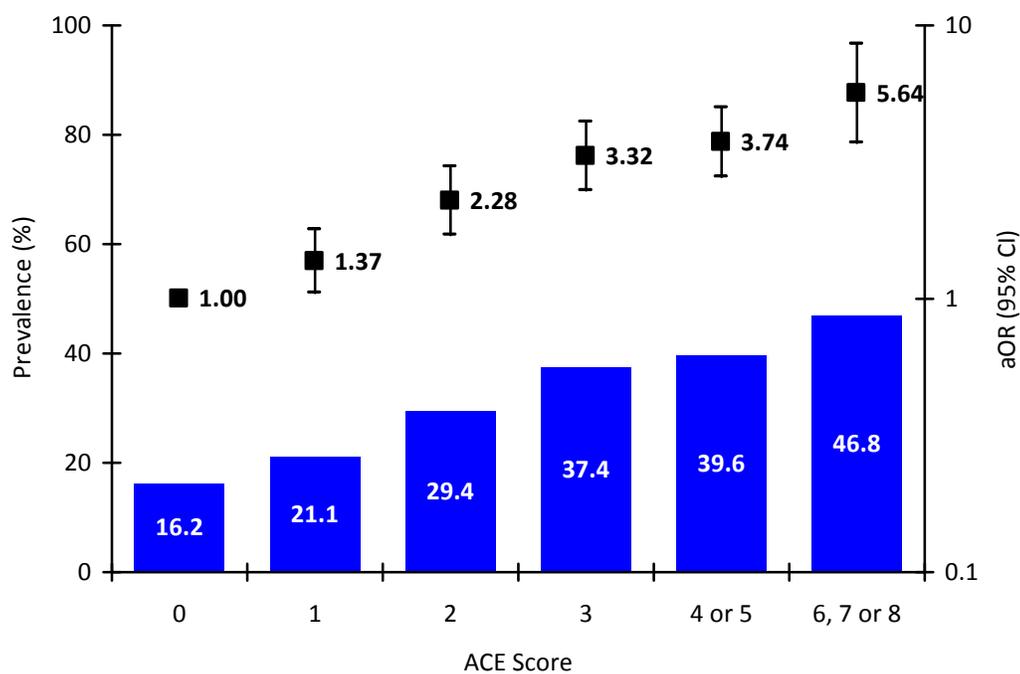
Note: Model adjusted for age, sex, race/ethnicity, education, income.

**Age-adjusted prevalence (%) and multivariable-adjusted relative odds of childhood marijuana use by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life**

ACE Category		N	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)
Physical abuse	Yes	1227	39.5 (2.0)	2.17 (1.75, 2.68)
	No	6244	24.0 (0.9)	
Sexual abuse	Yes	1024	36.9 (2.4)	2.02 (1.60, 2.54)
	No	6447	25.5 (0.9)	
Verbal abuse	Yes	2329	34.9 (1.4)	1.97 (1.65, 2.36)
	No	5142	22.4 (1.0)	
Household mental illness	Yes	1510	34.7 (1.6)	1.72 (1.40, 2.11)
	No	5961	24.2 (0.9)	
Household substance abuse	Yes	2228	38.4 (1.5)	2.62 (2.19, 3.15)
	No	5243	20.7 (0.9)	
Parents separated / divorced	Yes	1648	39.2 (1.5)	2.46 (2.04, 2.97)
	No	5823	21.6 (0.9)	
Witnessed domestic violence	Yes	1103	38.3 (2.0)	1.93 (1.54, 2.41)
	No	6368	24.5 (0.9)	
Incarcerated household member	Yes	360	43.6 (2.9)	2.08 (1.44, 3.01)
	No	7111	25.7 (0.9)	

Note: Model adjusted for age, sex, race/ethnicity, education, income.

**Age-adjusted prevalence and multivariable-adjusted relative odds of childhood marijuana use by ACE score**



**Crude and age-adjusted prevalence (%) and multivariable-adjusted relative odds of childhood marijuana use by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life, Washington BRFSS, 2009**

ACE Category	N	Prevalence of Childhood Marijuana Use			
		Crude % (std err)	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)	
Overall	7471	26.0 (0.8)	27.1 (0.8)		
Physical abuse	Yes	1227	41.1 (2.0)	39.5 (2.0)	2.17 (1.75, 2.68)
	No	6244	22.7 (0.8)	24.0 (0.9)	1.00 (referent)
Sexual abuse	Yes	1024	37.3 (2.1)	36.9 (2.4)	2.02 (1.60, 2.54)
	No	6447	24.3 (0.9)	25.5 (0.9)	1.00
Verbal abuse	Yes	2329	36.5 (1.5)	34.9 (1.4)	1.97 (1.65, 2.36)
	No	5142	20.4 (0.9)	22.4 (1.0)	1.00
Household mental illness	Yes	1510	37.1 (1.8)	34.7 (1.6)	1.72 (1.40, 2.11)
	No	5961	22.4 (0.9)	24.2 (0.9)	1.00
Household substance abuse	Yes	2228	40.2 (1.5)	38.4 (1.5)	2.62 (2.19, 3.15)
	No	5243	19.0 (0.9)	20.7 (0.9)	1.00
Parents separated / divorced	Yes	1648	42.2 (1.8)	39.2 (1.5)	2.46 (2.04, 2.97)
	No	5823	20.2 (0.8)	21.6 (0.9)	1.00
Witnessed domestic violence	Yes	1103	40.4 (2.1)	38.3 (2.0)	1.93 (1.54, 2.41)
	No	6368	23.1 (0.8)	24.5 (0.9)	1.00
Incarcerated household member	Yes	360	48.1 (3.8)	43.6 (2.9)	2.08 (1.44, 3.01)
	No	7111	24.3 (0.8)	25.7 (0.9)	1.00
ACE score					
0	3004	14.1 (1.1)	16.2 (1.3)	1.00 (referent)	
1	1632	19.9 (1.5)	21.1 (1.6)	1.37 (1.05, 1.79)	
2	992	29.9 (2.4)	29.4 (2.1)	2.28 (1.71, 3.04)	
3	718	38.1 (2.4)	37.4 (2.5)	3.32 (2.49, 4.43)	
4 or 5	796	42.8 (2.5)	39.6 (2.3)	3.74 (2.79, 5.00)	
6, 7, 8	329	54.8 (4.1)	46.8 (3.2)	5.64 (3.72, 8.55)	
					p-for-trend < 0.001

Note: Model adjusted for age, sex, race/ethnicity, education, income.

## ACEs and High Risk for HIV

More than 25 years into the AIDS epidemic, HIV infection continues to exact a tremendous toll in the United States [1]. At the end of 2006, an estimated 1.1 million persons in the United States were living with diagnosed or undiagnosed HIV/AIDS [2]. In 2007, 42,655 new cases of HIV/AIDS in adults, adolescents, and children were diagnosed in the 33 states with long-term, confidential name-based HIV reporting [3]. The behavioral mechanisms by which HIV is transmitted are widely known, and several (i.e., sexual promiscuity and parenteral drug use) are strongly associated with ACEs. On the basis of this evidence, a recent note [4] highlights the importance of considering ACEs as a risk factor for risk factor for transmission of HIV.

In Washington, an estimated 4.6% (std err, 0.5) of adults reported being at high risk for HIV. Moderate to strong relationships were observed between each of the component ACEs and high risk behavior for HIV, with odds ratios ranging from 1.68 (for persons exposed to household mental illness) to 3.69 (for persons exposed to sexual abuse). Strong, graded relationships were also observed between high risk behavior for HIV and the ACE score with odds ratios of 1.63 (95%CI: 0.69, 3.84) for 1 ACE, 3.94 (1.69, 9.18) for 2 ACEs, 2.98 (1.30, 6.87) for 3 ACEs, 4.42 (2.01, 9.71) for 4 or 5 ACEs and 6.58 (2.81, 15.32) for 6 or more ACEs compared to persons with an ACE score of zero.

### Variable definition

**High Risk for HIV** was defined by a positive response to the question, “Please tell me if any of the [following] situations apply to you. You do not need to tell me which one.

- You have used intravenous drugs in the past year.
- You have been treated for a sexually transmitted or venereal disease in the past year.
- You have given or received money or drugs in exchange for sex in the past year.
- You had anal sex without a condom in the past year.”

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### References

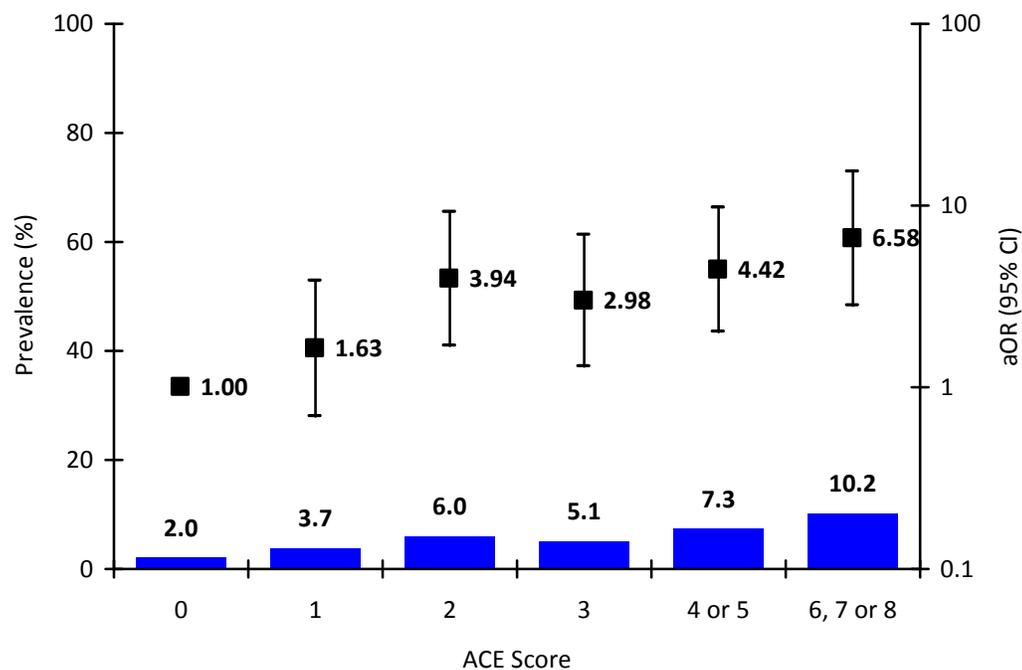
1. CDC. HIV and AIDS in the United States: a picture of today’s epidemic. CDC HIV/AIDS Media Facts, March 2008.
2. CDC. HIV Prevalence Estimates—United States, 2006. *MMWR* 2008;57:1073-1076.
3. CDC. HIV/AIDS Surveillance Report, 2007. Vol. 19. Atlanta: US Department of Health and Human Services, CDC: 2009. Accessed June 15, 2009.
4. Brown and Anda. Adverse childhood experiences: origins of behaviors that sustain the HIV epidemic. *AIDS* 2009;23:2231-2233.

**Age-adjusted prevalence (%) and multivariable-adjusted relative odds of being high risk for HIV by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life**

ACE Category		N	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)
Physical abuse	Yes	1227	7.5 (1.3)	1.90 (1.19, 3.04)
	No	6244	3.9 (0.5)	
Sexual abuse	Yes	1024	10.8 (2.1)	3.69 (2.20, 6.21)
	No	6447	3.8 (0.5)	
Verbal abuse	Yes	2329	6.5 (0.9)	1.89 (1.19, 3.01)
	No	5142	3.5 (0.5)	
Household mental illness	Yes	1510	6.6 (1.0)	1.68 (1.01, 2.79)
	No	5961	3.9 (0.5)	
Household substance abuse	Yes	2228	7.2 (1.0)	2.40 (1.50, 3.83)
	No	5243	3.3 (0.5)	
Parents separated / divorced	Yes	1648	6.8 (1.0)	2.07 (1.31, 3.27)
	No	5823	3.6 (0.5)	
Witnessed domestic violence	Yes	1103	7.7 (1.3)	2.19 (1.35, 3.55)
	No	6368	3.9 (0.5)	
Incarcerated household member	Yes	360	9.4 (2.1)	3.03 (1.69, 5.45)
	No	7111	4.1 (0.5)	

Note: Model adjusted for age, sex, race/ethnicity, education, income.

**Age-adjusted prevalence and multivariable-adjusted relative odds of being high risk for HIV by ACE score**



**Crude and age-adjusted prevalence (%) and multivariable-adjusted relative odds of high risk for HIV by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life, Washington BRFSS, 2009**

ACE Category	N	Prevalence of high risk for HIV			
		Crude % (std err)	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)	
Overall	7471	4.4 (0.5)	4.6 (0.5)		
Physical abuse	Yes	1227	7.3 (1.3)	7.5 (1.3)	1.90 (1.19, 3.04)
	No	6244	3.7 (0.5)	3.9 (0.5)	1.00 (referent)
Sexual abuse	Yes	1024	9.2 (1.6)	10.8 (2.1)	3.69 (2.20, 6.21)
	No	6447	3.7 (0.5)	3.8 (0.5)	1.00
Verbal abuse	Yes	2329	6.3 (0.9)	6.5 (0.9)	1.89 (1.19, 3.01)
	No	5142	3.3 (0.5)	3.5 (0.5)	1.00
Household mental illness	Yes	1510	6.5 (1.0)	6.6 (1.0)	1.68 (1.01, 2.79)
	No	5961	3.7 (0.5)	3.9 (0.5)	1.00
Household substance abuse	Yes	2228	6.8 (0.9)	7.2 (1.0)	2.40 (1.50, 3.83)
	No	5243	3.1 (0.5)	3.3 (0.5)	1.00
Parents separated / divorced	Yes	1648	7.3 (1.1)	6.8 (1.0)	2.07 (1.31, 3.27)
	No	5823	3.3 (0.5)	3.6 (0.5)	1.00
Witnessed domestic violence	Yes	1103	7.8 (1.3)	7.7 (1.3)	2.19 (1.35, 3.55)
	No	6368	3.7 (0.5)	3.9 (0.5)	1.00
Incarcerated household member	Yes	360	11.2 (2.5)	9.4 (2.1)	3.03 (1.69, 5.45)
	No	7111	3.8 (0.5)	4.1 (0.5)	1.00
ACE score					
0	3004	1.8 (0.5)	2.0 (0.6)	1.00 (referent)	
1	1632	3.4 (0.9)	3.7 (1.0)	1.63 (0.69, 3.84)	
2	992	5.9 (1.6)	6.0 (1.5)	3.94 (1.69, 9.18)	
3	718	4.6 (1.1)	5.1 (1.3)	2.98 (1.30, 6.87)	
4 or 5	796	7.4 (1.6)	7.3 (1.5)	4.42 (2.01, 9.71)	
6, 7, 8	329	11.1 (2.6)	10.2 (2.4)	6.58 (2.81, 15.32)	
				p-for-trend < 0.001	

Note: Model adjusted for age, sex, race/ethnicity, education, income.

## ACEs, Cardiovascular Disease and Related Risk Factors

Heart disease is the leading cause of death for both men and women in the United States. In 2006, one in four deaths were caused by heart disease, resulting in a total of 631,636 heart disease deaths [1]. Nine out of 10 heart disease patients have at least one risk factor, namely high cholesterol, high blood pressure, diabetes, or cigarette smoking [1].

Data from the ACE Study demonstrated a dose-response relation of ACEs to ischemic heart disease and a relation between most component ACEs and heart disease [2]. The report also highlighted the importance of psychological factors as potential mediators in the relation of ACEs to the risk of ischemic heart disease.

In Washington, nearly a third of adults reported high blood cholesterol (HBC), half reported high blood pressure (HBP), about 7% reported diabetes, 27% reported obesity and nearly one in twenty reported a history of heart disease or stroke. Modest associations were observed between some component ACEs and HBC, HBP, diabetes as well as obesity. Only persons with high ACE scores ( $\geq 6$ ) were observed to have an increased likelihood for HBC (compared to those with an ACE score of zero). Similarly for HBP, modest relationships with the ACE score were observed for persons with 4 or 5 ACEs (aOR=1.48; 95%CI=1.17, 1.88) or  $\geq 6$  ACEs (aOR=1.64; 95%CI=1.10, 2.46).

### **Variable definitions**

**History of cardiovascular disease** was defined by a positive response to the question, “Has a doctor, nurse, or other health professional ever told you that you had any of the following:

- a heart attack, also called a myocardial infarction?
- angina or coronary heart disease?
- a stroke?

**High blood cholesterol** was defined by a positive response to the question, “Have you ever been told by a doctor, nurse or other health professional that your blood cholesterol is high?”

**High blood pressure** was defined by a positive response to the question, “Have you ever been told by a doctor, nurse or other health professional that you have high blood pressure?” Women who reported hypertension only during pregnancy were considered to be normotensive.

**Diabetes** was defined by a positive response to the question, “Have you ever been told by a doctor, nurse or other health professional that you have diabetes?” Women who reported diabetes only during pregnancy were considered to be normoglycemic.

**Obesity** was defined by a body mass index  $\geq 30$  kg/m<sup>2</sup> based on self-reported height and weight.

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### **References**

1. American Heart Association. Heart disease and stroke statistics update – 2010 update. *Circulation* 2010;121:e46-e215.
2. Dong et al. Insights into causal pathways for ischemic heart disease: adverse childhood experiences study. *Circulation* 2004;110(13):1761-1766.

**Crude and age-adjusted prevalence (%) and multivariable-adjusted relative odds of being told that you have high blood cholesterol by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life, Washington BRFSS, 2009**

ACE Category	N	Prevalence of high blood cholesterol			
		Crude % (std err)	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)	
Overall	7471	37.8 (0.8)	32.1 (0.8)		
Physical abuse	Yes	1227	40.1 (2.0)	35.4 (2.0)	1.27 (1.05, 1.53)
	No	6244	37.4 (0.8)	31.4 (0.9)	1.00 (referent)
Sexual abuse	Yes	1024	37.3 (2.1)	32.7 (2.5)	1.02 (0.83, 1.24)
	No	6447	37.9 (0.8)	32.1 (0.9)	1.00
Verbal abuse	Yes	2329	36.3 (1.4)	32.1 (1.3)	1.09 (0.94, 1.27)
	No	5142	38.5 (0.9)	32.2 (1.0)	1.00
Household mental illness	Yes	1510	34.6 (1.7)	33.0 (1.8)	1.08 (0.91, 1.29)
	No	5961	38.7 (0.9)	31.7 (0.9)	1.00
Household substance abuse	Yes	2228	36.9 (1.4)	33.9 (1.5)	1.06 (0.92, 1.23)
	No	5243	38.2 (0.9)	31.4 (0.9)	1.00
Parents separated / divorced	Yes	1648	36.2 (1.7)	34.6 (1.5)	1.11 (0.93, 1.32)
	No	5823	38.3 (0.9)	31.1 (1.0)	1.00
Witnessed domestic violence	Yes	1103	38.6 (2.2)	36.6 (2.0)	1.23 (1.01, 1.50)
	No	6368	37.7 (0.8)	31.1 (0.9)	1.00
Incarcerated household member	Yes	360	35.0 (4.2)	37.6 (3.5)	1.23 (0.83, 1.83)
	No	7111	38.0 (0.8)	31.2 (0.7)	1.00
ACE score					
0	3004	39.1 (1.2)	31.5 (1.3)	1.00 (referent)	
1	1632	38.5 (1.6)	31.3 (1.6)	0.94 (0.78, 1.12)	
2	992	35.3 (2.1)	31.1 (1.9)	0.99 (0.79, 1.23)	
3	718	36.2 (2.3)	33.6 (3.5)	1.01 (0.79, 1.27)	
4 or 5	796	36.4 (2.3)	32.8 (2.2)	1.09 (0.87, 1.38)	
6, 7, 8	329	39.1 (4.5)	39.2 (3.7)	1.61 (1.09, 2.37)	
				p-for-trend = 0.056	

Note: Model adjusted for age, sex, race/ethnicity, education, income.

**Crude and age-adjusted prevalence (%) and multivariable-adjusted relative odds of being told that you have high blood pressure by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life, Washington BRFSS, 2009**

ACE Category	N	Prevalence of high blood pressure			
		Crude % (std err)	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)	
Overall	7471	27.5 (0.6)	26.1 (0.6)		
Physical abuse	Yes	1227	30.6 (1.7)	31.1 (1.5)	1.47 (1.21, 1.77)
	No	6244	26.9 (0.7)	25.1 (0.6)	1.00 (referent)
Sexual abuse	Yes	1024	27.7 (1.7)	26.5 (1.8)	1.13 (0.91, 1.39)
	No	6447	27.5 (0.7)	26.1 (0.6)	1.00
Verbal abuse	Yes	2329	26.1 (1.1)	27.8 (1.0)	1.18 (1.01, 1.38)
	No	5142	28.2 (0.8)	25.5 (0.7)	1.00
Household mental illness	Yes	1510	24.7 (1.4)	28.1 (1.3)	1.25 (1.04, 1.51)
	No	5961	28.4 (0.7)	25.5 (0.7)	1.00
Household substance abuse	Yes	2228	26.8 (1.2)	28.1 (1.0)	1.21 (1.04, 1.41)
	No	5243	27.9 (0.8)	25.3 (0.7)	1.00
Parents separated / divorced	Yes	1648	26.7 (1.4)	30.0 (1.2)	1.28 (1.07, 1.53)
	No	5823	27.8 (0.7)	24.7 (0.7)	1.00
Witnessed domestic violence	Yes	1103	28.5 (1.7)	30.9 (1.5)	1.40 (1.15, 1.71)
	No	6368	27.4 (0.7)	25.3 (0.6)	1.00
Incarcerated household member	Yes	360	23.4 (2.9)	31.1 (2.5)	1.35 (0.94, 1.95)
	No	7111	27.8 (0.7)	25.7 (0.6)	1.00
ACE score					
0	3004	28.9 (1.0)	25.1 (1.0)	1.00 (referent)	
1	1632	26.2 (1.3)	23.6 (1.1)	0.91 (0.75, 1.09)	
2	992	26.9 (1.8)	26.7 (1.6)	1.08 (0.85, 1.36)	
3	718	26.7 (2.0)	25.9 (1.9)	1.16 (0.90, 1.88)	
4 or 5	796	28.5 (2.0)	31.6 (1.8)	1.48 (1.17, 1.88)	
6, 7, 8	329	24.7 (3.2)	33.2 (2.9)	1.64 (1.10, 2.46)	
					p-for-trend < 0.001

Note: Model adjusted for age, sex, race/ethnicity, education, income.

**Crude and age-adjusted prevalence (%) and multivariable-adjusted relative odds of diabetes mellitus by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life, Washington BRFSS, 2009**

ACE Category	N	Prevalence of diabetes mellitus		
		Crude % (std err)	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)
Overall	7471	7.6 (0.3)	7.1 (0.3)	
Physical abuse				
Yes	1227	8.0 (0.9)	8.1 (0.9)	1.16 (0.87, 1.54)
No	6244	7.5 (0.4)	6.9 (0.3)	1.00 (referent)
Sexual abuse				
Yes	1024	8.7 (1.0)	8.0 (0.9)	1.30 (0.97, 1.74)
No	6447	7.5 (0.4)	6.9 (0.3)	1.00
Verbal abuse				
Yes	2329	6.9 (0.5)	7.2 (0.6)	1.15 (0.91, 1.44)
No	5142	8.0 (0.4)	7.0 (0.4)	1.00
Household mental illness				
Yes	1510	6.0 (0.6)	6.9 (0.7)	1.13 (0.87, 1.49)
No	5961	8.1 (0.4)	7.1 (0.4)	1.00
Household substance abuse				
Yes	2228	7.6 (0.6)	8.1 (0.7)	1.22 (0.97, 1.54)
No	5243	7.6 (0.4)	6.7 (0.4)	1.00
Parents separated / divorced				
Yes	1648	6.5 (0.6)	7.9 (0.6)	1.01 (0.79, 1.29)
No	5823	8.0 (0.4)	7.0 (0.4)	1.00
Witnessed domestic violence				
Yes	1103	7.8 (0.9)	8.5 (0.9)	1.29 (0.97, 1.71)
No	6368	7.6 (0.4)	6.9 (0.3)	1.00
Incarcerated household member				
Yes	360	6.8 (1.4)	11.1 (2.0)	1.33 (0.78, 2.28)
No	7111	7.7 (0.3)	6.9 (0.3)	1.00
ACE score				
0	3004	7.4 (0.5)	6.1 (0.5)	1.00 (referent)
1	1632	8.5 (0.8)	7.5 (0.7)	1.30 (0.99, 1.70)
2	992	8.2 (0.9)	8.0 (0.9)	1.31 (0.94, 1.81)
3	718	7.7 (1.2)	7.5 (1.2)	1.47 (0.98, 2.19)
4 or 5	796	6.7 (0.9)	7.9 (1.1)	1.37 (0.95, 1.98)
6, 7, 8	329	6.1 (1.3)	11.7 (2.0)	1.48 (0.88, 2.51)
				p-for-trend = 0.017

Note: Model adjusted for age, sex, race/ethnicity, education, income.

**Crude and age-adjusted prevalence (%) and multivariable-adjusted relative odds of obesity by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life, Washington BRFSS, 2009**

ACE Category	N	Prevalence of obesity		
		Crude % (std err)	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)
Overall	7471	27.2 (0.7)	27.1 (0.8)	
Physical abuse				
Yes	1227	32.9 (2.0)	32.2 (2.1)	1.33 (1.08, 1.63)
No	6244	26.0 (0.8)	25.9 (0.8)	1.00 (referent)
Sexual abuse				
Yes	1024	36.5 (2.2)	35.7 (2.7)	1.55 (1.25, 1.93)
No	6447	25.9 (0.8)	25.8 (0.8)	1.00
Verbal abuse				
Yes	2329	31.2 (1.4)	30.7 (1.4)	1.33 (1.13, 1.57)
No	5142	25.2 (0.9)	25.1 (0.9)	1.00
Household mental illness				
Yes	1510	31.3 (1.8)	30.4 (1.7)	1.32 (1.09, 1.60)
No	5961	26.0 (0.8)	25.7 (0.8)	1.00
Household substance abuse				
Yes	2228	30.5 (1.4)	30.2 (1.4)	1.24 (1.05, 1.47)
No	5243	25.7 (0.9)	25.7 (0.9)	1.00
Parents separated / divorced				
Yes	1648	30.1 (1.6)	30.1 (1.4)	1.10 (0.91, 1.33)
No	5823	26.3 (0.8)	25.9 (0.9)	1.00
Witnessed domestic violence				
Yes	1103	33.9 (2.2)	33.3 (2.1)	1.45 (1.16, 1.80)
No	6368	25.9 (0.8)	25.8 (0.8)	1.00
Incarcerated household member				
Yes	360	36.4 (3.8)	35.7 (3.0)	1.65 (1.15, 2.37)
No	7111	26.6 (0.7)	26.3 (0.8)	1.00
ACE score				
0	3004	24.1 (1.1)	24.2 (1.2)	1.00 (referent)
1	1632	26.4 (1.5)	26.0 (1.7)	1.12 (0.91, 1.38)
2	992	23.8 (1.8)	23.3 (1.7)	0.88 (0.70, 1.12)
3	718	30.2 (2.3)	30.0 (2.5)	1.29 (1.00, 1.65)
4 or 5	796	34.5 (2.5)	34.5 (2.4)	1.62 (1.25, 2.09)
6, 7, 8	329	39.0 (4.3)	36.5 (3.8)	1.96 (1.31, 2.94)
				p-for-trend < 0.001

Note: Model adjusted for age, sex, race/ethnicity, education, income.

**Crude and age-adjusted prevalence (%) and multivariable-adjusted relative odds of a lifetime history of cardiovascular disease by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life, Washington BRFSS, 2009**

ACE Category	N	Prevalence of cardiovascular disease			
		Crude % (std err)	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)	
Overall	7471	6.3 (0.3)	5.8 (0.3)		
Physical abuse	Yes	1227	7.6 (0.8)	8.6 (0.8)	1.72 (1.31, 2.25)
	No	6244	6.0 (0.3)	5.3 (0.3)	1.00 (referent)
Sexual abuse	Yes	1024	8.0 (0.9)	8.0 (0.9)	1.54 (1.13, 2.11)
	No	6447	6.0 (0.3)	5.5 (0.3)	1.00
Verbal abuse	Yes	2329	6.1 (0.5)	7.7 (0.6)	1.62 (1.27, 2.05)
	No	5142	6.3 (0.3)	5.3 (0.3)	1.00
Household mental illness	Yes	1510	5.3 (0.6)	7.0 (0.7)	1.53 (1.16, 2.03)
	No	5961	6.6 (0.3)	5.5 (0.3)	1.00
Household substance abuse	Yes	2228	5.4 (0.5)	6.6 (0.5)	1.08 (0.85, 1.37)
	No	5243	6.6 (0.3)	5.7 (0.3)	1.00
Parents separated / divorced	Yes	1648	5.7 (0.6)	7.2 (0.6)	1.32 (1.01, 1.71)
	No	5823	6.5 (0.3)	5.4 (0.3)	1.00
Witnessed domestic violence	Yes	1103	6.0 (0.7)	7.5 (0.8)	1.41 (1.06, 1.87)
	No	6368	6.3 (0.3)	5.6 (0.3)	1.00
Incarcerated household member	Yes	360	3.8 (0.9)	9.3 (1.6)	1.22 (0.73, 2.03)
	No	7111	6.4 (0.3)	5.8 (0.3)	1.00
ACE score					
0	3004	6.4 (0.5)	4.9 (0.3)	1.00 (referent)	
1	1632	6.6 (0.6)	5.6 (0.5)	1.26 (0.96, 1.66)	
2	992	6.0 (0.8)	6.7 (0.8)	1.37 (0.97, 1.94)	
3	718	4.8 (0.8)	5.6 (0.8)	1.19 (0.80, 1.77)	
4 or 5	796	7.7 (1.0)	9.4 (1.1)	2.48 (1.74, 3.54)	
6, 7, 8	329	4.3 (1.0)	8.1 (2.0)	1.79 (1.00, 3.20)	
					p-for-trend < 0.001

Note: Model adjusted for age, sex, race/ethnicity, education, income.

## ACEs and Cancer

Although extraordinary progress has been made during the past two decades in developing and using cancer prevention strategies, early detection interventions, and cancer treatments, cancer remains the second leading cause of death in the United States, claiming the lives of more than half a million Americans every year [1]. The leading cause of cancer death among men and women in the US is lung cancer followed by prostate cancer for men and breast cancer for women [1]. In addition, the cost of cancer continues to increase. Between 1987 and the 2001-2005 period, the total medical cost of cancer increased from nearly \$25 billion to \$48 billion [2].

During 2009, 9.8% (std err, 0.4) of Washington adults reported a history of cancer. For each of the component ACE categories, adults reporting exposure to the ACE had a higher cancer prevalence than those who did not report exposure.

Similar to the findings of ACE Study data for lung cancer [3], a modest relationship was observed between the ACE score and cancer with the strongest association observed among those with a high ACE score. For example, compared to adults with an ACE score of 0, adults with an ACE score of 3 had 1.5 times the risk of cancer while those with a ACE score of 6 or more had more than a 3-fold increased risk of cancer.

### **Variable definitions**

**History of cancer** defined by a positive response to the question, “Have you ever been told by a doctor, nurse, or other health professional that you had cancer?”

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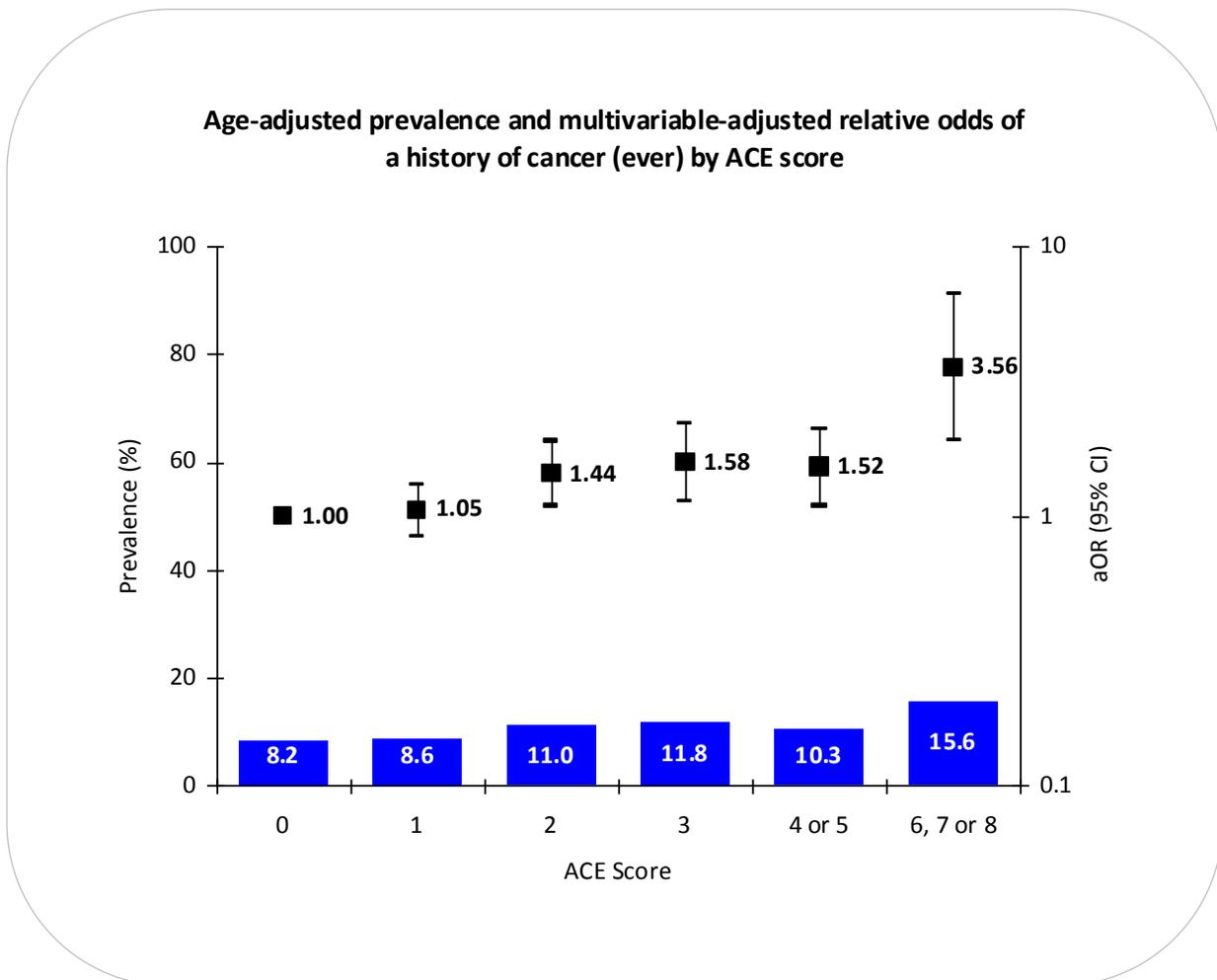
### **References**

1. Heron et al. Deaths: Final data for 2006. *Natl Vital Stat Rep* 2009;57(14).
2. Tangka et al. Cancer treatment cost in the United States. *Cancer* 2010. In Press.
3. Brown et al: Adverse childhood experiences are associated with the risk of lung cancer: a prospective cohort study. *BMC Public Health* 2010;10:20.

**Age-adjusted prevalence (%) and multivariable-adjusted relative odds of a history of cancer (ever) by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life**

ACE Category		N	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)
Physical abuse	Yes	1227	14.0 (1.4)	1.73 (1.31, 2.29)
	No	6244	8.9 (0.3)	
Sexual abuse	Yes	1024	14.8 (2.2)	1.63 (1.19, 2.22)
	No	6447	9.1 (0.3)	
Verbal abuse	Yes	2329	10.4 (0.8)	1.32 (1.07, 1.62)
	No	5142	9.2 (0.4)	
Household mental illness	Yes	1510	11.3 (1.0)	1.43 (1.11, 1.83)
	No	5961	9.1 (0.3)	
Household substance abuse	Yes	2228	12.1 (0.9)	1.46 (1.19, 1.79)
	No	5243	8.9 (0.4)	
Parents separated / divorced	Yes	1648	11.2 (0.9)	1.43 (1.10, 1.86)
	No	5823	9.2 (0.4)	
Witnessed domestic violence	Yes	1103	13.3 (1.4)	1.88 (1.39, 2.54)
	No	6368	9.1 (0.3)	
Incarcerated household member	Yes	360	14.0 (2.0)	2.01 (1.00, 4.04)
	No	7111	9.5 (0.3)	

Note: Model adjusted for age, sex, race/ethnicity, education, income.



**Crude and age-adjusted prevalence (%) and multivariable-adjusted relative odds of a history of cancer (ever) by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life, Washington BRFSS, 2009**

ACE Category	N	Prevalence of cancer		
		Crude % (std err)	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)
Overall	7471	10.6 (0.4)	9.8 (0.4)	
Physical abuse				
Yes	1227	13.0 (1.3)	14.0 (1.4)	1.73 (1.31, 2.29)
No	6244	10.1 (0.4)	8.9 (0.3)	1.00 (referent)
Sexual abuse				
Yes	1024	15.6 (1.5)	14.8 (2.2)	1.63 (1.19, 2.22)
No	6447	10.0 (0.4)	9.1 (0.3)	1.00
Verbal abuse				
Yes	2329	9.9 (0.8)	10.4 (0.8)	1.32 (1.07, 1.62)
No	5142	11.0 (0.5)	9.2 (0.4)	1.00
Household mental illness				
Yes	1510	9.7 (1.0)	11.3 (1.0)	1.43 (1.11, 1.83)
No	5961	10.9 (0.4)	9.1 (0.3)	1.00
Household substance abuse				
Yes	2228	10.8 (0.8)	12.1 (0.9)	1.46 (1.19, 1.79)
No	5243	10.5 (0.5)	8.9 (0.4)	1.00
Parents separated / divorced				
Yes	1648	9.3 (0.9)	11.2 (0.9)	1.43 (1.10, 1.86)
No	5823	11.1 (0.4)	9.2 (0.4)	1.00
Witnessed domestic violence				
Yes	1103	12.1 (1.4)	13.3 (1.4)	1.88 (1.39, 2.54)
No	6368	10.3 (0.4)	9.1 (0.3)	1.00
Incarcerated household member				
Yes	360	8.5 (2.3)	14.0 (2.0)	2.01 (1.00, 4.04)
No	7111	10.8 (0.4)	9.5 (0.3)	1.00
ACE score				
0	3004	10.9 (0.6)	8.2 (0.5)	1.00 (referent)
1	1632	10.0 (0.7)	8.6 (0.6)	1.05 (0.84, 1.31)
2	992	10.7 (1.1)	11.0 (1.0)	1.44 (1.09, 1.90)
3	718	11.2 (1.4)	11.8 (1.4)	1.58 (1.13, 2.20)
4 or 5	796	9.2 (1.2)	10.3 (1.3)	1.52 (1.09, 2.11)
6, 7, 8	329	12.5 (2.9)	15.6 (3.0)	3.56 (1.91, 6.65)
				p-for-trend < 0.001

Note: Model adjusted for age, sex, race/ethnicity, education, income.

## ACEs and Asthma

Asthma is a chronic inflammatory disorder of the airways characterized by episodic and reversible airflow obstruction and airway hyperresponsiveness [1]. Although the pathophysiology of asthma is fairly well understood, the exact etiology is not. Research by CDC shows that more than 30 million people in the United States have been diagnosed with asthma at some time, and the number of reported cases has been on the rise since 1980 [1]. In addition, an estimated 4000 Americans die each year from asthma-related causes, and asthma is a contributing factor in another 7000 deaths every year [1].

During 2009, 15.1% (std err, 0.6) of adults reported a lifetime history of asthma and 8.4% (0.5) reported that they currently had asthma. For both measures, asthma prevalence was increased among persons exposed to ACEs. For current asthma, the risk was increased more than 2-fold (95%CI=1.53, 4.29) for persons with  $\geq 6$  ACEs compared to those without; a similar result was observed for lifetime asthma (aOR=2.72; 95%CI=1.69, 4.37).

### Variable definitions

**Lifetime history of asthma** defined by a positive response to the question, “Have you ever been told by a doctor, nurse, or other health professional that you had asthma?”

**Current asthma** defined by a positive response to the lifetime history question above and the subsequent follow-up question, “Do you still have asthma?”

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### References

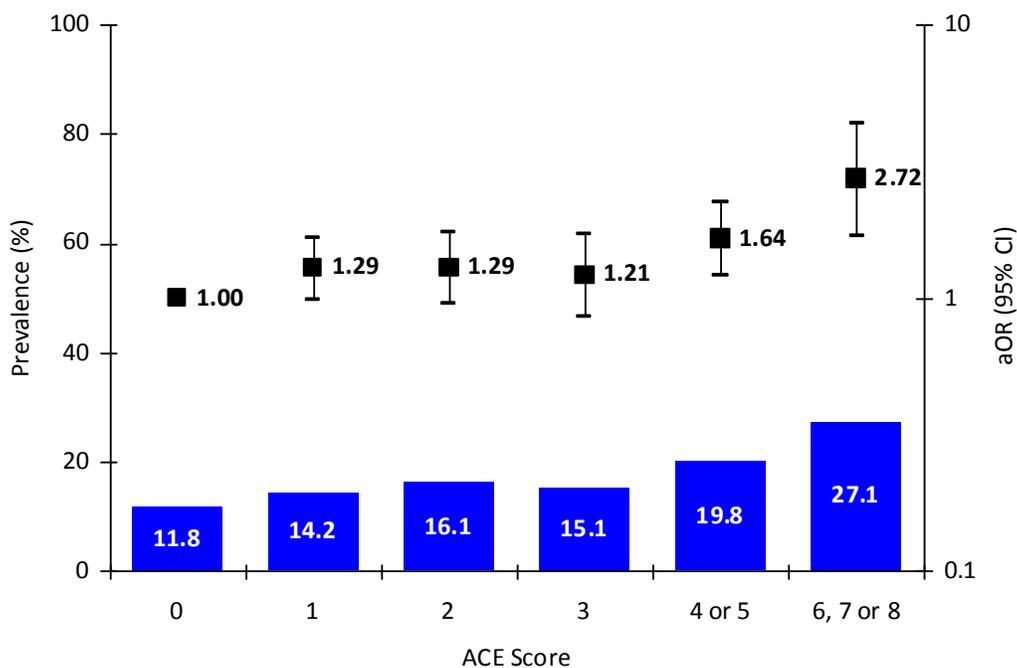
1. CDC. *America Breathing Easier*. CDC National Asthma Control Program. Available at [www.cdc.gov/asthma](http://www.cdc.gov/asthma).

**Age-adjusted prevalence (%) and multivariable-adjusted relative odds of a history of asthma (ever) by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life**

ACE Category		N	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)
Physical abuse	Yes	1227	20.7 (1.9)	1.47 (1.13, 1.90)
	No	6244	13.9 (0.7)	
Sexual abuse	Yes	1024	20.9 (2.5)	1.42 (1.10, 1.84)
	No	6447	14.2 (0.7)	
Verbal abuse	Yes	2329	17.7 (1.2)	1.30 (1.06, 1.60)
	No	5142	13.8 (0.7)	
Household mental illness	Yes	1510	20.5 (1.4)	1.70 (1.36, 2.13)
	No	5961	13.1 (0.7)	
Household substance abuse	Yes	2228	19.5 (1.3)	1.52 (1.24, 1.87)
	No	5243	13.0 (0.7)	
Parents separated / divorced	Yes	1648	17.8 (1.2)	1.19 (0.94, 1.51)
	No	5823	14.3 (0.7)	
Witnessed domestic violence	Yes	1103	19.6 (1.8)	1.38 (1.05, 1.81)
	No	6368	14.2 (0.7)	
Incarcerated household member	Yes	360	20.2 (2.5)	1.62 (1.04, 2.52)
	No	7111	14.4 (0.6)	

Note: Model adjusted for age, sex, race/ethnicity, education, income.

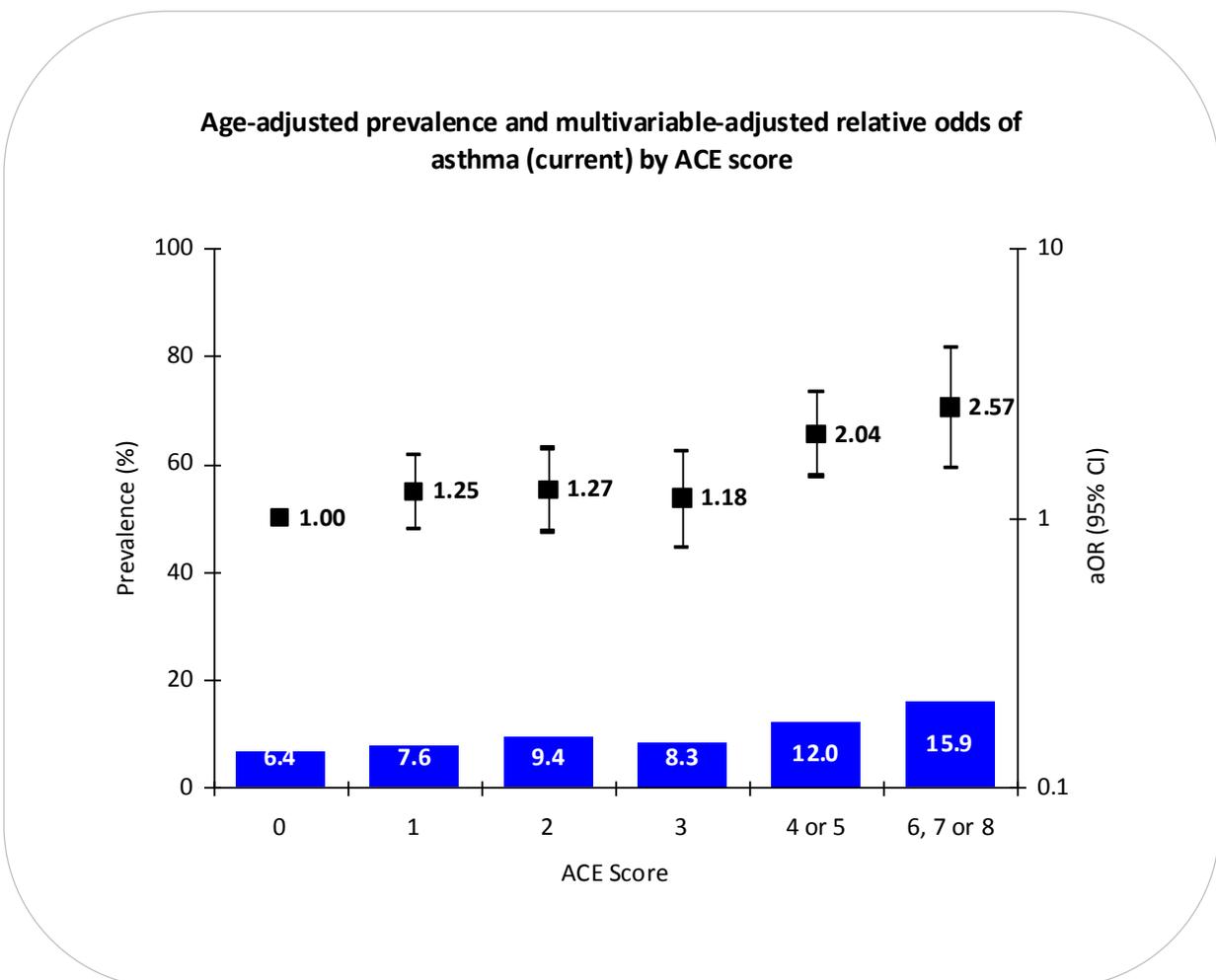
**Age-adjusted prevalence and multivariable-adjusted relative odds of a history of asthma (ever) by ACE score**



**Age-adjusted prevalence (%) and multivariable-adjusted relative odds of asthma (current) by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life**

ACE Category		N	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)
Physical abuse	Yes	1227	11.5 (1.3)	1.55 (1.18, 2.04)
	No	6244	7.7 (0.5)	
Sexual abuse	Yes	1024	12.2 (1.3)	1.47 (1.12, 1.94)
	No	6447	7.7 (0.5)	
Verbal abuse	Yes	2329	10.3 (0.9)	1.46 (1.15, 1.85)
	No	5142	7.4 (0.5)	
Household mental illness	Yes	1510	11.8 (1.1)	1.85 (1.42, 2.41)
	No	5961	7.1 (0.5)	
Household substance abuse	Yes	2228	9.9 (0.9)	1.38 (1.09, 1.75)
	No	5243	7.7 (0.5)	
Parents separated / divorced	Yes	1648	11.0 (1.0)	1.37 (1.05, 1.79)
	No	5823	7.4 (0.5)	
Witnessed domestic violence	Yes	1103	9.5 (1.0)	1.19 (0.90, 1.59)
	No	6368	8.2 (0.5)	
Incarcerated household member	Yes	360	10.9 (2.0)	1.52 (0.92, 2.51)
	No	7111	8.0 (0.4)	

Note: Model adjusted for age, sex, race/ethnicity, education, income.



**Crude and age-adjusted prevalence (%) and multivariable-adjusted relative odds of a history of asthma (ever) by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life, Washington BRFSS, 2009**

ACE Category	N	Prevalence of asthma (ever)			
		Crude % (std err)	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)	
Overall	7471	15.1 (0.6)	15.1 (0.6)		
Physical abuse	Yes	1227	20.8 (1.9)	20.7 (1.9)	1.47 (1.13, 1.90)
	No	6244	13.9 (0.6)	13.9 (0.7)	1.00 (referent)
Sexual abuse	Yes	1024	20.8 (1.9)	20.9 (2.5)	1.42 (1.10, 1.84)
	No	6447	14.3 (0.6)	14.2 (0.7)	1.00
Verbal abuse	Yes	2329	17.7 (1.2)	17.7 (1.2)	1.30 (1.06, 1.60)
	No	5142	13.8 (0.7)	13.8 (0.7)	1.00
Household mental illness	Yes	1510	21.4 (1.6)	20.5 (1.4)	1.70 (1.36, 2.13)
	No	5961	13.2 (0.6)	13.1 (0.7)	1.00
Household substance abuse	Yes	2228	19.4 (1.3)	19.5 (1.3)	1.52 (1.24, 1.87)
	No	5243	13.2 (0.7)	13.0 (0.7)	1.00
Parents separated / divorced	Yes	1648	18.0 (1.4)	17.8 (1.2)	1.19 (0.94, 1.51)
	No	5823	14.1 (0.7)	14.3 (0.7)	1.00
Witnessed domestic violence	Yes	1103	19.9 (1.9)	19.6 (1.8)	1.38 (1.05, 1.81)
	No	6368	14.2 (0.6)	14.2 (0.7)	1.00
Incarcerated household member	Yes	360	24.6 (3.8)	20.2 (2.5)	1.62 (1.04, 2.52)
	No	7111	14.4 (0.6)	14.4 (0.6)	1.00
ACE score					
0	3004	11.8 (0.9)	11.8 (0.9)	1.00 (referent)	
1	1632	14.3 (1.1)	14.2 (1.3)	1.29 (0.99, 1.67)	
2	992	16.9 (1.8)	16.1 (1.7)	1.29 (0.95, 1.75)	
3	718	14.7 (1.8)	15.1 (2.0)	1.21 (0.85, 1.71)	
4 or 5	796	19.8 (1.9)	19.8 (1.9)	1.64 (1.21, 2.23)	
6, 7, 8	329	28.3 (4.2)	27.1 (3.7)	2.72 (1.69, 4.37)	
					p-for-trend < 0.001

Note: Model adjusted for age, sex, race/ethnicity, education, income.

**Crude and age-adjusted prevalence (%) and multivariable-adjusted relative odds of current asthma by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life, Washington BRFSS, 2009**

ACE Category	N	Prevalence of asthma (current)			
		Crude % (std err)	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)	
Overall	7471	8.5 (0.4)	8.4 (0.5)		
Physical abuse	Yes	1227	11.6 (1.2)	11.5 (1.3)	1.55 (1.18, 2.04)
	No	6244	7.9 (0.5)	7.7 (0.5)	1.00 (referent)
Sexual abuse	Yes	1024	12.9 (1.3)	12.2 (1.3)	1.47 (1.12, 1.94)
	No	6447	7.9 (0.5)	7.7 (0.5)	1.00
Verbal abuse	Yes	2329	10.4 (0.8)	10.3 (0.9)	1.46 (1.15, 1.85)
	No	5142	7.6 (0.5)	7.4 (0.5)	1.00
Household mental illness	Yes	1510	12.2 (1.1)	11.8 (1.1)	1.85 (1.42, 2.41)
	No	5961	7.4 (0.5)	7.1 (0.5)	1.00
Household substance abuse	Yes	2228	10.0 (0.9)	9.9 (0.9)	1.38 (1.09, 1.75)
	No	5243	7.8 (0.5)	7.7 (0.5)	1.00
Parents separated / divorced	Yes	1648	11.0 (1.1)	11.0 (1.0)	1.37 (1.05, 1.79)
	No	5823	7.6 (0.5)	7.4 (0.5)	1.00
Witnessed domestic violence	Yes	1103	9.3 (1.0)	9.5 (1.0)	1.19 (0.90, 1.59)
	No	6368	8.3 (0.5)	8.2 (0.5)	1.00
Incarcerated household member	Yes	360	12.4 (2.9)	10.9 (2.0)	1.52 (0.92, 2.51)
	No	7111	8.2 (0.4)	8.0 (0.4)	1.00
ACE score					
0	3004	6.5 (0.6)	6.4 (0.7)	1.00 (referent)	
1	1632	7.8 (0.8)	7.6 (0.9)	1.25 (0.91, 1.71)	
2	992	9.9 (1.4)	9.4 (1.3)	1.27 (0.89, 1.81)	
3	718	8.1 (1.3)	8.3 (1.4)	1.18 (0.78, 1.76)	
4 or 5	796	11.6 (1.4)	12.0 (1.3)	2.04 (1.43, 2.93)	
6, 7, 8	329	15.2 (3.0)	15.9 (3.0)	2.57 (1.53, 4.29)	
					p-for-trend < 0.001

Note: Model adjusted for age, sex, race/ethnicity, education, income.

## ACEs and Poor Mental Health

Chronic sleep insufficiency is an under-recognized public health problem that has a cumulative effect on physical and mental health. The National Sleep Foundation reports that most adults need 7-9 hours of sleep each night to feel fully rested [1]. A CDC analysis of 2006 data from the Behavioral Risk Factor Surveillance System (BRFSS) in four states showed that an estimated 10.1% of adults reported receiving insufficient rest or sleep on all days during the preceding 30 days [2]. A recent CDC report examined the prevalence of insufficient rest or sleep in all 50 states, the District of Columbia (DC), and three U.S. territories (Guam, Puerto Rico, and U.S. Virgin Islands) in 2008 and found that 31% of adults reported no days of insufficient rest or sleep and 11% reported insufficient rest or sleep every day during the preceding 30 days [3].

Frequent mental distress is a measure of perceived mental health that is believed to be associated with health behaviors related to chronic disease and disability [4]. In 2008, about one in ten Americans reported frequent mental distress, defined as experiencing stress, depression, or emotional problems for 14 or more days in the previous 30 days. The 14-day period is often used as a marker for clinical depression and anxiety disorders.

In addition, we identified persons reporting 14 or more days of work / normal activity disruption due to a mental health condition or emotional problems and persons who have received medical treatment or pharmacotherapy for a mental health condition or emotional problems. Finally, we examined associations between ACEs and self-reported anxiety and hopelessness.

During 2009, one in ten Washington adults reported insufficient sleep on all days during the 30 days before the survey. The prevalence of insufficient sleep for the previous 30 days was 6.8% among adults with zero ACEs, 8.8% among those with 1 ACE, 9.7% for 2 ACEs, 8.4% for 3 ACEs, 14.9% for 4 or 5 ACEs, and 20.2% for 6 or more ACEs. Adults with 6 or more ACEs were 2.89 (95% CI: 1.80, 4.67) times more likely to report insufficient sleep on all days during the prior 30 days compared to those without exposure.

One in ten Washington adults reported frequent mental distress, and the prevalence increased in a strong, graded fashion with increasing ACE score. Compared to adults with an ACE score of zero (frequent mental distress, 5.8%), the likelihood of frequent mental distress was increased more than 3-fold for adults with an ACE score of 6 or more (aOR=3.33; 95%CI=2.08, 5.33).

Although the prevalence of adults reporting 14 or more days of disrupted work / normal activity due to a mental health condition was low (2.7%), a strong, graded association was observed with the ACE score with relative risks of 1.78 (95%CI=0.9, 3.52) for 1 ACE, 2.56 (1.23, 5.32) for 2 ACEs, 3.77 (1.86, 7.61) for 3 ACEs, 6.16 (3.31, 11.47) for 4 or 5 ACEs and 7.26 (3.58, 14.73) for 6 or more ACEs.

Slightly more than one in ten adults reported medical treatment or pharmacotherapy for a mental health condition or emotional problems with increasing prevalence across the ACE score. Nearly 5% of adults reported anxiety and about 2% reported feelings of hopelessness. While the prevalence of anxiety and hopelessness were low among adults with low ACE scores, those with ACE scores of 6 or more had odds ratios of 6.58 (95%CI=3.26, 13.28) and 8.46 (3.80, 18.81) for anxiety and hopelessness, respectively.

### **Variable definitions**

1. **Insufficient sleep for all days during the 30 days** prior to the survey was defined by a response of 30 days to the question, "During the past 30 days, for about how many days have you felt you did not get enough rest or sleep?"

2. **Insufficient sleep for 21 or more days during the 30 days** prior to the survey was defined by a response of  $\geq 21$  days to the question, “During the past 30 days, for about how many days have you felt you did not get enough rest or sleep?”.

3. **Frequent mental distress** was defined by **14 or more unhealthy mental days** in response to the following, “Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?”

4. **Frequent work/activity disruption due to a mental health condition** was defined by a response of 14 or more days to the question, “During the past 30 days, for about how many days did a mental health condition or emotional problem keep you from doing your work or other usual activities?”

5. **Medical treatment or pharmacotherapy for a mental health condition** was defined by a positive response to the question, “Are you taking medicine or receiving treatment from a doctor or other health professional for any type of mental health condition or emotional problem?”

6. **Anxiety** was defined by a response of “All of the time” or “Most of the time” to the question, “About how often during the past 30 days did you feel nervous – would you say all of the time, most of the time, some of the time, a little of the time, or none of the time?”

7. **Hopelessness** was defined by a response of “All of the time” or “Most of the time” to the question, “About how often during the past 30 days did you feel hopeless – would you say all of the time, most of the time, some of the time, a little of the time, or none of the time?”

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## References

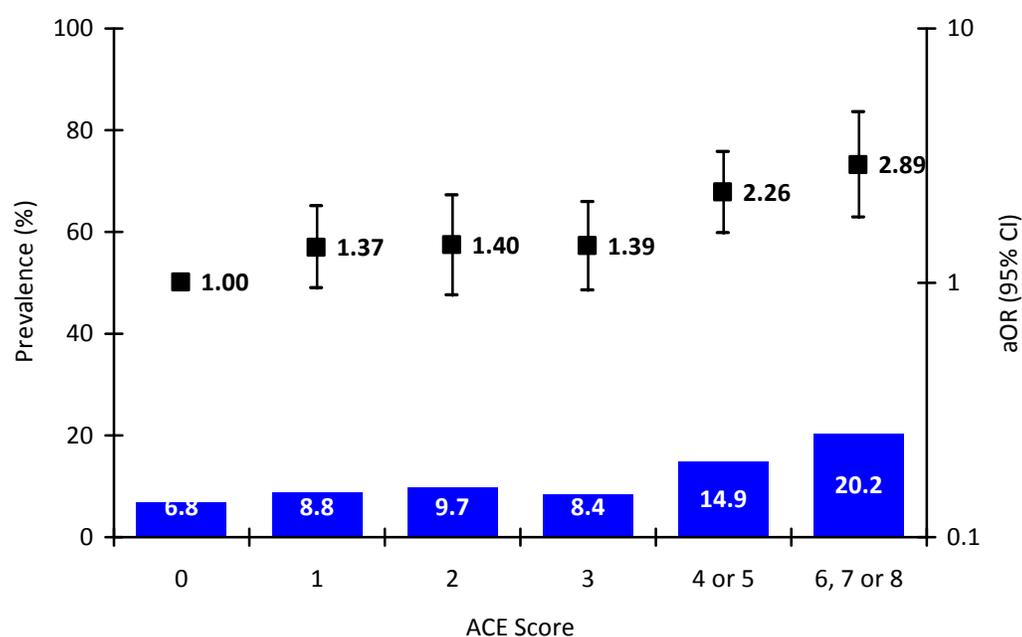
1. National Sleep Foundation. [www.sleepfoundation.org](http://www.sleepfoundation.org).
2. CDC. Perceived insufficient rest or sleep---four states, 2006. *MMWR* 2008;57:200-3.
3. CDC. Perceived Insufficient Rest or Sleep Among Adults---United States, 2008. *MMWR* 2009;58:1175-1179.
4. CDC. Measuring Healthy Days—Population Assessment of Health-Related Quality of Life. US Centers for Disease Control and Prevention, Atlanta, GA, 2000. [www.cdc.gov/hrqol/monograph.htm](http://www.cdc.gov/hrqol/monograph.htm)

**Age-adjusted prevalence (%) and multivariable-adjusted relative odds of insufficient sleep for all days during the 30 days prior to the survey by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life**

ACE Category		N	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)
Physical abuse	Yes	1227	15.0 (1.6)	1.60 (1.20, 2.14)
	No	6244	8.4 (0.6)	
Sexual abuse	Yes	1024	13.4 (1.7)	1.33 (0.96, 1.82)
	No	6447	9.1 (0.6)	
Verbal abuse	Yes	2329	13.4 (1.1)	1.75 (1.36, 2.26)
	No	5142	7.7 (0.6)	
Household mental illness	Yes	1510	12.6 (1.1)	1.54 (1.15, 2.06)
	No	5961	8.5 (0.6)	
Household substance abuse	Yes	2228	12.6 (1.1)	1.52 (1.16, 1.98)
	No	5243	8.2 (0.6)	
Parents separated / divorced	Yes	1648	12.1 (1.1)	1.34 (1.01, 1.78)
	No	5823	8.6 (0.6)	
Witnessed domestic violence	Yes	1103	14.8 (1.5)	1.63 (1.21, 2.18)
	No	6368	8.5 (0.6)	
Incarcerated household member	Yes	360	17.2 (2.4)	1.77 (1.12, 2.78)
	No	7111	8.9 (0.5)	

Note: Model adjusted for age, sex, race/ethnicity, education, income.

**Age-adjusted prevalence and multivariable-adjusted relative odds of insufficient sleep for all days during the 30 days prior to the survey by ACE score**

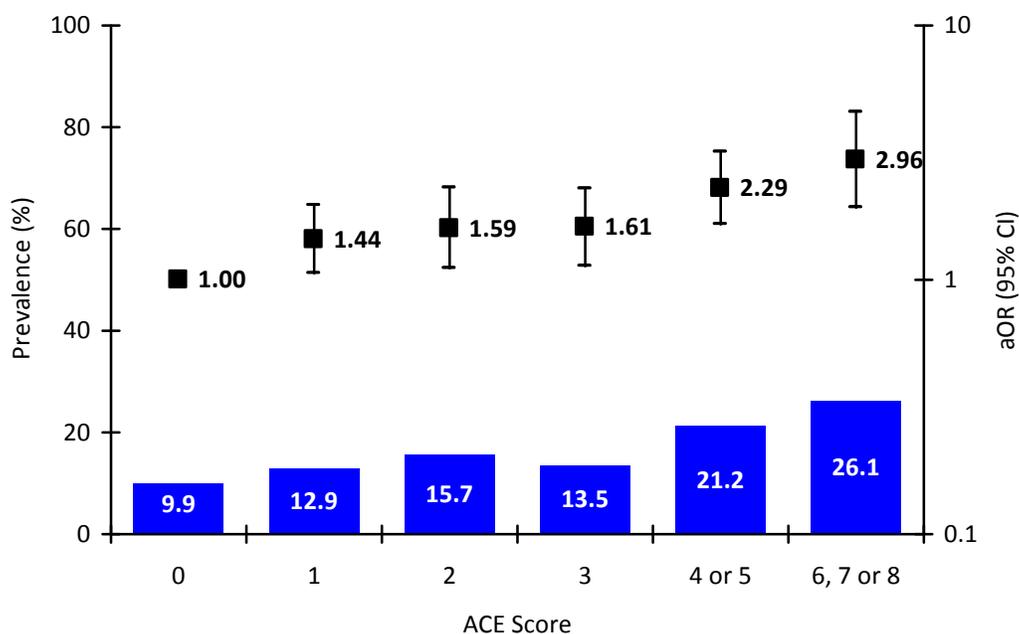


**Age-adjusted prevalence (%) and multivariable-adjusted relative odds of insufficient sleep for 21 or more days during the 30 days prior to the survey by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life**

ACE Category		N	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)
Physical abuse	Yes	1227	21.9 (1.8)	1.73 (1.35, 2.21)
	No	6244	12.5 (0.7)	
Sexual abuse	Yes	1024	20.0 (2.0)	1.50 (1.14, 1.97)
	No	6447	13.3 (0.7)	
Verbal abuse	Yes	2329	19.5 (1.3)	1.81 (1.46, 2.25)
	No	5142	11.5 (0.7)	
Household mental illness	Yes	1510	19.6 (1.3)	1.71 (1.35, 2.18)
	No	5961	12.3 (0.7)	
Household substance abuse	Yes	2228	17.6 (1.2)	1.37 (1.10, 1.71)
	No	5243	12.6 (0.7)	
Parents separated / divorced	Yes	1648	16.8 (1.3)	1.26 (0.99, 1.60)
	No	5823	13.2 (0.7)	
Witnessed domestic violence	Yes	1103	20.9 (1.7)	1.57 (1.22, 2.03)
	No	6368	12.9 (0.7)	
Incarcerated household member	Yes	360	22.1 (2.7)	1.61 (1.07, 2.42)
	No	7111	13.5 (0.7)	

Note: Model adjusted for age, sex, race/ethnicity, education, income.

**Age-adjusted prevalence and multivariable-adjusted relative odds of insufficient sleep for 21 or more days during the 30 days prior to the survey by ACE score**

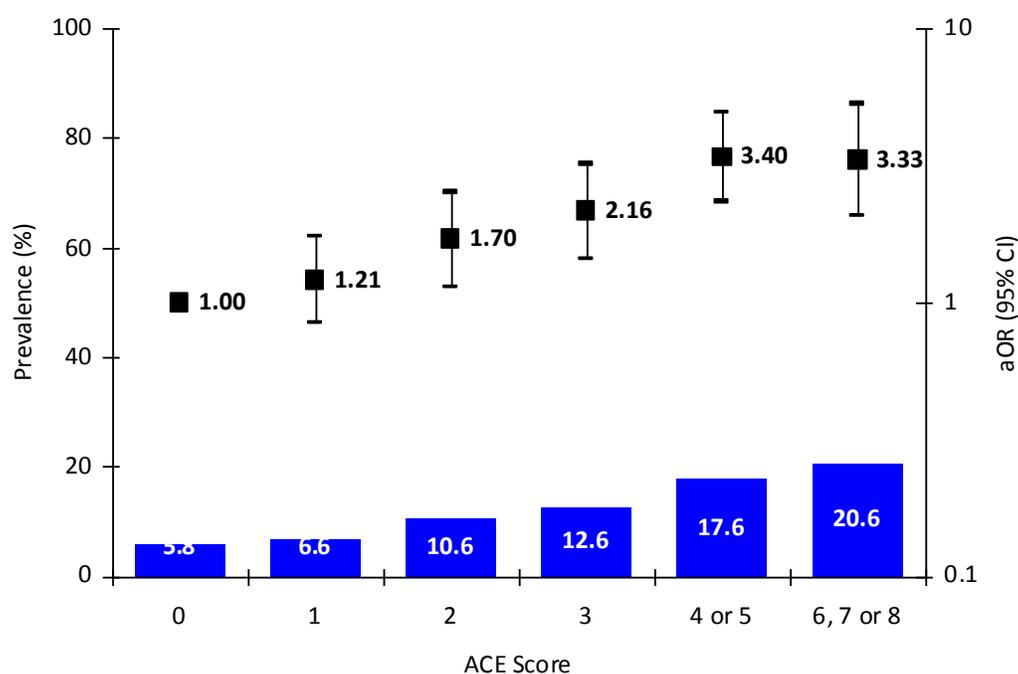


**Age-adjusted prevalence (%) and multivariable-adjusted relative odds of  $\geq 14$  unhealthy mental days during the 30 days preceding the survey by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life**

ACE Category		N	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)
Physical abuse	Yes	1227	18.4 (1.5)	2.61 (2.02, 3.38)
	No	6244	7.8 (0.5)	
Sexual abuse	Yes	1024	18.6 (2.0)	2.18 (1.63, 2.91)
	No	6447	8.5 (0.5)	
Verbal abuse	Yes	2329	14.5 (1.1)	2.19 (1.73, 2.79)
	No	5142	7.1 (0.5)	
Household mental illness	Yes	1510	16.8 (1.3)	2.50 (1.94, 3.22)
	No	5961	7.4 (0.5)	
Household substance abuse	Yes	2228	13.0 (1.0)	1.58 (1.24, 2.00)
	No	5243	8.1 (0.6)	
Parents separated / divorced	Yes	1648	11.9 (1.0)	1.07 (0.82, 1.38)
	No	5823	9.1 (0.6)	
Witnessed domestic violence	Yes	1103	15.7 (1.4)	1.89 (1.44, 2.48)
	No	6368	8.5 (0.5)	
Incarcerated household member	Yes	360	17.8 (2.5)	1.57 (1.02, 2.42)
	No	7111	9.0 (0.5)	

Note: Model adjusted for age, sex, race/ethnicity, education, income.

**Age-adjusted prevalence and multivariable-adjusted relative odds of  $\geq 14$  unhealthy mental days by ACE score**

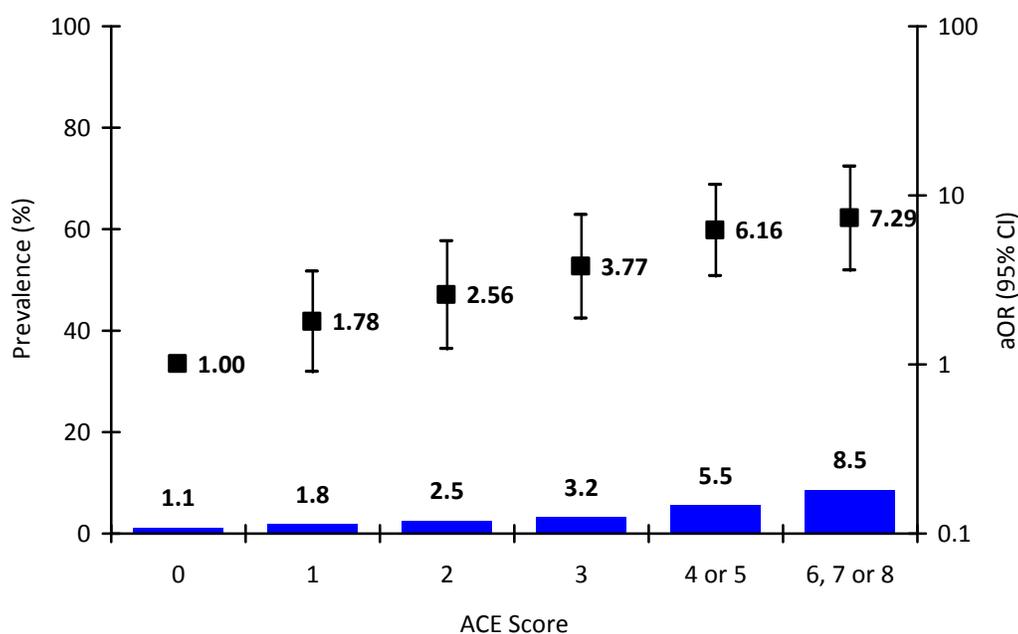


**Age-adjusted prevalence (%) and multivariable-adjusted relative odds of  $\geq 14$  days missed work due to mental health condition or emotional problems by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life**

ACE Category		N	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)
Physical abuse	Yes	1227	5.9 (0.9)	2.62 (1.71, 4.02)
	No	6244	2.0 (0.3)	
Sexual abuse	Yes	1024	7.5 (1.3)	3.56 (2.22, 5.70)
	No	6447	2.0 (0.3)	
Verbal abuse	Yes	2329	4.8 (0.7)	3.42 (2.26, 5.17)
	No	5142	1.6 (0.2)	
Household mental illness	Yes	1510	5.6 (0.7)	3.40 (2.07, 5.58)
	No	5961	1.7 (0.3)	
Household substance abuse	Yes	2228	4.1 (0.6)	2.16 (1.42, 3.28)
	No	5243	1.9 (0.3)	
Parents separated / divorced	Yes	1648	3.5 (0.5)	1.17 (0.75, 1.84)
	No	5823	2.3 (0.3)	
Witnessed domestic violence	Yes	1103	4.7 (0.8)	1.91 (1.21, 3.00)
	No	6368	2.3 (0.3)	
Incarcerated household member	Yes	360	6.6 (1.8)	2.71 (1.35, 5.42)
	No	7111	2.3 (0.2)	

Note: Model adjusted for age, sex, race/ethnicity, education, income.

**Age-adjusted prevalence and multivariable-adjusted relative odds of  $\geq 14$  days missed work due to mental health condition or emotional problem by ACE score**

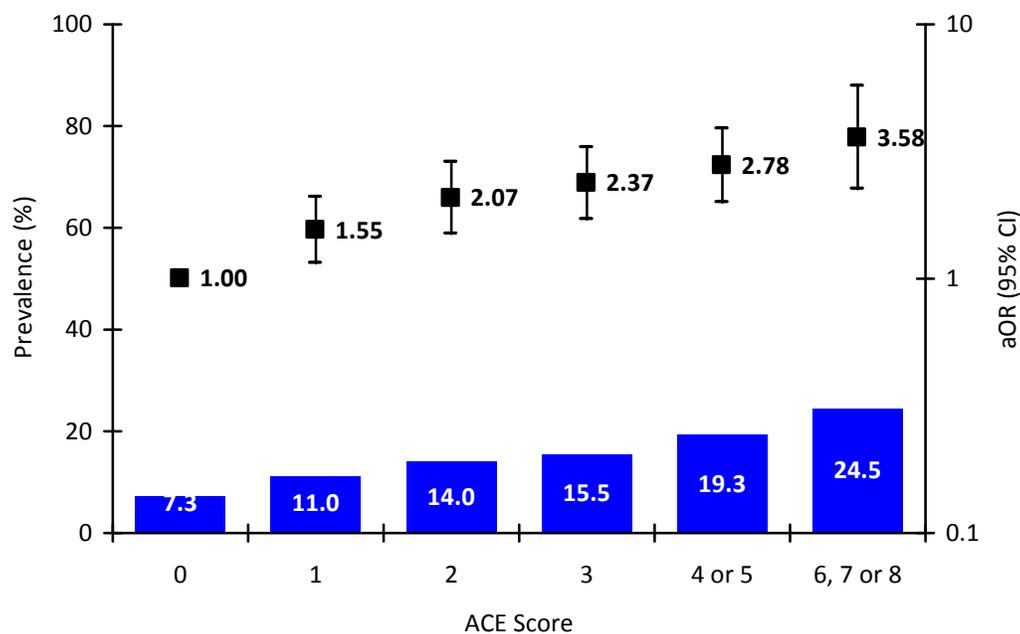


**Age-adjusted prevalence (%) and multivariable-adjusted relative odds of medical treatment or medication for mental health condition or emotional problem by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life**

ACE Category		N	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)
Physical abuse	Yes	1227	18.7 (1.5)	1.82 (1.43, 2.32)
	No	6244	11.0 (0.5)	
Sexual abuse	Yes	1024	19.6 (1.7)	1.64 (1.30, 2.07)
	No	6447	11.4 (0.6)	
Verbal abuse	Yes	2329	18.0 (1.1)	2.10 (1.72, 2.57)
	No	5142	9.5 (0.6)	
Household mental illness	Yes	1510	24.1 (1.4)	3.02 (2.42, 3.77)
	No	5961	8.8 (0.5)	
Household substance abuse	Yes	2228	15.8 (1.0)	1.43 (1.17, 1.76)
	No	5243	10.7 (0.6)	
Parents separated / divorced	Yes	1648	13.9 (1.0)	1.02 (0.80, 1.29)
	No	5823	11.9 (0.6)	
Witnessed domestic violence	Yes	1103	15.2 (1.4)	1.37 (1.06, 1.77)
	No	6368	11.8 (0.6)	
Incarcerated household member	Yes	360	19.6 (2.4)	1.56 (1.04, 2.32)
	No	7111	11.8 (0.5)	

Note: Model adjusted for age, sex, race/ethnicity, education, income.

**Age-adjusted prevalence and multivariable-adjusted relative odds of medical treatment or medication for mental health condition or emotional problems by ACE score**

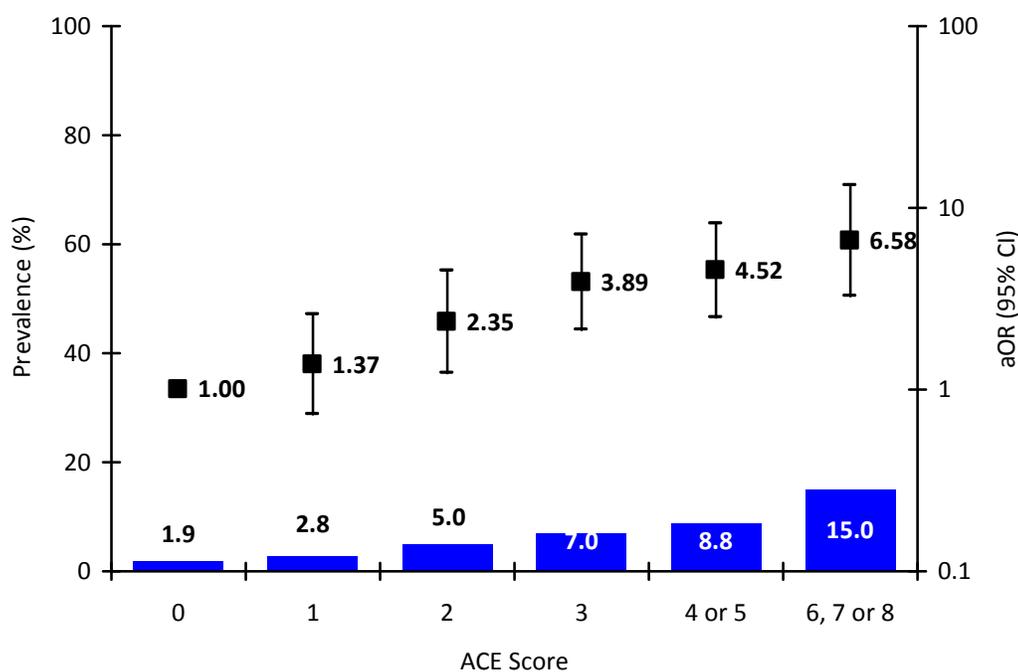


**Age-adjusted prevalence (%) and multivariable-adjusted relative odds of self-reported anxiety by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life**

ACE Category		N	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)
Physical abuse	Yes	1227	11.3 (1.4)	3.12 (2.19, 4.43)
	No	6244	3.3 (0.4)	
Sexual abuse	Yes	1024	10.6 (1.7)	2.07 (1.38, 3.12)
	No	6447	4.0 (0.4)	
Verbal abuse	Yes	2329	8.8 (0.9)	3.13 (2.22, 4.42)
	No	5142	2.7 (0.3)	
Household mental illness	Yes	1510	10.2 (1.1)	3.63 (2.55, 5.18)
	No	5961	2.8 (0.3)	
Household substance abuse	Yes	2228	7.2 (0.8)	1.89 (1.35, 2.63)
	No	5243	3.5 (0.4)	
Parents separated / divorced	Yes	1648	6.6 (0.8)	1.48 (1.03, 2.13)
	No	5823	4.1 (0.5)	
Witnessed domestic violence	Yes	1103	7.8 (1.0)	1.66 (1.13, 2.44)
	No	6368	4.2 (0.4)	
Incarcerated household member	Yes	360	11.5 (2.1)	2.83 (1.66, 4.80)
	No	7111	4.1 (0.4)	

Note: Model adjusted for age, sex, race/ethnicity, education, income.

**Age-adjusted prevalence and multivariable-adjusted relative odds of self-reported anxiety by ACE score**

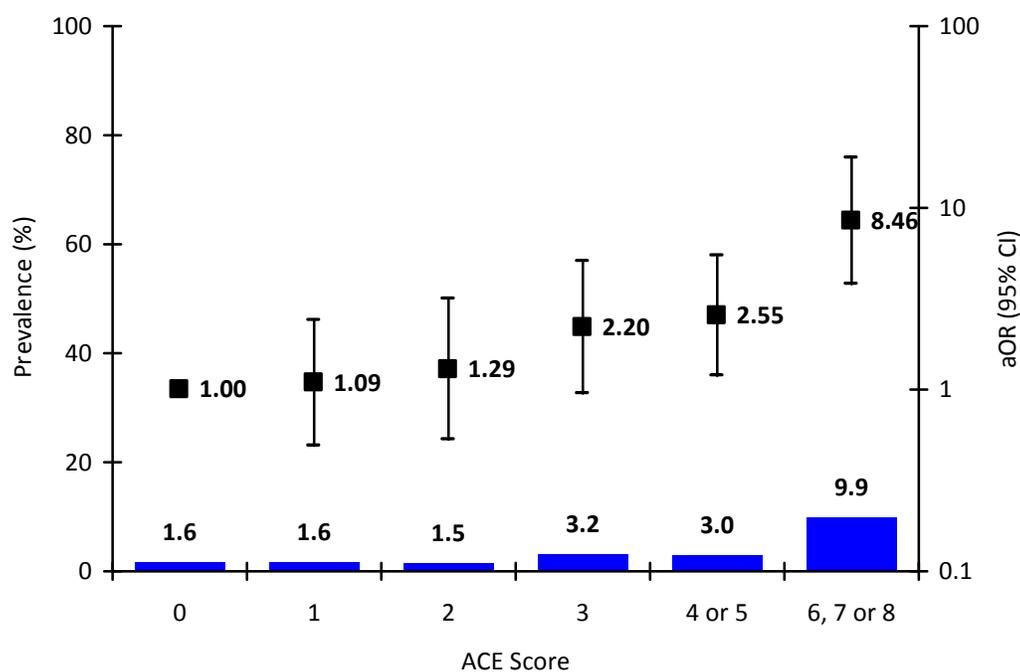


**Age-adjusted prevalence (%) and multivariable-adjusted relative odds of feelings of hopelessness by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life**

ACE Category		N	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)
Physical abuse	Yes	1227	5.9 (1.2)	3.78 (2.31, 6.18)
	No	6244	1.6 (0.2)	
Sexual abuse	Yes	1024	3.6 (0.8)	1.99 (1.10, 3.60)
	No	6447	2.2 (0.3)	
Verbal abuse	Yes	2329	4.2 (0.7)	3.90 (2.33, 6.55)
	No	5142	1.5 (0.3)	
Household mental illness	Yes	1510	4.1 (0.8)	3.18 (1.89, 5.36)
	No	5961	1.8 (0.3)	
Household substance abuse	Yes	2228	3.5 (0.7)	2.00 (1.24, 3.23)
	No	5243	1.8 (0.3)	
Parents separated / divorced	Yes	1648	3.2 (0.6)	1.43 (0.86, 2.38)
	No	5823	2.0 (0.3)	
Witnessed domestic violence	Yes	1103	4.3 (0.8)	2.24 (1.33, 3.79)
	No	6368	2.0 (0.3)	
Incarcerated household member	Yes	360	5.8 (1.7)	2.71 (1.34, 5.46)
	No	7111	1.9 (0.2)	

Note: Model adjusted for age, sex, race/ethnicity, education, income.

**Age-adjusted prevalence and multivariable-adjusted relative odds of feelings of hopelessness by ACE score**



**Crude and age-adjusted prevalence (%) and multivariable-adjusted relative odds of insufficient sleep for all days during the 30 days prior to the survey by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life, Washington BRFSS, 2009**

ACE Category	N	Prevalence of insufficient sleep			
		Crude % (std err)	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)	
Overall	7471	9.4 (0.5)	9.6 (0.5)		
Physical abuse	Yes	1227	14.9 (1.5)	15.0 (1.6)	1.60 (1.20, 2.14)
	No	6244	8.3 (0.5)	8.4 (0.6)	1.00 (referent)
Sexual abuse	Yes	1024	13.1 (1.5)	13.4 (1.7)	1.33 (0.96, 1.82)
	No	6447	8.9 (0.6)	9.1 (0.6)	1.00
Verbal abuse	Yes	2329	13.3 (1.1)	13.4 (1.1)	1.75 (1.36, 2.26)
	No	5142	7.5 (0.5)	7.7 (0.6)	1.00
Household mental illness	Yes	1510	13.0 (1.2)	12.6 (1.1)	1.54 (1.15, 2.06)
	No	5961	8.3 (0.6)	8.5 (0.6)	1.00
Household substance abuse	Yes	2228	12.7 (1.1)	12.6 (1.1)	1.52 (1.16, 1.98)
	No	5243	7.9 (0.6)	8.2 (0.6)	1.00
Parents separated / divorced	Yes	1648	12.8 (1.4)	12.1 (1.1)	1.34 (1.01, 1.78)
	No	5823	8.3 (0.5)	8.6 (0.6)	1.00
Witnessed domestic violence	Yes	1103	15.1 (1.5)	14.8 (1.5)	1.63 (1.21, 2.18)
	No	6368	8.3 (0.6)	8.5 (0.6)	1.00
Incarcerated household member	Yes	360	20.1 (3.5)	17.2 (2.4)	1.77 (1.12, 2.78)
	No	7111	8.6 (0.5)	8.9 (0.5)	1.00
ACE score					
0	3004	6.5 (0.7)	6.8 (0.7)	1.00 (referent)	
1	1632	8.5 (1.1)	8.8 (1.2)	1.37 (0.95, 1.99)	
2	992	9.9 (1.8)	9.7 (1.7)	1.40 (0.89, 2.20)	
3	718	8.5 (1.2)	8.4 (1.3)	1.39 (0.93, 2.07)	
4 or 5	796	14.9 (1.8)	14.9 (1.7)	2.26 (1.56, 3.26)	
6, 7, 8	329	22.0 (3.5)	20.2 (3.3)	2.89 (1.80, 4.67)	
				p-for-trend < 0.001	

Note: Model adjusted for age, sex, race/ethnicity, education, income.

**Crude and age-adjusted prevalence (%) and multivariable-adjusted relative odds of insufficient sleep for 21 or more days during the 30 days prior to the survey by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life, Washington BRFSS, 2009**

ACE Category	N	Prevalence of insufficient sleep			
		Crude % (std err)	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)	
Overall	7471	13.8 (0.6)	14.2 (0.6)		
Physical abuse	Yes	1227	22.0 (1.8)	21.9 (1.8)	1.73 (1.35, 2.21)
	No	6244	12.1 (0.6)	12.5 (0.7)	1.00 (referent)
Sexual abuse	Yes	1024	20.0 (1.8)	20.0 (2.0)	1.50 (1.14, 1.97)
	No	6447	13.0 (0.7)	13.3 (0.7)	1.00
Verbal abuse	Yes	2329	19.5 (1.3)	19.5 (1.3)	1.81 (1.46, 2.25)
	No	5142	11.0 (0.7)	11.5 (0.7)	1.00
Household mental illness	Yes	1510	20.4 (1.5)	19.6 (1.3)	1.71 (1.35, 2.18)
	No	5961	11.8 (0.7)	12.3 (0.7)	1.00
Household substance abuse	Yes	2228	17.8 (1.2)	17.6 (1.2)	1.37 (1.10, 1.71)
	No	5243	12.0 (0.7)	12.6 (0.7)	1.00
Parents separated / divorced	Yes	1648	17.6 (1.5)	16.8 (1.3)	1.26 (0.99, 1.60)
	No	5823	12.5 (0.7)	13.2 (0.7)	1.00
Witnessed domestic violence	Yes	1103	21.3 (1.8)	20.9 (1.7)	1.57 (1.22, 2.03)
	No	6368	12.4 (0.7)	12.9 (0.7)	1.00
Incarcerated household member	Yes	360	25.5 (3.7)	22.1 (2.7)	1.61 (1.07, 2.42)
	No	7111	13.0 (0.6)	13.5 (0.7)	1.00
ACE score					
0	3004	9.3 (0.8)	9.9 (0.9)	1.00 (referent)	
1	1632	12.5 (1.2)	12.9 (1.3)	1.44 (1.06, 1.96)	
2	992	15.9 (2.0)	15.7 (1.9)	1.59 (1.11, 2.30)	
3	718	13.8 (1.6)	13.5 (1.7)	1.61 (1.13, 2.28)	
4 or 5	796	21.4 (2.1)	21.2 (2.0)	2.29 (1.65, 3.18)	
6, 7, 8	329	29.2 (3.9)	26.1 (3.5)	2.96 (1.92, 4.56)	
					p-for-trend < 0.001

Note: Model adjusted for age, sex, race/ethnicity, education, income.

**Crude and age-adjusted prevalence (%) and multivariable-adjusted relative odds of low life satisfaction by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life, Washington BRFSS, 2009**

ACE Category	N	Prevalence of low life satisfaction			
		Crude % (std err)	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)	
Overall	7471	5.0 (0.3)	5.0 (0.4)		
Physical abuse	Yes	1227	11.6 (1.2)	11.4 (1.2)	3.07 (2.24, 4.21)
	No	6244	3.6 (0.3)	3.5 (0.3)	1.00 (referent)
Sexual abuse	Yes	1024	9.8 (1.2)	9.4 (1.3)	2.40 (1.68, 3.43)
	No	6447	4.3 (0.3)	4.3 (0.4)	1.00
Verbal abuse	Yes	2329	8.9 (0.8)	9.0 (0.8)	3.43 (2.51, 4.67)
	No	5142	3.0 (0.3)	2.9 (0.3)	1.00
Household mental illness	Yes	1510	9.1 (0.9)	8.9 (0.9)	2.85 (2.03, 3.99)
	No	5961	3.7 (0.3)	3.7 (0.4)	1.00
Household substance abuse	Yes	2228	7.6 (0.7)	7.2 (0.7)	1.94 (1.42, 2.65)
	No	5243	3.8 (0.4)	3.8 (0.4)	1.00
Parents separated / divorced	Yes	1648	6.9 (0.8)	6.9 (0.7)	1.37 (0.99, 1.89)
	No	5823	4.4 (0.4)	4.3 (0.4)	1.00
Witnessed domestic violence	Yes	1103	9.1 (1.1)	8.7 (1.0)	2.07 (1.49, 2.88)
	No	6368	4.2 (0.3)	4.2 (0.4)	1.00
Incarcerated household member	Yes	360	11.8 (2.5)	11.0 (1.9)	2.78 (1.66, 4.63)
	No	7111	4.5 (0.3)	4.4 (0.3)	1.00
ACE score					
0	3004	1.9 (0.3)	1.8 (0.3)	1.00 (referent)	
1	1632	4.5 (0.8)	4.6 (0.9)	2.85 (1.69, 4.79)	
2	992	5.0 (0.9)	5.0 (0.9)	3.12 (1.86, 5.23)	
3	718	5.5 (0.9)	5.2 (0.9)	3.73 (2.25, 6.17)	
4 or 5	796	10.5 (1.3)	10.2 (1.3)	6.76 (4.24, 10.77)	
6, 7, 8	329	14.6 (2.7)	15.3 (2.5)	8.96 (5.08, 15.81)	
				p-for-trend < 0.001	

Note: Model adjusted for age, sex, race/ethnicity, education, income.

**Crude and age-adjusted prevalence (%) and multivariable-adjusted relative odds of  $\geq 14$  days of missed work due to mental health condition or emotional problems by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life, Washington BRFSS, 2009**

ACE Category		N	<i>Prevalence of <math>\geq 14</math> days of missed work due to mental health condition or emotional problems</i>		
			<i>Crude</i> % (std err)	<i>Age-adjusted</i> % (std err)	Multivariable-adjusted OR (95% CI)
Overall		7471	2.9 (0.3)	2.7 (0.3)	
Physical abuse	Yes	1227	6.0 (0.9)	5.9 (0.9)	2.62 (1.71, 4.02)
	No	6244	2.0 (0.2)	2.0 (0.3)	1.00 (referent)
Sexual abuse	Yes	1024	7.4 (1.2)	7.5 (1.3)	3.56 (2.22, 5.70)
	No	6447	2.0 (0.2)	2.0 (0.3)	1.00
Verbal abuse	Yes	2329	4.7 (0.6)	4.8 (0.7)	3.42 (2.26, 5.17)
	No	5142	1.6 (0.2)	1.6 (0.2)	1.00
Household mental illness	Yes	1510	5.7 (0.8)	5.6 (0.7)	3.40 (2.07, 5.58)
	No	5961	1.7 (0.2)	1.7 (0.3)	1.00
Household substance abuse	Yes	2228	4.2 (0.6)	4.1 (0.6)	2.16 (1.42, 3.28)
	No	5243	1.9 (0.2)	1.9 (0.3)	1.00
Parents separated / divorced	Yes	1648	3.7 (0.6)	3.5 (0.5)	1.17 (0.75, 1.84)
	No	5823	2.3 (0.3)	2.3 (0.3)	1.00
Witnessed domestic violence	Yes	1103	4.9 (0.9)	4.7 (0.8)	1.91 (1.21, 3.00)
	No	6368	2.3 (0.3)	2.3 (0.3)	1.00
Incarcerated household member	Yes	360	7.8 (2.3)	6.6 (1.8)	2.71 (1.35, 5.42)
	No	7111	2.3 (0.2)	2.3 (0.2)	1.00
ACE score					
0		3004	1.1 (0.2)	1.1 (0.2)	1.00 (referent)
1		1632	1.9 (0.4)	1.8 (0.5)	1.78 (0.90, 3.52)
2		992	2.2 (0.6)	2.5 (0.7)	2.56 (1.23, 5.32)
3		718	3.2 (0.8)	3.2 (0.9)	3.77 (1.86, 7.61)
4 or 5		796	5.8 (1.1)	5.5 (1.1)	6.16 (3.31, 11.47)
6, 7, 8		329	9.2 (2.3)	8.5 (1.9)	7.26 (3.58, 14.73)
					p-for-trend < 0.001

Note: Model adjusted for age, sex, race/ethnicity, education, income.

**Crude and age-adjusted prevalence (%) and multivariable-adjusted relative odds of medication or treatment for mental health condition or emotional problem by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life, Washington BRFSS, 2009**

ACE Category	N	Prevalence of medication or treatment for mental health condition or emotional problems			
		Crude % (std err)	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)	
Overall	7471	12.7 (0.5)	12.5 (0.5)		
Physical abuse	Yes	1227	19.6 (1.6)	18.7 (1.5)	1.82 (1.43, 2.32)
	No	6244	11.2 (0.5)	11.0 (0.5)	
Sexual abuse	Yes	1024	20.8 (1.6)	19.6 (1.7)	1.64 (1.30, 2.07)
	No	6447	11.5 (0.5)	11.4 (0.6)	
Verbal abuse	Yes	2329	18.6 (1.1)	18.0 (1.1)	2.10 (1.72, 2.57)
	No	5142	9.6 (0.5)	9.5 (0.6)	
Household mental illness	Yes	1510	24.1 (1.5)	24.1 (1.4)	3.02 (2.42, 3.77)
	No	5961	9.1 (0.5)	8.8 (0.5)	
Household substance abuse	Yes	2228	16.5 (1.1)	15.8 (1.0)	1.43 (1.17, 1.76)
	No	5243	10.9 (0.6)	10.7 (0.6)	
Parents separated / divorced	Yes	1648	14.0 (1.1)	13.9 (1.0)	1.02 (0.80, 1.29)
	No	5823	12.3 (0.6)	11.9 (0.6)	
Witnessed domestic violence	Yes	1103	16.3 (1.5)	15.2 (1.4)	1.37 (1.06, 1.77)
	No	6368	12.0 (0.5)	11.8 (0.6)	
Incarcerated household member	Yes	360	20.3 (2.9)	19.6 (2.4)	1.56 (1.04, 2.32)
	No	7111	12.1 (0.5)	11.8 (0.5)	
ACE score					
0	3004	7.5 (0.7)	7.3 (0.7)	1.00 (referent)	
1	1632	11.3 (1.0)	11.0 (1.1)	1.55 (1.15, 2.09)	
2	992	14.1 (1.4)	14.0 (1.4)	2.07 (1.50, 2.87)	
3	718	16.8 (1.6)	15.5 (1.6)	2.37 (1.71, 3.28)	
4 or 5	796	19.9 (1.9)	19.3 (1.8)	2.78 (1.99, 3.88)	
6, 7, 8	329	24.9 (3.5)	24.5 (2.9)	3.58 (2.25, 5.71)	
					p-for-trend < 0.001

Note: Model adjusted for age, sex, race/ethnicity, education, income.

**Crude and age-adjusted prevalence (%) and multivariable-adjusted relative odds of self-reported anxiety by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life, Washington BRFSS, 2009**

ACE Category	N	Prevalence of self-reported anxiety			
		Crude % (std err)	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)	
Overall	7471	4.8 (0.4)	4.8 (0.4)		
Physical abuse	Yes	1227	11.6 (1.4)	11.3 (1.4)	3.12 (2.19, 4.43)
	No	6244	3.3 (0.3)	3.3 (0.4)	1.00 (referent)
Sexual abuse	Yes	1024	10.0 (1.4)	10.6 (1.7)	2.07 (1.38, 3.12)
	No	6447	4.0 (0.4)	4.0 (0.4)	1.00
Verbal abuse	Yes	2329	8.8 (0.9)	8.8 (0.9)	3.13 (2.22, 4.42)
	No	5142	2.6 (0.3)	2.7 (0.3)	1.00
Household mental illness	Yes	1510	10.8 (1.2)	10.2 (1.1)	3.63 (2.55, 5.18)
	No	5961	2.8 (0.3)	2.8 (0.3)	1.00
Household substance abuse	Yes	2228	7.4 (0.8)	7.2 (0.8)	1.89 (1.35, 2.63)
	No	5243	3.5 (0.4)	3.5 (0.4)	1.00
Parents separated / divorced	Yes	1648	6.9 (0.9)	6.6 (0.8)	1.48 (1.03, 2.13)
	No	5823	4.0 (0.4)	4.1 (0.5)	1.00
Witnessed domestic violence	Yes	1103	8.1 (1.1)	7.8 (1.0)	1.66 (1.13, 2.44)
	No	6368	4.1 (0.4)	4.2 (0.4)	1.00
Incarcerated household member	Yes	360	13.6 (2.9)	11.5 (2.1)	2.83 (1.66, 4.80)
	No	7111	4.1 (0.3)	4.1 (0.4)	1.00
ACE score					
0	3004	2.0 (0.4)	1.9 (0.5)	1.00 (referent)	
1	1632	2.7 (0.5)	2.8 (0.5)	1.37 (0.73, 2.55)	
2	992	4.9 (1.1)	5.0 (1.2)	2.35 (1.23, 4.50)	
3	718	6.7 (1.2)	7.0 (1.4)	3.89 (2.13, 7.10)	
4 or 5	796	9.3 (1.3)	8.8 (1.2)	4.52 (2.49, 8.18)	
6, 7, 8	329	16.9 (3.3)	15.0 (2.7)	6.58 (3.26, 13.28)	

p-for-trend < 0.001

Note: Model adjusted for age, sex, race/ethnicity, education, income.

**Crude and age-adjusted prevalence (%) and multivariable-adjusted relative odds of feelings of hopelessness by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life, Washington BRFSS, 2009**

ACE Category	N	Prevalence of hopelessness			
		Crude % (std err)	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)	
Overall	7471	2.3 (0.3)	2.4 (0.3)		
Physical abuse	Yes	1227	5.9 (1.1)	5.9 (1.2)	3.78 (2.31, 6.18)
	No	6244	1.5 (0.2)	1.6 (0.2)	1.00 (referent)
Sexual abuse	Yes	1024	3.7 (0.8)	3.6 (0.8)	1.99 (1.10, 3.60)
	No	6447	2.1 (0.3)	2.2 (0.3)	1.00
Verbal abuse	Yes	2329	4.0 (0.6)	4.2 (0.7)	3.90 (2.33, 6.55)
	No	5142	1.4 (0.3)	1.5 (0.3)	1.00
Household mental illness	Yes	1510	4.1 (0.8)	4.1 (0.8)	3.18 (1.89, 5.36)
	No	5961	1.7 (0.3)	1.8 (0.3)	1.00
Household substance abuse	Yes	2228	3.5 (0.6)	3.5 (0.7)	2.00 (1.24, 3.23)
	No	5243	1.7 (0.3)	1.8 (0.3)	1.00
Parents separated / divorced	Yes	1648	3.4 (0.7)	3.2 (0.6)	1.43 (0.86, 2.38)
	No	5823	1.9 (0.3)	2.0 (0.3)	1.00
Witnessed domestic violence	Yes	1103	4.4 (0.9)	4.3 (0.8)	2.24 (1.33, 3.79)
	No	6368	1.9 (0.3)	2.0 (0.3)	1.00
Incarcerated household member	Yes	360	7.7 (0.3)	5.8 (1.7)	2.71 (1.34, 5.46)
	No	7111	1.9 (0.2)	1.9 (0.2)	1.00
ACE score					
0	3004	1.4 (0.4)	1.6 (0.4)	1.00 (referent)	
1	1632	1.6 (0.4)	1.6 (0.4)	1.09 (0.49, 2.40)	
2	992	1.4 (0.5)	1.5 (0.5)	1.29 (0.53, 3.15)	
3	718	2.8 (0.9)	3.2 (1.0)	2.20 (0.95, 5.07)	
4 or 5	796	3.0 (0.7)	3.0 (0.7)	2.55 (1.19, 5.45)	
6, 7, 8	329	10.8 (2.9)	9.9 (2.5)	8.46 (3.80, 18.81)	
				p-for-trend < 0.001	

Note: Model adjusted for age, sex, race/ethnicity, education, income.

## ACEs and General Health Status, Disability, and Social Problems

### Health Related Quality of Life

The *Healthy People* national health objectives aim to increase the quality of life and years of healthy life for all persons in the US. Health-related quality of life has evolved to include aspects of life that affect perceived physical or mental health, and it is a fundamental measure used to understand the health status of a population [1]. Moreover, studies have shown that self-reported fair or poor health status is a strong predictor of future mortality [2]. Similarly, life dissatisfaction, a broad and nonspecific subjective perception comparable to self-rated health, is strongly related to poor health behaviors, poor affective status including depressive symptoms, psychiatric morbidity as well as mortality and suicide [3,4].

In Washington, nearly 1 in 10 adults reported fair or poor health or 14 or more unhealthy physical days. Strong graded relationships were observed between the ACE score and each of these quality of life measures with 3-fold increased risks for those with 6 or more ACEs compared to those reporting no ACEs. Even more striking were relationships between ACEs and life dissatisfaction, which was observed among 5% of adults. Compared to adults with zero ACEs for whom the prevalence of life dissatisfaction was about 2%, adults with 6 or more ACEs were nearly 9 times more likely to report low life satisfaction.

#### Variable definitions

The following questions on HRQOL, life satisfaction and presence of social/emotional support were used to provide an overview of quality of life among Washington adults.

**Fair or poor health** was defined by a response of “fair” or “poor” to the question, “Would you say that in general your health is Excellent/Very good/Good/Fair/or Poor?”

We defined several dichotomous HRQOL variables that categorized persons into two mutually exclusive groups depending on whether they did or did not report **14 or more unhealthy physical days, activity limitation days** in response to the following:

- “Now thinking about your physical health, which includes physical illness and injury, for how many days during the past 30 days was your physical health not good?”
- “During the past 30 days, for about how many days did poor physical or mental health keep you from doing your usual activities, such as self-care, work, or recreation?”

\* Note that the question on unhealthy mental days was included above in the Poor Mental Health section.

**Low life satisfaction** was defined by a response of "dissatisfied" or "very dissatisfied" to the question "In general, how satisfied are you with your life?"

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#### References

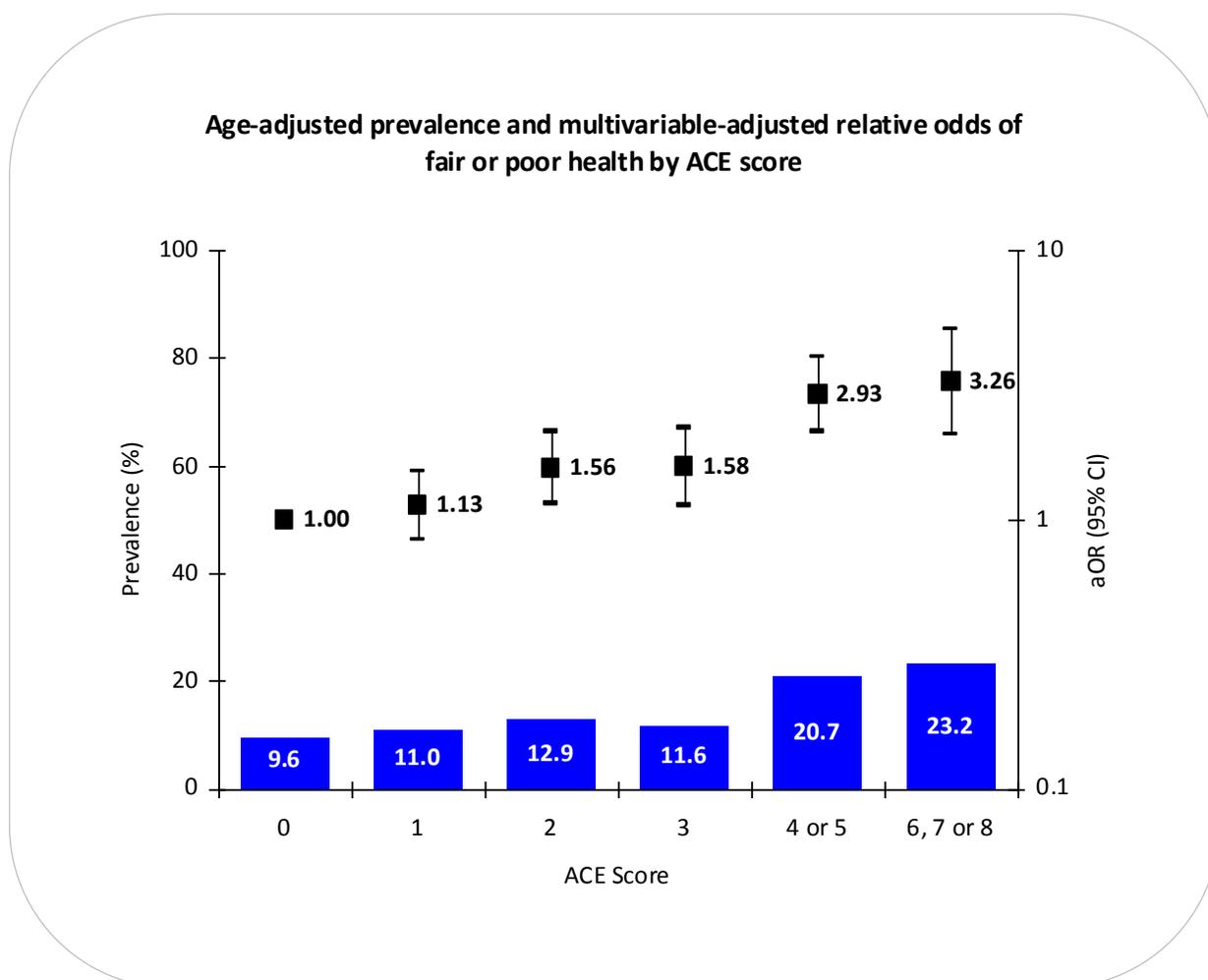
1. US Centers for Disease Control and Prevention. Measuring Healthy Days: Population Assessment of Health-Related Quality of Life. Atlanta, GA: Centers for Disease Control and Prevention, 2000, pp. 1-44.

2. Idler EL, Benyamini Y: Self-rated health and mortality: a review of twenty-seven community studies. *J Health Soc Behav* 1997; 38:21–37
3. Koivumaa-Honkanen H, Honkanen R, Viinamäki H, Heikkilä K, Kaprio J, Koskenvuo M: Self-reported life satisfaction and 20-year mortality in healthy Finnish adults. *Am J Epidemiol* 2000; 152:983–991
4. Koivumaa-Honkanen H, Honkanen R, Viinamäki H, Heikkilä K, Kaprio J, Koskenvuo M. Life satisfaction and suicide: a 20-year follow-up study. *Am J Psychiatry* 2001;158(3):433-439.

**Age-adjusted prevalence (%) and multivariable-adjusted relative odds of fair or poor health by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life**

ACE Category		N	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)
Physical abuse	Yes	1227	19.2 (1.4)	1.97 (1.55, 2.50)
	No	6244	11.2 (0.5)	
Sexual abuse	Yes	1024	16.8 (1.5)	1.60 (1.22, 2.08)
	No	6447	12.0 (0.5)	
Verbal abuse	Yes	2329	17.0 (1.0)	1.97 (1.60, 2.43)
	No	5142	10.7 (0.6)	
Household mental illness	Yes	1510	17.3 (1.2)	2.33 (1.84, 2.94)
	No	5961	11.0 (0.5)	
Household substance abuse	Yes	2228	15.9 (1.0)	1.66 (1.34, 2.04)
	No	5243	11.1 (0.6)	
Parents separated / divorced	Yes	1648	14.3 (0.9)	1.10 (0.88, 1.38)
	No	5823	12.2 (0.6)	
Witnessed domestic violence	Yes	1103	19.9 (1.6)	2.06 (1.61, 2.65)
	No	6368	11.2 (0.5)	
Incarcerated household member	Yes	360	22.2 (2.6)	2.08 (1.34, 3.22)
	No	7111	12.0 (0.5)	

Note: Model adjusted for age, sex, race/ethnicity, education, income.

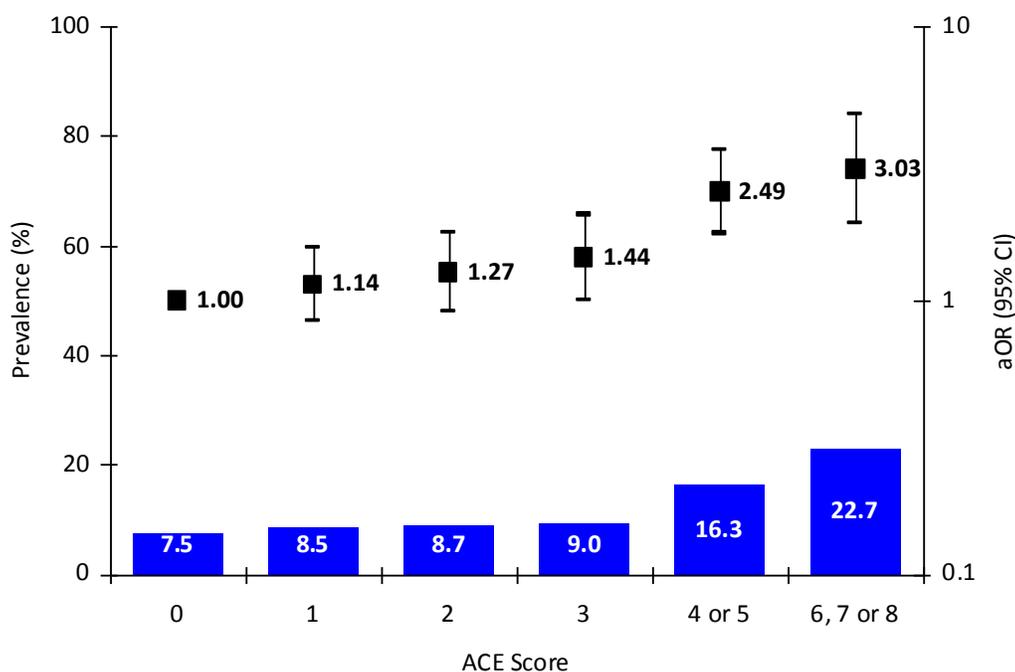


**Age-adjusted prevalence (%) and multivariable-adjusted relative odds of  $\geq 14$  unhealthy physical days during the 30 days preceding the survey by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life**

ACE Category		N	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)
Physical abuse	Yes	1227	16.6 (1.3)	2.15 (1.68, 2.74)
	No	6244	8.2 (0.5)	
Sexual abuse	Yes	1024	15.7 (1.6)	1.77 (1.35, 2.32)
	No	6447	8.8 (0.5)	
Verbal abuse	Yes	2329	13.0 (0.9)	1.70 (1.36, 2.13)
	No	5142	8.2 (0.5)	
Household mental illness	Yes	1510	14.0 (1.0)	1.91 (1.50, 2.43)
	No	5961	8.4 (0.5)	
Household substance abuse	Yes	2228	12.6 (0.9)	1.57 (1.27, 1.96)
	No	5243	8.4 (0.5)	
Parents separated / divorced	Yes	1648	12.8 (0.9)	1.32 (1.04, 1.67)
	No	5823	8.8 (0.5)	
Witnessed domestic violence	Yes	1103	14.6 (1.3)	1.65 (1.27, 2.13)
	No	6368	8.8 (0.5)	
Incarcerated household member	Yes	360	14.7 (2.2)	1.28 (0.82, 2.00)
	No	7111	9.4 (0.5)	

Note: Model adjusted for age, sex, race/ethnicity, education, income.

**Age-adjusted prevalence and multivariable-adjusted relative odds of  $\geq 14$  unhealthy physical days by ACE score**

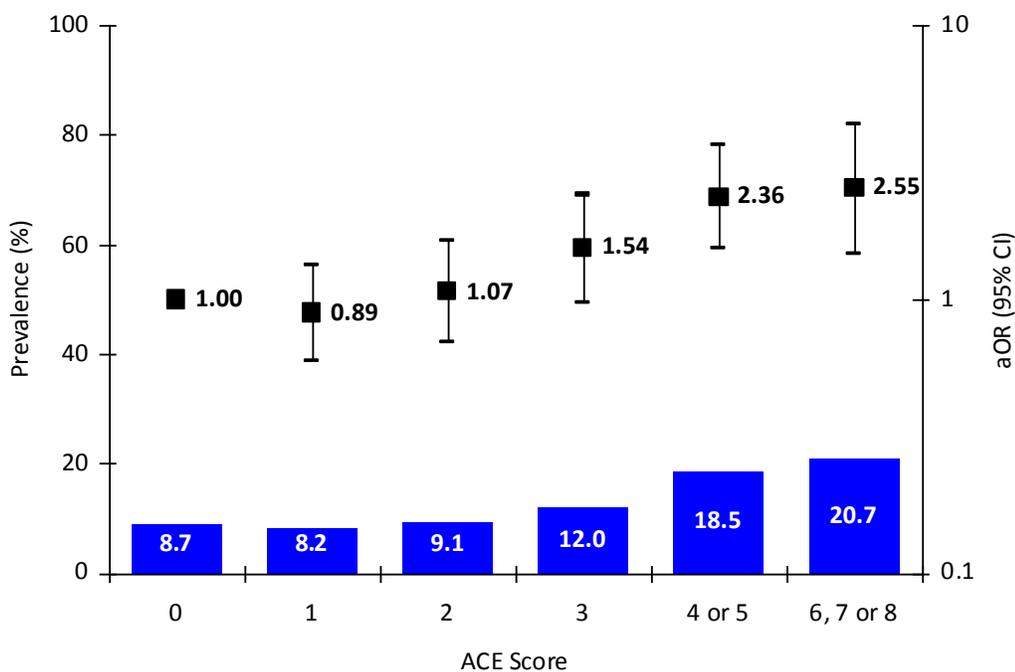


**Age-adjusted prevalence (%) and multivariable-adjusted relative odds of  $\geq 14$  activity limitation days during the 30 days preceding the survey by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life**

ACE Category		N	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)
Physical abuse	Yes	1227	17.3 (1.5)	1.92 (1.44, 2.55)
	No	6244	9.5 (0.6)	
Sexual abuse	Yes	1024	17.0 (1.9)	1.77 (1.28, 2.44)
	No	6447	10.2 (0.6)	
Verbal abuse	Yes	2329	14.7 (1.1)	1.81 (1.38, 2.38)
	No	5142	9.1 (0.7)	
Household mental illness	Yes	1510	14.3 (1.2)	1.61 (1.20, 2.16)
	No	5961	9.9 (0.7)	
Household substance abuse	Yes	2228	14.1 (1.1)	1.53 (1.16, 2.01)
	No	5243	9.6 (0.7)	
Parents separated / divorced	Yes	1648	15.0 (1.3)	1.30 (0.97, 1.73)
	No	5823	10.0 (0.7)	
Witnessed domestic violence	Yes	1103	15.7 (1.6)	1.44 (1.05, 1.97)
	No	6368	10.1 (0.6)	
Incarcerated household member	Yes	360	16.3 (2.9)	1.55 (0.92, 2.59)
	No	7111	10.6 (0.6)	

Note: Model adjusted for age, sex, race/ethnicity, education, income.

**Age-adjusted prevalence and multivariable-adjusted relative odds of  $\geq 14$  activity limitation days by ACE score**

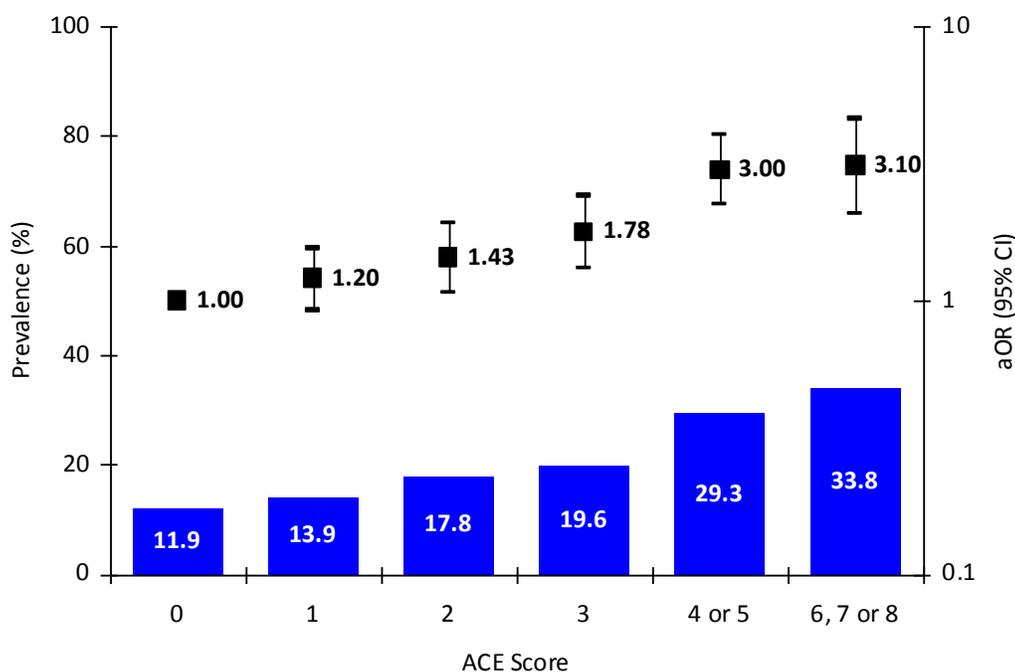


**Age-adjusted prevalence (%) and multivariable-adjusted relative odds of  $\geq 14$  unhealthy physical/mental days during the 30 days preceding the survey by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life**

ACE Category		N	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)
Physical abuse	Yes	1227	28.9 (1.7)	2.35 (1.90, 2.90)
	No	6244	14.6 (0.7)	
Sexual abuse	Yes	1024	27.9 (2.2)	1.88 (1.49, 2.37)
	No	6447	15.7 (0.7)	
Verbal abuse	Yes	2329	24.1 (1.3)	1.98 (1.64, 2.39)
	No	5142	13.9 (0.7)	
Household mental illness	Yes	1510	26.7 (1.5)	2.27 (1.85, 2.79)
	No	5961	14.3 (0.7)	
Household substance abuse	Yes	2228	22.5 (1.2)	1.61 (1.33, 1.93)
	No	5243	14.7 (0.7)	
Parents separated / divorced	Yes	1648	21.4 (1.2)	1.15 (0.93, 1.41)
	No	5823	16.0 (0.8)	
Witnessed domestic violence	Yes	1103	25.3 (1.7)	1.71 (1.36, 2.13)
	No	6368	15.7 (0.7)	
Incarcerated household member	Yes	360	26.2 (2.8)	1.33 (0.92, 1.93)
	No	7111	16.5 (0.6)	

Note: Model adjusted for age, sex, race/ethnicity, education, income.

**Age-adjusted prevalence and multivariable-adjusted relative odds of  $\geq 14$  unhealthy physical/mental days by ACE score**

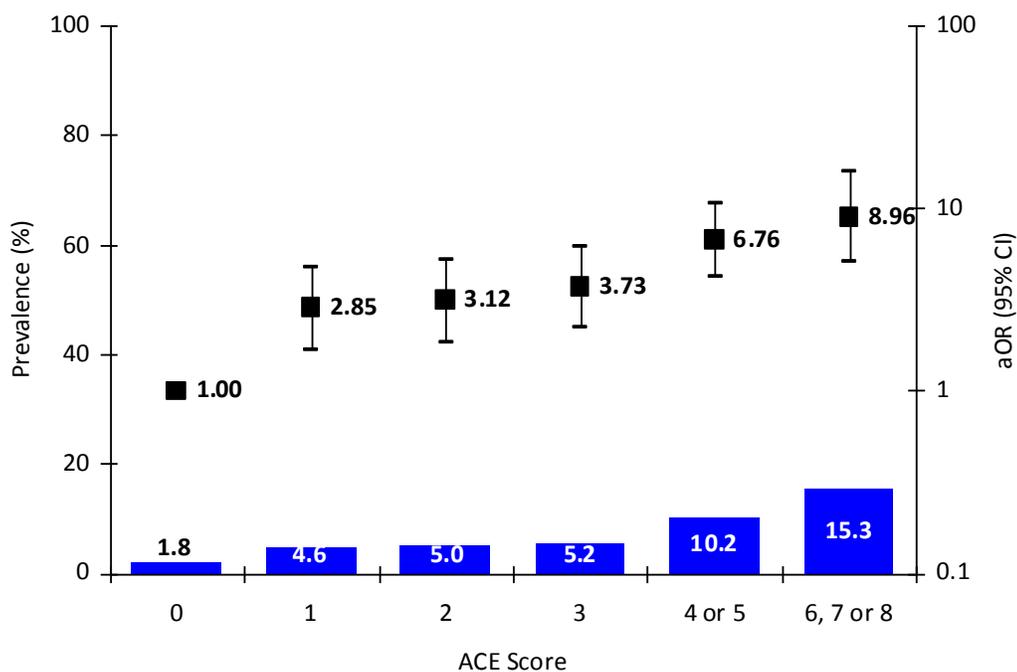


**Age-adjusted prevalence (%) and multivariable-adjusted relative odds of low life satisfaction by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life**

ACE Category		N	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)
Physical abuse	Yes	1227	11.4 (1.2)	3.07 (2.24, 4.21)
	No	6244	3.5 (0.3)	
Sexual abuse	Yes	1024	9.4 (1.3)	2.40 (1.68, 3.43)
	No	6447	4.3 (0.4)	
Verbal abuse	Yes	2329	9.0 (0.8)	3.43 (2.51, 4.67)
	No	5142	2.9 (0.3)	
Household mental illness	Yes	1510	8.9 (0.9)	2.85 (2.03, 3.99)
	No	5961	3.7 (0.4)	
Household substance abuse	Yes	2228	7.2 (0.7)	1.94 (1.42, 2.65)
	No	5243	3.8 (0.4)	
Parents separated / divorced	Yes	1648	6.9 (0.7)	1.37 (0.99, 1.89)
	No	5823	4.3 (0.4)	
Witnessed domestic violence	Yes	1103	8.7 (1.0)	2.07 (1.49, 2.88)
	No	6368	4.2 (0.4)	
Incarcerated household member	Yes	360	11.0 (1.9)	2.78 (1.66, 4.63)
	No	7111	4.4 (0.3)	

Note: Model adjusted for age, sex, race/ethnicity, education, income.

**Age-adjusted prevalence and multivariable-adjusted relative odds of low life satisfaction by ACE score**



**Crude and age-adjusted prevalence (%) and multivariable-adjusted relative odds of fair or poor general health status by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life, Washington BRFSS, 2009**

ACE Category	N	Prevalence of fair or poor health			
		Crude % (std err)	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)	
Overall	7471	13.0 (0.5)	12.7 (0.5)		
Physical abuse	Yes	1227	19.0 (1.5)	19.2 (1.4)	1.97 (1.55, 2.50)
	No	6244	11.8 (0.5)	11.2 (0.5)	1.00 (referent)
Sexual abuse	Yes	1024	17.7 (1.6)	16.8 (1.5)	1.60 (1.22, 2.08)
	No	6447	12.3 (0.5)	12.0 (0.5)	1.00
Verbal abuse	Yes	2329	16.1 (1.0)	17.0 (1.0)	1.97 (1.60, 2.43)
	No	5142	11.5 (0.5)	10.7 (0.6)	1.00
Household mental illness	Yes	1510	17.0 (1.3)	17.3 (1.2)	2.33 (1.84, 2.94)
	No	5961	11.8 (0.5)	11.0 (0.5)	1.00
Household substance abuse	Yes	2228	15.6 (1.0)	15.9 (1.0)	1.66 (1.34, 2.04)
	No	5243	11.9 (0.6)	11.1 (0.6)	1.00
Parents separated / divorced	Yes	1648	13.5 (1.0)	14.3 (0.9)	1.10 (0.88, 1.38)
	No	5823	12.9 (0.6)	12.2 (0.6)	1.00
Witnessed domestic violence	Yes	1103	19.5 (1.6)	19.9 (1.6)	2.06 (1.61, 2.65)
	No	6368	11.8 (0.5)	11.2 (0.5)	1.00
Incarcerated household member	Yes	360	20.2 (3.0)	22.2 (2.6)	2.08 (1.34, 3.22)
	No	7111	12.5 (0.5)	12.0 (0.5)	1.00
ACE score					
0	3004	11.0 (0.7)	9.6 (0.7)	1.00 (referent)	
1	1632	11.5 (1.1)	11.0 (1.2)	1.13 (0.85, 1.51)	
2	992	12.7 (1.3)	12.9 (1.3)	1.56 (1.15, 2.13)	
3	718	11.7 (1.3)	11.6 (1.3)	1.58 (1.13, 2.20)	
4 or 5	796	20.1 (1.9)	20.7 (1.9)	2.93 (2.13, 4.03)	
6, 7, 8	329	21.3 (3.0)	23.2 (2.9)	3.26 (2.07, 5.15)	
					p-for-trend < 0.001

Note: Model adjusted for age, sex, race/ethnicity, education, income.

**Crude and age-adjusted prevalence (%) and multivariable-adjusted relative odds of 14 or more unhealthy physical/mental days during the 30 days prior to the survey by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life, Washington BRFSS, 2009**

ACE Category	N	Prevalence of $\geq 14$ unhealthy physical/mental days			
		Crude % (std err)	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)	
Overall	7471	17.5 (0.6)	17.3 (0.6)		
Physical abuse	Yes	1227	29.9 (1.8)	28.9 (1.7)	2.35 (1.90, 2.90)
	No	6244	14.9 (0.6)	14.6 (0.7)	1.00 (referent)
Sexual abuse	Yes	1024	28.5 (2.0)	27.9 (2.2)	1.88 (1.49, 2.37)
	No	6447	15.9 (0.6)	15.7 (0.7)	1.00
Verbal abuse	Yes	2329	24.1 (1.3)	24.1 (1.3)	1.98 (1.64, 2.39)
	No	5142	14.1 (0.7)	13.9 (0.7)	1.00
Household mental illness	Yes	1510	26.9 (1.6)	26.7 (1.5)	2.27 (1.85, 2.79)
	No	5961	14.6 (0.6)	14.3 (0.7)	1.00
Household substance abuse	Yes	2228	22.8 (1.2)	22.5 (1.2)	1.61 (1.33, 1.93)
	No	5243	15.0 (0.7)	14.7 (0.7)	1.00
Parents separated / divorced	Yes	1648	21.1 (1.4)	21.4 (1.2)	1.15 (0.93, 1.41)
	No	5823	16.2 (0.7)	16.0 (0.8)	1.00
Witnessed domestic violence	Yes	1103	25.9 (1.9)	25.3 (1.7)	1.71 (1.36, 2.13)
	No	6368	15.9 (0.6)	15.7 (0.7)	1.00
Incarcerated household member	Yes	360	27.7 (3.6)	26.2 (2.8)	1.33 (0.92, 1.93)
	No	7111	16.7 (0.6)	16.5 (0.6)	1.00
ACE score					
0	3004	12.4 (0.8)	11.9 (0.9)	1.00 (referent)	
1	1632	14.4 (1.2)	13.9 (1.3)	1.20 (0.92, 1.55)	
2	992	17.9 (1.8)	17.8 (1.8)	1.43 (1.07, 1.92)	
3	718	19.5 (1.9)	19.6 (2.0)	1.78 (1.31, 2.41)	
4 or 5	796	29.7 (2.2)	29.3 (2.1)	3.00 (2.24, 4.02)	
6, 7, 8	329	34.5 (3.8)	33.8 (3.3)	3.10 (2.09, 4.61)	
					p-for-trend < 0.001

Note: Model adjusted for age, sex, race/ethnicity, education, income.

**Crude and age-adjusted prevalence (%) and multivariable-adjusted relative odds of 14 or more poor health days during the 30 days prior to the survey by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life, Washington BRFSS, 2009**

ACE Category	N	Prevalence of $\geq 14$ poor health days			
		Crude % (std err)	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)	
Overall	7471	11.2 (0.6)	11.3 (0.6)		
Physical abuse	Yes	1227	17.3 (1.6)	17.3 (1.5)	1.92 (1.44, 2.55)
	No	6244	9.5 (0.6)	9.5 (0.6)	1.00 (referent)
Sexual abuse	Yes	1024	17.6 (1.8)	17.0 (1.9)	1.77 (1.28, 2.44)
	No	6447	10.1 (0.6)	10.2 (0.6)	1.00
Verbal abuse	Yes	2329	13.9 (1.1)	14.7 (1.1)	1.81 (1.38, 2.38)
	No	5142	9.4 (0.7)	9.1 (0.7)	1.00
Household mental illness	Yes	1510	13.5 (1.2)	14.3 (1.2)	1.61 (1.20, 2.16)
	No	5961	10.3 (0.7)	9.9 (0.7)	1.00
Household substance abuse	Yes	2228	13.8 (1.1)	14.1 (1.1)	1.53 (1.16, 2.01)
	No	5243	9.8 (0.7)	9.6 (0.7)	1.00
Parents separated / divorced	Yes	1648	13.3 (1.3)	15.0 (1.3)	1.30 (0.97, 1.73)
	No	5823	10.4 (0.7)	10.0 (0.7)	1.00
Witnessed domestic violence	Yes	1103	15.0 (1.7)	15.7 (1.6)	1.44 (1.05, 1.97)
	No	6368	10.3 (0.6)	10.1 (0.6)	1.00
Incarcerated household member	Yes	360	15.1 (3.1)	16.3 (2.9)	1.55 (0.92, 2.59)
	No	7111	10.9 (0.6)	10.6 (0.6)	1.00
ACE score					
0	3004	9.4 (1.0)	8.7 (1.0)	1.00 (referent)	
1	1632	8.3 (1.0)	8.2 (1.0)	0.89 (0.60, 1.33)	
2	992	8.9 (1.2)	9.1 (1.2)	1.07 (0.70, 1.65)	
3	718	12.1 (1.7)	12.0 (1.8)	1.54 (0.98, 2.41)	
4 or 5	796	17.0 (2.0)	18.5 (2.0)	2.36 (1.53, 3.66)	
6, 7, 8	329	19.3 (3.3)	20.7 (3.4)	2.55 (1.47, 4.39)	
					p-for-trend < 0.001

Note: Model adjusted for age, sex, race/ethnicity, education, income.

**Crude and age-adjusted prevalence (%) and multivariable-adjusted relative odds of 14 or more unhealthy mental days during the 30 days prior to the survey by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life, Washington BRFSS, 2009**

ACE Category	N	Prevalence of $\geq 14$ unhealthy mental days			
		Crude % (std err)	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)	
Overall	7471	9.8 (0.5)	9.8 (0.5)		
Physical abuse	Yes	1227	19.5 (1.6)	18.4 (1.5)	2.61 (2.02, 3.38)
	No	6244	7.8 (0.5)	7.8 (0.5)	1.00 (referent)
Sexual abuse	Yes	1024	18.4 (1.8)	18.6 (2.0)	2.18 (1.63, 2.91)
	No	6447	8.5 (0.5)	8.5 (0.5)	1.00
Verbal abuse	Yes	2329	15.2 (1.1)	14.5 (1.1)	2.19 (1.73, 2.79)
	No	5142	7.1 (0.5)	7.1 (0.5)	1.00
Household mental illness	Yes	1510	17.6 (1.4)	16.8 (1.3)	2.50 (1.94, 3.22)
	No	5961	7.4 (0.5)	7.4 (0.5)	1.00
Household substance abuse	Yes	2228	13.6 (1.0)	13.0 (1.0)	1.58 (1.24, 2.00)
	No	5243	8.0 (0.5)	8.1 (0.6)	1.00
Parents separated / divorced	Yes	1648	12.2 (1.1)	11.9 (1.0)	1.07 (0.82, 1.38)
	No	5823	8.9 (0.5)	9.1 (0.6)	1.00
Witnessed domestic violence	Yes	1103	16.7 (1.6)	15.7 (1.4)	1.89 (1.44, 2.48)
	No	6368	8.5 (0.5)	8.5 (0.5)	1.00
Incarcerated household member	Yes	360	20.7 (3.4)	17.8 (2.5)	1.57 (1.02, 2.42)
	No	7111	9.0 (0.5)	9.0 (0.5)	1.00
ACE score					
0	3004	5.8 (0.6)	5.8 (0.7)	1.00 (referent)	
1	1632	6.7 (0.8)	6.6 (0.8)	1.21 (0.85, 1.74)	
2	992	10.7 (1.6)	10.6 (1.6)	1.70 (1.14, 2.53)	
3	718	12.5 (1.7)	12.6 (1.8)	2.16 (1.45, 3.21)	
4 or 5	796	18.9 (1.9)	17.6 (1.7)	3.40 (2.34, 4.95)	
6, 7, 8	329	23.0 (3.4)	20.6 (2.5)	3.33 (2.08, 5.33)	
				p-for-trend < 0.001	

Note: Model adjusted for age, sex, race/ethnicity, education, income.

**Crude and age-adjusted prevalence (%) and multivariable-adjusted relative odds of 14 or more unhealthy physical days during the 30 days prior to the survey by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life, Washington BRFSS, 2009**

ACE Category	N	Prevalence of $\geq 14$ unhealthy physical days			
		Crude % (std err)	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)	
Overall	7471	9.9 (0.4)	9.7 (0.5)		
Physical abuse	Yes	1227	16.7 (1.3)	16.6 (1.3)	2.15 (1.68, 2.74)
	No	6244	8.5 (0.5)	8.2 (0.5)	1.00 (referent)
Sexual abuse	Yes	1024	16.4 (1.5)	15.7 (1.6)	1.77 (1.35, 2.32)
	No	6447	9.1 (0.5)	8.8 (0.5)	1.00
Verbal abuse	Yes	2329	12.6 (0.9)	13.0 (0.9)	1.70 (1.36, 2.13)
	No	5142	8.6 (0.5)	8.2 (0.5)	1.00
Household mental illness	Yes	1510	13.4 (1.0)	14.0 (1.0)	1.91 (1.50, 2.43)
	No	5961	8.9 (0.5)	8.4 (0.5)	1.00
Household substance abuse	Yes	2228	12.5 (0.8)	12.6 (0.9)	1.57 (1.27, 1.96)
	No	5243	8.8 (0.5)	8.4 (0.5)	1.00
Parents separated / divorced	Yes	1648	11.9 (0.9)	12.8 (0.9)	1.32 (1.04, 1.67)
	No	5823	9.3 (0.5)	8.8 (0.5)	1.00
Witnessed domestic violence	Yes	1103	14.3 (1.3)	14.6 (1.3)	1.65 (1.27, 2.13)
	No	6368	9.1 (0.5)	8.8 (0.5)	1.00
Incarcerated household member	Yes	360	12.3 (2.2)	14.7 (2.2)	1.28 (0.82, 2.00)
	No	7111	9.8 (0.5)	9.4 (0.5)	1.00
ACE score					
0	3004	8.0 (0.7)	7.5 (0.7)	1.00 (referent)	
1	1632	8.8 (1.0)	8.5 (1.1)	1.14 (0.84, 1.56)	
2	992	8.8 (1.0)	8.7 (0.9)	1.27 (0.91, 1.77)	
3	718	9.4 (1.1)	9.0 (1.1)	1.44 (1.00, 2.06)	
4 or 5	796	15.7 (1.6)	16.3 (1.6)	2.49 (1.76, 3.54)	
6, 7, 8	329	19.4 (2.7)	22.7 (2.8)	3.03 (1.93, 4.77)	
					p-for-trend < 0.001

Note: Model adjusted for age, sex, race/ethnicity, education, income.

## **ACEs and Disability**

As noted above, the ACE Study has demonstrated associations between ACEs and a wide range of health behaviors and health outcomes associated with an increased risk of morbidity and mortality. Using measures developed by those in public health focused on improving the health of people who have a disability at the state level and nationally, we examined associations between ACEs and a general measure of disability.

Overall, an estimated 6.6% of Washington adults reported a health problem requiring use of special equipment. The prevalence of such health problems was increased in the presence of each of the component ACEs, and a strong graded relationship was observed across the ACE score. Compared to adults reporting zero ACEs, the age-adjusted prevalence of health problems requiring special equipment was increased 3-fold for those with 6 or more ACEs, from 5% to 15%. Similarly strong relationships were observed between ACEs and the presence of activity limitation due to physical, mental or emotional problems.

### **Variable definitions**

**Activity limitations due to a health problem** defined by a positive response to the question, “Are you limited in any way in any activities because of physical, mental, or emotional problems?”

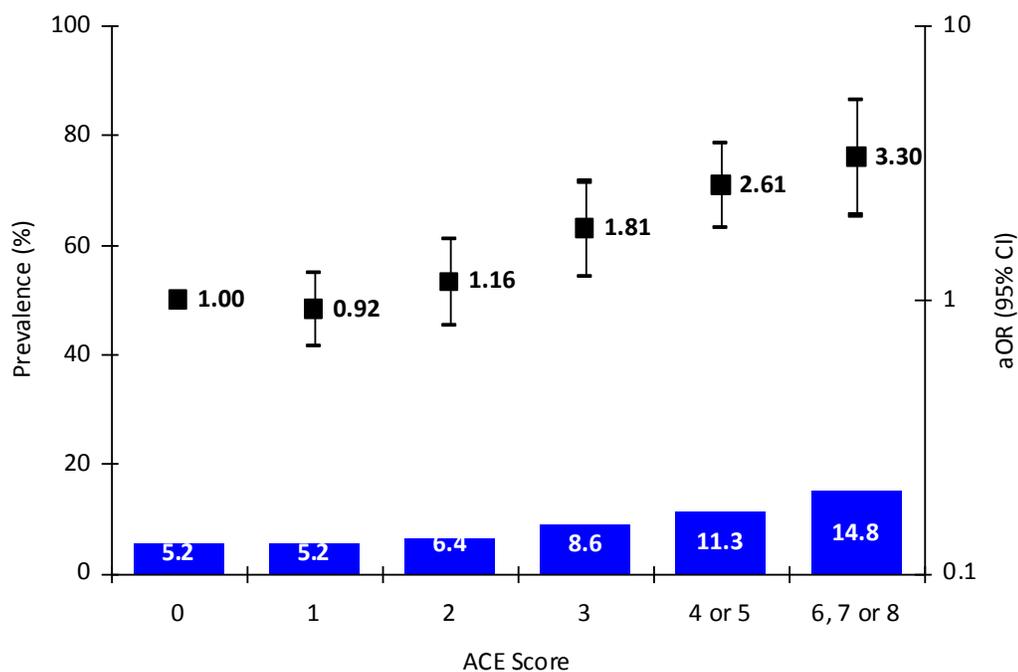
**Use of special equipment** defined by a positive response to the question, “Do you now have any health problem that requires you to use special equipment, such as a cane, a wheelchair, a special bed, or a special telephone?”

**Age-adjusted prevalence (%) and multivariable-adjusted relative odds of health problems requiring special equipment use by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life**

<b>ACE Category</b>		<b>N</b>	<i>Age-adjusted</i> <b>% (std err)</b>	<b>Multivariable-adjusted</b> <b>OR (95% CI)</b>
Physical abuse	Yes	1227	10.6 (0.9)	1.84 (1.41, 2.39)
	No	6244	5.9 (0.3)	
Sexual abuse	Yes	1024	11.7 (1.5)	2.11 (1.58, 2.82)
	No	6447	6.0 (0.3)	
Verbal abuse	Yes	2329	9.1 (0.7)	1.82 (1.44, 2.31)
	No	5142	5.6 (0.3)	
Household mental illness	Yes	1510	10.0 (0.9)	2.40 (1.85, 3.10)
	No	5961	5.5 (0.3)	
Household substance abuse	Yes	2228	8.0 (0.6)	1.37 (1.08, 1.73)
	No	5243	6.1 (0.4)	
Parents separated / divorced	Yes	1648	8.6 (0.7)	1.33 (1.03, 1.72)
	No	5823	6.1 (0.4)	
Witnessed domestic violence	Yes	1103	10.2 (1.0)	2.16 (1.62, 2.87)
	No	6368	6.0 (0.3)	
Incarcerated household member	Yes	360	12.1 (1.7)	1.94 (1.26, 2.98)
	No	7111	6.4 (0.3)	

Note: Model adjusted for age, sex, race/ethnicity, education, income.

**Age-adjusted prevalence and multivariable-adjusted relative odds of health problems requiring special equipment use by ACE score**

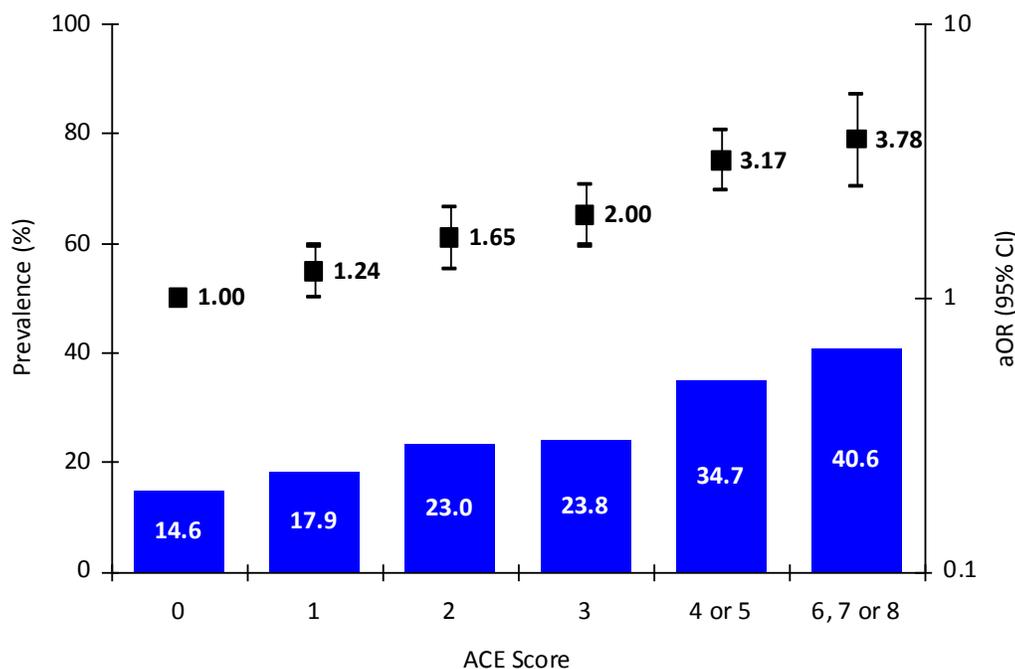


**Age-adjusted prevalence (%) and multivariable-adjusted relative odds of activity limitation due to health problems by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life**

ACE Category		N	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)
Physical abuse	Yes	1227	32.3 (1.8)	1.95 (1.61, 2.37)
	No	6244	18.8 (0.6)	
Sexual abuse	Yes	1024	34.6 (2.2)	2.03 (1.65, 2.49)
	No	6447	19.3 (0.6)	
Verbal abuse	Yes	2329	29.3 (1.2)	2.14 (1.81, 2.53)
	No	5142	17.1 (0.7)	
Household mental illness	Yes	1510	32.8 (1.5)	2.44 (2.03, 2.94)
	No	5961	17.3 (0.6)	
Household substance abuse	Yes	2228	26.3 (1.2)	1.49 (1.26, 1.77)
	No	5243	18.7 (0.7)	
Parents separated / divorced	Yes	1648	25.5 (1.3)	1.27 (1.06, 1.53)
	No	5823	19.6 (0.7)	
Witnessed domestic violence	Yes	1103	30.0 (1.6)	1.82 (1.49, 2.23)
	No	6368	19.4 (0.7)	
Incarcerated household member	Yes	360	34.9 (2.9)	2.17 (1.51, 3.11)
	No	7111	20.1 (0.6)	

Note: Model adjusted for age, sex, race/ethnicity, education, income.

**Age-adjusted prevalence and multivariable-adjusted relative odds of activity limitation due to health problems by ACE score**



**Crude and age-adjusted prevalence (%) and multivariable-adjusted relative odds of health problems requiring special equipment use by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life, Washington BRFSS, 2009**

ACE Category	N	Prevalence of health problems requiring special equipment use			
		Crude % (std err)	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)	
Overall	7471	7.0 (0.3)	6.6 (0.3)		
Physical abuse	Yes	1227	9.7 (0.9)	10.6 (0.9)	1.84 (1.41, 2.39)
	No	6244	6.4 (0.3)	5.9 (0.3)	1.00 (referent)
Sexual abuse	Yes	1024	11.6 (1.3)	11.7 (1.5)	2.11 (1.58, 2.82)
	No	6447	6.3 (0.3)	6.0 (0.3)	1.00
Verbal abuse	Yes	2329	7.8 (0.6)	9.1 (0.7)	1.82 (1.44, 2.31)
	No	5142	6.5 (0.4)	5.6 (0.3)	1.00
Household mental illness	Yes	1510	8.9 (0.8)	10.0 (0.9)	2.40 (1.85, 3.10)
	No	5961	6.4 (0.3)	5.5 (0.3)	1.00
Household substance abuse	Yes	2228	7.3 (0.6)	8.0 (0.6)	1.37 (1.08, 1.73)
	No	5243	6.8 (0.4)	6.1 (0.4)	1.00
Parents separated / divorced	Yes	1648	7.3 (0.7)	8.6 (0.7)	1.33 (1.03, 1.72)
	No	5823	6.9 (0.4)	6.1 (0.4)	1.00
Witnessed domestic violence	Yes	1103	9.3 (1.0)	10.2 (1.0)	2.16 (1.62, 2.87)
	No	6368	6.5 (0.3)	6.0 (0.3)	1.00
Incarcerated household member	Yes	360	7.7 (1.4)	12.1 (1.7)	1.94 (1.26, 2.98)
	No	7111	6.9 (0.3)	6.4 (0.3)	1.00
ACE score					
0	3004	6.5 (0.5)	5.2 (0.5)	1.00 (referent)	
1	1632	5.8 (0.6)	5.2 (0.5)	0.92 (0.68, 1.25)	
2	992	5.9 (0.8)	6.4 (0.8)	1.16 (0.81, 1.66)	
3	718	7.8 (1.1)	8.6 (1.3)	1.81 (1.21, 2.70)	
4 or 5	796	9.3 (1.1)	11.3 (1.3)	2.61 (1.83, 3.73)	
6, 7, 8	329	10.6 (1.9)	14.8 (2.4)	3.30 (2.03, 5.38)	
					p-for-trend < 0.001

Note: Model adjusted for age, sex, race/ethnicity, education, income.

**Crude and age-adjusted prevalence (%) and multivariable-adjusted relative odds of activity limitation due to health problems by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life, Washington BRFSS, 2009**

ACE Category	N	Crude prevalence % (std err)	Age-adjusted prevalence % (std err)	Multivariable adjusted OR (95% CI)
Overall	7471	21.9 (0.6)	21.2 (0.6)	
Physical abuse				
Yes	1227	32.0 (1.8)	32.3 (1.8)	1.95 (1.61, 2.37)
No	6244	19.9 (0.6)	18.8 (0.6)	1.00 (referent)
Sexual abuse				
Yes	1024	35.8 (2.0)	34.6 (2.2)	2.03 (1.65, 2.49)
No	6447	20.0 (0.6)	19.3 (0.6)	1.00
Verbal abuse				
Yes	2329	28.8 (1.2)	29.3 (1.2)	2.14 (1.81, 2.53)
No	5142	18.5 (0.7)	17.1 (0.7)	1.00
Household mental illness				
Yes	1510	31.7 (1.6)	32.8 (1.5)	2.44 (2.03, 2.94)
No	5961	18.9 (0.6)	17.3 (0.6)	1.00
Household substance abuse				
Yes	2228	26.1 (1.2)	26.3 (1.2)	1.49 (1.26, 1.77)
No	5243	20.0 (0.7)	18.7 (0.7)	1.00
Parents separated / divorced				
Yes	1648	23.9 (1.4)	25.5 (1.3)	1.27 (1.06, 1.53)
No	5823	21.3 (0.7)	19.6 (0.7)	1.00
Witnessed domestic violence				
Yes	1103	29.8 (1.8)	30.0 (1.6)	1.82 (1.49, 2.23)
No	6368	20.5 (0.7)	19.4 (0.7)	1.00
Incarcerated household member				
Yes	360	31.3 (3.5)	34.9 (2.9)	2.17 (1.51, 3.11)
No	7111	21.3 (0.6)	20.1 (0.6)	1.00
ACE score				
0	3004	16.8 (0.8)	14.6 (0.8)	1.00 (referent)
1	1632	19.1 (1.2)	17.9 (1.2)	1.24 (1.00, 1.55)
2	992	22.6 (1.8)	23.0 (1.8)	1.65 (1.28, 2.14)
3	718	25.2 (1.9)	23.8 (1.8)	2.00 (1.55, 2.58)
4 or 5	796	32.8 (2.1)	34.7 (2.0)	3.17 (2.46, 4.08)
6, 7, 8	329	37.5 (3.9)	40.6 (3.6)	3.78 (2.56, 5.57)
				p-for-trend < 0.001

Note: Model adjusted for age, sex, race/ethnicity, education, income.

## ACEs and Social Problems

Research on social support has demonstrated an association between weak social networks and adverse health outcomes. Several prospective population-based studies have shown increased mortality from all causes in persons with few social ties. Research has shown divorce, and the separation process more generally, to have long-term negative consequences for health. During 2007, there were an estimated 4.0 divorces per 1000 population in Washington, slightly higher than for the US overall (3.5 per 1000) [1].

About 6% of Washington adults were lacking needed social or emotional support during 2009. Lack of support was associated with some, although not all, of the ACE categories. Compared to those with an ACE score of zero, adults with a score of 6 or more were more than twice as likely to report lacking social or emotional support.

One in ten adults were separated or divorced at the time of the survey. Those who reported growing up in a household where the parents were separated or divorced were 20% more likely to be separated or divorced themselves (aOR=1.22; 95%CI=0.99, 1.52) and those who were physically abused were 88% more likely to be divorced or separated (aOR=1.88; 95%CI=1.51, 2.32). The prevalence of separation or divorce ranged from 7% among those with an ACE score of zero to 17% among those with a score of 6 or more with a strong, graded increase in the relative risk of divorce or separation with increasing ACE score.

### Variable definitions

**Lacking social/emotional support** was defined by a response of "rarely" or "never" to the question "How often do you get the social and emotional support you need?"

**Separation or divorce** defined by a positive response of "Divorced" or "Separated" to a question on current marital status.

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### References

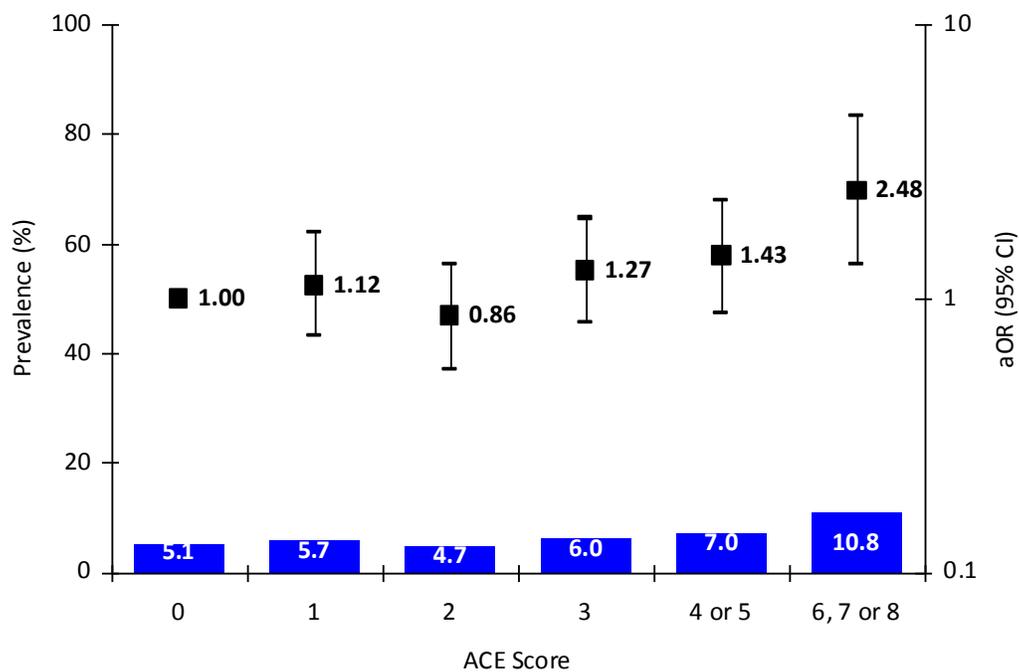
1. Tejada-Vera B, Sutton PD. Births, marriages, divorces, and deaths: Provisional data for 2008. National vital statistics reports; vol 57, no 19. Hyattsville, MD: National Center for Health Statistics. 2009.

**Age-adjusted prevalence (%) and multivariable-adjusted relative odds of lacking social/emotional support by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life**

ACE Category		N	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)
Physical abuse	Yes	1227	9.7 (1.2)	1.81 (1.30, 2.51)
	No	6244	5.0 (0.4)	
Sexual abuse	Yes	1024	7.1 (11.8)	1.60 (1.06, 2.43)
	No	6447	5.6 (4.2)	
Verbal abuse	Yes	2329	6.9 (0.7)	1.58 (1.17, 2.12)
	No	5142	5.2 (0.5)	
Household mental illness	Yes	1510	6.9 (0.8)	1.44 (1.02, 2.04)
	No	5961	5.5 (0.5)	
Household substance abuse	Yes	2228	6.5 (0.7)	1.16 (0.86, 1.57)
	No	5243	5.5 (0.5)	
Parents separated / divorced	Yes	1648	6.5 (0.7)	1.03 (0.75, 1.42)
	No	5823	5.7 (0.5)	
Witnessed domestic violence	Yes	1103	8.4 (1.2)	1.40 (0.97, 2.01)
	No	6368	5.3 (0.4)	
Incarcerated household member	Yes	360	10.0 (2.0)	1.59 (0.89, 2.85)
	No	7111	5.5 (0.4)	

Note: Model adjusted for age, sex, race/ethnicity, education, income.

**Age-adjusted prevalence and multivariable-adjusted relative odds of lacking social/emotional support by ACE score**

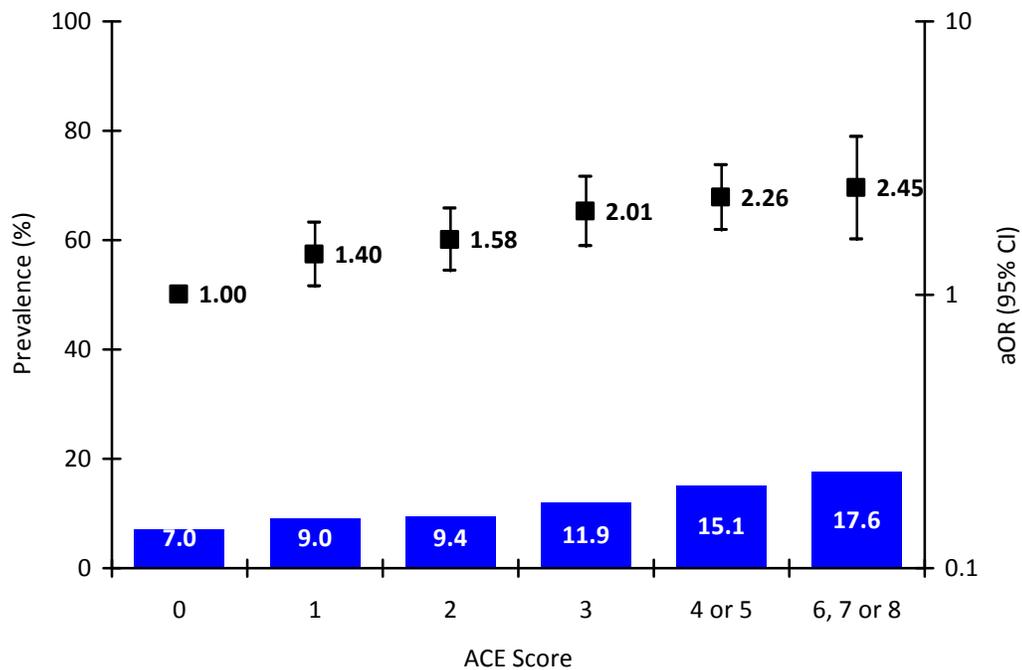


**Age-adjusted prevalence (%) and multivariable-adjusted relative odds of separation or divorce by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life**

ACE Category		N	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)
Physical abuse	Yes	1227	15.6 (1.2)	1.88(1.51, 2.32)
	No	6244	8.3 (0.4)	
Sexual abuse	Yes	1024	14.4 (1.5)	1.59 (1.26, 2.00)
	No	6447	9.0 (0.4)	
Verbal abuse	Yes	2329	12.4 (0.8)	1.56 (1.29, 1.88)
	No	5142	8.3 (0.4)	
Household mental illness	Yes	1510	12.4 (0.8)	1.41 (1.13, 1.75)
	No	5961	8.9 (0.4)	
Household substance abuse	Yes	2228	12.5 (0.8)	1.59 (1.31, 1.95)
	No	5243	8.3 (0.4)	
Parents separated / divorced	Yes	1648	12.3 (0.9)	1.22 (0.99, 1.52)
	No	5823	8.9 (0.4)	
Witnessed domestic violence	Yes	1103	14.1 (1.2)	1.56 (1.24, 1.96)
	No	6368	8.9 (0.4)	
Incarcerated household member	Yes	360	15.3 (2.0)	1.39 (0.94, 2.07)
	No	7111	9.2 (0.4)	

Note: Model adjusted for age, sex, race/ethnicity, education, income.

**Age-adjusted prevalence and multivariable-adjusted relative odds of separation or divorce by ACE score**



**Crude and age-adjusted prevalence (%) and multivariable-adjusted relative odds of lacking social/emotional support by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life, Washington BRFSS, 2009**

ACE Category	N	Prevalence of lack of social/emotional support			
		Crude % (std err)	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)	
Overall	7471	5.8 (0.4)	5.9 (0.4)		
Physical abuse	Yes	1227	9.5 (1.2)	9.7 (1.2)	1.81 (1.30, 2.51)
	No	6244	5.1 (0.4)	5.0 (0.4)	1.00 (referent)
Sexual abuse	Yes	1024	7.3 (1.1)	7.1 (11.8)	1.60 (1.06, 2.43)
	No	6447	5.6 (0.4)	5.6 (4.2)	1.00
Verbal abuse	Yes	2329	6.9 (0.7)	6.9 (0.7)	1.58 (1.17, 2.12)
	No	5142	5.3 (0.4)	5.2 (0.5)	1.00
Household mental illness	Yes	1510	6.8 (0.9)	6.9 (0.8)	1.44 (1.02, 2.04)
	No	5961	5.5 (0.4)	5.5 (0.5)	1.00
Household substance abuse	Yes	2228	6.6 (0.7)	6.5 (0.7)	1.16 (0.86, 1.57)
	No	5243	5.5 (0.5)	5.5 (0.5)	1.00
Parents separated / divorced	Yes	1648	6.3 (0.7)	6.5 (0.7)	1.03 (0.75, 1.42)
	No	5823	5.7 (0.4)	5.7 (0.5)	1.00
Witnessed domestic violence	Yes	1103	8.3 (1.2)	8.4 (1.2)	1.40 (0.97, 2.01)
	No	6368	5.4 (0.4)	5.3 (0.4)	1.00
Incarcerated household member	Yes	360	9.7 (2.1)	10.0 (2.0)	1.59 (0.89, 2.85)
	No	7111	5.6 (0.4)	5.5 (0.4)	1.00
ACE score					
0	3004	5.1 (0.6)	5.1 (0.7)	1.00 (referent)	
1	1632	5.8 (0.8)	5.7 (0.9)	1.12 (0.73, 1.74)	
2	992	4.3 (0.7)	4.7 (0.7)	0.86 (0.55, 1.34)	
3	718	6.1 (1.1)	6.0 (1.2)	1.27 (0.82, 1.97)	
4 or 5	796	7.1 (1.2)	7.0 (1.2)	1.43 (0.89, 2.29)	
6, 7, 8	329	11.5 (2.5)	10.8 (2.2)	2.48 (1.33, 4.65)	
				p-for-trend = 0.012	

Note: Model adjusted for age, sex, race/ethnicity, education, income.

**Crude and age-adjusted prevalence (%) and multivariable-adjusted relative odds of separation or divorce by eight categories of adverse childhood experiences (ACEs) during the first 18 years of life, Washington BRFSS, 2009**

ACE Category	N	Prevalence of lack of separation or divorce			
		Crude % (std err)	Age-adjusted % (std err)	Multivariable-adjusted OR (95% CI)	
Overall	7471	10.1 (0.4)	9.7 (0.4)		
Physical abuse	Yes	1227	16.3 (1.3)	15.6 (1.2)	1.88(1.51, 2.32)
	No	6244	8.8 (0.4)	8.3 (0.4)	1.00 (referent)
Sexual abuse	Yes	1024	15.8 (1.3)	14.4 (1.5)	1.59 (1.26, 2.00)
	No	6447	9.3 (0.4)	9.0 (0.4)	1.00
Verbal abuse	Yes	2329	12.8 (0.8)	12.4 (0.8)	1.56 (1.29, 1.88)
	No	5142	8.7 (0.4)	8.3 (0.4)	1.00
Household mental illness	Yes	1510	12.2 (0.9)	12.4 (0.8)	1.41 (1.13, 1.75)
	No	5961	9.4 (0.4)	8.9 (0.4)	1.00
Household substance abuse	Yes	2228	12.8 (0.8)	12.5 (0.8)	1.59 (1.31, 1.95)
	No	5243	8.8 (0.4)	8.3 (0.4)	1.00
Parents separated / divorced	Yes	1648	11.4 (0.9)	12.3 (0.9)	1.22 (0.99, 1.52)
	No	5823	9.6 (0.4)	8.9 (0.4)	1.00
Witnessed domestic violence	Yes	1103	14.1 (1.3)	14.1 (1.2)	1.56 (1.24, 1.96)
	No	6368	9.3 (0.4)	8.9 (0.4)	1.00
Incarcerated household member	Yes	360	13.1 (2.2)	15.3 (2.0)	1.39 (0.94, 2.07)
	No	7111	9.9 (0.4)	9.2 (0.4)	1.00
ACE score					
0	3004	7.5 (0.5)	7.0 (0.5)	1.00 (referent)	
1	1632	9.5 (0.9)	9.0 (0.9)	1.40 (1.07, 1.83)	
2	992	9.8 (0.9)	9.4 (0.9)	1.58 (1.22, 2.06)	
3	718	12.6 (1.4)	11.9 (1.5)	2.01 (1.50, 2.69)	
4 or 5	796	14.9 (1.4)	15.1 (1.4)	2.26 (1.72, 2.97)	
6, 7, 8	329	16.2 (2.6)	17.6 (2.2)	2.45 (1.59, 3.77)	
				p-for-trend < 0.001	

Note: Model adjusted for age, sex, race/ethnicity, education, income.

## Chapter 10

### Population Attributable Risk (PAR) Percent

Policymakers are often confronted with community-level decisions about which risk factors to target in order to have the maximum impact on the public health of their citizens. The population attributable risk percent (PAR%) is often used to inform such decisions regarding allocation of resources for prevention. If the PAR% is high, “an argument can be made that directing resources towards modifying or eliminating the [exposure] (or the factors it interacts with to produce the [outcome]) might be a better investment than trying to identify other causal pathways leading to the same [outcome] (p202).”<sup>1</sup>

The population attributable risk (PAR) (or population attributable fraction as first introduced by Levin, 1953<sup>2</sup>) expresses the proportion of an outcome in the population that would be eliminated if a risk factor was eliminated. The population attributable fraction takes into account both the strength of the association between the exposure and the outcome and the prevalence of a risk factor in the population.

To determine the possible impact of the observed risk of ACEs to the Washington population, it is possible to compute the population attributable risk by combining the risk of an outcome associated with ACEs with the prevalence of exposure to ACEs. Using the estimated odds ratios for each level of ACE exposure, we compute the attributable risk (or attributable fraction) as (OR-1)/OR for each level of the ACE score for a given outcome. Then, by multiplying this number by the prevalence of each ACE score level in Washington, we estimate the population attributable risk, or the proportion of the total number of cases observed that might be due to ACE exposure. Thus, the formula for a polytomous exposure, where the population prevalence of the exposure is (p) and the relative risk associated with the exposure is (r), is as follows:  $PAR\% = [ p_1(r_1-1) + p_2(r_2-1) + p_k(r_k-1) ] / [ 1 + ( p_1(r_1-1) + p_2(r_2-1) + p_k(r_k-1) ) ] \times 100\%$ .<sup>3</sup> The PAR% for a dichotomous exposure is:  $PAR\% = (p(r-1)/(1+p(r-1))) \times 100\%$ .

Table 1 displays the PAR% values for ACEs and select health behaviors and outcomes previously described. The population prevalence of ACEs assumed in the calculation are 21%-ACE score of 1, 14%-ACE score of 2, 10%-ACE score of 3, 12%-ACE score of 4 or 5, 5%-ACE score of  $\geq 6$  from Table 1 in Chapter 8. PAR% values range from 21% for heavy drinking to 67% for life dissatisfaction. What does this imply? Using the case of life dissatisfaction, assuming a causal relationship between ACEs and life dissatisfaction and the statistical models of the association are correct, if the causal actions of ACEs were to be removed or blocked, the occurrence of life dissatisfaction would diminish by 67% in Washington.

It is important to remember that the PAR% is influenced by the prevalence of the exposure. That is to say, the more common a exposure associated with a given outcome, the greater the amount or proportion of that outcome it will be responsible for.<sup>1</sup> Therefore, the PAR% may not accurately characterize different populations if the prevalence of exposure differs between the populations even if the risk of the outcome associated with the exposure is similar.

It is also important to remember that a given event (e.g., lifetime use of marijuana or life dissatisfaction, etc) can be caused by more than one causal mechanism and every causal mechanism may involve the interaction of multiple component causes.<sup>4</sup> When considering attributable risk, we must avoid falling into the trap of thinking that every event has a single cause and that two causes cannot contribute to the occurrence of the same event.<sup>4</sup> This would be false and might lead one to believe that the attributable risks for a given event must sum to 100% when in fact attributable risks may sum to more than 100% because two causes can interact and contribute to the same case.

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**Table 1. Population attributable risk percent for ACEs and select health behaviors or outcomes, Washington BRFSS, 2009**

<i>Health behavior or outcome</i>	<b>Population attributable risk (PAR) percent</b>
<b>Risk factors</b>	
Tobacco, lifetime smoking	28.0%
Tobacco, current smoking	36.7%
Alcohol, heavy drinking	21.3%
Alcohol, binge drinking	32.5%
Drugs, lifetime marijuana use	54.3%
Drugs, childhood initiation of marijuana	51.2%
High risk for HIV	58.9%
<b>Chronic disease</b>	
Cardiovascular disease	25.5%
Cancer	24.3%
Asthma	22.2%
<b>Poor mental health</b>	
Insufficient sleep (30 days)	29.5%
Frequent mental distress	39.9%
≥14 days of disturbed work/activity due to a mental health condition(s)	61.4%
Medical treatment or pharmacotherapy for a mental health condition(s)	42.7%
Anxiety	55.7%
Hopelessness	42.5%
<b>General health</b>	
Fair or poor health	33.7%
≥14 unhealthy physical or mental days	34.4%
Life dissatisfaction	67.2%
Health problem that requires special medical equipment	28.3%
Health problem that limits your daily activity	39.1%
Separation or divorce	32.9%

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## Chapter 11

### Summary and Suggestions

#### The Scope of the Problem

Adverse childhood experiences have a strong and cumulative impact on the health and functioning of adults in Washington. It is important to note that these effects extend beyond what is measured in the BRFSS. Inclusion of other important health-related or social issues in future questionnaires along with the ACE module will further define the scope of the problem.

#### Co-morbidity

This report describes the effects of ACEs one problem at a time. More in depth analysis would show how ACE-related problems tend to effect people in multiple ways. Some who review this type of information view persons with high ACE Scores who do not have the single outcome being measured view this as a sign of resilience. However, by looking at the relationship of ACEs to the number of health and social problems, you would likely find that the average number of problems rises along with their Scores. This phenomenon has been described in the Kaiser-CDC ACE Study (see Figure below); in this example 18 different health and social problems were considered.<sup>1</sup> Persons with 7-8 ACEs averaged about 4.5 of these problems compared to 1.5 for those with an ACE Score of 0—a tripling of co-morbidity.

This type of approach to the BRFSS data would yield *a more complete understanding of the variety of negative effects of ACEs on the lives of persons surveyed.*

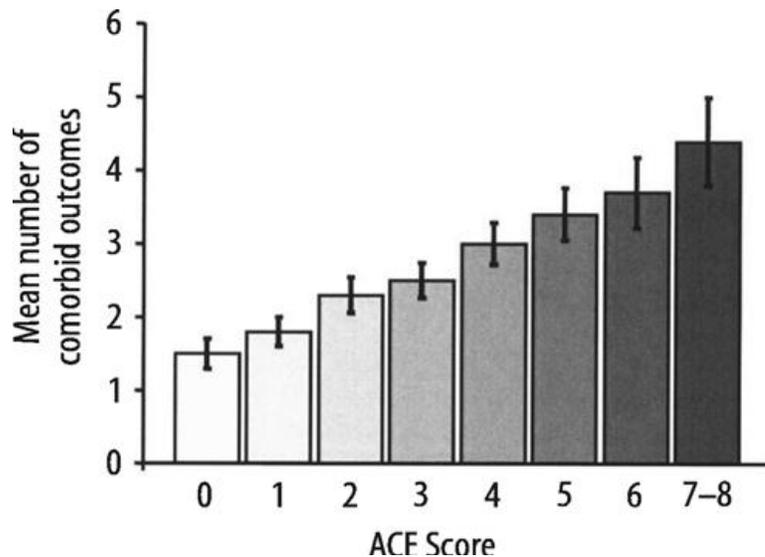


Figure. The mean number of comorbid outcomes in the study sample was 2.1 (range: 0–14); means are adjusted for age, sex, race, and educational attainment. Data are from the Kaiser-CDC ACE Study. The trend in the means is significant ( $P < 0.0001$ ); vertical error bars represent 95% confidence intervals

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### **Potential for Prevention--PARs**

Population attributable risks (PARs) are presented in Chapter 10. The percentage of health and social problems attributable to ACEs is very large—ranging from 21% for heavy drinking to 67% for life dissatisfaction. Nearly 60% of persons at high risk for infection with human immunodeficiency virus (HIV) have their risk generated by childhood adversity. PARs in this range are rare in public health, but are common in the study of ACEs. Prevention and treatment of ACEs has huge potential for improving health and well-being.