The Influence of Adverse Childhood Experiences on the Health of Wisconsin Citizens in Adulthood

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Acknowledgments

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Research has linked adults' reports of adverse childhood experiences (ACEs) to a number of negative consequences in adulthood. The original ACE study, conducted by Robert F. Anda, MD, MS and Vincent J. Felitti, MD between 1995 and 1997, was the first large-scale study to establish the relationship between ACEs and adult health and well-being. Following the original study, the Centers for Disease Control and Prevention worked with Drs. Anda and Felitti to develop ACE questions for individual states to use in their Behavioral Risk Factor Surveys. In 2010, the Wisconsin Child Abuse and Neglect Prevention Board, Children's Hospital of Wisconsin Community Services, the Wisconsin Department of Health Services and the Wisconsin Department of Children and Families funded the addition of the ACE module to the Wisconsin Behavioral Risk Factor Survey. The 2012 report, "Adverse Childhood Experiences in Wisconsin: Findings from the 2010 Behavioral Risk Factor Survey" revealed that ACEs are common in Wisconsin and that there is a relationship between ACEs and poor adult health and well-being among Wisconsinites. A second report titled "Wisconsin ACE Brief: 2011 and 2012 Data" focused on the relationship between sociodemographic differences and ACE scores. This current brief, utilizing the findings from the cumulative data of 2011, 2012 and 2013, confirms the relationship between ACEs among Wisconsin adults and various aspects of poor mental and physical health.

Overview

The relationship between adverse childhood experiences (ACEs) and poor health among Wisconsin adults has been corroborated as a result of the cumulative findings from the 2011, 2012 and 2013 Behavioral Risk Factor Surveys (BRFS). Between 2011 and 2013, more than 14,500 Wisconsinites responded to ACE questions in the surveys. The results of the surveys indicate that adverse experiences in childhood, such as maltreatment, exposure to domestic violence, or having parents or household members who have experienced incarceration, divorce, substance abuse or mental illness, are strongly related to poor health in adulthood.

This report focuses on the findings from the 2011, 2012, and 2013 BRFS surveys, which demonstrate that ACEs are linked to the following health threats among Wisconsin adults:

- Higher rates of depression
- Increased health risk behaviors
- Poor general health
- Occurrence of chronic health conditions

Furthermore, the harm is cumulative. The more ACEs a Wisconsin adult reported from childhood, the greater the number of poor health conditions that individual suffers from in adulthood.

Introduction

Adverse Childhood Experiences (ACEs)[1] are negative life events or experiences which occur during childhood and have the potential to impede healthy child development. Where developmentally supportive experiences in childhood often lead to a healthier and more productive adulthood, adverse experiences frequently lead to impaired mental and physical health, poorer school and work success, and lower socioeconomic status in adulthood.

The original ACE Study, conducted in San Diego, California in the mid-1990s[2], examined the relationship between adverse experiences in childhood and adult behaviors and health outcomes. According to this study, an ACE is a stressful or traumatic experience in childhood as a result of child abuse or household dysfunction. The ACE Study was the first large-scale study looking at short- and long-term impacts of childhood trauma. The ACE Study measured three categories of adverse childhood experiences: abuse, neglect and household dysfunction. Specific factors measured in the abuse category included physical abuse, emotional abuse and sexual abuse. The neglect category consisted of emotional neglect and physical neglect factors. The household dysfunction category was characterized by the following indicators: mother treated violently, household substance abuse, household mental illness, parental separation or divorce, and incarcerated household member. Among the 17,000 primarily middle-class, well-educated adults surveyed in California, ACEs were linked to an increased risk of unhealthy behaviors such as smoking and alcohol use, chronic disease, impaired mental health, and disability.

In 2010, the ACE module from the Centers for Disease Control and Prevention was added to Wisconsin's annual BRFS.[3] The questions in the ACE module assess the frequency and co-occurrence of ACEs among Wisconsin adults. Following the first wave of data collection in 2010, a report, "Adverse Childhood Experiences in Wisconsin: Findings from the 2010 Behavioral Risk Factor Survey", was issued in 2012. This initial report detailed the frequency of ACEs in Wisconsin and identified linkages between ACEs and a number of adult health and well-being outcomes.

In 2014, a second report, "Wisconsin ACE Brief: 2011 and 2012 Data", was published. The second report summarized the findings from the second and third waves of data collection occurring in those years. The document highlighted the inverse correlation between number of ACEs and adult income as well as the racial disparity in experiences of childhood adversity.[4]

1. The original Adverse Childhood Experiences Study was conducted by the Kaiser Permanente Health System in San Diego, CA. More information on this research can be found at the following link: http://www.acestudy.org.
2. Felitti VJ, Anda RF, Nordenberg D, Williamson DF, Spitz AM, Edwards V, Koss MP, Marks JS. Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: The Adverse Childhood Experiences (ACE) Study. American Journal of Preventive Medicine 1998;14:245–258.
3. Center for Disease Control and Prevention (CDC) ACE module measures child abuse and household dysfunction factors. Questions assessing neglect are not included in the CDC ACE module.
4. The 2014 report, "Wisconsin ACE Brief: 2011 and 2012 Data," developed by the Child Abuse and Neglect Prevention Board and Children's Hospital of Wisconsin Community Services.

This current report encompasses the cumulative ACE data from 2011, 2012, and 2013 Behavioral Risk Factor Surveys.[5] The number of Wisconsin residents who responded to the ACE module questions from 2011 to 2013 is large enough to draw some parallels between the number of ACEs they experienced and negative health outcomes in adulthood. A higher number of co-occurring ACEs are linked to the following health threats among Wisconsin adults:

- Higher rates of depression
- Increased health risk behaviors, including tobacco use, heavy drinking and HIV risk behaviors
- Poor general health, such as obesity, lost teeth and daily feeling of unwellness
- Poor chronic health conditions, encompassing asthma, cancer, arthritis and diabetes among others

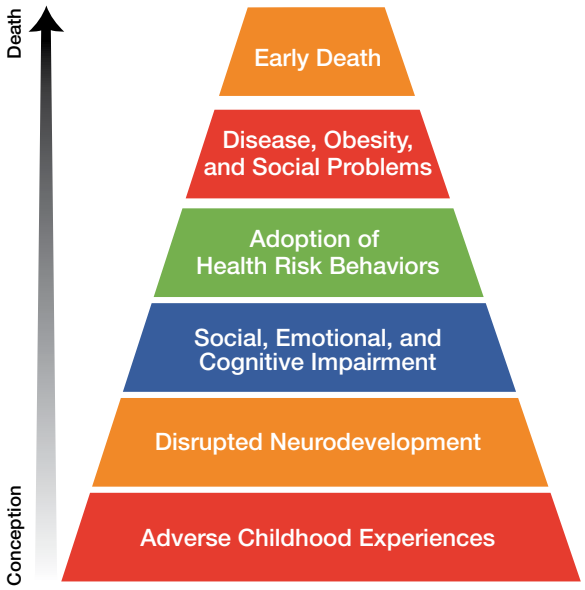
Why ACEs Have Such a Significant Impact

The human brain builds the foundation for future learning, emotional regulation and social interaction during the first few years of life. It continues to build upon that foundation throughout adolescence and into young adulthood. While genetics provide the brain's basic layout, experiences develop and shape our brains. These early experiences impact the way we view ourselves and our world, the way we learn, how we cope with life's stressors, and how we form relationships throughout our lives. ACEs can disrupt healthy development, causing changes in the brain which can result in diminished learning capacity, reduced ability to form healthy relationships, and faulty emotional control. This disruption increases the likelihood of engaging in behaviors or experiencing circumstances which compromise health and can lead to disease, disability and social dysfunction.

How ACEs are Identified & Measured

The Centers for Disease Control and Prevention (CDC) and its partners sponsor an annual survey to collect data within all 50 states, including Wisconsin. Survey questions focus on a range of health behaviors and conditions, as well as a host of health-related risk factors. Early research on adverse childhood experiences led the CDC to develop a specific survey module of ACE-related questions. Wisconsin includes this module in the state's annual Behavioral Risk Factor Survey (BRFS).[6] To assess the occurrence of ACEs among Wisconsin adults, the BRFS asks if they experienced any of the following events or circumstances prior to the age of 18:

1. Physical abuse
2. Emotional abuse
3. Sexual abuse
4. An alcohol and/or drug abuser in the household
5. An incarcerated household member
6. A household member who was chronically depressed, mentally ill, institutionalized, or suicidal
7. Violence between adults in the home
8. Parental separation or divorce



Mechanisms by Which Adverse Childhood Experiences Influence Health and Well-being Throughout the Lifespan

Figure 1. *The ACE Pyramid: Pathway linking ACEs to negative adult health outcomes across the life cycle*

5. Data from the original 2010 Wisconsin BRFS ACE module was not included in the present analysis because prior to 2011, only landlines were used to contact sample members. Beginning in 2011, both cell phones and landlines were used, improving the generalizability of the annual BRFS samples.
6. The Behavioral Risk Factor Surveillance System (BRFSS) is the CDC sponsored system of state surveys. The specific Wisconsin survey is called the Wisconsin Behavioral Risk Factor Survey (BRFS).

ACE Findings for Wisconsin Adults

This report focuses on the cumulative results from the second through fourth waves of data collected between 2011 and 2013 using the Wisconsin BRFS.[7] Responses were collected via phone interviews of 17,190 Wisconsin residents, age 18 or over, located in various geographical regions of the state. Of that number, 14,551 individuals answered questions from the ACE module.[8] The group of Wisconsin adults surveyed was predominantly comprised of individuals who identified as white. The mean age of the group was just below 50 years. A little more than half of the individuals surveyed indicated that they had obtained some college education, were married and earned below the median income of $50,000 per year in Wisconsin. The following table details the characteristics of the adults who were surveyed.

One of the most impactful findings from the original ACE study in California is the prevalence of ACEs among the general adult population.[9] Earlier waves of ACE data in Wisconsin identified comparable patterns, which have been validated by the results of the cumulative data analysis.

Sample Size	**14, 551 Adults who answered ACE questions**	
Mean Age	**47.9 Years**	
Education	**56.5% Some College**	**43.5% No College**
Marital Status	**55.6% Married**	**44.4% Unmarried**
Income	**56% less than $50,000**	**44% greater than $50,000**
Race/Ethnicity	**87% White** **3.2% Asian** **5% Black** **1% American Indian** **3.4% Hispanic** **Less than 1% Other Race/Ethnicity**	

***Table 1**. Characteristics of Wisconsin Adults who Answered ACE Questions in 2011-2013 (combined) BRFS*

ACEs are Common among Wisconsin Adults and They Co-Occur

According to the 2011-2013 Wisconsin BRFS data, approximately 58% of adults surveyed reported one or more ACEs. This percentage has remained consistent among Wisconsin adults since data collection began in 2010. ACEs are typically presented as a cumulative count of the number of categories of ACEs experienced[10], where each type of ACE is weighted equally. Previous research has determined this simple count or "ACE Score" is highly predictive of outcomes in adulthood. The more ACEs an individual has experienced the poorer their mental, physical and socioeconomic well-being.

Figure 2 shows the distribution of ACE scores among Wisconsin residents. Of the 58% of adults who experienced one or more ACEs, nearly one quarter of that group experienced four or more ACEs.

Certainly the specific types of ACEs that adults have endured are an important prerequisite to understanding how to address those specific risks among future generations. The prevalence of individual ACEs within the Wisconsin adult population has proven consistent. The cumulative 2011-2013 data align with the initial 2010 findings.

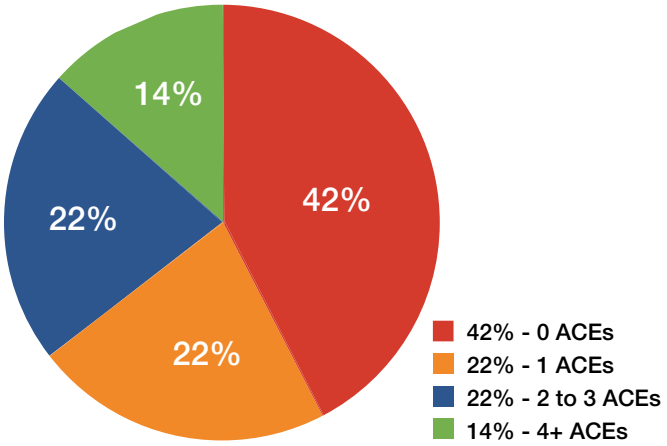


***Figure 2**. Distribution of ACE Scores among Wisconsin Residents (2011-2013)*[11]

7. Data from the original 2010 Wisconsin BRFS ACE module was not included in the present analysis because, prior to 2011, only landlines were used to contact sample members. Beginning in 2011 both cell phones and landlines were used, improving the generalizability of the annual BRFS samples.
8. When comparing ACE module respondents to ACE module non-respondents, there are several statistically significant differences. Those who did not provide answers to the ACE questions are slightly more likely than those who answered the ACE questions to have lower incomes, to have never married, to have a high school degree or less and to identify their race as other than white. As a group, they are, slightly more disadvantaged in terms of socioeconomic status.
9. The original ACE study was conducted by the Kaiser Permanente Health System in San Diego, CA. More information on this research can be found at the following link: http://www.ACEsstudy.org.
10. ACE score does not tally incidents within a category, but represents the cumulative count of categories indicated by a respondent.
11. Percentages are rounded to the nearest whole number.

Figure 3 shows the prevalence of each type of ACE among Wisconsin adults, ranging from a high of 26% to a low of 5%. The most frequently reported ACE is emotional abuse, with more than one quarter or 26% of Wisconsin adults indicating that a parent or another adult in their home swore at them, insulted them or belittled them. Parental or other adult substance abuse in the home is just slightly less common at 24%. Even in the case of the least frequently reported ACEs, one out of ten adults reported being victims of childhood sexual abuse and one out of twenty had an incarcerated household member.

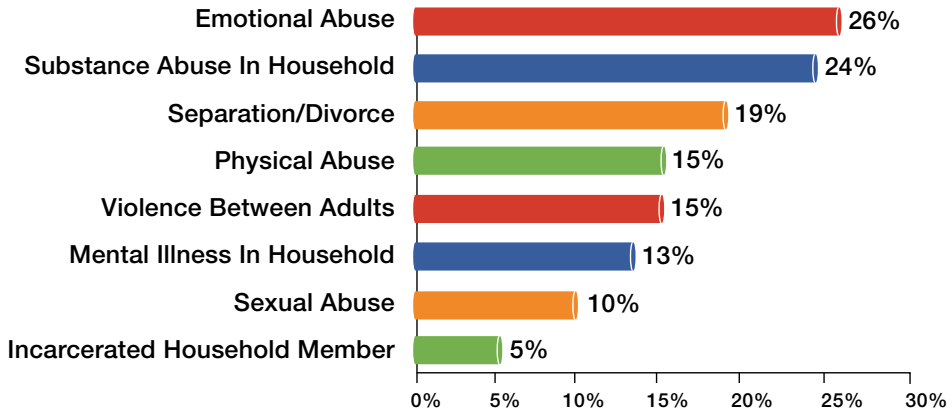


Figure 3. *Prevalence of Specific Types of ACEs among Wisconsin Residents (2011-2013)*
Source: Wisconsin BRFS, 2011-2013

ACE Score Continues to be Associated with Risk to Socioeconomic Well-being among Wisconsin Adults

The BRFS has provided opportunity for Wisconsin researchers to delve into the relationship between some social determinants of health[12] and ACE scores. The cumulative data verifies what was initially identified in earlier data sets.[13] Among Wisconsin residents, ACEs are found to be more prevalent among those with lower incomes, those who are unemployed, those who lack health insurance and those with lower levels of education.

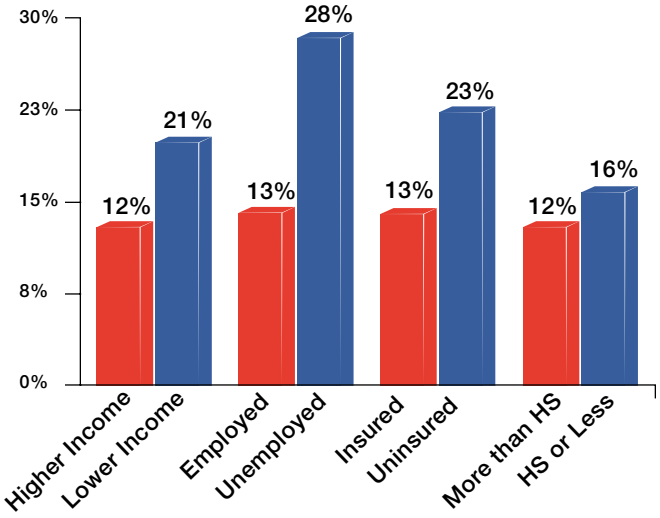


Figure 4. *Wisconsin Adults with 4+ ACEs and Socioeconomic Factors*
Source: Wisconsin BRFS, 2011-2013

Figure 4 shows that 21% of Wisconsin residents with an annual income below $25,000 report experiencing four or more ACEs, compared to 12% of residents who earn $25,000 or more. Of the survey respondents who reported four or more ACEs, 28% were unemployed compared to 13% of those who were employed. This pattern is also evident for health insurance status where 23% of uninsured Wisconsinites report four or more ACEs compared to 13% of respondents with private insurance. In terms of education level, 16% of those who did not continue school after high school graduation or who did not complete high school reported experiencing four or more ACEs, whereas 12% of those respondents with some type of post-secondary education reported experiencing a higher number of ACEs.

12. The World Health Organization defines social determinants of health (SDH) as the conditions in which people are born, grow, work, live, and age, and the wider set of forces and systems shaping the conditions of daily life. These forces and systems include economic policies and systems, development agendas, social norms, social policies and political systems -- http://www.who.int/social_determinants/en/.
13. The 2014 report, "Wisconsin ACE Brief: 2011 and 2012 Data," developed by the Child Abuse and Neglect Prevention Board and Children's Hospital of Wisconsin Community Services.

ACEs and Compromised Mental and Physical Health among Wisconsin Adults

The original Adverse Childhood Experiences Study and subsequent research has repeatedly shown that ACEs have a cumulative impact on health. The higher the number of ACEs, the greater the risk for neurobehavioral changes, social, cognitive and emotional disorders, and risk behaviors, all of which can predispose individuals to disease, disability, and early death. This is referred to as a dose-response relationship.

The association between poor mental health and ACEs was established in the 2012 report "Adverse Childhood Experiences in Wisconsin: Findings from the 2010 Behavioral Risk Factor Survey." This relationship remains strong in the 2011-2013 findings. Overall, 16% of Wisconsin residents report ever being diagnosed with a depressive disorder (encompassing depression, major depression, dysthymia, or minor depression). The percentage of depression among those adults who have experienced four or more ACEs is more than twice that at 35%.

Figure 5 demonstrates that the prevalence of a reported diagnosis of depression rises in a linear fashion from 8%, for respondents with no ACEs, to 35%, for respondents with four or more ACEs.

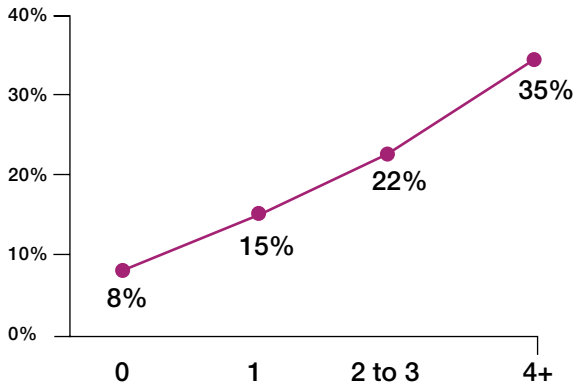


Figure 5. *Prevalence of Depression by ACE Score*
Source: Wisconsin BRFS, 2011-2013

The mental health findings are also of great significance in relationship to physical health as poor mental health is closely associated with poor physical health. Compromised mental health predisposes individuals to an array of physical health problems, including those highlighted below. In studies outside of Wisconsin a higher number of ACEs has been determined to be independently related to multiple physical health concerns as well. However, this current report of the cumulative 2011-2013 responses is the first time that the sample size was large enough to verify connections between ACEs and several of the less prevalent, as well as more common, physical health outcomes for Wisconsin survey participants.[14]

The Relationship between ACEs and Poor Physical Health

The cumulative 2011-2013 data indicates a significant relationship between ACEs and multiple physical health indicators. In comparable fashion to the original ACE Study, physical health is divided into three categories: health risk behaviors, poor general health and chronic health conditions. 1) "Health Risk Behavior" is any behavior undertaken by individuals with a frequency or intensity that it increases their risk of disease or injury.[15] 2) "General Health" refers to the quality of health in daily life. The Wisconsin BRFS asks for self-reports on general health indicators, which have been shown to closely align with documented health status. 3) "Chronic Health Conditions" include chronic or severe illnesses for which ACE science has demonstrated causal links between the adversity in childhood and the disease in adulthood. According to their responses, 39.2% of those surveyed engaged in one or more types of health risk behaviors, 48% of survey respondents indicated they suffered from one or more aspect of poor general health and 40.8% possessed one or more chronic health conditions.[16]

14. Page 27 of the January 2012 report, "Adverse Childhood Experiences in Wisconsin: Findings from the 2010 Behavioral Risk Factor Survey," developed by the Child Abuse and Neglect Prevention Board and Children's Hospital of Wisconsin Community Services.
15. Steptoe, A. & Wardle, J. (2004). Health-related behavior: prevalence and links with disease. In A. Kaptein, & J. Weinmen (Eds.), Health Psychology. BPS: Blackwell.
16. Respondents who reported any of the individual indicators within the health risk behavior category were indicated as having a health risk behavior. This same strategy applied to the summary scores for poor general health and chronic health conditions, respectively. HIV risk behaviors are not included in the summary score for health risk behaviors due to the omission of these questions in the 2013 BRFS survey.

Figure 6 depicts the prevalence of each general health category indicator by the number of reported ACEs. An increase in the number of ACEs is generally accompanied by an observable increase in the prevalence of concerning behaviors and health conditions. Although not linear, there is a jump in the prevalence of chronic conditions from those reporting 0-3 ACEs to those reporting 4 or more ACEs.

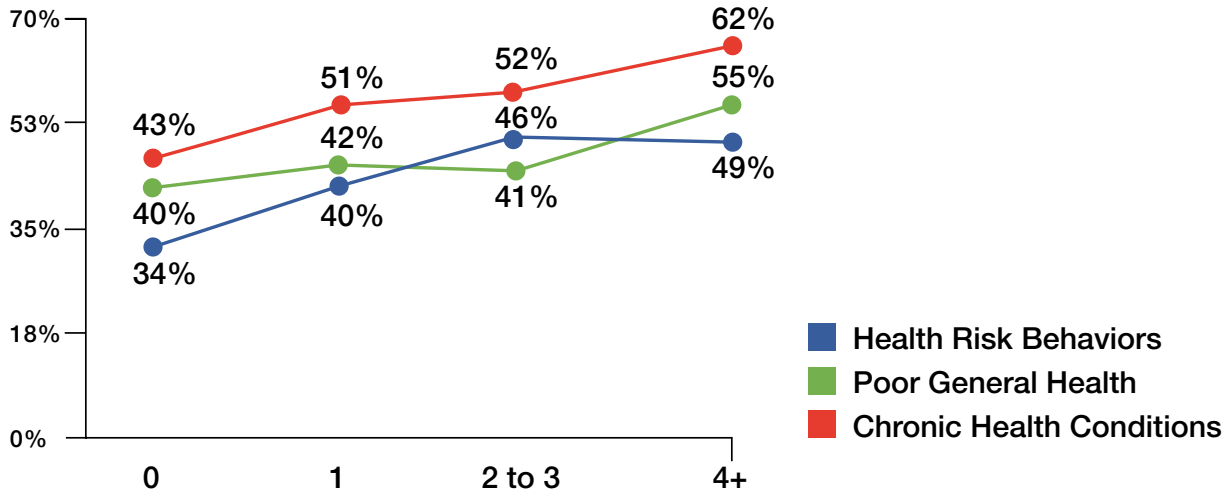


***Figure 6**. Prevalence of Health Category Indicators by ACE Score*
Source: Wisconsin BRFS, 2011-2013

"Health Risk Behaviors" indicators include:

- Tobacco use (defined as smoking cigarettes some days or every day, or chewing tobacco every day)
- Heavy drinking (defined as having 5 or more drinks for men or 4 or more drinks for women on at least one occasion in the past month)
- HIV risk behaviors (defined as intravenous drug use, unprotected sex, or having a sexually transmitted disease)

"Poor General Health" indicators include:

- Obesity (defined as body mass index of 30 and above)
- Fair or poor health
- Bad mental and physical health days (defined as having more than 10 bad health days in the past month)
- Lost teeth (defined as 6 or more permanent teeth lost or removed)

"Chronic Health Conditions" include a diagnosis of:

- Kidney disease
- Stroke
- Angina
- Cancer
- COPD
- Adult-Onset Diabetes
- Asthma
- Any Form of Arthritis

Table 2 indicates the prevalence rates of a range of health indicators delineated by specific health risk behavior, indicators of poor general health, and chronic health conditions as reported by respondents. The "Total Prevalence" column indicates the percentage of the total number of survey respondents who indicated that they suffer from the designated physical health problem. The middle and right hand columns indicate the distinction in percentages between those respondents who indicated they had no ACEs and those who indicated that they had experienced four or more ACEs. For every single physical health indicator, a substantially higher percentage of those indicating they suffered from the particular ailment reported that they had experienced four or more ACEs in childhood than the percentage of those who had not suffered any ACEs.

***Table 2**. Physical Health*

Health Risk Behaviors			
	Total Prevalence	**0 ACEs**	**4+ ACEs**
Tobacco Use*	20.9%	13.0%	27.8%
Heavy Drinking	6.3%	5.7%	7.7%
No Exercise	20.7%	21.7%	22.2%
HIV Risk Behaviors	3.1%	1.2%	7.6%
Poor General Health			
Obesity*	27.3%	25.7%	32.5%
Fair/Poor Health*	14.7%	10.8%	20.4%
Bad Physical Health Days*	11.4%	8.6%	20.4%
Bad Mental Health Days*	10.5%	4.8%	24.7%
Lost Teeth*	13.5%	14.3%	24.7%
Chronic Health Conditions			
COPD*	5.0%	4.0%	9.5%
Kidney Disease	2.2%	1.9%	3.1%
Angina*	4.3%	1.9%	7.1%
Stroke*	2.4%	2.0%	4.5%
Cancer*	10.3%	11.7%	16.4%
Arthritis*	25.2%	24.4%	39.8%
Diabetes*	7.8%	8.0%	10.5%

**Indicates that difference between 0 and 4 ACEs is statistically significant for that health factor.*

Conclusion

ACEs are consistently associated with poor social, mental, and physical health outcomes in adulthood. The cumulative findings from the 2011-2013 waves of ACE data continue to identify life trajectory outcomes for Wisconsin residents that are closely related to early adverse experiences. Given the expense of health care, lost earnings and human services as a result of the long-term physical and mental impairment resulting from adverse childhood experiences; ACEs impact everyone. Multiple state and private agency partners are working on advancing ACE prevention efforts and policy recommendations in an effort to support child well-being and family functioning in an effort to mitigate those eventual costs. Partners continue to examine ACE data to identify communities at higher risk, to increase education and outreach efforts, and to improve access to effective services. Awareness is one of the most powerful tools both for preventing and addressing ACEs. Through education, and a heightened awareness of ACEs, trauma-informed approaches can be infused into the social consciousness of individuals, families, businesses, organizations and communities to mobilize prevention and mitigate the negative effects of ACEs on childhood and later adulthood.

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