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Title

A Cross-sectional Analysis of Adverse Childhood Experience Exposure on Cancer Diagnosis Utilizing the 2022 Behavioral Risk Factor Surveillance Survey Data

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Abstract:

Objective: To determine the association between Adverse Childhood Experiences (ACEs) and cancer diagnosis based on ACE exposure levels.

Methods: We utilized data collected in the 2022 Behavioral Risk Factor Surveillance System (BRFSS) survey. The study population (n=54,148) was restricted to states that reported on the optional model of experiencing ACEs and those who responded about cancer diagnosis. A univariate analysis, bivariate analysis and a multivariate logistic regression were performed. Odds of cancer diagnosis among those with differing ACE exposure levels were calculated.

Results: High ACE exposure had 20% higher odds of cancer diagnosis when compared to low ACE exposure. White, non-Hispanics, females, those over the age of 65 and those who reported poor overall health had the highest odds of receiving a cancer diagnosis.

Conclusions: ACEs were significantly associated with a cancer diagnosis, as high ACE exposure was positively associated with increased risk of cancer diagnosis. However, there may not be a direct link between ACEs and cancer diagnosis. Further research needs to be conducted regarding the biological and behavioral pathways that exist between ACEs and cancer.

Introduction

Cancer is a disease that affects many people Worldwide, and is the second leading cause of death in the United States.[1] The World Health Organization (WHO) defines cancer as a disease caused by uncontrollable division and growth of abnormal cells in the body.[2] About 1.9 million new cancer diagnoses occur each year in the U.S., and around 600,000 individuals die from cancer each year in the U.S.[3] Many factors influence cancer diagnoses such as race and ethnicity, age, geographic location, education level, social behaviors (i.e., smoking, alcohol, and drug use), environmental factors, and genetics.[4] Individuals who are lower income, have lower health literacy, live in more rural areas, and lack transportation or health insurance are less likely to be screened for cancer than those who do not face these same disparities.[4] Additionally, these same individuals are more likely to be diagnosed with more severe cancer staging than others.[4]

In the past few decades, there has been an increased interest in the role of Adverse Childhood Events (ACEs) in many health outcomes. Adverse childhood experiences (ACEs) are potentially traumatic events that occur in childhood.[5] These experiences can include experiencing or witnessing violence, abuse, or neglect or having a family member attempt or die via suicide.[5] Other forms of ACEs include growing up in a household where there are substance abuse or mental health problems present, instability due to parental separation, or members of the household being in jail or prison.[5]

ACEs are correlated with an increased risk of developing certain chronic diseases, including cancer.[6] One study utilizing the Behavioral Risk Factor Surveillance System (BRFSS) data from 2010 found there to be an association between ACEs and adulthood cancer but stated it may be because ACEs increase one's likelihood of developing other chronic diseases that could lead to cancer, as opposed to being solely associated with cancer.[7] Researchers suggested evaluating the pathways driving the association of ACEs and cancer.[8] For example, exposure to ACEs increases one’s likelihood of smoking, which can potentially lead to lung cancer.[9] You cannot directly link ACEs with lung cancer, but ACEs can influence the behavior (smoking) that can eventually lead to lung cancer diagnosis. Additionally, researchers have evaluated

pathways between ACEs and cancer survival and found that ACE exposure resulted in poorer cancer survival.[10] Binge drinking,[11,12] poor physical, mental, and overall health are associated with both ACEs and cancer diagnosis.[13,14]

While the association between ACEs and cancer has been exhaustively investigated, there are still gaps that exist in the literature. Some of those gaps are the mechanisms and biological pathways that may exist between ACEs and cancer. For example, one study found lower interleukin-2 (IL-2) levels (a signaling molecule for the immune system) and poorer survival in those diagnosed with cancer.[10] In a systematic review of the literature, ACE exposure was associated with epigenetic modifications.[15] Additionally, the relationship between ACEs and cancer subtypes is not well-researched and inconsistent. For example, in a systematic review of 12 studies, physical and psychological abuse was associated with increased cancer risk for any cancer, including cervical cancer, while two other studies reported no association between sexual or physical abuse and cervical cancer.[16] Although, one study found a significant relationship between having experienced 3 or more ACEs and developing HPV-related cancer.[17]

This study does not seek to address or validate gaps found in the literature regarding the relationship between ACEs and cancer diagnosis. This study seeks to validate and reinforce previously established correlations between ACEs and cancer, to ensure reliability and consistency of findings.

Overall, this study aims to evaluate the relationship between adverse childhood events (ACEs) and cancer diagnosis. Furthermore, it addresses the relationship between cancer diagnosis and ACEs by considering ACE exposure levels (low exposure vs. high exposure). Specifically, high ACE exposure is expected to be positively associated with an increased risk of cancer diagnosis.

Methods

Study Design

Data from the 2022 Behavioral Risk Factor Surveillance System (BRFSS) survey were used. The BRFSS survey is a randomly selected telephone survey administered by the Center for Disease Control and Prevention (CDC) and state health departments that evaluate the health and health behaviors of adults aged 18 years or older who

reside in the United States, the District of Columbia, Guam, Puerto Rico, and the US Virgin Islands.[18] Data were collected on health-related risk behaviors, chronic health conditions, healthcare access, and use of preventative services.[18] There is a core component to the survey, followed by optional modules, such as adverse childhood experiences, cancer survivorship, and many others, which can be found on the BRFSS CDC website.[19] The BRFSS is designed to be nationally representative data. It involves dividing the population into strata based on certain characteristics and the use of weighted variables.

Study Population

The BRFSS can include optional survey modules that each state has the choice to distribute and collect on. This study restricted the data to states that recorded and reported on the optional model of experiencing Adverse Childhood Experiences (ACEs). Those states were Arkansas, Florida, Iowa, Nevada, North Dakota, Oregon, South Dakota, Virginia, Arizona, Ohio, New Jersey, and Oklahoma. For the outcome variable of cancer diagnosis, only individuals who reported on their cancer diagnosis status were included. In total, only individuals who reported their ACE exposure and cancer diagnosis status were included in the study population. Due to the sample size restriction, including only those who reported on ACEs and cancer diagnosis, the overall sample size was 58,127. The sample size of the final model was approximately 54,148.

Cancer

Respondents were asked questions to assess cancer diagnosis. Only individuals who reported whether they had been told they have or had melanoma, or any other type of cancer were included in the analysis. The variable was coded dichotomously. Those who answered "yes" were considered to have a cancer diagnosis, and those who responded "no" were considered to have no cancer diagnosis. Responses of "don't know" or "refused" were marked as "missing" and not included in the analysis.

Adverse Childhood Experiences

The interviewer asked 13 questions for the ACE module to measure whether an adverse childhood event occurred. ACEs for respondents were represented by an ACE score, a standardized method for measuring exposure to childhood trauma. Responses of "don't know" or "refused" were marked as "missing" and not included in the analysis.

Each ACE question was coded dichotomously with 0 indicating not having experienced the ACE and 1 indicating having experienced the ACE. The ACEs were then summed and scored for individuals who answered all 13 ACE questions. The ACE sums were coded dichotomously into two exposure groups: low exposure and high exposure. Those who experienced zero to three ACEs were considered to have a low ACE exposure, and those who experienced four or more were considered to have high ACE exposure.

Measures

Demographic characteristics of respondents included gender, age, race and ethnicity, income, and education level (less than high school, high school graduate, some college, college graduate). Age was recategorized into three subgroups: 18-44, 45-64, and 65+. Race and ethnicity were recategorized together into the following subgroups: White Non-Hispanic, Black Non-Hispanic, Other Non-Hispanic, Multiracial, and Hispanic. Income was recategorized into <$50,000, $50,000-$99,999, >$100,000, and not reported, which included those who did not report income (24.5%).

Self-reported health risks included binge drinking[11] (yes, no), smoking status[9] (current smoker, former smoker, never smoked), exercise[20,21] (one or more occasions in the previous month), mental health[13] (0, 1-13, or 14+ days of poor mental health in the past 30 days), physical health[14] (0, 1-13, or 14+ or more days of poor physical health in the past 30 days), and overall health[13] (excellent, very good, good, fair, poor).

Statistical Analysis

Due to the complex nature of the survey data, weighted analyses were conducted to help reduce bias and maximize the generalizability of the study to the population of the states included. Additionally, the data were merged only to include the states that evaluated ACEs, excluding all other states and territories that did not assess ACEs.

A univariate analysis was conducted for all variables, including the outcome, the exposure, and all other covariates. Frequencies and percentages were calculated for the demographic characteristics and self-reported health risks.

The bivariate analysis evaluated the relationship between ACE exposure and cancer without considering the other covariates. Additionally, the bivariate analysis

evaluated the relationship between cancer diagnosis and all covariates individually, as well as exposure and all other covariates individually to determine if they should be included in the final model. Chi-square tests were run to evaluate the individual relationship between each dichotomous variable and the outcome of cancer diagnosis. A logistic regression model was run for non-dichotomous categorical variables to assess the relationship to the outcome. The same process of chi-square test and logistic regression models were run for each variable to evaluate their relationship to the exposure variable of ACEs. Frequencies, p-values, and odds ratios were reported for all covariates and the outcome.

The multivariate analysis involved a weighted logistic regression model assessing the relationship between ACEs experienced during childhood and being diagnosed with cancer. A backward stepwise logistic regression was performed to determine the final model and evaluate the relationship between cancer diagnosis and ACEs while accounting for confounders. The threshold used was Pr > F values less than 0.05, variables that were not significant ($Pr > F \geq 0.05$) after running the logistic regression were removed. Variables of least significance were eliminated first, then the new model without the variable was run to obtain new significance values, and the process was repeated until all variables in the model were significant. No interaction terms were found or evaluated. The following covariates were rendered non-significant and removed from the final model via backward stepwise regression: income, exercise, and binge drinking. The final model included the following variables: cancer diagnosis, ACE exposure, sex, race, age, education level, smoking status, poor mental health days in the last month, poor physical health days in the last month, and overall health.

All percentages shown are weighted percentages. All analyses were conducted using SAS Studio version 3.82 (SAS Institute, Cary, NC).

Results

A total of 58,127 participants responded to both the ACE module and the cancer diagnosis question, for a response rate of 73.1%. Of the 58,127 respondents, 7,291 (9.4%) respondents did report a cancer diagnosis, while 50,511 (90.6%) did not report a cancer diagnosis. Most respondents were White, non-Hispanic (65.35%), between the ages of 18-44 (41.58%), who had completed some college (31.43%), and reported

making less than $50,000 annually (33.37%). Most report having never smoked (61.28%), having exercised at least once in the last month (76.05%), and overall, reported having very good health (32.93%). Additionally, over 50% of respondents reported having zero poor mental or physical health days during the last 30 days. Over 80% of the study population did not report participating in binge drinking. Population demographic characteristics and rates of health risks can be found in Table 1.

The bivariate analysis between the exposure and the outcome showed individuals who reported high ACE exposure (4+ ACEs) had 0.82 times the odds (95% CI: 0.72, 0.94) of being diagnosed with cancer compared to those who reported low ACE exposure (0-3 ACEs) (Table 3).

All races that were not White and non-Hispanic had lower odds of being diagnosed with cancer, excluding those who were multiracial, as the results were non-significant (Table 3). Individuals under the age of 65 had significantly lower odds of cancer diagnosis than those 65 or older (Table 3). The higher an individual's education level, the higher the odds of a cancer diagnosis, but the higher the individual's income, the lower the odds of a cancer diagnosis (Table 3). However, the results of those who make $50,000 to $100,000 were non-significant (Table 3). Those who reported binge drinking had almost 50% lower odds of a cancer diagnosis than those who reported not engaging in binge drinking (Table 3).

Current and former smokers both had higher odds of cancer diagnosis. However, the current smoker's odds were non-significant (OR=1.17 [95% CI: 1.00, 1.37]). Exercise and poor mental health days were associated with lower cancer odds. As self-reported overall health decreased and poor physical health days increased, the odds of cancer diagnosis increased.

In the final model (Table 3), individuals with high ACE exposure had 1.2 times the odds (95% CI: 1.03, 1.30) of cancer diagnosis when compared to those who reported low ACE exposure. Respondents who were female had 24% higher odds (AOR=1.24, [95% CI: 1.12, 1.38]) than males. Individuals aged 45 to 64 had over 56% lower odds of receiving a cancer diagnosis, and those aged 18 to 44 had 90% lower odds than those aged 65 or older. Those who had graduated high school had 1.38 higher odds (95%CI: 1.02, 1.87) of being diagnosed with cancer than those who did not

graduate high school. Furthermore, college graduates had the highest odds of being diagnosed with cancer (AOR=1.67, [95% CI: 1.24, 2.24]). Individuals with some college did not have a significant association with cancer diagnosis in the final model (AOR=1.30 [95% CI: 0.96, 1.76]). Respondents who reported being a former smoker had the highest odds of being diagnosed with cancer in both the bivariate model (OR=1.88, [95% CI: 1.69, 2.08]) and the final model (AOR=1.22, [95% CI: 1.09, 1.36]). Current smokers did not have any significant association with cancer diagnosis in both the bivariate analysis and the final model.

When evaluating the respondents' self-reported health statuses, as the overall health of the respondent declined, the odds of cancer diagnosis increased (Table 3). Those who reported "excellent" health were the reference group. Individuals who reported "very good" health (AOR=1.41, [95% CI: 1.15, 1.73]) and "good" health (AOR=1.76, [95% CI: 1.44, 2.15]) had higher odds of a cancer diagnosis than those who reported "excellent" health (Table 3). Those who reported "fair" health had 2.17 higher odds (95% CI: 1.71, 2.75) than those who reported “excellent” health (Table 3). Individuals who reported "poor" health had the highest odds (AOR=3.46, [95% CI: 2.56, 4.69]) of cancer diagnosis (Table 3). Experiencing 14 or more poor physical health days in the past 30 days, resulted in 20% higher odds of being diagnosed with cancer than those who experienced 13 days or less, and 46% higher odds than those who experienced no poor physical health days (Table 3). Experiencing 13 or less poor mental health in the past 30 days, resulted in 18% lower odds of cancer diagnosis than those who experienced zero poor mental health days within the last 30 days (Table 3). Experiencing 14 or more poor mental health days in the last 30 days did not have a significant association with cancer diagnosis (Table 3).

Discussion

This study aimed to evaluate the association between Adverse Childhood Experiences (ACEs) exposure levels and cancer diagnosis using data from the 2022 Behavioral Risk Factor Surveillance System. Experiencing an adverse childhood experience was correlated with one's likelihood of developing cancer at some point in their life. The odds of cancer diagnosis were higher among those who reported

experiencing high ACE exposure compared to those who reported having low ACE exposure.

High ACE exposure resulted in higher odds of cancer diagnosis, however, there may not be a direct link between ACEs and cancer, as ACEs tend to lead people to engage in cancer-causing behaviors such as smoking.[9] More research needs to be conducted regarding the pathways that exist between ACEs and cancer.

White non-Hispanics and those over the age of 65 had the highest odds of cancer diagnosis, which is consistent with other published data.[3] All other races had lower odds of cancer diagnosis, except for those who were multiracial, whose results were non-significant. This could be due to individuals who identify as multiracial may be of White, non-Hispanic race and ethnicity, which may be why the results were non-significant as they were too close to the reference point (White, Non-Hispanic). In the future, multiracial individuals may need to be evaluated more specifically to better understand their cancer risk. This study's findings suggest that women have higher odds of receiving a cancer diagnosis, which contrasts with data published by the American Cancer Society in 2022.[3] According to their reports, men generally exhibit higher rates of cancer diagnoses than women.[3] This inconsistency could be due to women having more complex patterns of ACE exposure[22] and are more likely to report having ACE exposure than men.[23]

Higher education levels were associated with higher odds of cancer diagnosis, while other literature found the opposite to be true.[24] Another study found that lower education level and income were associated with higher odds of an advanced-stage diagnosis.[25] Income was excluded from the final model due to non-significance, but the literature suggests that lower income correlates with both higher cancer risk and higher ACE exposure.[26] Conversely, one study did find that higher income was not protective against ACE exposure, suggesting the relationship between income, cancer diagnosis, and ACE exposure is much more complex.[27]

Overall health includes both physical and mental health. Exercise was excluded from the final model due to non-significance, but the American Cancer Society[28] and the National Cancer Institute[29] suggest exercising can reduce your risk of cancer diagnosis and help prevent obesity. One study found that about four to six percent of cancers are

caused by obesity.[30] Additionally, one study found that exercise can help to reduce the effect of ACEs on depression,[31] indicating that exercise may play a role in the pathway between ACEs and cancer. ACEs and cancer are both linked to poor mental health and poor physical health, which can result in poorer overall health.[13]

Strengths and Limitations

One strength of the study is the sample size of the final model (n=54,148). The main limitation of the analysis is the generalizability of the study. The generalizability of the study is decreased due to excluding those who did not report their cancer diagnosis status, as well as only including those who responded to all 13 ACE questions. It would be better to sum up all the ACEs experienced by each individual and record the ones they did not respond to as zero or “no”. In doing this it would help to decrease the number of individuals excluded from the analysis.

Another limitation is the lack of covariates analyzed. Other chronic diseases (i.e., obesity, diabetes, infectious diseases, and many others) that have been associated with ACEs and cancer were not included in the model. Additionally, the model did not include health insurance, geographic location, and other environmental factors, which may influence the relationship between ACEs and cancer diagnosis.

The BRFSS dataset has limitations that affected the study as well. The first is that recall and social desirability biases[32] might cause underestimation of the self-reported ACEs. Many individuals may not want to re-live or disclose traumatic events, especially ones from their childhood that they may have suppressed or forgotten. Additionally, the ACEs module questions may not be representative of the severity of the ACEs, or the frequency in which they may have occurred. Indicating they can be experienced differently by different people, especially when considering demographic, geographic, or cultural differences that may be present.

Lastly, cancer is a broad and in-depth medical diagnosis that varies drastically on a case-to-case basis. Generalizing cancer into a dichotomous variable is not representative of the reality of the situation and may result in misrepresented results. Similarly, adverse childhood experiences vary in severity, as well as one's ability to handle stress. While categorizing these variables aids in the statistical analysis, a more

in-depth and detailed analysis of ACEs and cancer is required to understand their relationship further.

Public Health Importance

Adverse childhood experiences are associated with many negative health outcomes, including cancer. However, the research evaluating the pathways that exist between ACEs and cancer is limited. As a result of this study, it was found that high ACE exposure is associated with increased odds of a cancer diagnosis. Additionally, it evaluated whether certain social behaviors, such as smoking, and self-reported health statuses, such as poor mental health, play a role in this association.

This study did not aim to address or validate any gaps found in the literature regarding ACEs and cancer, however, it did validate the correlation between ACEs and cancer. The validation this study provides helps ensure findings in other literature are reliable and consistent, strengthening the scientific evidence and solidifying the foundation for future research or decision-making. The results of this study indicate further public health interventions need to be implemented to reduce ACE exposure, which may potentially reduce cancer risk.

Furthermore, more studies need to be done to evaluate the biological pathways that may exist between ACE exposure and cancer diagnosis, including epigenetic and environmental transmissions. Evaluating these pathways will help to fill gaps found in the literature surrounding the ACE-cancer relationship. A longitudinal study following a birth cohort throughout life would be beneficial in understanding the role ACEs play in cancer diagnosis, as well as other diseases and behaviors.

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Table 1 – Demographic Characteristics of the Study Population: Behavioral Risk Factor Surveillance System, 2022 (n = 58,127)

Variables	n	Adjusted %
Cancer Diagnosis		
Yes	7 291	9.40
No	50 511	90.60
Adverse Childhood Experience(s)		
Low Exposure	47 160	77.65
High Exposure	10 967	22.35
Sex		
Male	26 867	48.23
Female	31 260	51.77
Race/Ethnicity		
White, Non-Hispanic	46 330	65.35
Black, Non-Hispanic	3 269	10.40
Other, Non-Hispanic	2 336	5.41
Multiracial	1 094	3.44
Hispanic	3 733	15.40
Age		
18-44	15 611	41.58
45-65	19 267	32.26
65+	23 249	26.16
Education		
Did not graduate High School	3 042	9.80
High School Graduate	14 768	27.91
Some College	16 830	31.43
College Graduate	23 328	30.87
Income		
<$50,00	20 380	33.37
$50,00-<$100,000	15 622	25.25
$100,000+	12 329	23.36
Not Reported	9 796	18.01
Smoking Status		
Current Smoker	7 559	12.90
Former Smoker	16 546	25.82
Never Smoked	33 689	61.28
Binge Drinking		
Yes	8 236	16.35
No	48 838	83.65
General Health		
Excellent	8 696	16.87
Very Good	19 559	32.93
Good	18 969	32.26
Fair	8 165	13.83
Poor	2 620	4.10
Poor Mental Health		
0 days	35 377	56.98
1-13 days	14 058	27.05
14+ days	7 703	15.97
Poor Physical Health		
0 days	34 815	61.20
1-13 days	14 169	25.47
14+ days	7 888	13.33
Exercise		
Yes	43 421	76.05
No	14 611	23.95

Note. n = number of respondents

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Table 2 – Crude Relationship between Cancer Diagnosis and Adverse Childhood Experiences and all Covariates Among the Study Population: Behavioral Risk Factor Surveillance System, 2022 (n = 58,127)

	Cancer Diagnosis (n=7,291		No Cancer Diagnosis (n=50,511)		p-value
Variable	**n**	**Adjusted %**	**n**	**Adjusted %**	
Adverse Childhood Experience(s)					
Low Exposure	6 200	80.61	40 695	77.34	0.0035
High Exposure	1 091	19.39	9 816	22.66	
Sex					
Male	3 167	42.32	23 527	48.71	<.0001
Female	4 124	57.68	26 984	51.29	
Race/Ethnicity					
White, Non-Hispanic	6 490	82.40	39 564	63.59	<.0001
Black, Non-Hispanic	205	5.32	3 053	10.94	
Other, Non-Hispanic	157	2.11	2 170	5.77	
Multiracial	112	3.10	978	3.41	
Hispanic	200	7.08	3 524	16.30	
Age					
18-44	337	8.69	15 232	45.04	<.0001
45-65	1 912	33.00	17 269	32.18	
65+	5 042	58.31	18 010	22.77	
Education					
Did not graduate High School	304	7.42	2 715	10.02	0.0113
High School Graduate	1 812	28.64	12 871	27.90	
Some College	2 159	31.03	14 578	31.37	
College Graduate	2 999	32.91	20 207	30.71	
Income					
<$50,00	2 774	36.42	17 470	32.95	0.0099
$50,00-<$100,000	1 867	24.91	13 684	25. 34	
$100,000+	1 345	20.87	10 945	23.68	
Not Reported	1 305	17.80	8 412	18.03	
Smoking Status					
Current Smoker	813	12.19	29 844	12.91	<.0001
Former Smoker	2 744	37.33	13 692	24.63	
Never Smoked	3 699	50.48	6 684	62.46	
Binge Drinking					
Yes	554	9.46	7 646	17.05	<.0001
No	6 622	90.54	41 933	82.95	
General Health					
Excellent	583	8.56	8 804	17.80	<.0001
Very Good	2 030	28.66	17 441	33.41	
Good	2 517	33.21	16 350	32.22	
Fair	1 452	19.15	6 646	13.13	
Poor	681	10.42	1 902	3.43	
Poor Mental Health					
0 days	4 781	64.36	30 414	56.19	<.0001
1-13 days	1 502	20.97	12 487	27.76	
14+ days	873	14.66	6 769	16.05	
Poor Physical Health					
0 days	1 558	23.33	6 243	12.22	<.0001
1-13 days	1 792	25.41	12 295	25.41	
14+ days	3 751	51.00	30 919	62.37	
Exercise					
Yes	5 102	69.26	38 113	76.78	<.0001
No	2 175	30.74	12 320	23.22	

Note. ACE = Adverse Childhood Experiences Module; n = number of respondents.

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Table 3 – Crude and Adjusted Odds Ratios of Cancer Diagnosis in Study Population: Behavioral Risk Factor Surveillance System, 2022 (n = 58,127)

Variables	Crude Odds Ratio (95% CI) (n = 58,127)	Adjusted Odds Ratio (95% CI) (n = 54,148)
Adverse Childhood Experience(s)		
Low Exposure	Reference	Reference
High Exposure	**0.82 (0.72, 0.94)**	**1.20 (1.03, 1.39)**
Sex		
Male	Reference	Reference
Female	**1.29 (1.17, 1.43)**	**1.24 (1.12, 1.38)**
Race/Ethnicity		
White, Non-Hispanic	Reference	Reference
Black, Non-Hispanic	**0.38 (0.29, 0.49)**	**0.46 (0.35, 0.60)**
Other, Non-Hispanic	**0.28 (0.20, 0.41)**	**0.45 (0.30, 0.66)**
Multiracial	0.70 (0.48, 1.03)	0.96 (0.64, 1.44)
Hispanic	**0.34 (0.26, 0.44)**	**0.53 (0.39, 0.72)**
Age		
18-44	**0.08 (0.06, 0.09)**	**0.10 (0.08, 0.13)**
45-65	**0.40 (0.36, 0.45)**	**0.44 (0.39, 0.50)**
65+	Reference	Reference
Education		
Did not graduate High School	Reference	Reference
High School Graduate	**1.39 (1.06, 1.81)**	**1.38 (1.02, 1.87)**
Some College	**1.34 (1.03, 1.74)**	1.30 (0.96, 1.76)
College Graduate	**1.45 (1.12, 1.87)**	**1.67 (1.24, 2.24)**
Income		
<$50,00	Reference	Reference
$50,00-<$100,000	0.89 (0.79, 1.01)	N/A
$100,000+	**0.80 (0.70, 0.91)**	N/A
Not Reported	0.89 (0.77, 1.04)	N/A
Smoking Status		
Current Smoker	1.17 (1.00, 1.37)	1.08 (0.90, 1.29)
Former Smoker	**1.88 (1.69, 2.08)**	**1.22 (1.09, 1.36)**
Never Smoked	Reference	Reference
Binge Drinking		
Yes	**0.51 (0.43, 0.60)**	N/A
No	Reference	Reference
General Health		
Excellent	Reference	Reference
Very Good	**1.78 (1.47, 2.16)**	**1.41 (1.15, 1.73)**
Good	**2.14 (1.78, 2.58)**	**1.76 (1.44, 2.15)**
Fair	**3.03 (2.49, 3.70)**	**2.17 (1.71, 2.75)**
Poor	**6.32 (4.98, 8.02)**	**3.46 (2.56, 4.69)**
Poor Mental Health		
0 days	Reference	Reference
1-13 days	**0.66 (0.59, 0.74)**	**0.82 (0.72, 0.94)**
14+ days	**0.80 (0.68, 0.93)**	0.84 (0.69, 1.01)
Poor Physical Health		
0 days	Reference	Reference
1-13 days	**1.24 (1.09, 1.40)**	**1.26 (1.10, 1.45)**
14+ days	**2.34 (2.05, 2.66)**	**1.46 (1.22, 1.74)**
Exercise		
Yes	**0.68 (0.61, 0.76)**	N/A
No	Reference	Reference

Note. CI = Confidence Interval. **Bold values are significant.**

*N/A = indicates variables that were not included in the final model via backward stepwise deletion

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