Community Medicine & Health Education

Brown and Cohen, J Community Med Health Educ 2014, S2
http://dx.doi.org/10.4172/2161-0711.S2-008

Research Article Open Access

Association between Abusive and Non-abusive Adverse Childhood Experiences and Diagnosis of Cancer in Wisconsin, USA

Monique J Brown* and Steven A Cohen

Department of Family Medicine and Population Health, Division of Epidemiology, Virginia Commonwealth University School of Medicine, USA

Abstract

Background: Adverse childhood experiences (ACEs) have been found to be associated with cancer diagnosis.

Aim: The main aim of this study was to determine the extent to which ACEs (abusive and nonabusive) are associated with diagnosis of all cancers in Wisconsin, USA.

Methods: Data for this cross-sectional study were obtained from the 2010 Behavioral Risk Factor Surveillance System (BRFSS) survey, which was administered from January to December. The BRFSS is the largest ongoing telephone health survey, conducted in all US states, the District of Columbia, Puerto Rico, Guam and the U.S. Virgin Islands. The BRFSS provides data on a variety of health behaviors and outcomes among the non-institutionalized US population, 18 years and older. Wisconsin was the only state that asked questions on adverse childhood experiences and cancer diagnosis and the final sample size was 4,163.

Results: Respondents who reported ≥ 2 ACEs were 53% more likely to have a diagnosis of cancer compared to respondents who did not report ACEs (adjusted OR: 1.53; 95% CI: 1.09-2.13, p=0.0127). Respondents who reported 1 and ≥ 2 nonabusive ACEs were 49% and 53% more likely, respectively, to have a diagnosis of cancer compared to respondents who did not report nonabusive ACEs (adjusted OR: 1.49; 95% CI: 1.07-2.09, p=0.0198; adjusted OR: 1.53; 95% CI: 1.07-2.19, p=0.0201).

Conclusion: Exposure to ACEs overall and, specifically, non-abusive ACEs, was found to be associated with diagnosis of cancer. This association could be due to stressors during childhood influencing health behaviors, which may contribute to tumor growth, and/or stressors resulting in epigenetic modifications, which may result in tumor growth, which may lead to cancer.

Keywords: Adverse childhood experiences; Cancer; Abusive; Nonabusive; BRFSS

Abbreviations: ACEs: Adverse childhood experiences; CI: Confidence Interval

Introduction

Adverse childhood experiences (ACEs) are defined as the negative events that a child may undergo, including abuse (emotional, physical or sexual), witnessing violence among household members, losing a parent due to death or divorce, or household mental illness, substance abuse or criminal behavior [1,2]. Recent estimates suggest that approximately six in ten people in the general population have been exposed to at least one adverse event during childhood [3]. In one longitudinal study, 87% of participants who reported one ACE also reported at least one additional ACE. Household dysfunction, such as substance abuse occurred among one in four participants; physical abuse among one in ten; emotional abuse among one in ten and sexual abuse among one in five [4]. The high prevalence highlights that ACEs continue to be a major public health issue in the US [1], as they are common, not well-recognized and severely impact overall health and well-being [4,5].

One potential risk factor for cancer diagnosis is childhood adversity. Adverse events during childhood have been linked to cancer in adulthood [3,6], and more specifically, ovarian cancer [7] and lung cancer [8]. Respondents who reported experiencing at least six ACEs had a three-fold increase in risk of lung cancer compared to respondents who reported no exposure to ACEs [8]. A strong relationship has been shown between trauma and stress during childhood, and consequent smoking behavior [9,10]. Nevertheless, the increased risk of lung cancer could only be partially explained by the association between childhood adversity and smoking. Therefore, this finding suggests that the relationship between ACEs and cancer may be due to other mechanisms in which trauma and stress during childhood adversely affect health [8].

Adverse childhood events may be linked to cancer via psychosocial and/or biological pathways. As a result, childhood adversity, which may be a source of acute and chronic stressors, may result in susceptibility to cancer development due to risky health behaviors and/or biological factors such as epigenetic modifications and mutations [11]. Childhood adversity occurring between ages six and eight, such as being taken into foster care, being physically hurt by someone, sexual abuse, and being separated from mother and/or father occurring between ages six and eight, and cumulative adversity from birth to age eight were found to be associated with increased levels of inflammatory markers such as interleukin-6 and C-reactive protein at age ten [12]. Adverse events during childhood have also been shown to be associated with an increased emotional and physiological sensitivity response to trauma and stress [13,14], and may result in more vulnerability to dysregulation of the immune system during childhood [15].

Many studies have determined the role of multiple ACEs via an assessment of a graded relationship between these exposures and health

***Corresponding author:** Monique J Brown, MPH, Department of Family Medicine and Population Health, Division of Epidemiology, Virginia Commonwealth University School of Medicine, 830 East Main Street, 8th Floor Richmond, VA 23219, USA, Tel: 207-514-6233; E-mail: brownmj7@vcu.edu

Received December 04, 2013; **Accepted** April 02, 2014; **Published** April 07, 2014

Citation: Brown MJ, Cohen SA (2014) Association between Abusive and Non-abusive Adverse Childhood Experiences and Diagnosis of Cancer in Wisconsin, USA. J Community Med Health Educ S2: 008. doi:10.4172/2161-0711.S2-008

outcomes [6,8,9,16]. While the link between ACEs and cancer has been demonstrated, to the authors' knowledge, the association between the number of abusive and nonabusive ACEs and diagnosis of all cancers has not been examined. The main objectives of this study were to: 1) Examine the association between the number of ACEs and diagnosis of cancer; and 2) Assess the association between the number of abusive and nonabusive ACEs, and diagnosis of cancer. To date, this is the first study to examine the association between abusive and nonabusive ACEs and cancer using a population-based sample in the US.

Methods

Data source and sample

Data for this cross-sectional study were obtained from the 2010 Behavioral Risk Factor Surveillance System (BRFSS) survey, which is established by the Centers for Disease Control and Prevention (CDC). Questionnaires are implemented in January, and usually remain unchanged throughout the year [17]. The survey is administered from January to December. The BRFSS is the largest ongoing telephone health survey, conducted in all US states, the District of Columbia, Puerto Rico, Guam and the U.S. Virgin Islands [18]. The BRFSS provides data on a wide range of health behaviors and outcomes among the non-institutionalized adult population (age 18 years and older). The survey includes core questions, which are asked by every state, and optional modules that consist of other health topics or ask more in-depth questions on a topic previously addressed among the core questions. The 2010 survey included optional ACE and cancer survivorship modules [19]. However, Wisconsin was the only state that included both modules [19], and, therefore, is the only state on which the current study is based. There were 4,781 respondents in Wisconsin. Respondents were not eligible for the current study if they answered "don't know" or refused questions on ACEs. These criteria resulted in 4,163 respondents who were eligible for inclusion in the study.

Using a sample size of 4,163, an alpha level of 0.05, a two-sided test, an expected odds ratio of 1.5, and the squared correlation of the exposure with the included covariates to be 0.25, the expected power of the study was >99%. Power calculations were done in nQuery Advisor (Los Angeles, CA).

Operational definition of adverse childhood experiences

The ACE module consisted of questions about adverse, stressful and/or traumatic events experienced during childhood. Questions that garnered information on *abuse directed* to children were classified as "*abusive ACEs*". Questions that garnered information on events, while not directed towards the child, but still were considered adverse childhood events were classified as "*nonabusive ACEs*" (Table 1). ACE scores of 0, 1, and ≥ 2 for overall, abusive and nonabusive ACEs were used as previous research has shown a graded relationship between ACEs and adverse health outcomes [8]. The impact of exposure to any ACE, abusive or nonabusive ACE on cancer diagnosis was also examined. The use of adverse childhood events for research has shown to be dependable. The kappa coefficient indicating the test-retest reliability in responses to ACE questions has been found to range from 0.46-0.86 [20]. Our previous study examining the association between ACEs and cancer diagnosis using principal component analysis allowed for the aggregation of ACE components that were likely to cluster together, and accounted for the loading of each adverse event [3]. This approach allowed for the derivation of three components of ACEs (sexual abuse, other abuse, and ACEs not directed towards the child) as derived from the data. To build upon this previous work, we were interested in examining the association between overall abusive experiences directed towards the child and other ACEs that were not directed towards the child, and cancer diagnosis.

Type of ACEs	Questions	Operational Definition
Abusive	1) How often did a parent or adult in your home ever swear at you, insult you, or put you down?	Never vs. At least once
	2) How often did anyone at least 5 years older than you or an adult, ever touch you sexually?	Never vs. At least once
	3) How often did anyone at least 5 years older than you or an adult, try to make you touch them sexually?	Never vs. At least once
	4) How often did anyone at least 5 years older than you or an adult, force you to have sex?	Never vs. At least once
	5) 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.	Never vs. At least once
Nonabusive	1) Did you live with anyone who was depressed, mentally ill or suicidal?	No vs. Yes
	2) Did you live with anyone who was a problem drinker or alcoholic?	No vs. Yes
	3) Did you live with anyone who used illegal street drugs or who abused prescription medications?	No vs. Yes
	4) Did you live with anyone who served time or was sentenced to serve time in a prison, jail, or other correctional facility?	No vs. Yes
	5) Were your parents separated or divorced?	No vs. Yes
	6) How often did your parents or adults in your home ever slap, hit, kick, punch or beat each other up?	Never vs. At least once

Table 1: Types of ACEs, related BRFSS questions and operational definitions.

Operational definition of cancer

The cancer survivorship module included several questions on cancer diagnosis. Cancer was selected as previous research has suggested a link between ACEs and cancer diagnosis [3,6-8]. Cancer diagnosis was operationalized by the question: 1) "Have you ever been told by a doctor, nurse, or other health professional that you had cancer?". This question elicited a yes/no response. Self-reported cancer diagnoses have been shown to have high sensitivity and specificity [21] with high validity and moderate to excellent agreement to medical chart information [22]. These data have also been shown to be useful for epidemiologic research [22].

Potential confounders

Potential confounders considered were factors that have been shown to be associated with ACEs or cancer diagnosis. Sociodemographic variables have been included as covariates in prior studies [3,23]. Older age is also a known risk factor for cancer [24,25]; and sex and race/ethnicity are risk factors for certain types of cancer. For example, aside from non-melanoma skin cancer, breast cancer is the most common cancer among women, and prostate cancer is the most common cancer among men [26-28]. According to data from the CDC, from 1999 to 2008, White women had the highest breast cancer incidence rates while Black women had the highest mortality rates [29]. Socioeconomic characteristics such as income and education, and marital status have also been considered as covariates in ACEs studies [8,23]; and socioeconomic status may partially explain the association of childhood adversity with chronic illness [30]. Insurance status may also be a potential confounder in the association between ACEs and

cancer, as childhood adverse events have been linked to health [31]. Therefore, the factors that were considered as potential confounders in the study included: age, sex, race/ethnicity, and annual household income, and education, marital and insurance status.

Analytic approach

All analyses considered the complex multistage sampling strategy used in the BRFSS [17]. Weighted prevalence estimates were obtained for overall, abusive, and nonabusive ACEs; and cancer. P values were used to compare the distributions of age, gender, race/ethnicity, annual household income, educational status, marital status and insurance status by exposure to overall ACEs and no exposure to ACEs.

Three separate models were examined using an iterative approach (not computer-driven) for assessing the associations between overall, abusive and non-abusive exposure to ACEs, and cancer. A variable was considered to be a potential confounder based on a review of the literature as well as analyses shown in Table 2 comparing individuals reporting exposure to ACEs and respondents not reporting exposure to ACEs. Each potential confounder was placed in each model with overall, abusive and non-abusive ACEs as separate outcomes. The confounder that changed the effect of ACEs the most was then retained for the next iteration. This process was repeated until the change in effects of ACEs was no greater than 10%.

Multivariable logistic regression models were used to obtain adjusted odds ratios (OR) and 95% confidence intervals (CI) for the association between the number of ACEs experienced, and exposure to any ACE (overall, abusive, and non-abusive) and all cancers adjusting for age, gender, race/ethnicity, annual household income, educational status, marital status, and insurance status (Table 3). Sensitivity analyses were conducted excluding skin cancer diagnoses, which are the most common types of cancer, in the fully adjusted models examining the relationship between overall, abusive and non-abusive ACEs and cancer.

Ethics statement

Verbal consent was provided for participation in the BRFSS survey. The Virginia Commonwealth University Institutional Review Board identifies studies using publicly available, de-identified, secondary data as exempt.

Results

Weighted prevalence estimates

The weighted prevalence of ACEs was approximately 63%. In the sample, 57% and 54% of respondents reported being exposed to abusive and nonabusive ACEs, respectively. Ten percent of respondents

Confounders	ACEs	Abusive ACEs[a]	NonabusiveACEs[b]	No ACEs	P value[c]
	N=2,509 WN=2,463,391	N=1,945 WN=1,913,523	N=1,703 WN=1,696,620	N=1,654 WN=1,438,266	
	%	%	%	%	
Age					
18-34	36.6	34.7	40.7	20.3	<0.0001
35-49	25.8	26.6	25.7	24.8	
50+	37.6	38.7	33.6	55.0	
Gender					
Female	50.5	49.3	53.9	50.5	0.9949
Male	49.5	50.7	46.1	49.5	
Race/Ethnicity					
White	87.6	88.9	85.5	93.5	0.0001
Black	3.5	3.4	4.3	1.5	
Hispanic	3.0	2.0	3.8	0.8	
Other*	5.9	5.7	6.4	4.2	
Household Income (Annual)					
<$15,000	5.4	6.0	6.0	2.1	<0.0001
$15,000-<$50,000	52.2	51.6	53.9	44.6	
$50,000+	42.4	42.4	40.1	53.3	
Education					
<HS Graduate	5.0	4.6	6.0	4.5	0.1436
HS Graduate	32.9	33.5	34.0	29.2	
>HS Graduate	62.1	61.9	60.0	66.3	
Marital Status					
Married	58.8	58.7	57.0	69.7	<0.0001
Not married	41.2	41.3	43.0	30.3	
Insurance Status					
Insured	87.1	87.1	86.1	93.7	<0.0001
Not insured	12.9	12.9	13.9	6.3	

N=Frequency; WN=Weighted frequency

*The group "Other" contains respondents who identified themselves as "Multiracial", "Other", "Native American/Alaska Native" and "Native Hawaiian/Other Pacific Islander"

[a]Abusive ACEs refers to being hurt, being swore at, or being sexually abused as a child

[b]Nonabusive ACEs refers to living with anyone who was mentally ill, alcoholic, abused drugs/prescriptions, serving time in a correctional facility, had separated/divorced parents, had seen parents abuse each other.

[c]P value shows differences between overall ACEs and no ACEs.

Table 2: Distribution of socio-demographic characteristics of BRFSS respondents by ACEs, Abusive ACEs, Nonabusive ACEs and No ACEs.

Types of ACEs	All Cancers					
Overall ACEs	OR[a]	95% CI[a]	P-value	OR[b]	95% CI[b]	P-value
0	1.00	--	--	1.00	--	--
1	0.73	0.53–1.01	0.0570	1.05	0.72–1.54	0.8076
≥2	0.87	0.67–1.15	0.3301	**1.53**	**1.09–2.13**	**0.0127**
Abusive ACEs						
0	1.00	--	--	1.00	--	--
1	0.94	0.70–1.27	0.6931	1.25	0.89–1.75	0.1955
≥2	0.90	0.67–1.21	0.4942	1.33	0.95–1.85	0.0956
Nonabusive ACEs						
0	1.00	--	--	1.00	--	--
1	1.07	0.80–1.45	0.6350	**1.49**	**1.07–2.09**	**0.0198**
≥2	0.88	0.65–1.18	0.3921	**1.53**	**1.07–2.19**	**0.0201**

Bolded estimates show statistically significant results at 95% confidence level

[a]Unadjusted odds ratios and 95% confidence intervals

[b]Adjusted odds ratios and 95% CIs–adjusted for age, gender, race/ethnicity, annual household income, education, marital status and insurance status

Table 3: Association between Overall, Nonabusive and Abusive ACEs, and All Cancers.

reported being diagnosed with cancer, with 9.3% reporting their first at 18 years or older. Among respondents who reported a diagnosis of cancer, 98.5% reported having their first diagnosis at age 18 or older.

Distribution of characteristics across exposure groups

Table 2 shows the distribution of socio-demographic characteristics of respondents by exposure to overall, abusive, nonabusive ACEs and no exposure to ACEs. There were statistically significant differences by age, race/ethnicity, annual household income, marital, and insurance status in the proportions of respondents who reported ACEs compared to those who did not. A higher percentage of respondents 18-34 (34.7%) and 50 years and older (38.7%) reported abusive ACEs compared to respondents 35-49 (26.6%). Of the respondents who reported ACEs, 87.6% were White, 3.5% were Black and 3.0% were Hispanic. A higher percentage of respondents reporting an annual household income of $15,000-50,000 reported nonabusive (53.9%) relative to abusive ACEs (51.6%).

Approximately a third of respondents who reported ACEs were high school graduates compared to folks who didn't have an ACE, of whom 29.2% were high school graduates. Irrespective of the type of ACEs experienced, most respondents (abusive: 61.9%; nonabusive: 60.0%) had more than a high school education. Six in ten respondents who reported overall, abusive and nonabusive ACEs were married, while three in ten respondents who reported non-exposure to ACEs were not married. Among respondents who reported overall and abusive ACEs, 12.9% did not have health insurance. However, among respondents who did not report any ACEs, 6.3% did not have insurance.

Association between ACEs and diagnosis of cancer

Table 3 shows the association between ACEs and diagnosis of all cancers. There were no statistically significant results using the unadjusted models. However, after adjusting for age, gender, race/ethnicity, annual household income, education, marital and insurance status, respondents who reported at least two ACEs were 53% more likely to report a diagnosis of cancer compared to respondents who did not report ACEs (OR: 1.53; 95% CI: 1.09-2.13, p=0.0127). There were no statistically significant results seen for abusive ACEs and diagnosis of cancer. However, respondents who reported one and at least two nonabusive ACEs were 49% and 53% more likely, respectively, to report a cancer diagnosis compared to respondents who did not report nonabusive ACEs (OR: 1.49; 95% CI: 1.07-2.09, p=0.0198; OR: 1.53; 95% CI: 1.07-2.19, p=0.0201).

Additional analyses showed that after adjusting for sociodemographic characteristics, respondents who were exposed to any nonabusive ACE were 47% more likely to report a cancer diagnosis (OR:1.47; 95% CI: 1.04–2.08, p=0.0299). No statistically significant result was seen for the association between any type of ACE or abusive ACE and cancer diagnosis (Table 4). Sensitivity analyses excluding skin cancer from the operational definition of cancer diagnosis showed a negative association between nonabusive ACEs and diagnosis of cancer (OR: 0.52; 95% CI: 0.28–0.97, p=0.0404). However, adjusting for sociodemographic characteristics attenuated the relationship so that the confidence intervals included unity (OR: 0.50; 95% CI: 0.25–1.01, p=0.0541) (Table 5).

Discussion

There has been an increasing interest in the relationship between ACEs and cancer, and many recent studies have explored this association. However, to the authors' knowledge, no study has reported on the association between abusive and nonabusive ACEs and cancer diagnosis. Respondents who were exposed to at least two ACEs were more likely to be diagnosed with cancer, compared to respondents who were not exposed. An association was also seen between nonabusive ACEs and cancer diagnosis.

Types of ACEs	All Cancers					
Overall ACEs	OR[a]	95% CI[a]	P-value	OR[b]	95% CI[b]	P-value
None	1.00	--	--	1.00	--	--
Any	0.81	0.62–1.04	0.0996	1.27	0.93–1.73	0.1283
Abusive ACEs						
None	1.00	--	--	1.00	--	--
Any	0.83	0.63–1.09	0.1749	1.29	0.93–1.79	0.1263
Nonabusive ACEs						
None	1.00	--	--	1.00	--	--
Any	0.83	0.63–1.10	0.1875	**1.47**	**1.04–2.08**	**0.0299**

Bolded estimates show statistically significant results at 95% confidence level

[a]Unadjusted odds ratios and 95% confidence intervals

[b]Adjusted odds ratios and 95% CIs–adjusted for age, gender, race/ethnicity, annual household income, education, marital status and insurance status

Table 4: Association between Any Overall, Nonabusive and Abusive ACE, and All Cancers.

Types of ACEs	All Cancers					
Overall ACEs	OR[a]	95% CI[a]	P-value	OR[b]	95% CI[b]	P-value
0	1.00	--	--	1.00	--	--
1	0.72	0.36–1.45	0.3540	0.65	0.29–1.47	0.3019
≥2	0.82	0.44–1.53	0.5224	0.81	0.39–1.71	0.5824
Abusive ACEs						
0	1.00	--	--	1.00	--	--
1	1.45	0.75–2.82	0.2727	1.74	0.84–3.61	0.1362
≥2	1.59	0.86–2.94	0.1393	1.51	0.77–2.97	0.2273
Nonabusive ACEs						
0	1.00	--	--	1.00	--	--
1	**0.52**	**0.28–0.97**	**0.0404**	0.50	0.25–1.01	0.0541
≥2	0.72	0.37–1.41	0.3395	0.79	0.37–1.69	0.5384

Bolded estimates show statistically significant results at 95% confidence level

[a]Unadjusted odds ratios and 95% confidence intervals

[b]Adjusted odds ratios and 95% CIs–adjusted for age, gender, race/ethnicity, annual household income, education, marital status and insurance status

Table 5: Sensitivity Analyses Examining the Association between Overall, Nonabusive and Abusive ACEs, and All Cancers excluding Skin Cancers.

A change in direction of the association is seen in the majority of the ORs and the adjusted ORs depicting the association between ACEs, and cancer. Testing for confounding demonstrated that controlling for age was the main reason for the change in direction of the ORs. This finding suggests that age drastically confounds the association between ACEs, and cancer in adulthood. Nevertheless, after adjusting for age and other sociodemographic characteristics, a statistically significant graded relationship was not observed between ACEs and cancer as reported by Brown et al. (2010). This same study found a graded association between ACEs and risk of lung cancer. However, the current study used a cross-sectional design and considered prevalence of all cancers while Brown et al. (2010) looked at incident lung cancer using a prospective study design [8]. These differences in study design could have contributed to the discrepancies seen in the results.

Previous studies have shown an association between adverse events during childhood and cancer. Our previous work showed an association between sexual abuse and cancer using principal component analysis [3]. The current study did not show a statistically significant association between overall abusive (sexual, physical and psychological) experiences and cancer, but showed an association between the number of nonabusive ACEs and cancer. In a longitudinal study, Kelly-Irving et al. (2013) found that among women, respondents who reported being exposed to at least two ACEs were twice as likely to have had cancer before 50 years old compared to women who reported not being exposed to ACEs [6], which is similar to the findings in the current study of exposure to at least two ACEs being associated with diagnosis of cancer.

ACEs were separated into abusive and nonabusive ACEs. We expected to see an association between abusive ACEs and cancer diagnosis. In the current study, a statistically significant association was observed between nonabusive ACEs and cancer, but was not observed for abusive ACEs and cancer. There are strong graded relationships between abusive experiences and health-risk behaviors [32] and chronic illnesses [33] while research on ACEs, specifically on nonabusive experiences, is scant. Nevertheless, these findings are crucial as they highlight the notion that nonabusive adverse experiences during childhood should not be neglected in future research on ACEs, and that more studies should be done separating abusive and nonabusive experiences to determine if certain types of adverse health outcomes would result from specific categories of ACEs (abusive and/or nonabusive). One previous study examining the association between abusive and nonabusive experiences showed that respondents who reported abusive (direct) experiences were 50% more likely to be smokers while respondents who reported nonabusive (environmental) experiences were 80% more likely to be smokers [34]. This difference in likelihood of smoking between exposure to abusive versus nonabusive experiences suggests that some adverse health behaviors and, therefore, health outcomes may be more attributable to nonabusive experiences compared to abusive experiences.

The association seen between ACEs, and more specifically, nonabusive ACEs and all cancers maybe attributable to mechanisms in which stressors during childhood may have a negative impact on health [8]. The constant exposure to stress and trauma may influence system regulation which has been shown to impact cancer development [35]. ACEs have also been shown to be associated with behaviors such as smoking [36,37], risky sexual behaviors [38-40], and sexually transmitted infections [4,39,41], which have been shown to be predictors for cancer diagnosis [6]. The negative association seen between nonabusive ACEs and diagnosis of cancers except skin cancer, and the positive association between nonabusive ACEs and all cancers suggest that there may be a strong positive association between nonabusive ACEs and skin cancer. Overall, these findings suggest that the risk of cancer may be influenced by adverse events during childhood and may be helpful in understanding more about the potential risk factors for cancer. These findings may also help to redirect cancer etiology research and help to develop appropriate cancer prevention policies [6].

The study should be considered with limitations in mind. First, the study was cross-sectional. Questions on ACEs did not ask about the age of exposure. Therefore, it is possible that exposure to ACEs could have occurred after a cancer diagnosis. However, 98.5% of the cancers were diagnosed in adulthood. Consequently, the ambiguity of temporal sequence between ACEs and cancer would have only applied to 1.5% of the cancer diagnoses. Second, ACEs could have been underreported which may have resulted in non-differential misclassification of ACEs. However, if this were the case, the odds ratios produced would have been biased towards the null. Third, due to the small number of childhood cancer diagnoses, we were not able to determine the association between ACEs and childhood cancer.

Nevertheless, the study also had several strengths. First, to our knowledge, this study is the first study to determine the association between abusive and nonabusive ACEs and cancer diagnosis. Second, the estimates produced accounted for sociodemographic confounders. Even after controlling for characteristics that are known risk factors for cancer and/or are associated with adverse events during childhood, an association was seen between overall, nonabusive ACEs and cancer. Third, the associations between the quantity (number) and quality (type) of ACEs, and cancer diagnosis were examined. Fourth, sensitivity analyses were done excluding skin cancer (the most common type) from the operational definition of cancer.

Conclusion

The results show an association between overall ACEs, nonabusive (environmental) ACEs and cancer diagnosis. ACEs screening should be implemented during routine healthcare examinations so as identify patients who may be at risk for chronic illnesses [3].

Future Research

Future research should also focus on nonabusive ACEs and adverse health outcomes. Studies should also endeavor to oversample participants who have been diagnosed with childhood cancer to determine if the association between ACEs and cancer starts from childhood and persists into adulthood [3].

References

1. Anda RF, Butchart A, Felitti VJ, Brown DW (2010) Building a framework for global surveillance of the public health implications of adverse childhood experiences. Am J Prev Med 39: 93-98.

2. Centers for Disease Control and Prevention (CDC) (2010) Adverse childhood experiences reported by adults five states, 2009. MMWR Morb Mortal Wkly Rep 59: 1609-1613.

3. Brown MJ, Thacker LR, Cohen SA (2013) Association between adverse childhood experiences and diagnosis of cancer. PLoS One 8: e65524.

4. Felitti VJ, Anda RF, Nordenberg D, Williamson DF, Spitz AM, et al. (1998) Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults. The Adverse Childhood Experiences (ACE) Study. Am J Prev Med 14: 245-258.

5. Larkin H, Felitti VJ, Anda RF (2014) Social work and adverse childhood experiences research: implications for practice and health policy. Soc Work Public Health 29: 1-16.

6. Kelly-Irving M, Lepage B, Dedieu D, Lacey R, Cable N, et al. (2013) Childhood

adversity as a risk for cancer: findings from the 1958 British birth cohort study. BMC Public Health 13: 767.

7. van der Meer LB, van Duijn E, Wolterbeek R, Tibben A (2012) Adverse childhood experiences of persons at risk for Huntington's disease or BRCA1/2 hereditary breast/ovarian cancer. Clin Genet 81: 18-23.
8. Brown DW, Anda RF, Felitti VJ, Edwards VJ, Malarcher AM, et al. (2010) Adverse childhood experiences are associated with the risk of lung cancer: a prospective cohort study. BMC Public Health 10: 20.
9. Anda RF, Croft JB, Felitti VJ, Nordenberg D, Giles WH, et al. (1999) Adverse childhood experiences and smoking during adolescence and adulthood. JAMA 282: 1652-1658.
10. Jun HJ, Rich-Edwards JW, Boynton-Jarrett R, Austin SB, Frazier AL, et al. (2008) Child abuse and smoking among young women: the importance of severity, accumulation, and timing. J Adolesc Health 43: 55-63.
11. Kelly-Irving M, Mabile L, Grosclaude P, Lang T, Delpierre C (2013) The embodiment of adverse childhood experiences and cancer development: potential biological mechanisms and pathways across the life course. Int J Public Health 58: 3-11.
12. Slopen N, Kubzansky LD, McLaughlin KA, Koenen KC (2013) Childhood adversity and inflammatory processes in youth: a prospective study. Psychoneuroendocrinology 38: 188-200.
13. Hammen C, Henry R, Daley SE (2000) Depression and sensitization to stressors among young women as a function of childhood adversity. J Consult Clin Psychol 68: 782-787.
14. McLaughlin KA, Green JG, Gruber MJ, Sampson NA, Zaslavsky AM, et al. (2010) Childhood adversities and adult psychiatric disorders in the national comorbidity survey replication II: associations with persistence of DSM-IV disorders. Arch Gen Psychiatry 67: 124-132.
15. Fagundes CP, Glaser R, Malarkey WB, Kiecolt-Glaser JK (2013) Childhood adversity and herpesvirus latency in breast cancer survivors. Health Psychol 32: 337-344.
16. Dong M, Anda RF, Felitti VJ, Dube SR, Williamson DF, et al. (2004) The interrelatedness of multiple forms of childhood abuse, neglect, and household dysfunction. Child Abuse Negl 28: 771-784.
17. Centers for Disease Control and Prevention (CDC) (2012) Behavioral Risk Factor Surveillance System: 2010 BRFSS Overview.
18. Centers for Disease Control and Prevention (CDC) (2012) Behavioral Risk Factor Surveillance System.
19. Centers for Disease Control and Prevention (CDC) (2010) Behavioral Risk Factor Surveillance System: Questionnaires: Modules by Category.
20. Dube SR, Williamson DF, Thompson T, Felitti VJ, Anda RF (2004) Assessing the reliability of retrospective reports of adverse childhood experiences among adult HMO members attending a primary care clinic. Child Abuse Negl 28: 729-737.
21. Stavrou E, Vajdic CM, Loxton D, Pearson SA (2011) The validity of self-reported cancer diagnoses and factors associated with accurate reporting in a cohort of older Australian women. Cancer Epidemiol 35: e75-80.
22. Gupta V, Gu K, Chen Z, Lu W, Shu XO, et al. (2011) Concordance of self-reported and medical chart information on cancer diagnosis and treatment. BMC Med Res Methodol 11: 72.
23. Vander Weg MW (2011) Adverse childhood experiences and cigarette smoking: the 2009 Arkansas and Louisiana Behavioral Risk Factor Surveillance Systems. Nicotine Tob Res 13: 616-622.
24. Centers for Disease Control and Prevention (CDC) (2012) Breast Cancer Risk by Age.
25. Centers for Disease Control and Prevention (CDC) (2012) Prostate Cancer Risk by Age.
26. Centers for Disease Control and Prevention (CDC) (2012) Breast Cancer Statistics.
27. Centers for Disease Control and Prevention (CDC) (2012) Cancer Prevention and Control: Cancer Among Men.
28. Centers for Disease Control and Prevention (CDC) (2012) Cancer Prevention and Control Cancer Among Women.
29. Centers for Disease Control and Prevention (CDC) (2012) Breast Cancer Rates by Race/Ethnicity.
30. Mock SE, Arai SM (2011) Childhood trauma and chronic illness in adulthood: mental health and socioeconomic status as explanatory factors and buffers. Front Psychol 1: 246.
31. Cambois E, Jusot F (2011) Contribution of lifelong adverse experiences to social health inequalities: findings from a population survey in France. Eur J Public Health 21: 667-673.
32. Chaopricha S, Jirapramukpitak T (2010) Child abuse and risky behaviors among youths. J Med Assoc Thai 93 Suppl 7: S160-165.
33. Heitkemper M, Jarrett M, Taylor P, Walker E, Landenburger K, et al. (2001) Effect of sexual and physical abuse on symptom experiences in women with irritable bowel syndrome. Nurs Res 50: 15-23.
34. Yeoman K, Safranek T, Buss B, Cadwell BL, Mannino D (2013) Adverse childhood experiences and adult smoking, Nebraska, 2011. Prev Chronic Dis 10: E159.
35. Lutgendorf SK, Sood AK, Antoni MH (2010) Host factors and cancer progression: biobehavioral signaling pathways and interventions. J ClinOncol 28: 4094-4099.
36. Ford ES, Anda RF, Edwards VJ, Perry GS, Zhao G, et al. (2011) Adverse childhood experiences and smoking status in five states. Prev Med 53: 188-193.
37. Dube SR, Cook ML, Edwards VJ (2010) Health-related outcomes of adverse childhood experiences in Texas, 2002. Prev Chronic Dis 7: A52.
38. Brown DW, Anda RF (2009) Adverse childhood experiences: origins of behaviors that sustain the HIV epidemic. AIDS 23: 2231-2233.
39. Hillis SD, Anda RF, Felitti VJ, Nordenberg D, Marchbanks PA (2000) Adverse childhood experiences and sexually transmitted diseases in men and women: a retrospective study. Pediatrics 106: E11.
40. Klein H, Elifson KW, Sterk CE (2007) Childhood neglect and adulthood involvement in HIV-related risk behaviors. Child Abuse Negl 31: 39-53.
41. Jewkes RK, Dunkle K, Nduna M, Jama PN, Puren A (2010) Associations between childhood adversity and depression, substance abuse and HIV and HSV2 incident infections in rural South African youth. Child Abuse Negl 34: 833-841.

Citation: Brown MJ, Cohen SA (2014) Association between Abusive and Non-abusive Adverse Childhood Experiences and Diagnosis of Cancer in Wisconsin, USA. J Community Med Health Educ S2: 008. doi:10.4172/2161-0711.S2-008

This article was originally published in a special issue, **Management and Prevention of Chronic Disease and Disability: A Global Challenge** handled by Editor. Dr. Syeda Zakia Hossain, University of Sydney, Australia