



Original article

Gender Differences in the Association between Adverse Childhood Experiences and Cancer

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A B S T R A C T

Objectives: Adverse childhood experiences (ACEs) have been linked to a variety of diseases in adulthood, including cancer. However, current research has yet to determine if all abuse types are associated with cancer and if women are more adversely impacted by ACEs than men.

Methods: Data from the 2011 Behavioral Risk Factor Surveillance System, a national survey of American adults 18 and older ($N = 111,964$) were analyzed. Logistic regression models were fit to estimate odds of ever being diagnosed with cancer after experiencing one or more of eight different ACEs, while adjusting for potential confounders. These analyses were then stratified by gender.

Results: Among women, childhood experiences of physical abuse, sexual abuse, emotional abuse, living with someone who was mentally ill, living with a problem drinker, living with a drug user, and living in a household where adults treated each other violently were associated with higher odds of cancer. Among men, only emotional abuse was associated with higher odds of cancer.

Conclusions: Results suggest that ACEs increase risk of cancer later in life. However, this impact occurs mostly among women. This finding may be because women experience many ACEs at higher rates than men and because women, via sexual abuse, can be exposed to cancer-causing viruses.

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Adverse childhood experiences (ACEs) have been linked to a number of negative health consequences in both adults and children (Alcalá, Keim-Malpass, & Mitchell, 2017; Alcalá, von Ehrenstein, & Tomiyama, 2016; Lindert et al., 2014; Maniglio, 2009; Rohde et al., 2008; Springer, Sheridan, Kuo, & Carnes, 2007; U.S. Department of Health & Human Services, 2012). Physical and sexual abuse are particularly problematic because they are associated with short-term outcomes such as bruising, bone fractures, and death (U.S. Department of Health & Human Services, 2012). In addition to short-term consequences, ACEs are detrimental

because they have been linked to poor health later in life (Lindert et al., 2014; Maniglio, 2009; Rohde et al., 2008; Springer et al., 2007). Also, ACEs have been associated with precursors of poor health, including substance abuse, tobacco use, risky sexual behaviors, reduced rates of use of preventative health services, and criminality (Alcalá, Mitchell, & Keim-Malpass, 2016; Alcalá, von Ehrenstein, et al., 2016; Gilbert et al., 2009). Overall, available evidence has documented consistent associations between ACEs and, primarily, physical health consequences in the short-term and psychiatric health consequences in the long term (Hughes, Hardcastle, & Bellis, 2016).

Emerging research has suggested associations between ACEs and cancer later in life. The number of ACEs reported is associated with elevated odds of cancer in adulthood (Brown et al., 2010; Felitti et al., 1998; Llabre et al., 2016), and lung cancer mortality (Brown et al., 2010). Because ACEs encompass measures of both child abuse and household dysfunction, some insight into the impact of ACEs can be gleaned from examining specific ACEs. For example, physical abuse as a child is associated

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with increased odds of cancer in adulthood (Fuller-Thomson, Bottoms, & Brennenstuhl, 2009). Similarly, research has suggested child sexual abuse is associated with increased risk of cervical cancer (Coker, Hopenhayn, DeSimone, Bush, & Crofford, 2009). Specifically, women who have been sexually abused as children have double the risk of cervical cancer, when compared with those who have not been abused (Coker et al., 2009).

When researchers have attempted to examine the impact of different ACEs on cancer health in the same population, inconsistent results have been noted. For example, when extracting three factors from ACE items, only the factor with the strongest loading on measures of sexual abuse was associated with elevated odds of cancer (Brown, Thacker, & Cohen, 2013). Conversely, when comparing the impact of child abuse and household dysfunction, a study in the rural United States found that experiencing any child abuse was not associated with odds of cancer, whereas experiencing any household dysfunction was associated with a lower odds of cancer (Iniguez & Stankowski, 2016). In all, available evidence suggests that the impact of individual ACEs is not uniform; given variability, the practice of summing items or creating categorical measures of ACEs may obscure associations (Alcalá, von Ehrenstein, et al., 2016). This is important because, as some have argued, not all ACE items may be linked to cancer by the same mechanisms or to the same degree (Alcalá, 2016).

Limited cross-sectional research has explored the role of gender in the association between ACEs and cancer. In the Behavioral Risk Factor Surveillance System (BRFSS), women experience higher rates of most ACEs, including sexual abuse (Centers for Disease Control and Prevention, 2010). This is of concern in relation to cancer because sexual abuse can involve exposure to the human papilloma virus or human immunodeficiency virus (Lindgren et al., 1998; Rogstad, Wilkinson, & Robinson, 2016); both viruses are associated with an increased risk of cancer (Engels et al., 2008; Walboomers et al., 1999), with human papilloma virus being of particular concern for cervical cancer. In the cancer context, experiencing any child abuse is more strongly associated with cancer among women than men (Afifi et al., 2016). Experiences of physical, but not emotional, abuse increase the risk for cancer for both men and women (Morton, Schafer, & Ferraro, 2012). Overall, the gender-specific impact of ACEs and cancer has received limited attention, but available evidence suggests that women have a greater exposure to ACEs and female survivors of ACEs are more adversely impacted than are males. Consequently, we hypothesize that the association between ACE items and cancer will depend on gender, such that female ACE survivors will have a higher odds of cancer, relative to male survivors.

Materials and Methods

Data Source

The present study used publicly available data from the 2011 BRFSS, thus not requiring institutional review board approval. This multistage, random digit dial telephone survey is designed to be representative of noninstitutionalized adults (ages 18 and over) living in all U.S. states and some territories. The BRFSS is conducted on an annual basis (Centers for Disease Control and Prevention, 2011a). A core set of questions were asked of all participants in all states and territories (Centers for Disease Control and Prevention, 2011a). Optional modules of questions were asked of all or some participants in states electing to administer them (Centers for Disease Control and Prevention, 2011a). Data on core questions were collected using both

landlines and cell phones in all states, and optional modules were administered with landlines and/or cellphones (Centers for Disease Control and Prevention, 2011a). For the 2011 BRFSS, 10 states (California, Maine, Minnesota, Montana, Nebraska, Nevada, Oregon, Vermont, Washington, and Wisconsin) administered a module that measured ACEs (Centers for Disease Control and Prevention, 2011b). Among these 10 states, the median weighted American Association for Public Opinion Research response rate (RR4) was almost 50%, which is better than other telephone-based surveys in the U.S. (BRFSS, 2013a).

Among the 10 states that administered the ACEs module, 131,686 respondents participated in the BRFSS. Individuals with missing data (i.e., missing or responses of “don’t know” or “refused”) on any variable used in the present analyses were excluded, resulting in an analytic sample size of 111,964.

Measures

The main independent variables of interest were measures of childhood adversity. These were measured in the BRFSS with the widely used ACE scale, which assesses adversity occurring before age 18. The psychometric properties of the ACEs scale have been examined among both clinical and community-dwelling samples and have shown good internal consistency and strong correlations with other self-reported measures of adversity (Ford et al., 2014; Murphy et al., 2014; Wingenfeld et al., 2011). The 11-item scale includes measures of child abuse as well as household dysfunction (Felitti et al., 1998). These questions were: 1) “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.”; 2) “How often did a parent or adult in your home ever swear at you, insult you, or put you down?”; 3) “How often did anyone at least 5 years older than you or an adult, ever touch you sexually?”; 4) “How often did anyone at least 5 years older than you or an adult, try to make you touch them sexually?”; 5) “How often did anyone at least 5 years older than you or an adult, force you to have sex?”; 6) “Did you live with anyone who was depressed, mentally ill, or suicidal?”; 7) “Did you live with anyone who was a problem drinker or alcoholic?”; 8) “Did you live with anyone who used illegal street drugs or who abused prescription medications?”; 9) “Did you live with anyone who served time or was sentenced to serve time in a prison, jail, or other correctional facility?”; 10) “Were your parents separated or divorced?”; and 11) “How often did your parents or adults in your home ever slap, hit, kick, punch, or beat each other up?” Because the California BRFSS did not have any data for the item on imprisonment and jail, this item was not included. All items were coded to indicate if the respondent had experienced the specific adversity in question. Based on evidence from prior studies indicating that sexual abuse measures in the ACE scale capture the same underlying construct (Brown et al., 2013; Ford, et al., 2014), the three items measuring sexual abuse were combined to create a singular measure of sexual abuse. This yielded eight ACE measures.

Existing research has treated the ACEs module as a count of experiences or extracted factors, and this greatly limits our understanding of how these experiences impact later health outcomes. Specifically, because these experiences have unique characteristics, treating them as interchangeable does not advance our understanding of how and if each of these experiences impact disease. For example, as noted, sexual abuse is associated with increased risk of infections that are associated with cancer, suggesting that some adversities have biological pathways linking to disease that are likely irrelevant for other adversities. Also, as

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