Examining exposure to adverse childhood experiences and later outcomes of poor physical and mental health among South Carolina adults

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ABSTRACT

Recent research on adverse childhood experiences (ACEs) has used factor analysis to categorize ACEs. Further research is needed to determine if these previously identified factors are related to specific health outcomes. Using data obtained from the 2014–2015 South Carolina Behavioral Risk Factor Surveillance System, this study assessed the association between categories (household dysfunction; emotional and physical abuse; sexual abuse) and combinations of categories of ACEs on mental and physical health outcomes in adulthood (n = 15,638). Respondents who had all three categories of abuse were much more likely to report poor health and mental distress. Sexual abuse in childhood increased the odds of reporting poor health and mental distress; some ACEs may have stronger associations to long term health than others. These findings can help lead to effective and targeted prevention or intervention strategies that incorporate the new insight on the combination of ACE categories that are likely to co-occur.

1. Introduction

Adverse childhood experiences (ACEs) include various types of abuse: physical, sexual, and emotional; as well as household dysfunctions, such as living in a home with violence, alcohol, and substance misuse and disorders, mental illness, incarceration, and parental separation or divorce (Felitti et al., 1998). ACEs have typically been examined via the ACE Survey, a series of questions developed by Drs. Robert Anda and Vincent Felitti (Anda & Felitti, 2003). ACEs have been associated with negative long-term behavioral and health outcomes, as well as overall poor physical and mental health (Anda et al., 2006; Crouch, Strompolis, Bennett, Morse, & Radcliff, 2017; Felitti et al., 1998). These outcomes include chronic disease (Gilbert et al., 2015), cancer (D. W. Brown et al., 2010), drug use, depression and anxiety, and premature death (D. W. Brown et al., 2009; Chapman et al., 2013; Chapman et al., 2004; Dube et al., 2003).The impact of ACEs on health can be explained through the activation of toxic stress, the prolonged activation of the body's stress system, which leads to the disruption of biological systems and brain development, affecting gene activation and thereby impacting lifelong behavioral, health, and social outcomes. Toxic stress results from traumatic experiences and detrimental environments in childhood (Shonkoff, Boyce, & McEwen, 2009; Shonkoff & Garner, 2012).

Certain types of ACEs may have a stronger relationship with particular adult health or social outcomes (Font & Maguire-Jack, 2016). For example, mental illness within the household, emotional abuse, and physical abuse experienced during childhood are more likely to yield poor mental health in adulthood than parental separation or divorce or incarceration of a family member (Nurius, Logan-Greene, & Green, 2012). Additionally, the experience of sexual abuse during childhood has been found to have the strongest association with unsafe sexual practices, delinquency, and suicidality when compared to other combinations of ACEs (Hahm, Lee, Ozonoff, & Van Wert, 2010).

A dose-response relationship between ACEs and later life outcomes has also been reported; the more ACEs an individual experiences, the more likely they are to have poorer health or social outcomes in adulthood (Felitti et al., 1998). Subsequent studies have confirmed these findings (Crouch et al., 2017; Green et al., 2010). ACEs are often interrelated and co-occur, with individuals having at least one ACE often having additional ACEs (Anda et al., 2006; Dong et al., 2004; Morse, Strompolis, Priester, & Srivastav, 2017; Rich-Edwards et al., 2012; Roy, Janal, & Roy, 2010; Waite, Davey, & Lynch, 2013). Thus, examining the impact of ACEs is often done via the ACE Score-a count of the number of individual adversities experienced. Recent research

has also used factor analysis or principal component analysis to group ACEs into related categories (e.g., household dysfunction, emotional and physical abuse, sexual abuse) (M. J. Brown, Thacker, & Cohen, 2013; Ford et al., 2014; Green et al., 2010; Scott, Burke, Weems, Hellman, & Carrión, 2013). The use of three composite scores are more "content specific, internally consistent, and also reflect exposure intensity", with composite scores more reliable than singe item score analysis (Ford et al., 2014). Use of the cluster, rather than typical cumulative model, has not focused on specific health outcomes (Fuller-Thomson & Sawyer, 2014). This is an important area for further examination as the underlying factors of the ACE Survey could be related to specific health outcomes (Ford et al., 2014) and single constructs, versus multiple questions examining the same construct, could assist in the construction of studies that would like to administer the ACE survey, but do not have the financial resources to ask all elven questions, providing further information for targeted prevention, intervention, and treatment efforts.

Given our knowledge of the links between ACEs and long-term outcomes, childhood adversity has increasingly been recognized as a public health concern. Continued research on the impact of ACEs and health outcomes is needed in order to understand and target the families most vulnerable to experiencing ACEs, particularly to prevent intergenerational ACE exposure (Metzler, Merrick, Klevens, Ports, & Ford, 2017). Research has suggested that addressing adversity by examining co-occurrence of ACEs may have important implications for prevention, mitigation, and treatment efforts (Caron & Rutter, 1991; Dong et al., 2004). Previous research examining the effects of ACEs on the health and well-being of adults has focused on the cumulative, not cluster model, of ACEs (Anda et al., 2006; Crouch et al., 2017; Felitti et al., 1998). We are unaware of any studies that have examined the association between categories and combinations of categories of ACEs on mental and physical health outcomes in adulthood using a multi-year BRFSS sample. This study will use an expanded dataset with two years of South Carolina BRFSS data to examine the relationship between the ACE Score, three categories of related or co-occurring ACEs, (household dysfunction; emotional and physical abuse; sexual abuse) and combinations of three categories of ACEs on mental and physical health outcomes in adulthood.

2. Materials and methods

Data was obtained from the 2014–2015 South Carolina Behavioral Risk Factor Surveillance System (BRFSS). The BRFSS is a national survey designed by the Center for Disease Control and Prevention (CDC) and collects data on health-related diseases, conditions, and behaviors by each state (US Centers for Disease Control and Prevention, 2014). The South Carolina BRFSS survey is managed by the South Carolina Department of Health and Environmental Control (SCDHEC) and administered by the University of South Carolina's Institute of Public Service and Policy Research. Using cell phones and landlines, the survey is conducted on a daily basis to adults who are eighteen years or older and not institutionalized. Data was collected from 11,027 South Carolina adults in 2014 and 11,607 adults in 2015. Of those, 15,368 answered the ACE module and had complete demographic information. Population weights were assigned, by the CDC, to adjust for non-response, non-coverage, or under or oversampling (Morse et al., 2017).

Starting in 2014, Children's Trust of South Carolina (a nonprofit organization focused on strengthening families and preventing child maltreatment) partnered with SCDHEC to add the ACE Survey to the South Carolina BRFSS (Morse et al., 2017). The ACE Survey from the South Carolina BRFSS asked adults eleven questions to determine ACE exposure. The eleven questions can be found in Table 1. Data from the ACE Survey was grouped into three categories based on previously confirmed factor analysis: household dysfunction, emotional and physical abuse, and sexual abuse (M. J. Brown et al., 2013; Ford et al., 2014; Green et al., 2010; Scott et al., 2013). The category of household

dysfunction used the questions referring to household mental illness, substance use, incarceration, and parental separation/divorce (questions 1–5). The emotional and physical abuse category utilized the questions for witnessing household violence and experiencing physical abuse (questions 6–8). Finally, the sexual abuse category included the three questions referencing sexual abuse in childhood (questions 9–11). These three factors were further grouped into combinations of three categories of ACEs various combinations, in order to examine the dose-response effect of ACE factors. Previous research identified a dose-response relationship between ACEs and later life outcomes; we hypothesize that the same relationship may hold for factors and combinations of factors of ACEs (Crouch et al., 2017; Felitti et al., 1998; Green et al., 2010).

Dependent variables were self-reported health status and mental distress. The question to determine self-reported health status was "Would you say that in general your health is excellent, very good, fair, or poor?" Health was categorized as good if the responses included good, very good or excellent. Health was categorized as poor if the responses included poor or fair. Mental distress was determined with the question "Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?" Responses of zero to 13 days were categorized as low to moderate mental distress. Responses greater than or equal to 14 days were categorized as frequent (Bensley, Van Eenwyk, & Wynkoop Simmons, 2003). The 14-day marker is often used by clinicians as a metric for diagnosis of clinical depression and anxiety disorders (*Mental disorder, work disability and the law*, 1997; US Centers for Disease Control and Prevention, 1998).

Sociodemographic variables included sex, age, race, educational attainment, and income. Age was divided into six categories: 18 to 29, 30 to 39, 40 to 49, 50 to 59, 60 to 69, and 70 to 80. Race was classified into four groups: Non-Hispanic White, Non-Hispanic African-American, Hispanic, and "Other" Non-Hispanic. Education was separated into groups: those with less than or equal to high school degree/GED and those with at least some college. Finally, income was measured as those making less than $25,000, $25,000 to $49,999, and $50,000 or more.

Differences between categories of ACEs and health variables were tested using chi-square tests with $\alpha = 0.05$. To examine the impact of categories of ACEs on overall health and mental distress, multivariate regression models were used. Sampling weights were used to account for the sampling strategy and analyses were conducted with statistical software (SAS, version 9.3; SAS Institute Inc.). The [blinded for review]'s institutional review board approved this study as exempt.

3. Results

The total sample was primarily located in urban areas (84.5%), female (51.8%), and non-Hispanic White (69.2%, Table 2). Just over a fifth of respondents were between the ages of 18 and 29 (20.8%), with the distribution of respondents fairly evenly spread across the remaining age groups. Less than half of respondents were high school graduates or less (43.5%). The majority of respondents made less than $50,000 (50.8%). Regarding our primary outcomes of interest, 17.1% of respondents reported poor general health. A smaller percentage of respondents stated that they had high mental distress in the last month (12.7%).

3.1. ACE exposure

The largest percent of respondents reported experiencing ACEs in the category of household dysfunction only (20.9%); 20.8% of respondents reported experiencing ACES in both the categories of household dysfunction and emotional and physical abuse. Seven percent of survey respondents reported experiencing ACEs in all three categories (household dysfunction, emotional and physical abuse, sexual abuse). Only 1.6% of respondents reported sexual abuse only.