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Intimate partner violence in late adolescence and young adulthood and subsequent cardiovascular risk in adulthood

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ABSTRACT

Background. Childhood maltreatment has been linked to adulthood cardiovascular disease (CVD). Little is known about the relationship between intimate partner violence (IPV) in late adolescence and young adulthood and CVD risk later in adulthood.

Purpose. To examine whether IPV perpetration and victimization experienced in late adolescence and young adulthood are associated with CVD risk among adults in the United States and whether this relationship differs by sex.

Methods. Data include 9976 participants (50% female) in the National Longitudinal Study of Adolescent to Adult Health. Physical and sexual IPV were measured at wave 3 (2001/02) with items from the revised Conflict Tactics Scales. Participants'30-year risk of CVD was calculated at wave 4 (2008/09) using a Framingham prediction model. Linear regression models adjusted for confounders and IPV by sex interaction terms were tested to examine the relationship.

Results. The mean CVD risk score was 13.18% (95% CI: 12.71, 13.64). Aone-standard deviation increase in the victimization score was associated with a 0.28% (95% CI: 0.03, 0.54) increase in CVD risk. Perpetration was similarly positively associated with CVD risk (beta: 0.33, 95% CI: 0.03, 0.62). When measured as a composite, all violence types were associated with increased CVD risk but only prior exposure to both victimization and perpetration reached statistical significance (0.62%, 95% CI: 0.01, 1.22). No differences by sex were detected.

Conclusions. Effect sizes are not large, but early detection of increased CVD risk in this relatively young population is notable and worthy of further study to inform the clinical response.

1. Introduction

Cardiovascular disease (CVD) primarily affects individuals of middle and old age; however risk factors for CVD are apparent at a much younger age (Eaton et al., 2010; Kavey et al., 2003; Skinner and Skelton, 2014). Adverse childhood experiences, particularly child maltreatment, have been associated with CVD in adulthood (Batten et al., 2004; Dong et al., 2004; Wegman and Stetler, 2009). Less is known, however, about the potential relationship between highly prevalent forms of violence in adolescence and young adulthood, such as intimate partner violence (IPV) and CVD risk. Ten percent of US high school students in the 2013 Youth Risk Behavior Survey reported physical partner violence in the prior year (Kann et al., 2014). Further, the majority of the 29% of men and 36% of women who reported lifetime exposure to IPV in the 2010 National Intimate Partner and Sexual Violence Survey were victimized for the first time before the age of 25 (Black et al., 2011). Greater attention to the role of partner violence exposure during

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adolescence and young adulthood in the development of CVD risk is warranted to identify primary prevention strategies.

Existing research on the relationship between IPV and CVD risk has focused almost exclusively on adult female populations and has generated inconclusive findings (Suglia et al., 2015). IPV has been positively associated with self-reported diagnosis of CVD(Breiding et al., 2008; Coker et al., 2000b; Gass et al., 2010; Lown and Vega, 2001), smoking (Crane et al., 2013), diabetes (Mason et al., 2013), hypertension (Gass et al., 2010; Mason et al., 2012), use of antihypertensive medication (Stene et al., 2013), and weight gain, higher body mass index and obesity (Clark et al., 2014c; Garcia et al., 2014; Sato-DiLorenzo and Sharps, 2007; Yount and Li, 2011). Alternatively, studies have found a lack of association with CVD and many of these same risk factors (Breiding et al., 2008; Coker et al., 2000b; Gass et al., 2010; Lown and Vega, 2001; Stene et al., 2013). In addition to disparate findings, most prior research examines individual risk factors associated with IPV despite the fact that risk factors cluster in individuals (Freedman et al., 1999) and few studies have examined the relationship between CVD risk and exposure to both victimization and perpetration (see Clark et al., 2014b; Crane et al., 2014 for examples) despite the prominence of bi-directionally violent relationships, especially among adolescents and young adults (Gray and Foshee, 1997; Whitaker et al., 2007).

CVD risk manifests over the life course and is prominent in adolescence and young adulthood(Clark et al., 2014a). This fact, with growing evidence of the cost effectiveness of primary prevention (Weintraub et al., 2011), has prompted increasing attention to the extent of early life CVD risk and its contributing factors to inform prevention strategies. The present study addresses this need using a nationally representative, longitudinal study of adolescents to examine whether IPV victimization and perpetration experienced during adolescence and young adulthood are associated with increased CVD risk in adulthood and to determine whether this relationship differs by sex.

2. Methods

The study sample includes participants of the National Longitudinal Study of Adolescent to Adult Health (Add Health) which is a longitudinal study of a nationally representative sample of adolescents in grades 7–12 in the U.S. during the 1994–95 school year (Harris et al., 2009) who have been followed into adulthood (2008–09). Student rosters were used to select a sample of 20,745 adolescents who were interviewed at baseline (wave 1, 1995, participant age range 11–21). A parental figure was also interviewed at this time. A year later, a second wave of data collection occurred. In 2001 and 2002, approximately 6 years after baseline, a third wave of data was collected (age range of participants, 18–28). In 2008 and 2009, approximately 13 years since baseline and approximately 7 years since wave 3, a fourth wave of data was collected (age range of participants, 24–34). Response rates across the 4 waves of data collection were 79%, 89%, 77% and 80%, respectively, and the parental response rate for wave 1 was 85%. The present study is restricted to respondents who had valid sampling weights ($n = 12{,}288$), reported on a relationship at wave 3 (first time point in which IPV perpetration was asked in addition to victimization) in which IPV was assessed ($n = 10{,}171$), and were free from CVD and cancer at the time of CVD risk factor assessment at Wave 4 ($n = 9976$). Participants provided written informed consent, and the parent study was approved by the Institutional Review Board (IRB) of the University of North Carolina, Chapel Hill. The University of Minnesota IRB determined that the present analysis did not meet the regulatory definition of human subjects' research due to the sole use of de-identified data.

2.1. Measures

2.1.1. Exposure

IPV was retrospectively assessed at the wave 3 interview in reference to relationships that occurred between the summer of 1995 (average age 16) and the wave 3 interview (2001/02, average age 22) representing up to 7 years of recall. Four items measured victimization (threatened by partner with violence, pushed or shoved, or had something thrown at you that could hurt; partner slapped, hit or kicked you; partner made you have sexual relations when you did not want to; you had an injury, such as a sprain, bruise, or cut because of a fight with your partner); these items were based on the Revised Conflict Tactics Scales (Straus et al., 1996), the most frequently used scale to assess IPV. The same 4 items also were used to assess perpetration. The scale was self-administered using a laptop computer to protect the participant's privacy and to reduce the likelihood of socially desirable responses.

Continuous scales of IPV victimization and perpetration were created using Rasch modeling based on the conditional probabilities of giving a positive response to each item given its severity and the true but unobserved violence exposure level of each person. Because acts of low/moderate violence severity are most frequently perpetrated by U.S. couples in intimate relationships (Black et al., 2011), items that were more commonly reported were considered less severe (i.e.,being threatened with violence versus being forced to have sexual relations). The model is generalized to account for whether the event occurred once or more than once in the same relationship and whether the event occurred in more than one relationship (Suglia et al., 2008). Separate scales for men and women were created; however, the analytic procedure generates scores with similar distributions enabling them to be combined into one perpetration and one victimization scale. Each score was scaled by its standard deviation. To assess whether IPV predicted CVD risk differently accordingly to the dynamics of the prior experience, a nominal composite variable was created with the following categories: no IPV experience, victimization only, perpetration only, and bi-directional (both victimization and perpetration).

2.1.2. Outcomes

The risk of developing CVD over a 30-year time frame was estimated using a prediction model developed by Pencina et al. (2009). According to guidelines from the American Heart Association and the American College of Cardiology, long-term risk prediction is an appropriate assessment tool in individuals asyoung as 20 (Goff et al., 2014) and average long-term risk CVD in the Addhealth population has been shown to be high (Clark et al., 2014a). Data used in the prediction model were collected at wave 4 when the participationswere on average 29 years of age (2008/09). The function predicts the risk of occurrence of CVD (coronary death, myocardial infarction, coronary insufficiency, angina pectoris, stroke, transient ischemic attack, intermittent claudication, and congestive heart failure) over a 30-year time frame (Pencina et al., 2009). Risk factors used to calculate the 30-yearFRS include sex, age, systolic blood pressure (SBP), use of antihypertensive medication, smoking, diabetes, and body mass index (BMI), all of which were ascertained from interview data, anthropometric measurements, and biological specimens taken at wave 4. Standardized approaches to height and measurements were used (Entzel et al., 2009). SBP was measured after a 5-min seated rest; 3 measurements were obtained at 30-second intervals, and the latter 2 readings were averaged for resting SBP(Entzel et al., 2009). Use of antihypertensive medication in the prior 4 weeks was assessed by the interviewer through a medication inventory (Tabor and Whitsel, 2010). Cigarette smoking in the 30 days preceding the interview was ascertained by self-report. Diabetes mellitus was considered presentif the respondent had: a fasting glucose ≥126 mg/dl, a non-fasting glucose ≥200 mg/dl, an HbA1c ≥ 6.5%, self-reported a health provider diagnosis of diabetes except during pregnancy, or used *anti*-diabetic medication in the prior four weeks (Whitsel et al., 2012).

2.1.3. Potential confounders

Socio-demographic variables were included in the analysis because they have been associated with CVD risk (Go et al., 2013; Murray et al., 2010) and IPV experience (Cunradi et al., 2000; Field and Caetano, 2005; Renner and Whitney, 2010). Socio-demographics collected at wave 3 include age, sex (male, female), race/ethnicity (Non-Hispanic White, Black, Native American/American Indian, Asian/Pacific Islander, Mixed race (i.e.,report of two or more races), and Hispanic), educational attainment (number of years of education past the 6th grade), and financial stress (a positive response to any of 7 items indicating an inability to pay for basics). Indicators of early life socioeconomic status included educational attainment of the parental figure at wave 1 (1994/95) and neighborhood poverty defined as the proportion of families in the census block group with incomes in 1989 below the poverty line.

Frequency of parent/adult-caregiver perpetrated abuse and neglect that occurred prior to the 6th grade was assessed at wave 3 and was included in the analysis because experiencing childhood maltreatment is independently associated with later IPV experience (Renner and Whitney, 2012) and CVD risk in adulthood (Wegman and Stetler, 2009). Abuse and neglect that occurred prior to the 6th grade was retrospectively assessed at wave 3 using modified versions of existing scales (Finkelhor and Dziuba-Leatherman, 1994; Hussey et al., 2006; Straus et al., 2008). Each type of maltreatment was defined similarly to prior