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Incarceration of a family member during childhood is associated with later heart attack: Findings from two large, population-based studies

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ABSTRACT

Purpose: We examined the relationship between exposure to family member incarceration during childhood (FMIC) and myocardial infarction, controlling for traditional cardiovascular risk and social risk factors.
Methods: Gender-specific analyses were conducted in two, independent large population-based data sets of respondents aged 50 and over. Data were obtained from the Behavioral Risk Factor Surveillance System (BRFSS). We first analyzed the 2012 BRFSS sample (n = 5721 men, 9240 women), and then replicated the analyses using the 2011 BRFSS sample (n = 9393 men, 13,147 women). Both samples excluded respondents reporting childhood physical or sexual abuse.
Results: After adjustment for 17 factors, in men, the odds of heart attack among those with FMIC was significantly higher in both the 2012 and 2011 analyses (OR = 1.77, 95% CI = 1.20, 2.61; OR = 2.32, 95% CI = 1.60, 3.37, respectively). Among women, FMIC was not associated with heart attack in either fully adjusted analysis (OR = 1.14, 95% CI = 0.59, 2.18; OR = 1.23, 95% CI = 0.66, 2.29, respectively).
Conclusions: Findings suggest that FMIC is associated with myocardial infarction in men, even after adjusting for a wide range of traditional risk factors (e.g., socio-demographics, substance abuse, smoking physical activity, body mass, lifetime diabetes, and depression). Future research should explore plausible mechanisms and why the observed gender differences exist.

Introduction

Over the last 40 years, there has been a sharp increase in the incarceration rate in the United States (Rich, Wakeman, & Dickman, 2011). More than half of state prisoners and federal inmates have children under the age of 18 (Glaze & Maruschak, 2008), thus the number of children exposed to incarceration of a household member has also dramatically grown. There may be some advantages to family member incarceration, such as interrupting ongoing criminal activity that would otherwise expose children in the household to various risks. However, incarceration plays havoc with stability of housing, employment, and marital relationships (London & Myers, 2006; Pager, Western, & Sugie, 2009; Visher & Travis, 2003). Family member incarceration during childhood (FMIC) is increasingly recognized as an adverse childhood experience. Exposure to FMIC has been found to be associated with psychosocial maladjustment and mental disorders in children, including delinquency and conduct problems (e.g., Baglivio, Wolff, Piquero, & Epps, 2015; Evans-Chase, 2014; Geller, Garfinkel, Cooper, & Mincy, 2009; Murray, Loeber, & Pardini, 2012). Yet little is known about the overall health outcomes of FMIC-exposed children once they have reached adulthood, particularly with respect to physical health (Gjelsvik, Dumont, & Nunn, 2013). In a nationally representative longitudinal survey, parental incarceration was recently shown to be associated with a wide range of physical health outcomes in early adulthood, including high cholesterol, migraine, asthma, and self-reported poor health (Lee, Fang, & Luo, 2013), yet potential longer-term impacts of FMIC remain less well understood.

Early adversities such as FMIC may influence physical health in later adulthood through lasting changes to physiological systems regulating the body's inflammation response, via a process known as biological embedding (Hertzman, 1999). According to Hertzman's (1999) theory, early adverse experiences systematically affect the development of physiological pathways which in turn impacts the body's interpretation of stressors and long-term organ system functioning via various metabolic and inflammatory processes. Disruption of hypothalamus–pituitary–adrenal (HPA) axis development for instance can result in subsequent dysregulation of cortisol production and the stress response (Hertzman, 1999).

One particularly important inflammation-linked disease to investigate is myocardial infarction (heart attack). Myocardial infarction usually reflects coronary heart disease, the leading cause of death in men and women globally including in the United States. The high morbidity, mortality, and financial costs associated with myocardial infarction

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make exploration of its full range of risk factors a public health priority (Roger et al., 2011a). Most research on cardiovascular disease in general, and myocardial infarction in particular, has focused primarily on proximal risk factors (e.g., physical inactivity, obesity, smoking, diabetes mellitus, high blood cholesterol). However, the importance of distal risk factors in cardiovascular disease, particularly adverse childhood experiences, is a burgeoning area of research (Lehman, Taylor, Kiefe, & Seeman, 2009; Taylor, Lehman, Kiefe, & Seeman, 2006a). In particular, a dose–response relationship has been observed between the number of different types of adverse events experienced during childhood (e.g., abuse and neglect) and the odds of adulthood cardiovascular disease (Dong et al., 2004; Felitti et al., 1998a,b), even after adjusting for a host of potential confounds including demographic factors and health behaviors (Fuller-Thomson, Bejan, Hunter, Grundland, & Brennenstuhl, 2012; Scott et al., 2011). Accumulating evidence supports Hertzman's (1999) theory of biological embedding including HPA axis and cortisol dysregulation as a possible mechanism in the association between early adverse events and later development of heart disease. For instance, cortisol levels are predictive of cardiovascular mortality (Vogelzangs et al., 2010). Furthermore, childhood exposure to risky family environments has been associated with elevations of C-reactive protein, an inflammation biomarker associated with risk of heart disease (Taylor, Lehman, Kiefe, & Seeman, 2006b).

The potential for a strong association specifically between FMIC as an adverse childhood experience and heart disease is supported by several previous community-based studies. Despite low overall rates of chronic physical health problems in their young adult sample, Lee et al. (2013) found a significant bivariate association between parental incarceration and heart disease. This relationship was no longer significant in logistic regression analyses that adjusted for race/ethnicity, gender, grade, whether the respondent was foreign born, childhood abuse (physical, emotional, and sexual), family structure, and parental education, parental alcoholism, and family receipt of public assistance. In an adult health plan cohort survey, FMIC was found to increase the odds of ischemic heart disease by 70% (Dong et al., 2004). Dong et al. (2004) did not report separately on outcomes for men and women. We believe that gender-specific analyses are warranted due to previous research indicating that the association between other adverse childhood experiences (e.g., sexual abuse) and heart attack disproportionately impacted men as opposed to women (Fuller-Thomson et al., 2012).

In summary, emerging evidence suggests a possible association between FMIC and heart disease in adulthood via biological embedding, particularly in men. However, we are unaware of any published population-based studies examining the relationship between FMIC and myocardial infarction in older adults. Moreover, prior research on health impacts of FMIC has not consistently controlled for both traditional risk factors (e.g., diabetes, obesity, and smoking) and psychosocial risk factors (e.g., mental illness, social support, socioeconomic status). The present study was thus designed to test two hypotheses: (1) FMIC will be associated with myocardial infarction even after accounting for key risk factors for heart attack, and (2) the association between FMIC and myocardial infarction will be greater for men than for women.

Using gender-specific analysis in two different large population-based data sets, the current study builds upon prior ones to determine the relationship between FMIC and myocardial infarction, while adjusting for multiple other risk factors including age, race, childhood stressors, socioeconomic status (SES), health risk behaviors, marital status, depression, diabetes, and healthcare access. Each of these factors is considered further, below.

Myocardial infarction risk factors

Childhood stressors

Those exposed to FMIC are also more likely to face other childhood stressors, including parental addiction, family member depression, marital dissolution, and exposure to parental domestic violence. Men who are eventually incarcerated are more likely than those who are not to behave impulsively and to engage in substance abuse and domestic violence (Turney, Schnittker, & Wildeman, 2012). Incarceration contributes to depression and substance use disorders (Schnittker, Massoglia, & Uggen, 2012; Turney, Wildeman, & Schnittker, 2012) as well as to separation and divorce (Lopoo & Western, 2005). In comparison to fathers who have not been incarcerated, men who have been previously incarcerated are more likely to have poorer self-control, be abusive to their partners, and report higher rates of addiction (Wildeman & Western, 2010).

Cumulative exposure to such stressors during childhood increases risk of cardiovascular disease in adulthood (Felitti et al., 1998a,b). Thus we controlled for exposure to parental addiction, separation, domestic violence, and family member mental illness. Furthermore, family member incarceration is sometimes the result of child maltreatment, which itself has well-established negative impacts on subsequent health. In order to more clearly assess the impact of FMIC itself apart from maltreatment effects, we have excluded respondents who reported being abused as children.

Adult SES

FMIC has been associated with poorer educational achievement including lower likelihood of completing high school, and with lower adult annual income (Gjelsvik, Dumont, Nunn, & Rosen, 2014). In turn, lower levels of both income and educational achievement are associated with higher incidence of myocardial infarction (Rosengren et al., 2009).

Health risk behaviors

Previous studies have shown an association between exposure to FMIC and smoking and heavy drinking in adulthood (Gjelsvik et al., 2013). One study reported an association between parental incarceration and childhood physical inactivity and obesity (Turney, 2014), but another study did not find a link between FMIC and adult overweight or obesity, nor physical inactivity (Gjelsvik et al., 2013). Cardiovascular disease including myocardial infarction is clearly linked to harmful health behaviors, such as smoking, obesity and physical inactivity (Roger et al., 2011b). Whereas moderate drinking appears to protect against myocardial infarction, heavy or binge drinking increases cardiovascular disease risk (Roger et al., 2011b).

Marital status

Although we are not aware of studies investigating the marital status of adults who experienced FMIC in childhood, there is a substantial literature showing that married individuals, particularly males, have lower rates of cardiovascular disease and mortality than those who are widowed, separated, divorced, or never married (Johnson, Backlund, Sorlie, & Loveless, 2000; Kaplan & Kronick, 2006). Marriage may be a proxy for increased social and emotional support, which decreases risk of cardiovascular disease (Barth, Schneider, & von Kanel, 2010).

Depression

FMIC is associated with depression in early adulthood (Lee et al., 2013). Depression increases the risk of myocardial infarction (Malach & Imperato, 2004; Scherrer et al., 2010).

Additional control variables

Other risk factors for myocardial infarction such as age, race, and diabetes mellitus must also be taken into consideration (Roger et al., 2011b). Exposure to FMIC is more common among younger adults, due to the historical increase in incarceration rates over the past four