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Article

Gender differences in the pathways from childhood disadvantage to metabolic syndrome in adulthood: An examination of health lifestyles

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ABSTRACT

We investigate whether socioeconomic status (SES) in childhood shapes adult health lifestyles in domains of physical activity (leisure, work, chores) and diet (servings of healthy [i.e., nutrient-dense] vs. unhealthy [energy-dense] foods). Physical activity and food choices vary by gender and are key factors in the development of metabolic syndrome (MetS). Thus, we examined gender differences in the intervening role of these behaviors in linking early-life SES and MetS in adulthood. We used survey data (n = 1054) from two waves of the Midlife in the U.S. Study (MIDUS 1 and 2) and biomarker data collected at MIDUS 2. Results show that individuals who were disadvantaged in early life are more likely to participate in physical activity related to work or chores, but less likely to participate in leisure-time physical activity, the domain most consistently linked with health benefits. Women from low SES families were exceedingly less likely to complete recommended amounts of physical activity through leisure. Men from low SES consumed more servings of unhealthy foods and fewer servings of healthy foods. The observed associations between childhood SES and health lifestyles in adulthood persist even after controlling for adult SES. For men, lack of leisure-time physical activity and unhealthy food consumption largely explained the association between early-life disadvantage and MetS. For women, leisure-time physical activity partially accounted for the association, with the direct effect of childhood SES remaining significant. Evidence that material deprivation in early life compromises metabolic health in adulthood calls for policy attention to improve economic conditions for disadvantaged families with young children where behavioral pathways (including gender differences therein) may be shaped. The findings also underscore the need to develop gender-specific interventions in adulthood.

1. Introduction

1.1. Social disadvantage, health lifestyles, and metabolic health

Nearly one third of U.S. adults meet the criteria for metabolic syndrome (MetS), a combination of abdominal obesity, insulin resistance, dyslipidemia, and elevated blood pressure. The risk of developing MetS substantially increases in later life, from around 20% of those between 20 and 39 years of age to half of those aged 60 or older (Aguilar, Bhuket, Torres, Liu, & Wong, 2015). MetS is a known risk factor for several leading causes of death in the U.S., including cardiovascular disease and type 2 diabetes mellitus (Cornier et al., 2008). The biological, behavioral, and social determinants of MetS have been studied extensively (Kaur, 2014). Health-related risk behaviors, in particular, contribute to the development of chronic disease and adult mortality in the U.S. Around 40% of deaths in the U.S. in 2000 were related to health behaviors, including smoking, poor diet, physical activity, and alcohol use (Mokdad, Marks, Stroup, & Gerberding, 2004). Regular physical activity and healthy diet—two potentially modifiable lifestyle behaviors—have been recommended for the prevention and treatment of MetS (Grave *et al.* 2010). Such lifestyle behaviors are embedded in social, cultural, and economic contexts that influence individuals' daily health practices (Bourdieu, 1984).

According to health lifestyle theory (Cockerham, 2005), structural characteristics such as gender, race/ethnicity, and SES shape the availability and appropriateness of health behaviors. Though individuals may have personal preferences in health practices, their resources or environments constrain the type, quantity, and quality of foods or physical activities that are available. Specifically, there is an inverse association between SES and consumption of unhealthy foods (e.g., high in refined grains, added fats, and added sugars), which are energy-dense and nutrient-poor (Darmon & Drewnowski, 2008). Some

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low SES individuals may be aware that reducing their consumption of unhealthy (i.e., energy-dense) foods is important for health, but reside in "food deserts" with limited access to healthy (i.e., nutrient-dense) foods. Financial limitations may further prevent regular consumption of healthy foods (e.g., lean meats, fish, fresh fruits and vegetables) that are more costly per calorie than unhealthy foods (Drewnowski & Darmon, 2005). Indeed, the inverse association between SES and obesity is partially explained by higher consumption of low-cost, energy-dense foods among low SES individuals (Drewnowski & Specter, 2004). In addition, socioeconomic disadvantage is associated with more occupation-related physical activity, but less leisure-time physical activity (Beenackers et al., 2012). Recent studies have shown that only leisure-time physical activity (and not occupational or household physical activity) is associated with better glucoregulation and non-diabetic status (Tsenkova, Lee, & Boylan, 2017). Some low SES individuals may wish to be more active, but are unable to do so due to extended working hours and unsafe exercise environments.

1.2. Childhood disadvantage and health lifestyles

Many practices related to diet and physical activity originate in childhood. Specifically, the social norms and environments that determine appropriate meal etiquette and the characteristics of preferred foods are largely formed during childhood (Winter Falk, Bisogni, & Sobal, 1996). Parents typically have high control over the dietary environments and choices of young children (Scaglioni, Arrizza, Vecchi, & Tedeschi, 2011). Parental SES likely shapes children's consumption of healthy vs. unhealthy foods (Darmon & Drewnowski, 2008). Children from low SES families are likely to consume more foods high in fat and sugar than children from high SES families (Xie, Gilliland, Li, & Rockett, 2003). Such early familiarity with unhealthy foods may influence nutrition patterns throughout the life course. Similarly, children in disadvantaged environments have lower levels of physical activity and are more likely to engage in sedentary behaviors (Drenowatz et al., 2010). Low SES families may not be able to pay for children's sports activities outside of school, and insecure neighborhoods may limit opportunities for physical activity (Crossman, Anne Sullivan, & Benin, 2006). Parents' exercise habits and attitudes about exercise are also positively associated with children's physical activity (Vander Ploeg, Maximova, Kuhle, Simen-Kapeu, & Veugelers, 2012). Low SES parents who themselves are physically inactive may be less supportive of children's engagement in leisure-time physical activity. Such sedentary habits, ingrained in childhood, may persist throughout adulthood and affect metabolic health in later life.

1.3. Gender differences

Experiencing socioeconomic deprivation in early life is linked with risk of developing symptoms and a diagnosis of MetS (Hostinar, Ross, Chen, & Miller, 2017). Most studies use gender as a control variable, thereby neglecting the possibility of differential consequences of early-life disadvantage for women vs. men. Nonetheless, a few studies have suggested that the inverse association between childhood SES and adult MetS is stronger and more consistent for women than men. Low childhood SES, for example, is associated with accelerated trajectories of high blood pressure from young adulthood to early midlife for women, but not men (Janicki-Deverts, Cohen, Matthews, & Jacobs, 2012). The adverse impacts of childhood SES on adult BMI are stronger among women than men (Giskes et al. 2008). Similarly, women, but not men, with low SES parents are at greater risk of developing MetS (Gustafsson, Persson, & Hammarström, 2011). Gender inequality and cumulative SES disadvantage may partially explain the association, yet the impact of early-life SES remains significant, particularly for women, even after controlling for adult SES.

Several studies have found that the mediating role of adult health behaviors (smoking, physical activity, alcohol use) in the association between childhood SES and Mets is relatively small (Chichlowska et al. 2009; Gustafsson et al., 2011; Schooling et al. 2008). Most studies have used dichotomous indicators or single domain assessments of physical activity and have rarely considered diet as a mediator, possibly due to data limitations. Distinct patterns of food preferences and physical activity may vary by gender and socioeconomic background. During childhood, girls like fruits and vegetables more than boys, whereas boys like fatty and sugary foods and processed meat products more than girls (Cooke & Wardle, 2005). In contrast, girls are less physically active than boys (Telford, Telford, Olive, Cochrane, & Davey, 2016). During adulthood men from low SES backgrounds are more likely to consume high calorie diets, while women across social classes are more concerned with healthy eating (Øygard, 2000). However, low SES women are exceedingly less likely than high SES women to participate in physical activity across different domains, except household chores (Ford et al., 1991). These findings suggest that gender is an important moderator, yet few studies have directly investigated how early-life SES affects health lifestyles for men vs. women.

1.4. Aims of the current study

Potentially modifiable lifestyle factors, ingrained in early life, influence the risk of developing MetS. The multifaceted nature of lifestyle behaviors varies by social class and gender; thus, single domains or dichotomous measures of health behaviors may not capture lifestyle behaviors rooted in childhood SES. Using comprehensive measures of health behaviors, with a focus on diet and physical activity, the first aim of this study is to investigate whether disadvantage in early life shapes health lifestyles in adulthood, in terms of physical activity in multiple domains (leisure, work, chores) and healthy (nutrient-dense) vs. unhealthy (energy-dense) foods. Second, we examine whether the effects of childhood disadvantage on comprehensive measures of diet and physical activity vary by gender. Finally, we investigate whether the intervening role of these behaviors in the association between childhood SES and MetS differs by gender.

2. Data and methods

2.1. Sample

Data were drawn from the Midlife in the U.S. Study (MIDUS), a national study of health and well-being. MIDUS began in 1995/96 with a sample of non-institutionalized, English speaking residents of the contiguous United States, aged 25–78 (n = 7108), recruited via random digital dialing (RDD) from the 48 contiguous states, siblings of the RDD sample, and a large sample of twins. Between 2004 and 2006, 4963 of the original respondents completed a follow-up telephone survey and self-assessment questionnaire (see Radler & Ryff, 2010 for retention details). Between 2004 and 2009, around 39% of those eligible for biomarker participation completed a two-day visit to a general clinical research center (GCRC) for a physical exam that included a fasting blood sample, and measurements of height, weight, waist–hip circumference, and blood pressure. Respondents participating in the biomarker project were more likely to have higher levels of education than those from the full sample in wave 2, but other sociodemographic characteristics (e.g., age, gender, race, marital status) were similar to respondents from the full sample (Love, Seeman, Weinstein, & Ryff, 2010). The study was approved by Institutional Review Boards at Georgetown University, University of California, Los Angeles, and University of Wisconsin–Madison. All participants provided written informed consent.

Our analytic sample includes 1054 respondents who participated in two waves of the MIDUS survey (MIDUS 1 and 2) and the biomarker project in MIDUS 2. Approximately 16% of respondents had missing data for at least one variable of interest. We implemented ten imputations to predict missing variables by generating imputed values,

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