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Research paper

Childhood hunger and depressive symptoms in adulthood: Findings from a population-based study

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ABSTRACT

Background: Several studies have linked childhood hunger to an increased risk for later depression. However, as yet, there has been little research on this relation in adults of all ages or whether there are sex differences in this association. The current study examined these issues using data from a national population-based sample.
Methods: Data were analyzed from 5095 adults aged 25–84 collected during the Estonian Health Interview Survey 2006. Information was obtained on the frequency of going to bed hungry in childhood and on depressive symptoms using the Emotional State Questionnaire (EST-Q). Logistic regression analysis was used to examine the association between hunger and depression while controlling for other demographic, socioeconomic and health-related variables.
Results: In a fully adjusted model, going to bed hungry in childhood either sometimes or often was associated with significantly increased odds for depressive symptoms. When the analysis was stratified by sex the association was more evident in men where any frequency of childhood hunger was linked to adult depression while only women who had experienced hunger often had higher odds for depressive symptoms in the final model.
Limitations: Data on childhood hunger were retrospectively reported and may have been affected by recall bias. We also lacked information on potentially relevant variables such as other childhood adversities that might have been important for the observed associations.
Conclusion: Childhood hunger is associated with an increased risk for depressive symptoms among adults. Preventing hunger in childhood may be important for mental health across the life course.

1. Introduction

Hunger, which has been defined as a prolonged and involuntary lack of food that can lead to discomfort, weakness, pain and illness (National Research Council, 2006), is common in children around the world. Studies from both developed (Molcho et al., 2007; Niclasen et al., 2013a; Pickett et al., 2015) and developing countries (Romo et al., 2016; Swahn et al., 2010) have indicated that many school-children (9–41%) experience hunger and that specific subpopulations such as children in low income (Findlay et al., 2013; Sharkey et al., 2013) and immigrant families (Kersey et al., 2007) may be especially vulnerable to feelings of hunger.

The high prevalence of childhood hunger is particularly troubling given that hunger has been associated with a variety of negative outcomes. Research has shown that children who experience hunger are more likely to have increased problems at school and exhibit worse behaviors (absenteeism/lateness) (Kleinman et al., 1998; Murphy et al., 1998), possibly due to higher levels of psychosocial dysfunction including greater oppositional, aggressive and hyperactive behavior (Kleinman et al., 1998; Murphy et al., 1998). In addition, childhood hunger has been linked to worse health. Specifically, hungry children have worse self-rated health (Niclasen et al., 2013b) and are more likely to have chronic health conditions (Weinreb et al., 2002) as possibly reflected in their greater frequency of using medicines (Niclasen et al., 2013b). Depression and anxiety are also more common in hungry children (Weinreb et al., 2002), while not having enough food to eat has also been linked to dysthymia, thoughts of death and suicide attempts in adolescents (Alaimo et al., 2002).

There is also some evidence that the negative effects of childhood hunger for mental health may stretch into adulthood. For example, two recent longitudinal studies from Canada have linked hunger among children and youth to subsequent depression and suicide ideation in late adolescence and young adulthood (McIntyre et al., 2013, 2017). Research among older adults has also produced similar findings. A cross-sectional study that used data from respondents aged 50 plus in 11 European countries who retrospectively reported experiencing

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hunger before age 16 found that both men and women had an increased risk for more depressive symptoms if they had experienced hunger in childhood (Halmdienst and Winter-Ebmer, 2013), while for older adults (aged ≥ 60) in six large Latin American cities, hunger before age 16 was associated with higher odds for depressive symptoms in a combined male and female sample (Alvarado et al., 2007). An association between childhood hunger and adult depression was also found in a study undertaken among US working age adults (aged 25–64) but was attenuated ($p > 0.05$) when adjusting for adult socioeconomic status (SES) in the statistical analysis (Goosby, 2013).

Although there has been little systematic focus on the factors that might underlie an association between childhood hunger and adult depression several pathways might exist. For example, childhood hunger has been associated with nutritional deficiencies (Ashiabi and O'Neal, 2008). In turn, deficiencies in various vitamins (e.g. B_{12}, D, folate) have been linked to depression in adults (Anglin et al., 2013; Sachdev et al., 2005; Tiemeier et al., 2002) and it has been suggested that such deficiencies may be important for the association between childhood hunger and later depression (McIntyre et al., 2013). It is also possible that childhood hunger acts as a stressor (Bronte-Tinkew et al., 2007; Jyoti et al., 2005) which like other adverse childhood experiences, might have a detrimental physiological effect that is important for future health (Berens et al., 2017). It has been hypothesized for example, that childhood stressors may be linked to future depression through their effect (dysregulation) on the hypothalamic-pituitary-adrenal (HPA) axis (Shea et al., 2005). Alternatively, as childhood hunger may lead to children's academic, internalizing and externalizing problems, and is also associated with poorer parenting practices and worse parental mental health (Alaimo et al., 2001; Ashiabi and O'Neal, 2008; Kleinman et al., 1998; Weinreb et al., 2002), it is possible that these factors individually or in combination across the life course might lead to poorer mental health in adulthood. For instance, experiencing parental mental illness in childhood has been associated with an increased risk for the onset of mood disorders in adulthood (Green et al., 2010), while an earlier study showed that externalizing problems in childhood were associated with internalizing problems in early adulthood via poorer academic performance in adolescence (Masten et al., 2005).

Building on earlier research the current study had two aims: (1) to examine the association between childhood hunger and depression in a general population sample, and (2) to determine whether there is a difference in this association between the sexes. To the best of our knowledge, as yet, the association between childhood hunger and depression has not been studied in a broader age group covering both younger and older adults, while there has been little focus on potential sex-specific differences. As there is some indication that the prevalence of depression differs between men and women (Van de Velde et al., 2010), and that the occurrence of childhood hunger can also vary between the sexes (Alvarado et al., 2007), then focusing on this relation in both men and women may be particularly instructive for understanding the association between childhood hunger and adult depression.

2. Methods

2.1. Data source

Data were obtained from the Estonian Health Interview Survey 2006 – a national survey on health, health behaviors and health care utilization conducted in the form of face-to-face structured interviews between October 2006 and October 2007. All permanent residents aged 15–84 on 1 January 2006 were eligible for sampling. Stratified systematic random sampling (based on region, age and gender) with a predefined inclusion probability across sampling units was used to select 11 023 individuals from the Population Registry. The survey was approved by the Tallinn Medical Research Ethics Committee, with informed consent being obtained from all respondents before the interview. In all, 6434 interviews were completed. After adjustment for sampling frame error, the overall response rate was 60.2%. The survey methodology is described in detail elsewhere (Oja et al., 2008). After exclusion of respondents younger than 25 years of age (due to the difficulty of defining adult SES before this age) (N = 856) and those with missing information for any of the study variables (N = 483), the analytical sample consisted of 5095 individuals (2411 men and 2684 women) in the 25–84 age group. Fifty-four respondents who had their 85th birthday between 1 January 2006 and the time of the interview were included in the 80–84 age group.

2.2. Measures

2.2.1. Depressive symptoms

Depressive symptoms were assessed with the Emotional State Questionnaire (EST-Q) depression subscale which determines past four-week symptoms of depressive disorder using ICD-10 and DSM-IV criteria (Aluoja et al., 1999). The eight items concerning sadness, loss of interest, worthlessness, hopelessness, self-accusations, thoughts of suicide, feelings of loneliness, and impossibility of enjoyment were rated on a 0–4 scale. Respondents were classified as depressive (with a score ≥ 12) and non-depressive (< 12).

2.2.2. Childhood hunger

Hunger in childhood was assessed with the question "Did it ever happen in your childhood that you had to go to bed hungry?" with response options being 1) never, 2) seldom, 3) sometimes, and 4) often. In an earlier section of the questionnaire childhood was repeatedly defined as referring to the age group younger than 14 years.

2.2.3. Control variables

A range of demographic, socioeconomic and health-related variables were included in the statistical models as control variables. *Demographic variables* included age at interview in 5-year groups, sex, marital status and ethnicity. Marital status was categorized as 1) married or cohabiting, 2) single, 3) divorced or separated, and 4) widowed. Ethnicity was self-identified and was divided into 1) Estonian, 2) Russian, and 3) other ethnic groups. *Socioeconomic variables* included education, occupational class and household income. Educational level was categorized as 1) tertiary (International Standard Classification of Education [ISCED-97] codes 5–6), 2) upper secondary (3 − 4), and 3) lower secondary or less (0 − 2). For occupational class the main occupation during the lifetime was classified as 1) non-manual and 2) manual. Household equivalent income was calculated by using the OECD-modified equivalence scale (Hagenaars et al., 1994). The average monthly net income per household member was thereafter converted from Kroons to Euros and divided into quartiles corresponding to 1) ≥ 448 Euros, 2) 299–447, 3) 223–298, and 4) ≤ 222 Euros.

Health-related variables included doctor diagnosed chronic diseases, body mass index, smoking, and binge drinking in the past 12 months. Information was obtained on 23 chronic diseases: asthma, allergy, diabetes, thyroid diseases, cataract, glaucoma, hypertension, myocardial infarction, cardiac ischemia, stroke, chronic bronchitis, chronic obstructive lung disease or emphysema, respiratory tuberculosis, gastric or duodenum ulcer, gastric or duodenum inflammation, hepatitis, gallbladder inflammation or gallstones, nephritis, radiculitis, rheumatoid arthritis, osteoporosis, cancer, migraine or frequent headaches, and other chronic disease. For each disorder respondents were asked if they had ever had it and if the answer was yes, whether it had been diagnosed by a doctor. The answers were dichotomized as 1) no, and 2) yes. Body mass index (BMI) was calculated from self-reported height and weight data [BMI = weight (kg) / height $(m)^2$] and respondents were grouped as 1) normal weight (BMI = 18.50–24.99), 2) underweight (< 18.50), 3) overweight (25.00–29.99), and 4) obese (≥ 30.00). Smoking status was based on a question about regular smoking, i.e. smoking daily or almost daily during a one-year period with