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Association between household food insecurity during the COVID-19 pandemic and subjective cognitive difficulties among adolescents in the United States

Dear editor

Household food insecurity (HFI) in the United States (U.S.) has been recognized as a growing social, economic, and public health issue with significant adverse effects on both physical and mental health of young people (Coleman-Jensen et al., 2021). HFI is associated with lack of school engagement, poor academic performance, absenteeism, and conduct and behavioral problems among adolescents (Baiden et al., 2020). Among adults, HFI has been linked with deficits across multiple cognitive domains (Frith and Loprinzi, 2018). However, few studies have examined the association between HFI and subjective cognitive difficulties (SCD) among adolescents.

The COVID-19 pandemic has had a devastating impact on the nation's food basket, with resultant exacerbation of HFI among households with children. This study aims to provide timely insights and build on the existing literature on the impact of HFI on adolescent cognitive function in the context of a stressful global pandemic. Specifically, we sought to estimate the prevalence of HFI and subjective cognitive decline among adolescents and examine the cross-sectional association between HFI and SCD among adolescents in the U.S. during the COVID-19 pandemic.

Data for this study came from the 2021 Adolescent Behaviors and Experiences Survey (ABES). The ABES was a one-time, online survey conducted between January and June 2021 by the Centers for Disease Control and Prevention (CDC) to provide nationally representative data at a time when many students were attending school virtually due to the COVID-19 pandemic. There were 7705 adolescents in the ABES. Complete data on all variables included in this secondary data analysis was available for 6803 adolescents.

The outcome variable examined in this study was SCD, and it was measured as a binary variable based on participants' responses to the question, "Because of a physical, mental, or emotional problem, do you have serious difficulty concentrating, remembering, or making decisions?" Adolescents who answered "yes" were considered to have SCD whereas adolescents who answered "no" were considered not to have SCD.

The main explanatory variable examined in this study was HFI, and it was measured as a binary variable based on participants' responses to the question, "During the COVID-19 pandemic, how often did you go hungry because there was not enough food in your home?" The initial response was coded on a Likert scale ranging from "1 = Never" to "5 = Always." Adolescents who indicated rarely, sometimes, most of the time, or always were considered to have experienced HFI whereas adolescents who indicated never were considered not to have experienced HFI. Covariates of interest include age, gender, sexual identity, race/ethnicity, physical activity, sleep duration, experience of cyberbullying, and symptoms of depression.

Data were analyzed using descriptive, bivariate, and multivariable analytic techniques. Using Pearson chi-square test of association, we examined the bivariate association between HFI and the sample characteristics. Then, binary logistic regression was employed to investigate the association between HFI and SCD while simultaneously controlling for demographic characteristics and other covariates. To account for the weighting and complexity of the sampling design employed by the ABES, we used Stata's "svyset" command. All analyses were performed using Stata version 15 SE.

Of the 6803 adolescents examined, 44.9% had SCD, and about one in four (23.9%) were from households that experienced FI. A little over 62% of adolescents from households that experienced FI compared to 39.5% of adolescents from households that did not experience FI had cognitive difficulties ($\chi^2(1) = 263.16, p < .001$). In the fully adjusted model, adolescents from households that experienced FI had 1.71 times higher odds of having SCD when compared to their counterparts from households that did not experience FI (AOR = 1.71, 95% CI = 1.45–2.02).

The findings of this study add to the growing body of literature on HFI and cognition among adolescents and extend existing research by exploring associations in the context of the COVID-19 pandemic. Although the exact mechanisms through which HFI may impact SCD are not entirely understood, there are several plausible mechanisms that may help explain our findings. First, adolescence represents a critical stage of development marked by changes in brain morphology that are involved in higher-level cognitive processes (Fuhrmann et al., 2015). Thus, adolescents exposed to periods of hunger may be more susceptible to micronutrient deficiency resulting in impaired brain development and poor cognition. HFI may also result in acute malnutrition; thus, poor cognitive performance may be due to the brain and body being in starvation. Another potential explanation for our results is the conceptualization of HFI as a stressful experience. Prolonged household FI represents a chronic stressor, and evidence suggests that prolonged stress may induce structural brain changes (Hutchinson et al., 2012) with a resultant negative effect on cognitive ability.

This research highlights significant associations between HFI and SCD among school-aged adolescents in the context of the COVID-19 pandemic. Given the evidence of escalating HFI during the COVID-19 pandemic, our data provide evidence of a link between HFI and SCD among adolescents. This finding supports the need for increased nutrition services and programs for high school students experiencing FI. At the policy level, several strategies, including expansion of the Supplemental Nutrition Assistance Program, and providing economic relief funding to low-income families with children, may assist in reducing HFI. Additionally, implementing cognitive screening programs in schools for students from households experiencing FI and early referrals

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may provide a unique opportunity to facilitate early interventions for at-risk adolescents.

Limitations of our study's findings include the cross-sectional nature of the data, residual confounding, self-reported nature of measures, and potential for recall bias. Despite these limitations, to our knowledge, this is the first study utilizing data from a large and nationally representative survey to explore the association between HFI during the pandemic and SCD among adolescents. Future studies should consider longitudinal study designs and incorporate more objective measures such as caloric intake, meal patterns, monetary expenditure, and cognitive scales to better understand the intersection between FI and cognition in adolescents.

Declaration of Competing Interest

None

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