Original Investigation

Social Determinants of Health and Pediatric Long COVID in the US

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Key Points

Question What is the association between adverse social determinants of health and long COVID in school-aged children and adolescents?

Findings In this cross-sectional analysis of a meta-cohort study including 4584 US children and adolescents, households with greater economic instability and poorer social or community context (eg, low social support and high levels of discrimination) experienced significantly higher odds of pediatric long COVID. However, those experiencing food security, despite other economic challenges, did not have higher odds of

Meaning The findings of an association between adverse social determinants of health and greater likelihood of pediatric long COVID suggest that addressing adverse social drivers may mitigate future disease risk.

Abstract

Importance Millions of children worldwide are experiencing prolonged symptoms after SARS-CoV-2 infection, yet social risk factors for developing long COVID are largely unknown. As child health is influenced by the environment in which they live and interact, adverse social determinants of health (SDOH) may contribute to the development of pediatric long COVID.

Objective To identify whether adverse SDOH are associated with increased odds of long COVID in school-aged children and adolescents in the US.

Design, Setting, and Participants This cross-sectional analysis of a multicenter, longitudinal, meta-cohort study encompassed 52 sites (health care and community settings) across the US. School-aged children (6-11 years; n = 903) and adolescents (12-17 years; n = 3681) with SARS-CoV-2 infection history were included. Those with an unknown date of first infection, history of multisystem inflammatory syndrome in children, or symptom surveys with less than 50% of questions completed were excluded. Participants were recruited via health care systems, long COVID clinics, fliers, websites, social media campaigns, radio, health fairs, community-based organizations, community health workers, and existing research cohorts from March 2022 to August 2024, and surveys were completed by caregivers between March 2022 and August 2024.

Exposure Twenty-four individual social determinant of health factors were grouped into 5 Healthy People 2030 domains: economic stability, social and community context, caregiver education access and quality, neighborhood and built environment, and health care access and quality. Latent classes were created within each domain and used in regression models.

Main Outcomes and Measures Presence of long COVID using caregiver-reported, symptom-based, age-specific research indices.

Results The mean (SD) age among 4584 individuals included in this study was 14 (3) years, and 2330 (51%) of participants were male. The number of latent classes varied by domain; the reference group was the class with the least adversity. In unadjusted analyses, most classes in each domain were associated with higher odds of long COVID. After adjusting for many factors, including age group, sex, timing of infection, referral source, and other social determinant of health domains, economic instability characterized by difficulty covering expenses, poverty, receipt of government assistance, and food insecurity were associ-

(aOR, 0.93; 95% CI, 0.70-1.23). Poorer social and community context (eg, high levels of discrimination and low social support) was also associated with long COVID (aOR, 2.17; 95% CI, 1.77-2.66). Sensitivity analyses stratified by age group and adjusted for race and ethnicity did not alter or attenuate these results.

Conclusions and Relevance In this study, economic instability that included food insecurity and poor social and community context were associated with greater odds of pediatric long COVID. Those with food security, despite experiencing other economic challenges, did not have greater odds of long COVID. Further study is needed to determine if addressing SDOH factors can decrease the rate of pediatric long COVID.

Introduction

SARS-CoV-2 contributes to the development of long COVID, a postacute chronic condition lasting at least 3 months that can affect almost every organ system. Adolescents may experience loss of smell or taste, muscle or joint pain, fatigue, postexertional malaise, cognitive issues, and mood changes.[1,2] In younger children, abdominal pain and itchy skin are also reported. It is difficult to estimate the true prevalence of long COVID due to varying symptom clusters, potential relapsing or remitting course, and reliance on self-report data in children. Nevertheless, prospective studies have estimated that 10% of children have experienced long COVID,[3-5] translating to millions of youth worldwide.

The World Health Organization (WHO) defines social determinants of health (SDOH) as nonmedical factors that influence health outcomes and are related to the conditions in which one is born, grows, works, lives, and ages.[6] In the US, Healthy People 2030 characterized SDOH into 5 domains: (1) economic stability, (2) social and community context, (3) education access and quality, (4) neighborhood and built environment, and (5) health care access and quality.[7] Children who experience adverse SDOH have an increased risk of poor health outcomes, including the development of chronic diseases (eg, cardiovascular disease, type 2 diabetes, and cancer).[8] Adverse SDOH act as chronic stressors that activate the hypothalamic-pituitary-adrenal axis, triggering glucocorticoid production that modulates cardiovascular responses, metabolic activity, cognitive or emotional responses, and immune function.[8-10] Prolonged exposure can desensitize the hypothalamus, resulting in damage to multiple organs and influence the pathogenesis and progression of disease.[10,11] Chronic stressors, like poverty, food insecurity, and recurring discrimination, may increase inflammation and alter immune responses to toxic exposures, including infections.[12] Since long COVID is a postviral syndrome,[13] stress-related immune dysfunction may make it difficult for the body to combat persistent viral components, immune dysregulation, or tissue damage that result in long COVID symptoms.[14]

To date, most research examining the association between SDOH and COVID-related health outcomes has focused on the risk of contracting the SARS-CoV-2 virus. This evidence comes from ecological studies con-