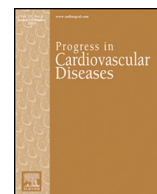




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The global food syndemic: The impact of food insecurity, Malnutrition and obesity on the healthspan amid the COVID-19 pandemic

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Introduction

The Coronavirus Disease 2019 (COVID-19) pandemic, caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection, has affected the entire world in unpredictable ways.¹ Currently, COVID-19 is one of the leading causes of death,² with prevalence rates surpassing that of diabetes and other diet-related non-communicable diseases (NCDs).³ While multinational⁴ and multicontinental¹ mitigation strategies (e.g., quarantine, shelter-in-place, shutdowns) have been enacted to stop the spread of the virus, these approaches have caused rapid shifts in the food environment and impacted population-wide dietary practices.⁵ In a world that operates with an already *stressed* food security system,⁶ further vulnerabilities to food insecurity, malnutrition and obesity imposed by the COVID-19 pandemic are expected and likely to magnify disparities in healthy living behaviors, perpetuating a viscous synergy of complex yet preventable nutrition conditions (“syndemic”⁷) that contribute to the development of diet-related NCDs. Viewed in the context of a global “food syndemic,” this commentary will highlight the interplay of food insecurity, malnutrition and obesity on dietary behaviors amid the COVID-19 pandemic, while also proposing opportunities for professionals and other stakeholders to address social and structural determinants of healthy eating as a treatment strategy to improve the healthspan of individuals.

The global food syndemic

Food insecurity, malnutrition and obesity, independently, represent three of the most complex conditions threatening the livelihoods of populations in nearly every country, making them leading causes of poor health, globally.⁷ Food insecurity, defined as a limitation in the accessibility and/or the lack of resources (e.g., income, transportation, skills, etc.) for safe and nutritious food to support normal growth, affects more than a quarter (26.4%) of the world's population.⁸ While estimates are lower in the United States (US) (11.1%),⁹ nearly one-third of US families reportedly struggle to meet basic needs during situations that disrupt normalcy in the food system, which is certainly the case with the

COVID-19 pandemic.¹⁰ These statistics are presumably underestimated among disadvantaged populations¹¹ who are challenged by numerous health disparities associated with education, income, environmental and behavioral factors, all of which influence health inequities and commonly results in a poor health trajectory. Perhaps the most damaging impact of the complex food insecurity phenomenon on individual health is the increased likelihood of malnutrition. Malnutrition is most often associated with undernutrition (i.e., wasting, stunting, underweight); however, it has increasingly been recognized as a physiological consequence of overnutrition with evidence suggesting its role in both the development and progression of diet-related NCDs (e.g., obesity, cardiovascular disease, diabetes, certain types of cancers) and premature mortality. Most recently, malnutrition has been associated with a higher risk for SARS-CoV-2 infection and, when contracted, more severe cases (e.g., hospitalization, mechanical ventilation).^{6,12,13} In particular, malnutrition is suggested to contribute to obesity just as obesity may contribute to malnutrition, and both are driven by unhealthy dietary behaviors, especially in the presence of food insecurity.⁷ Likewise, the accumulation of psychosocial, behavioral and environmental/societal factors (e.g., transportation, food deserts, low literacy skills, poverty, etc.) that lend to the development of food insecurity, may further propagate downstream shifts in both the food environment and personal dietary behaviors that contribute to the development and the progression of malnutrition and obesity. These various conditions may increase risk to adverse health outcomes, thereby setting the stage for a global food syndemic (Fig. 1). Thus, it is conceptually believed that the foundation of the global food syndemic is one that is dependent on the initial onset of food insecurity, its subsequent interplay with malnutrition and obesity, and the complex sequela that increases vulnerabilities to modifiable adverse health outcomes.⁷

Adjustments in food environment during COVID-19

The outbreak of the COVID-19 pandemic has been a proximate cause of a transcontinental food emergency, with impending threats to the food environment and nutrition, which is expected to be severe in the most vulnerable populations.⁵ World-wide mitigation strategies to reduce and control infection rates, particularly, have had a massive impact on economic markets (i.e. production, processing, transportation; trade/export restrictions, etc.), leading

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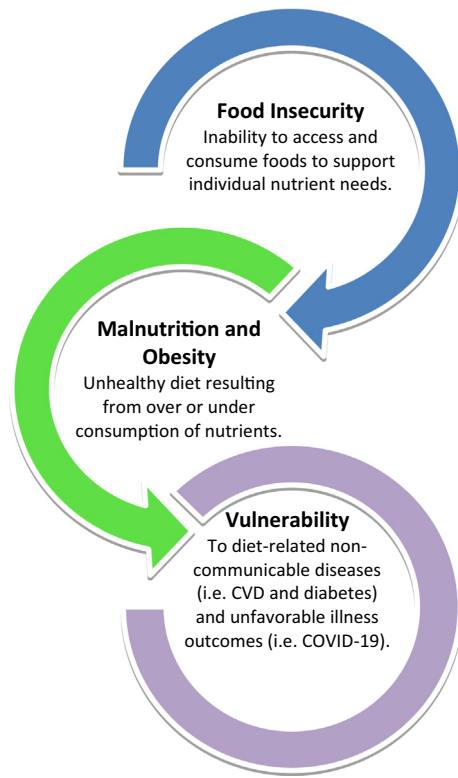


Fig. 1. The cascading syndemic interplay of food insecurity, malnutrition and obesity on disease vulnerability underlining the “global food syndemic”.

to significant disruptions in food availability and accessibility - the two pillars of a stable food security system.^{5,8} In the US alone, the rise in food insecurity prevalence has paralleled a 98% increase in the demand and reliance on receiving food from local food banks,¹⁴ and an increase in enrollment and service expansion of supplemental nutrition aid programs (e.g., the Supplemental Nutrition Assistance Program [SNAP],¹⁵ and the Supplemental Nutrition Program for Women, Infants and Children [WIC]).^{16–18} Notwithstanding, the impact of these efforts on food availability, accessibility and affordability is being felt across all socio-economic classes, with the greatest burden placed on disadvantaged and under-served populations.^{8,11} New and unprecedented challenges caused by the spread of the virus, such as the rising unemployment rates,¹⁹ fear of infection,¹⁰ modifications and/or cancellations of food and nutrition assistance programs,²⁰ and rapid surges in food prices²¹ have also threatened the livelihood of vulnerable communities across the country. In the same context, public and non-profit sectors who generally serve vulnerable and underserved populations have also been faced with serious ethical and health-related concerns regarding the risk of allowing individuals to go hungry at the cost of exposing them to infection. Consequently, for underserved populations, prioritizing healthy dietary practices often takes a back seat to meeting basic needs of survival. Drastic behaviors such as watering down food, following irregular eating patterns (e.g., eating smaller portions, frequent snacking, etc.), purchasing inexpensive unhealthy foods, and consuming foods/medicine past the expiration date²² are common, and often necessary approaches to secure the necessities of life, that may further increase risk for malnutrition and obesity as well as associated poor health outcomes.²¹ As the impacts of the COVID-19 crisis on the economy and food security system continue to unfold, the impending growth of the global food syndemic and the widening of global health disparities are inevitable. Immediate and pro-active responses to the global food emergency and

implementation of strategies to ensure continuity of food accessibility to the most vulnerable populations are imperative safeguards to maintain resilience and encumber the impact of the COVID-19 pandemic on the global food syndemic.

Perhaps a silver lining to the COVID-19 pandemic is the potential benefits of global and local mitigation efforts observed on changes in diet behaviors. Since the onset of this pandemic, local food markets have observed an increased demand for nutrient-dense versus low nutrient-dense (highly processed) foods. Likewise, the limited take-out food options due to widespread restaurant closures may lead to greater opportunities for individuals and families to purchase, prepare and consume healthy foods with higher nutrient-densities at home.^{11,23} Public and private health organizations have also leveraged social media as a strategy to increase health-promoting behaviors including diet-focused messages, recipes and recommendations to eat healthfully with limited resources.^{1,24,25} Whether this increase in consumer spending of nutritious foods reciprocates into long-term improved dietary behaviors will be told in due time.

The healthspan moving forward

Beyond dispute, reversing the components of the global food syndemic (i.e., food insecurity, malnutrition and obesity) presents an immensely complex challenge; the COVID-19 pandemic has magnified its complexity and highlighted the fragility of the global food structure. A system where all people are able and willing to access not just food, but healthy food that promotes the healthspan currently does not exist. While a host of governmental^{9,18,26} and non-profit^{20,27} relief approaches have been implemented before and during the COVID-19 pandemic to help alleviate food insecurity, these strategies have served as temporary “band-aids” to attenuate rather than prevent or reverse the components of the global food syndemic. Nonetheless, continuity and preservation of humanitarian food assistance programs combined with tailored efforts to ensure access to diverse, balanced and nutritious food to the underserved populations are paramount to alleviate food insecurity and the cascading effects leading to negative health outcomes.⁵ That being said, the COVID-19 pandemic has presented numerous eye-opening opportunities to shift the current paradigm of unhealthy eating behaviors and substandard food environments to one that promotes healthier dietary choices and behaviors. In time, the effects of food insecurity and eating behaviors on health and overall risk of NCDs after global reopening post the COVID-19 pandemic will eventually be known. Regardless of the resulting effects of the COVID-19 pandemic on the global food structure, a stronger response of health professionals to provide aggressive nutritional support, combined with greater collaboration from key stakeholders and policy makers to improve local food environments is an essential prescription to improving the healthspan in an equitable manner, especially in populations most vulnerable to the global food syndemic.

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