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SPECIAL ARTICLE

Biobehavioral Factors That Shape Nutrition in Low-Income Populations: A Narrative Review

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Although evidence exists for an association between income level and diet quality, a causal relationship has not been established. A number of studies found that the price of nutritious food and the time cost to prepare foods are economically driven reasons for this relationship. However, in addition to economic constraints, low-income individuals and families face a number of additional challenges linked with food choice, eating behaviors, and diet-related chronic conditions that contribute to diet quality and health. Low-income individuals have a higher burden of employment-, food-, and housing-related insecurity that threaten the livelihood of their household. Poverty and exposure to these insecurities are hypothesized to activate biobehavioral and psychological mechanisms—endocrine, immune, and neurologic systems—that influence food choice and consumption. Examples of biobehavioral and psychological factors that influence diet are stress, poor sleep, and diminished cognitive capacity. High levels of stress, poor sleep, and cognitive overload compound the challenges of economic constraints, creating a mentality of scarcity that leads to poor diet quality.

INTRODUCTION

Low-income individuals and families face a number of challenges to acquiring enough nutritious foods for a healthy and active life. High costs for nutritious foods are hypothesized as the most compelling challenge to acquiring high diet quality. For example, a report published by the U.S. Department of Agriculture examined how the purchase of fruits and vegetables varied across income levels. It was reported that monthly food spending on fruits and vegetables was about $53 for income categories ranging from $10,000–$14,000 to $50,000–$69,999.[1] Not until family incomes increased beyond $70,000 was there a significant increase in spending on fruits and vegetables to $76 per month, suggesting a threshold effect. At this higher income level; however, spending on other foods, including calorically dense foods, also increased.

A review of the literature linking SES and diet quality by Darmon and Drewnowski[2] makes a case for not only a causal relationship, but for a positive dose–response relationship between higher levels of SES linked to improved diet quality. The authors posit two primary reasons for the strong, monotonic relationship between income and diet quality.[2] The first is the higher cost in both food price and time to acquire and prepare food, which is highlighted in the Institute of Medicine's report, *Supplemental Nutrition Assistance Program: Examining the Evidence to Define Benefit Adequacy*.[3] The second is the limited access to nutritious foods because of limited availability of grocery stores in low-income neighborhoods.[2,4] Both of these mechanisms have been challenged. Using longitudinal data, economists have found that the income differences are weak when other factors are included, namely, education and nutrition knowledge.[5] Recent studies that focus on the food environment and dietary intake have been inconsistent for adults,[6] and found a moderately strong relationship

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for children[7] and have highlighted the wide variation in measurement of the food environment. Food price alone does not explain poor dietary intake. Understanding barriers to the purchase and consumption of nutritious foods is important for informing a new generation of interventions targeted at improving diet quality.

The U.S. Dietary Guidelines for Americans are a set of recommendations for a healthy eating pattern associated with decreased risk for diet-related chronic diseases.[8] Several studies have highlighted that the majority of Americans eat poorly.[9–12] For example, on a given day, only 2% of Americans reported meeting the recommendation for whole grains, 12.5% for fruits, and 13% for vegetables, thus suggesting that most Americans, regardless of income, eat poorly.[13] A number of cross-sectional and longitudinal analyses have found very modest income inequalities and social disparities in dietary intake,[14–16] and at least one study did not find income differences.[17] Although reasons for consuming a poor diet may differ between upper- and lower-income Americans, at all income levels, diet quality is much lower than what might indicate a healthy diet quality. Over the life course, a persistent poor-quality diet compounded by stress can adversely impact future dietary intake, eating behaviors, and health outcomes.[18]

Further compounding economic constraints of acquiring a nutritious diet are the accompanying psychological and biobehavioral factors experienced by low-income individuals and households. The biobehavioral theory of health suggests a complex interplay between social and environmental exposures and human biological responses, which change and shape behavior.[19] Stress and emotional responses to poverty and environmental uncertainties such as employment, food, and housing insecurities are regulated by the nervous, endocrine, and immune systems, and can influence health behaviors that play an important role in food choice, consumption, and diet-related chronic disease processes.[18–20]

This narrative review discusses several examples of diet-related psychological and biobehavioral challenges that low-income households may face in addition to economic constraints. Living in poverty, especially extreme poverty, may have direct effects on stress, sleep, and one's cognitive capacity. However, the authors posit that uncertainty and threat to one's well-being associated with employment, food, and housing insecurities are the main mechanisms of how poverty triggers elevated levels of stress, poor sleep, and cognitive burden (Figure 1). Under conditions of uncertainty and threat, a biological response is mounted, activating stress-, appetite-, and hunger-regulating hormones that signal the hypothalamus and shape eating behaviors.[21] Together, these contribute to a mentality of scarcity,[22] defined as the diminished cognitive capacity to manage challenges, which when combined with decreased purchasing power for healthy food, adversely affect dietary quality.

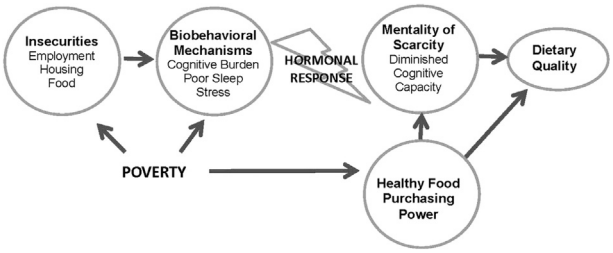

Figure 1. Conceptual framework: how poverty creates environment of scarcity leading to poor dietary quality.

APPROACH AND FINDINGS

The authors identified a set of socioenvironmental inputs for which low-income individuals are at risk—employment, food, and housing insecurity—as well as biobehavioral responses of poor sleep, stress, and cognitive burden, which have all been found to influence dietary intake. This paper reviews the literature focusing only on research studies that assessed the relationship between a source of uncertainty or biobehavioral response and dietary intake among low-income populations. Academic journal articles were prioritized if they: (1) had a population-based focus; (2) assessed associations among low-income individuals or households; or (3) were based on a low-income sample.

Evidence of the Relationship Between Employment Insecurity and Diet

Job insecurity is defined as a "psychosocial stressor at the job level, caused by employment conditions and work organization, and reflecting a worker's perceptions of fear of job loss or instability."[23] Job insecurity is perhaps most tangibly measured by how "precarious" one's employment conditions are; assessed with a scale to measure precariousness evaluating temporariness, disempowerment, vulnerability, wages, rights to benefits, and ability to exercise rights.[24] There is a preponderance of evidence from studies in the U.S., as well as countries around the world, suggesting that lower SES is linked with greater job insecurity.[23] The demands and psychosocial stress associated with insecure employment can have a deleterious effect not only on an individual's diet, but on the diet of the family as well. One qualitative study with low-wage employed parents described sacrifices and food choice coping strategies that were made in the household, and the researchers described a framework of "spill-over" between work and family.[25] This study describes parental behaviors of food choice coping to manage stress, by offering "quick meals" (e.g., macaroni and cheese, hot dogs) and using food as a treat to deal with stress. Despite multiple job