Factors Influencing Malnutrition in Children of Low-Income Families

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Introduction

Despite advancements in healthcare, poverty remains a leading risk factor for child morbidity and mortality, and it is associated with 52.5% of deaths of young children (Tette et al., 2015). Children worldwide from low-income households experience barriers to consuming healthy foods with essential macronutrients for proper growth and development and instead consume foods that do not align with the World Health Organization's (WHO) dietary recommendations. This literature review aims to explore the determinants affecting the consumption of nutritious foods, as per the WHO definition, among children of economically disadvantaged backgrounds.

According to the WHO, a healthy diet is one that consists of whole grains, fruits and vegetables, and legumes and is low in saturated and trans fats, salt, and free sugars (World Health Organization [WHO], 2024). Not only is nutrition crucial for lifelong health, but it also correlates with higher educational outcomes, heightened productivity, and optimal cognitive development. Moreover, healthy diets contribute to sustainability by reducing greenhouse gas emissions and minimizing land use (WHO, 2024). The significance of a healthy diet extends its role in maintaining overall health and preventing disease. However, individuals often face challenges in maintaining healthy eating habits due to both personal choices and external influences. Globally, 3 billion people lack access to safe and nutritious food, which is exacerbated by the proliferation of highly processed foods rich in quick energy, sugar, sodium and unhealthy fats. Unfortunately, healthy diets are not always accessible, especially within lower-income communities..

While adults possess greater autonomy in their dietary choices, children unfortunately lack comparable influence over what they eat. In low and middle-income countries, a startling 2 in 3 children under the age of five experience food poverty (United Nations Children's Fund [UNICEF], 2022). Of the children worldwide, nearly 150 million children, representing 22% of the child population, fail to receive adequate calorie intake necessary to maintain normal growth and development. The consequences of malnutrition are dire, with over 250,000 deaths annually attributed to stunting or chronic undernutrition, and more than 1 million to wasting or inadequate nutrition (Colford et al., 2023). Due to food poverty, the dietary quality of children from lower socioeconomic backgrounds is far from optimal: the daily consumption by these groups consists of cheap, filling foods high in unhealthy saturated and trans fats, sodium, and added sugars while lacking nutritional content (James et al., 1997).

The WHO emphasizes the macromolecules that children should receive less of, including added sugars like sucrose or dextrose, sodium, and saturated fat, to avoid poor health outcomes in childhood and down the line. Moreover, the WHO has created recommendations for crucial micronutrients in children's diets to ensure optimal nutrition, which include essential micronutrients such as dietary fiber, vitamin D, calcium, iron, and potassium (World Health Organization [WHO], 2020). Despite guidelines advocating

that children consume five servings of fruit and vegetables per day, it has been found that children eat more calorie-dense foods that are high in unhealthy fat, sugar, and salt while falling short on vitamin-rich whole grains, fruits, and vegetables (Magalhães et al., 2022).

Throughout all phases of life, low income is related to poor nutritional status; however, a lack of nutritious food in childhood can have detrimental short and long-term consequences on health status (Nelson, 2007). An imbalance in the nutritional content of food and inappropriate eating behaviors during childhood are predisposing factors for decreased learning ability and academic achievement, diabetes mellitus, osteoporosis among adults, atherosclerosis, certain cancers, and the outbreak of systemic diseases like hyperlipidemia (Kazemi et al., 2016). Childhood malnutrition is also associated with an increased risk of infection, cognitive development delays, and impeded physical growth. Contrary to misconceptions, this issue often stems not from parents misallocating funds but from insufficient financial resources to afford nutritious foods.

According to Healthy People 2030, the likelihood of experiencing food insecurity rises when there is a lack of funds to purchase or access food. The average percentage of food insecurity in the US is 10.5%, but in 2020, 28.6% of lower-income households experienced food insecurity (Office of Disease Prevention and Health Promotion, n.d.). Healthy People 2030 recognizes that low food security can cause adverse health outcomes and trouble in school, so this issue is being addressed through efforts to create nutrition assistance programs, increase benefit amounts, and reduce unemployment. Objectives to achieve these goals include “Reduce the proportion of people living in poverty” - SDOH-01 and “Increase the proportion of children living with at least 1 parent who works full time” - SDOH-03 (Office of Disease Prevention and Health Promotion, n.d.). Initiatives have also been created focusing on improving nutrition for people over the age of 2 through increasing the consumption of a variety of colored vegetables and legumes (NWS-08), whole grain consumption (NWS-09), and fruit consumption (NWS-06).

The Social Ecological Model is a framework that observes how health is influenced by multiple factors that overlap such as intrapersonal factors, interpersonal factors, and organizational, community, physical environment, and public policy factors (Bronfenbrenner, 1989). This literature review will consider the factors of the Social Ecological Model to investigate the influencers of poor nutritional consumption in children of low socioeconomic status throughout the world.

Theory

Health behaviors and outcomes from the individual level to a global scale can be explained through theories. Theories aid in fields of research and areas of public health because they help to understand, analyze, and explain phenomena. Without theories, we would be unable to explore and relate concepts to deliver change. Without Isaac Newton's theory of gravitation, we would not be nearly as knowledgeable in the orbits of planets, the laws of motion for planes and skyscrapers, the field of optics

for light and biology for the mechanics of organisms. Theories impact the world as we know it, and they can be used in all fields of research. In public health, we use theories to help explain health behaviors and their determinants and to find ways to promote better health and well-being.

Health Belief Model

When considering the behavior of nutritious food consumption in children, referring to the Health Belief Model can help explain why some children of low socioeconomic status do not fulfill WHO's recommendations. The Health Belief Model (HBM), developed by social psychologists Rosenstock and Hochbaum for the U.S. Public Health Service in 1952, aimed to investigate factors influencing individuals' participation in programs targeting disease detection and prevention (Becker, 1974). Now, this theory is one of the most widely used in public health, and it contains constructs that are used to determine why people engage in the prevention, screening, and controlling of health conditions. The HBM looks at a person's perceived susceptibility and severity, expected benefits and barriers, self-efficacy, and cues to action to determine how personal characteristics influence one's perceptions. Perceived susceptibility and perceived severity of a health condition label the perceived threat and involve an individual's belief about getting a disease and the seriousness of the disease if left untreated (University of Pennsylvania Perelman School of Medicine [UPenn], n.d.). Cues to action influence people to perform health-related actions (Becker, 1974).

A study in Benha on stunting, a condition that stunts a child's growth and development due to poor nutrition and recurrent illness, aimed to evaluate how a mother's nutritional education affected the rate of stunting in young children through education based on the Health Belief Model. In this study, a sample of 80 mothers and their children participated as subjects, and their perceived susceptibility, perceived severity, feeding practices, and Health Belief Model scores were determined before and after education (Elfeshawy et al., 2022). The study's data found significant disparities across the four categories following one month of the health education focused on preventing stunting in children. These differences included an increased perception of susceptibility and severity regarding childhood stunting among mothers who received nutritional education, a significant shift in feeding practices post-education, and statistically significant alterations in Health Belief Model scores before and after the mothers' health education. The conclusions from this study were that nutritional health education based on the Health Belief Model through increasing the knowledge of a mother's child's susceptibility and severity of stunting can help to reduce the condition in children from insufficient nutrition (Elfeshawy et al., 2022).

Theory of Reasoned Action/ Theory of Planned Behavior

Another useful theory in determining factors for poor nutrition in children of low-income families is the Theory of Planned Behavior (TPB). The theory started as the Theory of Reasoned Action (TPA) by Martin Fishbein and was later replaced by the Theory of Planned Behavior, developed by Icek Ajzen

(Fishbein, 1967). The two theories were created to understand behavioral intent: how behavioral intentions are influenced by attitudes surrounding the outcomes of behavior and evaluations of the benefits and risks associated with that outcome (Ajzen & Fishbein, 1980). The key components of the Theory of Planned Behavior are that behavioral achievement depends on intention (motivation to do a behavior) and behavioral control (the ability to perform and achieve a behavior). The TPA and TPB depend on behavioral beliefs of an outcome of behavior, evaluation of behavioral outcomes and their values, others' conceptions of a behavior (normative beliefs), motivation to comply with other's beliefs, perceived control of facilitators and barriers to performing a behavior, and perceived power of facilitating and constraining factors (Ajzen & Fishbein, 1980). These theories focus heavily on one's attitudes and beliefs and the beliefs and norms of those around them.

A qualitative study utilizing the Theory of Planned Behavior focuses on parental beliefs regarding the challenges of providing their children with nutritious foods. It explores various aspects such as determining responsibility for the child's diet within the family, navigating obstacles to ensure adequate feeding, familial pressures, the impact of work schedules, and the effectiveness of strategies employed to ensure their children's nutritional well-being (Kahlor et al., 2012). After the study, common expressions of negative attitudes towards unhealthy eating behaviors and attitudes about family relations for affirmation and conflict were found. In addition, normative beliefs were found in three-fourths of the responses by nuclear and extended family, race/ethnicity, society, schools, and restaurants. The most influential normative belief was from the nuclear family, and parents expressed awareness of their influences on their children's eating habits and control-related struggles between spouses (Kahlor et al., 2012). Also, extended families played a large role in the eating norms of normative families, and parents mentioned pressures felt by extended families to eat poorly. Parents also reported control beliefs, both internal control (self-efficacy) and external control (money and time). Positive and negative influences stemming from internal control shaped parents' decisions regarding their children's diet. For instance, some parents actively discouraged their children from consuming candy, while others inadvertently influenced their children's diet through their own food preferences. In addition, external control factors such as financial constraints and time pressures play affect parents' roles in their child's nutrition. Parents often struggle to find time to prepare balanced meals and also face challenges in finding nutritious options at grocery stores or fast-food chains due to their busy schedules on top of financial constraints (Kahlor et al., 2012). The Theory of Planned Behavior factors such as attitudes, perceived controls and subjective norms in this analysis emphasized the influences that affect whether a parent feeds their children nutritionally sufficient food (Ajzen & Fishbein, 1980).

Intrapersonal Factors

Globally, nearly half of deaths in children are attributable to malnutrition (United Nations Children's Fund [UNICEF], 2023). Many variables weigh into these statistics, and intrapersonal factors are one of them. Intrapersonal factors are biological and personal history factors that include age, education, income, and other characteristics of the individual, such as attitudes, behavior, knowledge, and skills (American College Health Association [ACHA], n.d.). Intrapersonal factors are specific to each individual and play prominent roles in behavior. However, intrapersonal factors differ substantially due to differences in developmental stages, maturity level, the ability to make financial decisions and level of education. Children often have limited choices in deciding what to eat; these decisions are usually left to parents or guardians, who determine the foods to buy and cook. In addition, children are born into their socioeconomic status, and financial constraints pose significant barriers to consuming a nutritious, well-balanced diet. A positive association has been found between socioeconomic status and micronutrient intake; low socioeconomic status was found to be associated with poor dietary decisions in a study of health behaviors among children (Ranjit et al., 2015). As a result, children in lower-income households may have less access to diverse, nutritious food options, leading to an unbalanced diet and vitamin deficiencies.

The intrapersonal factor of income status is typically out of the hands of children. However, it has been associated with many poor health outcomes. If a child's household cannot afford balanced meals, reliance is often made on low-cost, high-calorie foods that are often high in unhealthy fats, sugars, and sodium (Ranjit et al., 2015). Fresh fruits, vegetables and proteins, which contain essential macronutrients, are often more expensive than these processed, less nutritious foods. Financial burden may also result in reduced portion sizes or inconsistent meal patterns that are insufficient to meet growing children's nutritional needs. Individual dietary preferences are an intrapersonal factor that may harm a child's nutrition and growth, development, and involvement in physical activity (Hsun-Chin, 2018). Picky eating in children denotes preferring certain foods, consuming foods without nutritional variety, not eating full meals, unwillingness to try new foods, and restricting the intake of food groups. When children are raised on certain types of food from a young age, such as processed foods with high sugar and fat content, it can be difficult to change behavior to consume healthier alternatives like fresh fruits and vegetables.

Knowledge and awareness serve as an important intrapersonal factor influencing healthy food consumption. A child’s comprehension of nutrition shapes their dietary decisions just as in any social context; insufficient knowledge can lead to unhealthy dietary choices and malnutrition. Studies on nutrition education programs for children have shown that education increases their awareness of eating outside their homes and also increases their autonomy of food, enabling them to make healthier choices. These education programs have also been found to positively affect children's nutritional attitudes and

food preferences, encouraging healthy practices to improve daily nutritional intake, body composition, and overall quality of life (Mukhamedzhanov et al., 2023). Finally, a child's emotional well-being is an intrapersonal factor that greatly impacts their consumption of nutritious foods. Research indicates a correlation between negative emotions like sadness, stress, and anxiety and unhealthy dietary patterns in children, often characterized by behaviors such as binge eating, emotional eating, and a preference for high-calorie, low-nutrient foods. (Abdoli et al., 2023). Economic hardships and challenging living conditions can add to children's emotional stress, leading to behaviors that adversely affect their nutritional status.

Interpersonal Factors

Nutritional imbalances and unhealthy eating habits during childhood are predisposing factors for a range of adverse outcomes, including reduced learning capacity, lower academic achievement, as well as conditions such as diabetes, cancers, and other chronic diseases (Kazemi et al., 2016). Childhood malnutrition is not a light subject, as it has to determine factors for an individual's health status throughout life. Further, interpersonal factors exert a large influence on the nutritional status of children of low-income families. Interpersonal groups are formal and informal social networks and support systems that include family members, friends, work groups, or schoolmates (ACHA, n.d.). The socioeconomic context of a child's family significantly shapes their access to and consumption of nutritious foods. Parents play an important role in their child’s dietary habits, determining both the types and quantities of foods available. Through their food choices and eating behaviors, parents serve as primary role models, shaping their children’s developing preferences and eating habits (Savage et al., 2007). While adults can make their own choices in what they eat, children do not have the same opportunity to make these decisions (Hsun-Chin, 2018).

Parent-child interactions have powerful influences on a child's autonomy in eating; positive interactions include attempts to increase a child's consumption of nutritious foods (e.g., "eat your vegetables) or to restrict a child's intake of nutrient-poor "junk" foods (e.g., "no dessert until after dinner") (Savage et al., 2008). A cross-sectional study conducted in 17 New Zealand primary schools revealed that positive parental role modeling correlated with healthier parental dietary patterns, which, in turn, were associated with reduced consumption of low-nutrient, energy dense foods - such as cake, chocolate, biscuits and savory dishes - in their children. Similarly, another cross-sectional study including 13,300 children across nine European countries demonstrated links between parental role modeling of healthy eating habits and children’s dietary intake, preferences, and habits, particularly regarding fruit and vegetables (Mahmood et al., 2021). These findings display the critical role of parental role modeling in fulfilling children’s nutritional requirements.

One barrier to fostering positive parent-child interactions regarding food stems from parents' lack of education and awareness about their children's nutritional requirements. Parents of low-income families may not have access to information about meeting these nutritional needs, which can result in malnutrition. One study on 203 Polish infants evaluated the impact of parent education and found that providing information and knowledge about nutrition could improve children's nutritional status at the population level (Woźniak et al., 2022). Thus, it is crucial to ensure that parents are knowledgeable and have the ability to obtain information about proper nutrition. Along with knowledge about nutrition, family structure influences feeding habits. In many households, women typically assume the primary responsibility for feeding children. However, shifts in employment dynamics and family configurations frequently result in women having less time available to dedicate to this task. One consequence is that parents resort to feeding their children food away from home, such as fast food, which has higher fat and sugar content than food consumed at home (Savage et al., 2007). Single-mother households face numerous obstacles to ensuring proper nutrition, primarily relying on a single income for food purchases, with the responsibility of caring for the children typically falling solely on their shoulders.

In particular, there are many barriers to proper nutrition in single-mother households where only one income contributes to the purchase of food, and only one guardian is available to care for the children. A study on parental perception of the food environment found that economic difficulties negatively impact family food security and quality. Low-income families are less likely to purchase foods that align with the WHO's dietary guideline recommendations in comparison to families of higher income (Ravikumar et al., 2022). Next, the availability of social support networks within the community or from extended family plays a role in addressing the nutritious needs of a child for their healthy growth and development. A survey was given to mothers to study familial support for health behavior and found that a healthy support system was associated with increased fruit.vegetable intake, breakfast intake, physical activity and limited sugar-sweetened beverage intake (Delaney & Byrd-Bredbenner, 2022). A lack of social support may also result in reduced access to resources, information or assistance concerning healthy practices for children.

Finally, peer influences are interpersonal factors that impact a child's nutritional status. Children are often influenced by their peers regarding food choices and eating habits. In a study demonstrating peer modeling effects on food intake, children watching unfamiliar peers eat healthy snacks influenced them to consume healthier foods, even when unhealthy food options were available (Salvy et al., 2013). Another study supported the hypothesis that children are likely to adopt the eating behaviors of their peers; however, it was observed that social norms of peer groups have positive correlations with unhealthy

eating preferences (Zhou et al., 2023). Social pressures or fear of rejection can contribute to unhealthy dietary patterns among children.

Organizational, Community, Environmental, Policy Factors

Organizations are significant influencers of health status, given that the majority of one's day is spent in a workplace, school, or daycare. Particularly concerning the nutritional well-being of children from low-income households, the organizations they engage with - daycare facilities, public schools, or after-school programs- are responsible for ensuring access to balanced meals during school hours and teaching valuable nutritional knowledge for children to use outside of the school setting.

Considering that children spend a large amount of time in schools, a latent function of schools is the shaping of children's knowledge and attitudes towards health and their health outcomes. Studies show that organizations have large impacts on physical health status; poor-quality schools with few health resources, violence, and a distressed school environment show worsened outcomes for physical health in children (Huang et al., 2013). Children of lower-income families unfortunately are more likely to end up at schools with fewer resources for health promotion. In addition, schools of low socioeconomic status tend to sell unhealthy foods and few nutritious foods, even with state policies for nutrition set in place. In a study, high socioeconomic schools tended to sell more of a variety of foods, both healthy and unhealthy, giving children more choice in meals, which was less available in schools of low socioeconomic status (Taber et al., 2022).

Meals available at schools, daycare centers, and afterschool programs play a large role in determining a child's nutritional status because children typically eat one to three meals a day while in these institutions. Additionally, the availability of free meals at school has been associated with positive impacts on diet quality and food security specifically due to their nutrition standards emphasizing the inclusion of fruits, vegetables, and whole grains.. Associations have also been made between nutritious school meal consumption and a decreased intake of unhealthy foods outside of school. This is most likely due to the increased satiety from consuming foods high in nutrients and healthy fiber (Cohen et al., 2021). Not only do free meals provide nutritional benefits for children, but they also reduce the financial burden from parents to provide lunch for their children every day; school meal programs provide food security, especially to low income families (Cohen et al., 2021). School meal programs provide access to nutritious meals, along with student education and awareness about nutrition. A study on nutrition education in elementary schools found that qualified teachers educating about nutrition have positive influences on children's fruit and vegetable consumption, sugar consumption and energy intake, and nutritional knowledge (Cotton et al., 2020). So, schools and other childcare organizations play an important role offering children nutritious meals and teaching children about nutrition and health.

In addition to childcare institutions, workplace policies can impact parent's time and resources that they need to dedicate to their children's nutritional needs. When a parent's workplace lacks flexibility in hours or the option for time off, it could lead to compromised nutrition for their child as the parents might be unable to dedicate time to preparing meals for them. The more hours worked by parents, the more reliant parents may become on processed foods, food prepared away from home, and meals provided by childcare institutions to feed their children (Datar et al., 2015). A study found that greater maternal work hours contributes to a reduced likelihood of fruits and vegetables being consumed at least once per day in their children. In addition, a significant increase in the consumption of fast food at least once per week and at least four times per week was associated with an increase in maternal work hours (Datar et al., 2015). Institutions at both the child and parent level play a large role in the maintenance of a nutritious diet for children.

According to the American Hospital Association, community health pertains to non-clinical strategies aimed at improving health outcomes, preventing disease, and decreasing health inequities by tackling the behavioral, social, environmental, and economic factors that influence health within a specific geographic environment (American Hospital Association, n.d.). The community and physical environment that a child lives and grows up in influences their current health status as well as their future health outcomes. One community factor that may influence a child's nutritional status is access to affordable and nutritious food. It is common for low income families to live in areas known as "food deserts," which are typically low-income areas with low access to healthy foods (Rowe, 2022). Food deserts occur in both urban and rural areas, and stores in these areas usually lack fresh produce and other fresh foods critical to a well-balanced diet. The availability of grocery stores with fresh, nutritious food and restaurant options other than fast-food can impact the dietary choices of lower-income families. Studies have shown that children living in communities with access to large grocery stores are at less risk for poor diet quality (Williams et al., 2022). Areas without access to grocery stores are more susceptible to food insecurity, which increases a child's risk of malnutrition (Rowe, 2022).

In the community, the availability of health services such as pediatric clinics, nutritional counseling, and maternal support help to address malnutrition in children. One study in rural China found that community child health counseling intervention had significant progress on reducing stunting, undernutrition, wasting and anemia (Yao et al., 2022). A lack of community programs for health services and information may increase a child's susceptibility to malnutrition if a parent is uninformed in the subject and does not have adequate resources near them to create change.

Physical environments are also determinants of a child's nutritional health status. In addition to the lack of availability of food sources like restaurants and grocery stores, neighborhood safety, air and water quality, and housing conditions can affect overall health and nutritional status, particularly if it leads

to an increased susceptibility to illness. A safe neighborhood environment encourages outdoor activities and physical exercise, which contributes to an overall good health status. However, safety concerns may limit a child's ability to play and exercise outdoors, which can increase sedentary behaviors and other activities that promote malnutrition. Neighborhood crime is associated with worse long-term health outcomes for populations living in these unsafe areas; for children in particular, their physical environment plays an important role in shaping their weight and fitness (Laurito et al., 2023).

In addition to neighborhood safety, air and water quality can affect a child's nutritional status. A common result of chronic undernutrition in children is stunting, which is defined as low height for age (World Health Organization, n.d.). Underlying causes for this impaired growth include unhealthy environments, inadequate access to food, and recurrent infection. Poor child development is associated with stunting, along with lower productivity in adulthood and an increased risk of chronic disease later in life (Sinharoy et al., 2021). Poor water sanitation is a major cause of stunting through repeated diarrheal episodes; however, recent studies have found air pollution, both indoor and outdoor, to be a contributor to stunting as well. Repeated exposure to air and water pollution resulting in illness and malnutrition lead to increased activity of a child's immune system, which in turn increases metabolic requirements, anorexia, and altered metabolism of key nutrients like retinol and iron (Sinharoy et al., 2021).

Housing conditions also pose a threat to children's nutritional status. A study on living conditions in rural Indonesia found that children residing in houses with thatched or grass-roofs were 1.9 times more likely to be underweight compared to those living in homes made of iron sheeted or tiled roofs (Tasnim et al., 2017). In addition, children living in homes without piped water or deep well facilities were five times more likely to be underweight than those with water facilities. The absence of clean water in the homes of these children could increase the transmission of infectious diseases during daily activities like food preparation and child feeding; diarrhea and parasitic infections are also more likely to occur in the absence of clean water storing sites, often resulting in a reduction of appetite and food intake in children (Tasnim et al., 2017). Challenging living conditions in a community and unhealthy physical environments increase the risk of inadequate nutrition in children of lower socioeconomic backgrounds.

Public policy is crucial for maintaining the overall wellness and safety of a population. Specifically, policy, laws, regulations, and guidelines play a role in shaping the behavior of nutrition in children, especially those of low socioeconomic status. The implementation of public programs like the Supplemental Nutrition Assistance Program (SNAP), the National School Lunch Program and School Breakfast Program, and Afterschool Nutrition Programs help to eliminate food insecurity in lower income families and make nutritious food available and accessible. SNAP is a program enabling the acquisition of food from grocery stores and farmers' markets using an Electronic Benefit Transfer card (Grafton & Hassink, 2021). Another program, the National School Lunch/Breakfast Program allows for children from

low-income families to qualify for free or reduced-price meals, with federally based nutrition standards. The third Afterschool Nutrition Program offers free, healthy snacks and meals with federal nutrition standards for children participating in programs after school, on the weekends, or during school holidays (Grafton & Hassink, 2021).

Suggestions for Intervention

While food insecurity plays a role in child malnutrition, tackling this issue in low socioeconomic communities requires a multi-pronged approach that addresses more than just access to food, but also education, empowerment, and underlying social determinants of health. Interventions that address the root causes of poverty are crucial to prevention, and it is equally important to equip families with the knowledge and resources to raise healthy children. In the past, nutrition education approaches regarding child feeding have been one of the most effective interventions for preventing malnutrition (Ghodsi et al., 2021). In Karachi, trained community health workers educated mothers on child growth monitoring and feeding, especially promoting protein-based foods rich in iron as well as dietary diversity; this intervention directly affected linear growth and healthy weight while also reducing stunting and wasting of their children. Another intervention program involved nutrition education along with providing families with micronutrient powder for their children. Following this intervention, the height-for-age score (HAZ) improved significantly at children ages 6 months and 18 months in comparison to the control group who were not exposed to the nutritional powder. However, when following up with the children at the age of four, there were no significant differences found in the different groups with being underweight, stunting, or wasting (Ghodsi et al., 2021).

In Iran, studies on the effectiveness of food provision through food vouchers, in-kind food, electronic cards and cash observed cost effectiveness and how children's nutritional statuses improved (Ghodsi et al., 2021). Researchers found that the distribution of food vouchers had a positive effect on HAZ, while no changes were found in the other food provision methods. In addition, the food vouchers were also found to be the most cost-effective of the provisions. In the US, policies and programs have been made to reduce malnutrition such as food banks, food pantries and meal programs (Thorndike et al., 2022). Approximately 60% of the food is donated and 25% of the food is purchased through federal funding. Although these direct interventions may help some reduce the risk of malnutrition, they are not completely effective.

In order to reduce the incidence of child malnutrition globally, interventions need to be shifted from the narrow focus on providing food high in calories to families of low socioeconomic status to a larger focus on ensuring equity and availability of access, affordability and utilization of food with nutritional quality that follow the World Health Organization's recommendations. This initiative will require efforts at local, state, and federal levels in order to ensure that children are set up to live long

healthy lives. Further research is needed to determine the most effective method of delivering nutritional education to children and their families and the most cost-efficient, accessible method of providing them with nutritious food.

An intervention that would help both parents and children in their knowledge of nutrition is incorporating nutrition education into early childhood education programs. In Malaysia, a study on the protocol of School Nutrition Programme (SNP) observed the effectiveness of early childhood education on nutrition through measures of knowledge, attitude, eating behaviors, and practice on nutrition; the study secondly measured psychological distress, cognitive performance and long-term health outcomes in primary school children (Teo et al., 2019). The three-month education program showed significant increases in daily whole grain food consumption and lowered body mass index and body fat for children who were previously overweight. The WHO reports that nutrition education programs can end childhood malnutrition issues through the promotion of health and nutrition education and physical activity among children and adolescents (Teo et al., 2019). Through direct education, children feel a larger locus of control over the foods they eat to maintain a healthy wellbeing and less pressure will be felt by parents to control their child's diet now that they have this knowledge. However, potential challenges may arise through solely educating children about nutrition. If parents do not have the same level of knowledge of the importance of maintaining a diverse diet full of macro nutrients and children are unable to relay their knowledge learned in schools, the intervention may not work as well as expected.

Children often have less say in what food is purchased in their homes, so if they are unable to communicate their newly acquired knowledge, change in eating habits may not be made. For this reason, an even more effective nutrition education program that includes both parents and their children will eliminate this barrier. Schools can offer free after-school programs to provide knowledge about macronutrients, diverse diets, and cooking techniques that are appropriate for both children and adults. Through local, state, or federal governing, these programs can provide both education as well as fresh food as an incentive for families to join the program. This initiative would integrate two established interventions for reducing malnutrition: food banks and primary nutrition education programs. In this setting, both parents and children can gain insights into the significance of adequate nutrition and the consequences of malnutrition-related diseases, which can diminish quality of life. Simultaneously, they can increase their feelings of self-efficacy in making informed nutritional choices. In addition, children may acquire knowledge through observational learning from their parents regarding the importance of seeking health-related information and applying it in their daily lives. Potential barriers to this program include limited time availability for parents to attend these programs and teaching plans that will effectively reach both children and adults. Many low income families lack the time availability to prepare proper meals for their children, so attending these programs may be difficult for some. However,

incentives such as free food and cooking classes may persuade parents to take the time to attend these programs. Other barriers to encouraging parents to attend these programs is a lack of perceived susceptibility and severity to their children having malnutrition-related diseases like stunting and wasting or reduced development. By conducting effective campaigns for these programs, we can overcome these barriers, encouraging parents and their children to willingly participate.

Overall, the literature shows that a multifaceted approach is essential for addressing malnutrition in children from low-income families effectively. This requires a comprehensive strategy going forward that encompasses a complete analysis of social determinants from the Social Ecological Model, including intrapersonal, interpersonal, organizational, community, physical environment, and policy factors. By considering these dimensions, interventions can be developed to create change on child malnutrition on a global scale, thereby reducing rates of stunting, wasting and long-term chronic diseases on a population level.

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