The Food Environment and Public Health in Latin America and the Caribbean (LAC): A Systematic Review

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Abstract

Studies suggest that the food environment in Latin America and the Caribbean has the second-highest food insecurity (FI) globally, with a 40.9% prevalence. The food environment is described by geographic access, food insecurity, and physical, social, economic, cultural, or political factors that affect accessibility, availability, and nutritional adequacy in any community or region. Food security is one of the substantial factors that affect the food environment. These factors impact public health and increase the effect on lives and human society, especially in developing countries. Latin America and the Caribbean (LAC) region is prone to natural disasters that impact the food environment and could affect public health. We systematically searched Scopus, Web of Science, Google Scholar, JSTOR, and ScienceDirect databases to review articles published on the food environment and public health and presented the data. The systematic review results demonstrate that four in every ten people suffer from food insecurity in LAC. In addition, food insecurity is associated with an unhealthy diet and may lead to overweight, obesity, and diabetes. From the 604 articles searched, five selected articles illustrated the impacts of the food environment on public health. The food environment and public health of the LAC nations are influenced by several factors, which include food insecurity, malnutrition, obesity, geographical locations, and costs.

Keywords: The food environment, public health, obesity, malnutrition, diabetes, HIV/AIDS

Introduction

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Food environment refers to the socio-cultural, political, economic, and physical context in which consumers engage with the food system to decide about acquiring, preparing, and consuming food (European Public Health Alliance [EPHA], 2019). Because human-built and social settings influence food environments, food environments can be described as consumer experiences inside food establishments, services, and infrastructure in institutional settings or the knowledge available on food. They can also be defined as geographic access to food in a neighborhood or community (Rideout et al., 2015).

Food surroundings must be accessible, affordable, easy, and widely promoted to support long-term healthy diets. The accessibility and affordability of healthy food is increasing in the Caribbean and Latin America. Since Latin America and the Caribbean (LAC) were recovering their pre-pandemic levels of economic activity, a new and worrisome threat to food environments emerged. The threats include rising inflation and the accessibility of healthy food, a common menace to most developing countries such as those in LAC. Jaramillo and O'Brien (2022) reported that the impact of COVID-19 on the LAC region came with a dramatic period of setbacks that undermined food security and other public health issues. Latin America and the Caribbean were more severely affected by the pandemic compared to North America, Africa, and some parts of Asia in terms of mortality per person and economic decline (Husaini & Abubakar, 2020; Schwalb et al., 2022; Husaini et al., 2023).

Even before the COVID-19 pandemic, most countries in Latin America and the Caribbean experienced poverty at a high rate and catastrophes and natural disasters (Jarin et al., 2021a). The COVID-19 pandemic could impact these countries vastly and negatively. For instance, in three countries of Central America, El Salvador, Guatemala, and Nicaragua, an estimated 7.7 million people were affected by food insecurity because of the COVID-19 pandemic and Hurricane Iota and Eta in late 2020 (ECLA, 2022). Furthermore, the 2022 United Nations Report on Food Security and Nutrition reported that 22.5% of the population in Latin America and the Caribbean cannot afford a healthy diet. This percentage rises to 52% in the Caribbean, 27.8% in Mesoamerica, and 18.4% in South America. In addition, according to the Pan American Organization (PAHO), by the end of 2020, 131.3 million individuals in the LAC region could not afford a balanced diet due to the higher average daily cost of healthy diets compared to the rest of the World. The average daily cost of healthy diets was valued at USD 3.61 in South America, USD 4.23 in the Caribbean, and USD 3.47 in Mesoamerica. (PAHO, 2023). Therefore, the food environment has a crucial public health impact in LAC, which can become life-threatening if not addressed (EPHA, 2019). Changes in climate and weather conditions also impact the food environment, the agricultural sectors, and the food supply for farmers. For instance, heat waves, cyclones, hurricanes, fires, flooding, droughts, and pests have been reported to lower agricultural yields, in turn leading to increase in food prices (Lee et al., 2024).

Similarly, another factor that is detrimental to the food environment is diabetes and obesity. The health burden for people with high Body Mass Index (BMI) has been quantified and clearly defined in low and middle-income countries (Misra & Bhardwaj, 2014; Husaini et al., 2016; Frazzoli et al., 2023). A higher BMI has been linked to the development of Type 2 diabetes (DM2), especially in Latin America, where diabetes risk and prevalence have increased, and diabetes-associated mortality is higher than in any other region of the world. In addition, DM2 poses an imminent risk to the well-being of the population, the economy, and health care system by increasing health expenditure, morbidity, and mortality rates (Carrillo-Larco et al., 2020; Espinoza et al., 2022).

Evidently, the food environment is a critical public health issue; therefore, strategies, research, and solutions to problems are constantly being sought and implemented in LAC to address the issue.

This systematic review aims to analyze and synthesize data on the impact of the food environment in LAC, especially in the light of catastrophes and pandemics. In addition, the review will evaluate and demonstrate the relationship between public health and the food environment in LAC and provide a few suggestions for action to member states.

Research question: What is the impact of the food environment on public health in Latin America and the Caribbean?

Methodology

Electronic searches of research databases such as PubMed, EBSCOhost, Google Scholar, Scopus, ScienceDirect, Web of Science, and JSTOR were used to obtain relevant studies on the food environment and public health in LAC. Search terms included 'food environment,' 'public health,' 'Latin America,' 'Caribbean,' "nutrition" and' food security' with combined search terms. The Rayyan systematic software web tool was used to speed up the process by uploading, screening, and selecting the most relevant references included in the study (Ouzzani et al., 2016).

Table 1 Criteria for inclusion and exclusion

Inclusion	Exclusion
Peer-reviewed English Language	Non-English
Empirical Studies	Literature review
Published<15 years	Published>15 years
Focus on LAC countries	Focus on countries outside LAC
Quantitative data	Qualitative data
Casual Research	Laboratory Research

Risk of bias in individual studies

Two independent reviewers analyzed extracted data to help minimize bias in the systematic review. The higher risk of bias was also minimized by identifying which studies have been included or excluded and categorizing them as higher or lower risk of bias.

Results

A total of 604 articles were found in the database, five of which were selected for quantitative systematic review based on the inclusion criteria (Fig. 1). The five articles offer an in-depth analysis of the food environment, public health, and nutrition situation in Latin America and Caribbean LAC countries: nutrition, food insecurity, malnutrition, and public health.

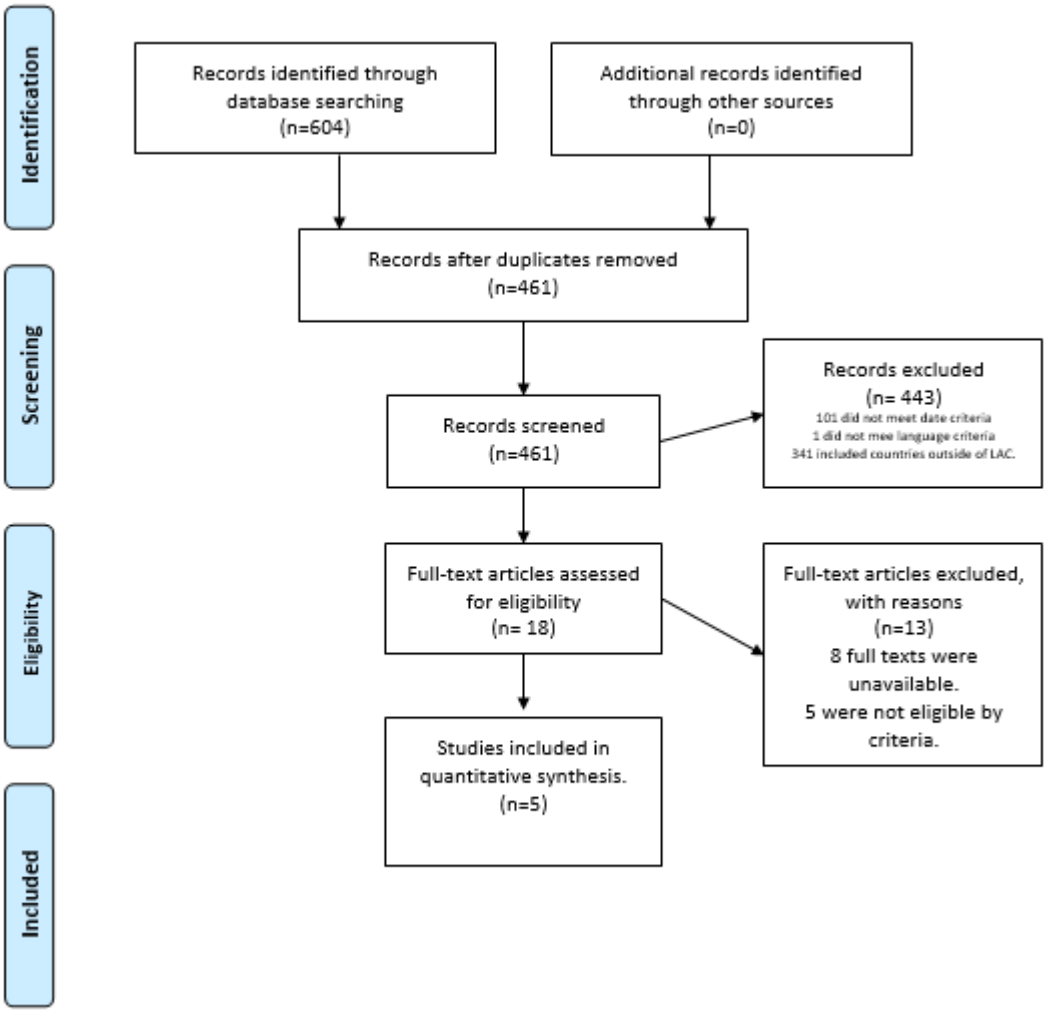

Fig. 1: Study identification and selection process

Table 2. Summary of included studies.

Country	**Country income**	**Study summary**	**Food environment effects**	**References**
Brazil	Upper middle income	In Brazil, adult overweight (body mass index 25 kg/m2) grew from 18% to 41% in males and 27% to 40% in women between 1975 and 2003. Obesity trends in Brazil also reflect rising health inequities, with the most significant burden of obesity falling on those with the lowest income and education.	Overweight & obesity.	Jaime et al. 2011
Mexico	Upper middle income	According to the most recent Mexican National Health and Nutrition Survey (2016), the prevalence of adult overweight and obesity is 72.5%. Children aged 5-11 had a 33.2% combined prevalence of obesity and overweight. The highest rate of obesity and diabetes was reported in Mexico. To address these dietary difficulties, the Mexican government implemented	Food insecurity, & obesity	Nieto et al. 2019

		initiatives. In 2014, a 10% tax on sugar-sweetened beverages (SSB) and a charge on energy-dense items exceeding the government's cut-off points were implemented to combat dietary disorders.		
Honduras	Low-income country	Honduras is the fifth most food-insecure nation in Latin America, with 14.6% of the population experiencing food insecurity between 2010 and 2012. Since rural poverty rates in Honduras are 65.0%, compared to 61.0% in urban areas, these populations will likely experience food insecurity in 2014. It was seen that most people living with HIV had moderate or severe household food insecurity (61% in Bolivia, 71% in Honduras, and 68% in Dominican Republic).	Food insecurity, & HIV	Alpízar et al. 2020 Derose et al. 2018
Guatemala	Low-income country	Guatemala is the sixth most food-insecure nation in Latin America, with 14.8% of the population experiencing food insecurity between 2010 and 2012. Since the rural poverty rate in Guatemala is 76.1%, compared to 42.1% in urban areas, these populations will likely experience food insecurity in 2014.	Food insecurity.	Alpízar et al. 2020

Discussion

Food insecurity, obesity, and diabetes are substantial food environmental issues in LAC, analyzed in this systematic review. It is estimated that Latin America and the Caribbean have the second highest food insecurity (FI) rates globally, with a prevalence of 40.9% (Hernandez-Vasquez et al., 2022). Although developing countries usually have the highest food insecurity rate that affects public health, first-class countries also experience this crisis but at a lower rate. Preventive FI measures such as investments in agricultural extension services and infrastructure carried out by governments in the Latin American and Caribbean region had reportedly not improved food insecurity, resulting in higher poverty rates, social inequality, catastrophe resistance, and slower economic growth (Hernández-Vásquez et al., 2022). Additionally, the food environment, specifically food insecurity, may be caused by various factors such as gender imbalance, level of education,

age, the number of members of the household, area of residence, the economic income of families, government support payments, job loss, or job change (Benites-Zapata et al., 2021). This systematic review showed that the Latin American and Caribbean countries are major countries whose public health are impacted by the food environment through diseases and weather conditions, as discussed below.

Body Mass Index (BMI) and diseases

Changes in diets and a lack of physical activity have resulted in high levels of adult obesity, and most LAC countries are currently experiencing significant rises in childhood obesity. As a result, obesity-related consequences, such as prediabetes, diabetes, and other health issues, are becoming more prevalent in children and adolescents. Furthermore, due to genetic and race-ethnic intricacies, a subset of the people in the region are more vulnerable to these public health issues (Popkin & Reardon, 2018). Concomitantly, food insecurity can lead to a population being underweight or overweight thereby affecting public health. The most common diseases related to the food environment and food insecurity are diabetes, malnutrition, and obesity (Stevenson, et el., 2022). According to Jaime et al. 2011, as the rates of chronic noncommunicable diseases (NCDs) increase globally, one of the leading public health issues is the increased prevalence of overweight and obesity. In addition, obesity is caused by an imbalance of energy input and output. Lifestyle changes that result in a lack of physical activity and poor diet are the main risk factors that explain this phenomenon. In Brazil, Jaime et al. (2011) reported that the mean prevalence of overweight was 41.69%, with an upward trend in this rate from the least poor? to the poorest areas.

Similarly, in Mexico, in 2016, there was a high prevalence of obesity and high diabetes mortality rates. According to the Mexican National Health and Nutrition Survey (2016), adults overweight and obese reached a prevalence of 72.5% (Nieto et al., 2019). The higher obesity prevalence rates were reportedly related to high Body Mass Index (BMI) and high plasma fasting glucose, which were related to dietary practices and the food environment. Concurrently, the Mexican government implemented some practical steps to address these diet-related issues. For instance, in 2014, the government imposed a fee on products with an abnormally high energy content and placed a 10% tax on sugar-sweetened beverages (SSB). As a result of this effort, the nation became recognized as a leader in using financial strategies to address diet-related disorders.

Geographic access and weather conditions

Conversely, the results of this systematic review showed that the food environment is affected by geographic factors, cost, or both, leading to impacts on public health. Hernandez-Vasquez et al. (2022) reported that most countries of LAC reported an increase in food prices, which led to households having less than what they needed post-COVID-19 pandemic. The weather in various LAC nations contributed to the food environment. The review showed that Central American countries like Guatemala and Honduras occasionally undergo abrupt weather changes, which impact the agricultural and food supply chain and lead to public health issues.

Furthermore, Alpizar et al. (2020) reported that changes in temperature, rainfall patterns, and frequency of extreme weather events cause significant declines in the production of many staple crops such as maize, beans, and other crops, threatening smallholder farmers' food security and livelihoods. To combat these concerns, national governments are developing regulations to preserve agricultural production and attain food security under changing climatic circumstances. Honduras and Guatemala are Latin America's fifth and sixth most food-insecure nations, with 14.6% and 14.8% of the population experiencing food insecurity between 2010 and 2012,

respectively. Since rural poverty rates in Guatemala and Honduras are 76.1% and 65.0%, compared to 42.1% and 61.0%, respectively, in urban areas, it is likely that these populations will experience food insecurity (Alpízar et al., 2020). Increased risks of developing diseases have also been associated with the environment (Husaini, Reneau, and Balam, 2022).

Food insecurity in HIV-related cases

In Honduras, many families who had HIV-related household members suffered food insecurity. Derose et al. (2018) reported that most people living with HIV had moderate or severe household food insecurity (61% in Bolivia, 71% in Honduras, and 68% in the Dominican Republic). Previous interventions to address food insecurity among people living with HIV have concentrated mainly on underweight and wasting individuals. However, high levels of food insecurity and overweight among people living with HIV in LAC have significant ramifications that need addressing. Illnesses such as diabetes and obesity affect people living with HIV and AIDS, significantly affecting the cost of therapy and public health.

The food environment, especially food insecurity, such as geography, price, accessibility, weather, age, gender, obesity, and HIV/AIDS, contribute to public health in LAC. A well-balanced diet and physical activity are good for public health; however, unhealthy diets and food insecurity significantly impact the health and development of many LAC countries. With LAC being the second most affected region in the world by food insecurity measures should be considered to combat food insecurity and help decrease the number of diseases caused by the food environment (Hernández-Vásquez et al., 2022).

Limitations

Limited research on this topic in Latin America and the Caribbean is a study limitation. Furthermore, numerous studies have been published for more than ten years, and as a result, they were excluded; this resulted in a lack of access to data needed for the quantification. Another limitation was that most studies focused on just diseases rather than specific consequences of the food environment on public health. Finally, some articles written in languages such as Spanish and Portuguese were not included, which may have limited the robustness of the data. Despite these limitations, to our knowledge, this is one of the most recent systematic reviews on the food environment and public health, hence its strength.

Conclusion

Though many factors impact the food environment and public health, as was apparent in this review, it is crucial to carry out research on the impacts of the food environment on public health, given that the region has limited published research. The food environment and public health of the LAC nations are influenced by several factors, which include food insecurity, malnutrition, obesity, geographical locations, and costs. In addition, obesity and being overweight are a concern caused by an imbalance in food consumption by individuals as a result of bad diets, food availability, and a lack of activity. The reviewers recommend that food should be readily available, affordable, easily accessible, and widely promoted to continue maintaining a sustainable dietary pattern. Moreover, improving the food environment and public health will be supported by improving and developing government systems that will fight food insecurity and, as a result, will reduce diseases caused by food and dietary insecurity at the food environment level.

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