



SUPPLEMENT ARTICLE

Migration as a determinant of childhood obesity in the United States and Latin America

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Summary

International migration has economic and health implications. The acculturation process to the host country may be linked to childhood obesity. We use the Community Energy Balance (CEB) framework to analyze the relationship between migration and childhood obesity in Mexican households with international migrants. Using longitudinal data from the Mexican Family Life Survey (MxFLS), we examine how migrant networks affect childhood obesity in origin communities. We also review binational health programs that could be effective at tackling childhood obesity in migrant households from Mexico. Children embedded in migrant networks are at greater risk of developing overweight or obesity, suggesting a significant relationship between childhood obesity and international migration in Mexican households. Based on our search criteria, our analysis of health outreach programs shows that Ventanillas de Salud (VDS)/Health Windows has great promise to prevent childhood obesity in a culturally sensitive and trustful environment. The CEB framework is useful to understand how migration contributes to the risk of childhood overweight and obesity in migrant households. VDS is a feasible and replicable strategy with great potential to address childhood obesity among migrant families accounting for the dynamic and binational determinants of childhood obesity.

KEYWORDS

CEB framework, childhood obesity, international migration, outreach

1 | INTRODUCTION

Migration is defined as “the movement of persons away from their place of usual residence, either across an international border or within a State”.¹ In the Americas, migratory flows are dominated by South to North migration, particularly from Latin America and the Caribbean (LAC) to the United States. By 2017, immigrants from Latin

American made up about half of the US immigrant population² and Mexico remains the country with the largest number of migrants living in the United States (over 12.5 million people), followed by El Salvador, Cuba, Dominican Republic, and Guatemala (around 1.25 million each).³ However, it is important to note that intraregional migration has increased in recent years, as explained in the Supplementary Material. The migration process within the LAC region and between

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LAC and the United States is mainly driven by economic factors such as salary differentials and labor shortages (although increasingly seeing flows due to violence, poverty and climate related disasters) and dominated by large shares of undocumented migrants that face important structural inequalities in both the origin and host communities.

Migratory flows in the region of the Americas are of substantial interest when studying childhood obesity, as migration is a powerful determinant and consequence of the social determinants of health that can have positive or negative impacts on the health, nutrition, and well-being of individuals and their families.⁴ Previous research shows that the process of migrant acculturation is linked to overweight and obesity.⁵ The prevalence of overweight and obesity is higher among adult migrants from Latin America in comparison with their US-born adults counterparts.⁶ Among children, the prevalence of overweight and obesity are higher among second- versus first-generation Latino migrants.⁶

These findings highlight the need to understand the mechanisms from which migration and post-migration factors might determine childhood obesity. Hence, the aim of this study is to summarize the potential pathways linking migration and childhood obesity through an ecological model—the community energy balance framework (CEB)⁷—and to exemplify the complex relationship between migration and childhood obesity, and the need for effective prevention strategies based on comprehensive, bi-national and systems-oriented approaches.

2 | BACKGROUND

A key aspect to consider when studying migration and health outcomes is its cultural dimension, oftentimes examined through the lens of acculturation, a dynamic process by which the culture of a group or individual is modified as a result of continuous, first-hand contact with a different culture.^{8,9} This process has been extensively researched among Latino migrants settling in the United States. Research shows that acculturation into the mainstream US-culture may lead to obesogenic dietary patterns, including a higher consumption of ultra-processed foods and beverages.^{10–13} Similarly, qualitative studies among migrant mothers show that they perceive American foods as less expensive and lower quality than foods of origin but also report that transportation and child care are barriers to shopping and preparing healthier foods.^{14,15} More generally, as migrants adjust to host communities,⁷ nutrition is a relevant part of this process, as food is in itself a symbol of hospitality, generosity, status, and good will, and it establishes cultural anchors for eating behaviors.¹⁶

The process of migration can also be a stressful experience that can pose an additional path to increased childhood obesity.¹⁷ Migrants frequently experience social isolation, and often lack access to essential health and social services, including food assistance programs that increase not only access to and consumption of healthy foods but can provide nutrition education and physical activity opportunities for children.¹² In addition, migrants live in constant

fear of detention and deportation when undocumented, and in the United States, even those migrants classified as documented are fearful of being classified as having a “public charge” status that could prevent them from gaining permanent residence or becoming citizens in the future.¹⁸ Stress brought about by migration can lead to significant alterations in energy metabolism and higher consumption of low-cost energy-dense and sugar-dense comfort foods among migrant families and, as a result, become a risk factor for childhood obesity.^{19,20}

Migrants influence their families within and across borders through social interactions that can influence norms, beliefs, and values about diet and physical activity patterns²¹ and that can affect childhood obesity in both the origin as well as the host countries through complex and dynamic migrant networks.^{22–24} Migrant networks refer to ties that connect migrants in the host community to individuals in the origin community; there are different mechanisms that lead to such interdependence, which in turn can affect health behaviors. For example, network literature highlights how social facilitation (how members in a network provide information associated with a behavior), normative influence (how network peers offer social rewards to encourage a behavior), and network externalities (institutionalized resources that facilitate the adoption of a behavior) affect choices and behaviors among migrants and their origin community networks.²⁵ Such networks can generate strong emotional connections through sources like visits, remittances, exchange of material goods, and exchange of values and advice, all likely to influence health behaviors in the origin community, including children's diets.²⁶ These diverse influences linking migration and childhood obesity can be conceptualized through the CEB framework.

3 | CONCEPTUAL FRAMEWORK

The CEB framework is an ecological approach to understand obesity. It posits that three factors determine energy balance and weight status among racial and ethnic minorities and migrants: settings and change agents, types of initiatives and action pathways, and cultural-contextual variables that influence change (see Figure 1). There are three specific aspects of the CEB framework that help explaining how migration can affect childhood obesity. First, it positions the migrant in the environment and aggregate lifestyle of the general population, but allows interactions with the self-identity, shared customs and traditions of migrants' communities, especially transmitted through family networks (both in the origin and in the host community). The recognition of the role of families is particularly relevant when studying children, as it is also the structure that provides the immediate material resources likely to impact opportunities for food intake and physical activity.

Second, the CEB framework explicitly recognizes the environments interacting with ethnic minority populations and their underlying processes, as a reflection of adaptations to circumstances created by migration (i.e., acculturation, assimilation, or negotiated

Source: Kumanyika S, Taylor WC, Grier SA, et al. Community energy balance: a framework for contextualizing cultural influences on high risk of obesity in ethnic minority populations. *Prev Med.* 2012;55(5):371-381

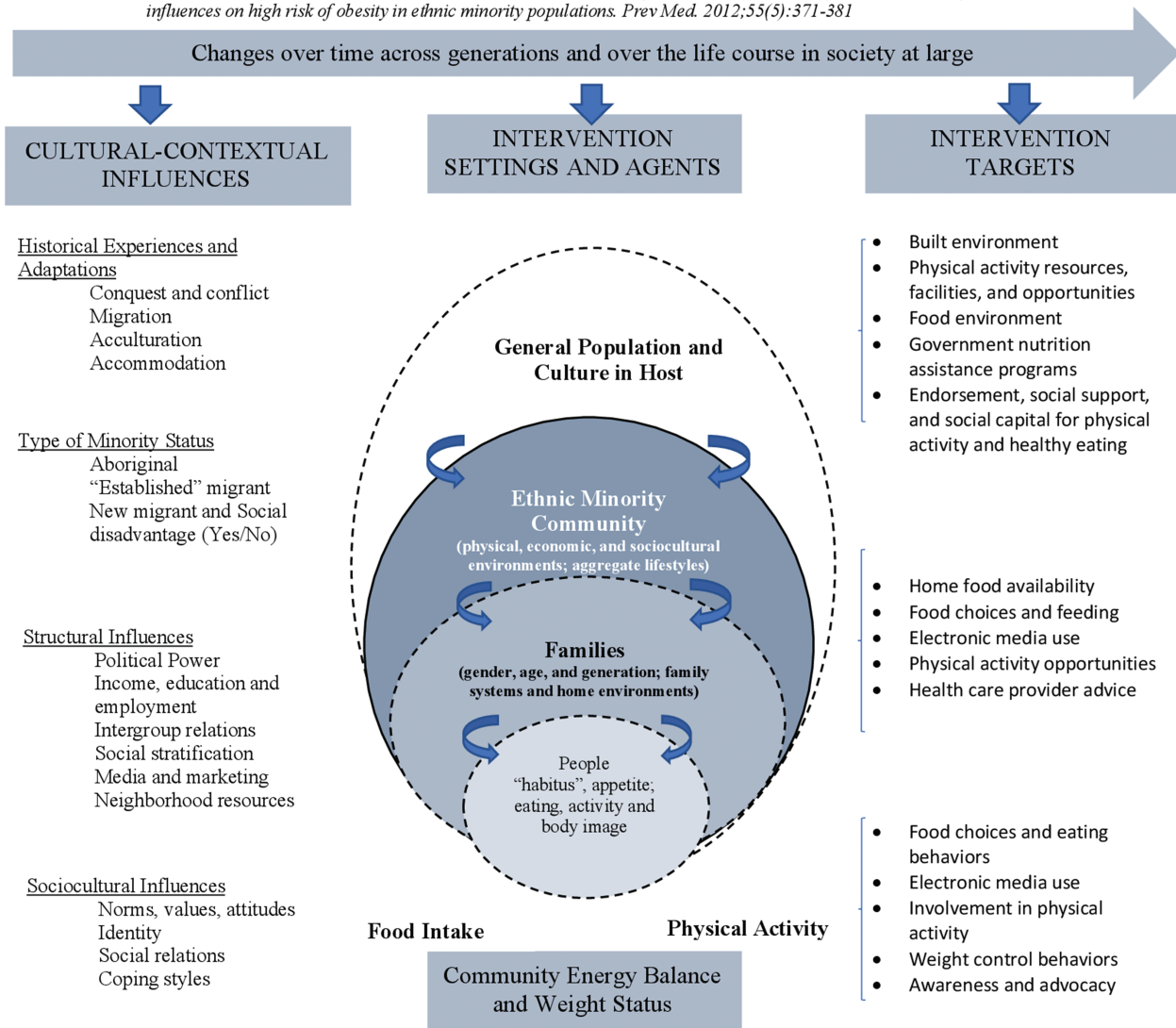


FIGURE 1 Community energy balance framework

segregation).²⁷ The framework underscores that these adaptation processes can be health-promoting, health adverse, or a mixture of both. Similarly, it recognizes that the type of minority status, for example, "established" or "new" migrants, is linked to dietary factors and socio-cultural history and challenges (i.e., type of diet or income level prior to migration). It further emphasizes the role of structural influences in obesity and their particular role among ethnic minorities. For example, migrants from Latin America to the United States are likely to encounter prejudice, discrimination, and negative social stratification. Economic and geographic segregation puts them at higher risk of living in areas with compromised access to healthful food choices and opportunities for physical activity.²⁸

Third, the CEB framework explicitly states that policies and interventions to prevent obesity need to be framed through an ecological perspective, as individuals from ethnic minorities cannot be successful in individually- or family-focused interventions without considering the contextual factors influencing their behaviors. Hence,

community-level approaches are needed to address challenges in the environments in which migrants live to promote healthy lifestyles among them.

To exemplify the application of the CEB framework in addressing migration and childhood obesity, we first empirically assess how migrant networks are associated with childhood obesity in origin communities using data from Mexico. This example highlights the complex role of kinship networks as channels for cultural and material resources transmission set into a double context: origin and host communities. We then turn to the importance of binational interventions addressing the porous borders of migration and considering the structural challenges posed by host communities to migrants' wellbeing, such as prejudice and discrimination. We identify a promising program that could offer a feasible outlet to deliver trustful and culturally sensitive childhood obesity prevention community outreach interventions through a binational approach—the *Ventanillas de Salud* (VDS, Health Windows).

4 | EMPIRICAL ANALYSIS ABOUT MIGRANT NETWORKS AS PREDICTORS OF CHILDHOOD OBESITY IN ORIGIN COMMUNITY IN MEXICO

Prior literature suggests that Mexican households with migrant networks in the United States are differentially exposed to United States-centric social norms and have a higher prevalence of childhood overweight and obesity.²⁹ One study made a distinction between households with close and extended networks; close networks include spouse, parent, sibling, and child, while extended networks consider in-laws, grandparents, grandchildren, cousins, uncles, aunts, nieces, nephews, and other unspecified relatives. The study concludes that children living in Mexico with family networks in the United States are significantly more likely to develop overweight or obesity than Mexican children without migrant ties, after controlling for individual, household, and community characteristics.³⁰ In addition, the study documents that the association is larger and more significant among children with extended rather than close networks.³⁰

Intuitively, closer networks should exert a stronger influence on behaviors than extended networks. However, a classic study found that the likelihood of developing obesity was higher when the influence came from friends (57%) than from siblings (40%) and even from a spouse (37%).³¹ Importantly, the probability of obesity increased when the sample was restricted to same-sex friendships, whereas opposite-sex friendships were non-significant. The authors conclude that people are more influenced by those they resemble than by those they do not. Consequently, larger extended networks, including horizontal relationships, like cousins, may be more influential than asymmetrical relationships in close networks, comprised mainly by their parents. Based on this literature,^{30,31} we assessed if migrant networks were a significant predictor of childhood obesity, as observed in prior studies.³⁰ We tested whether a modification in childhood obesity status over time in the community of origin was associated with having migrant networks (either extended or close living in the United States).

4.1 | Methods

The analysis was conducted with data from the second (2005) and third waves (2009) of the Mexican Family Life Survey (MxFLS). The MxFLS is a longitudinal study representative of the national, urban, and regional levels in Mexico. The first wave (MxFLS-1) collected information on 35,000 individuals in 8400 households from 150 localities in Mexico. In the second and third waves (MxFLS-2 and MxFLS-3), the baseline sample was re-interviewed, including individuals who migrated from Mexico to the United States and the new households formed in-between the waves. The re-contact rates for the MxFLS-2 and the MxFLS-3 were close to 90% of the original sample. The sample of the MxFLS baseline was undertaken by the National Bureau of Statistics and Geography, the Mexican statistics

agency, and was designed to represent the entire Mexican population living in Mexico at the time of the baseline survey. The baseline sample is probabilistic, stratified, multi-staged, and independent at every phase of the study.³²⁻³⁴

For purposes of the current example, the 2005 baseline sample comprises 3,052 children without overweight or obesity, age 5-15 years old, from 1967 households (Table S1). The outcome variable was the onset of overweight or obesity in the third wave (9-21 years old), using a dichotomous variable of body mass index.³⁵ Following Creighton et al., the dichotomous explanatory variables were having close and extended migrant networks in the United States in 2005. We estimated two-level random-intercept logistic models predicting childhood overweight and obesity for close and extended networks. Using a stepwise regression framework, model 1 examines the unadjusted association; model 2 adjusts for individual-level variables (sex, age, age-squared, and baseline BMI); model 3 adds controls for household expenditure on processed foods; model 4 additionally controls for household economic characteristics (assets, expenditure, number of rooms, and if households have electricity); and model 5 also accounts for household socio-demographic characteristics (both grandparents living in the household and household size).

4.2 | Results

The models indicated that children embedded in migrant networks are at a greater risk of developing overweight or obesity relative to children with no network ties to the United States; however, this association is larger and more significant among children in households with an extended family member in the United States (see Figures 2 and 3). Having migrant extended family networks in 2005 was associated with an increased risk among children in Mexico of developing overweight or obesity in 2009 (Figure 3), even after an extensive set of individual, and household variables were considered. Estimates from the two-level random-intercept logistic models are summarized in Tables S2 and S3.

4.3 | Implications

The results support the potential potency of these types of social networks in contributing to the diffusion of obesity across borders.^{31,36} This finding suggests that the influence of migration, especially of extended family members, on the nutritional behaviors of children remaining in the origin country can be strong and detrimental. As the CEB framework suggests, families are major sources and channels for cultural transmission. In the case of Mexico, it is extended kinship networks that yield a stronger influence, probably through intensive communication, inter- and intra-generational relationships (i.e., grandparents, cousins), and role modeling of those who migrated to the United States.⁷ These findings converge with prior literature,³⁰ including qualitative studies documenting that in

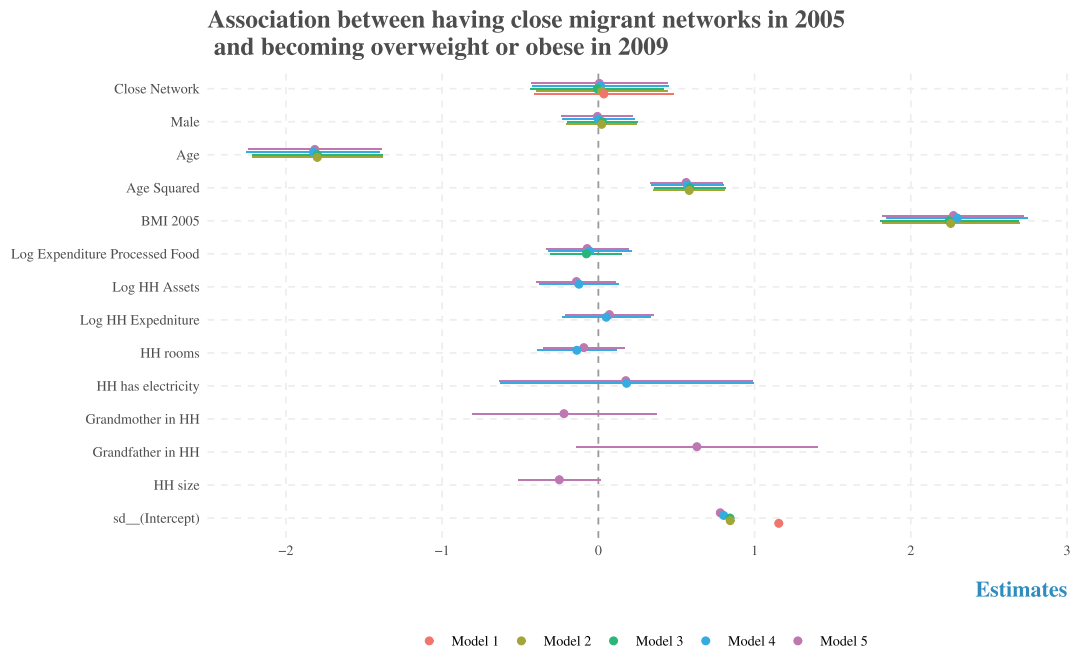


FIGURE 2 Estimate comparison of five two-level random-intercept logistic models on the probability of becoming overweight or obese in 2009; all independent were measured in 2005. The main explanatory variable is having a close migrant network and it was not statistically associated with becoming overweight or obese in any model

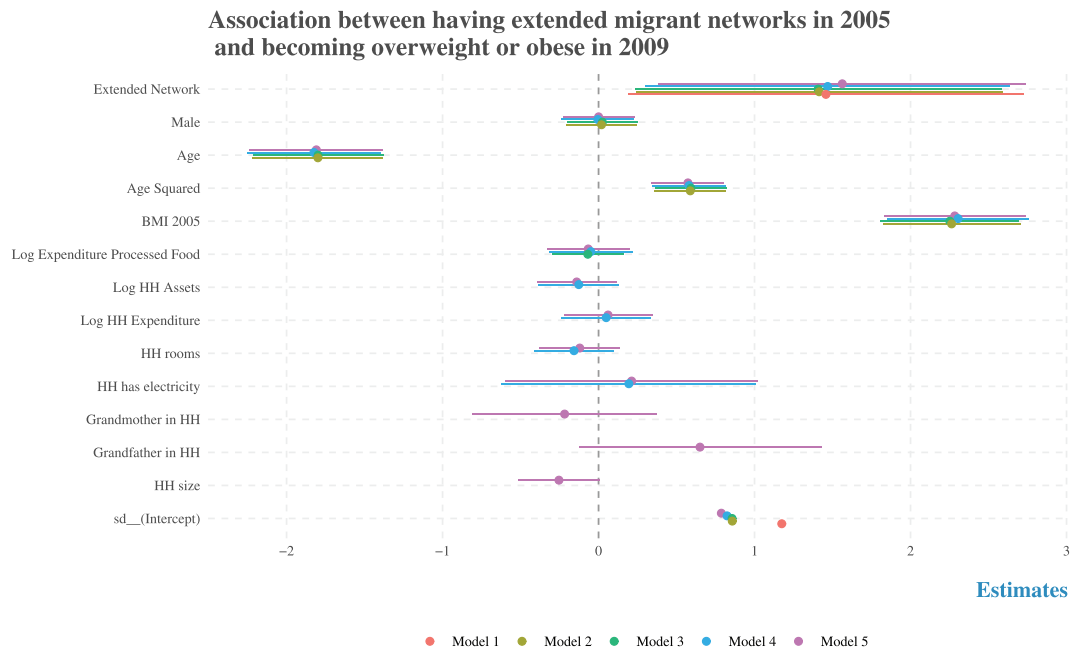


FIGURE 3 Estimate comparison of five two-level random-intercept logistic models on the probability of becoming overweight or obese in 2009; all independent were measured in 2005. The main explanatory variable is having an extended migrant network and it was statistically associated with becoming overweight or obese in every model

Mexico extended networks, relative to close ones, offer more interaction, reciprocity, and social support by virtue of their greater number of individuals.³⁷ There are still important gaps in explaining why extended networks have a more significant association with

children's health outcomes in Mexico, but this has been found consistently in different studies. From a public health perspective, it highlights the relevance of these extended networks in role modeling healthier habits.

In summary, our empirical analysis confirms the complexity of the associations between migration and childhood obesity and suggests that, despite the increasing obesogenic environment observed in originating communities, migration through its complex and dynamic networks can have an independent and significant effect on childhood obesity.

5 | VDS (HEALTH WINDOWS)—A PROMISING BINATIONAL OUTREACH MODEL TO HELP TACKLING CHILDHOOD OBESITY

Based on our empirical findings of the network analysis and the CEB framework, we reviewed existing programs that address the health needs of Mexican migrants' households based on a bicultural perspective; hence, we searched for programs with five criteria: (a) binational nature, (b) cultural sensitivity, (c) easily accessible nationwide in the United States, (d) addresses issues of fear of social service use among migrants, and (e) tackle structural inequalities. Although it has seldom been used to target childhood interventions, the VDS is the most promising program due to its binational and culturally sensitive outreach models able to consider the structural inequities in health faced by migrant families.

The VDS program started in 2003 as a collaboration between the Mexican Ministry of Health and the Mexican Ministry of Foreign Affairs, and was aimed at enabling Mexican migrants to access United States health care and local community resources. Over time, VDS started offering basic health screenings for Mexican migrants, and have partnered with local organizations to promote community outreach interventions responding to different levels of the ecological model. The Mexican government funds the program directly, but VDS operates in partnership with multiple public and private organizations, and in coordination with US federal, state and local governments. The VDS are located within the 49 Mexican consulates in the United States, distributed across the states of Washington, Oregon, California, Nevada, Arizona, Utah, Idaho, New Mexico, Colorado, Texas, Nebraska, Kansas, Louisiana, Indiana, Iowa, Minnesota, Wisconsin, Michigan, Georgia, Florida, North Carolina, Virginia, Pennsylvania, New York, and Massachusetts. Approximately 1.5 million individuals visit VDS sites every year,^{38,39} obtaining services that are culturally and linguistically sensitive and provided in a safe and trustful environment.

5.1 | Methods

In order to understand how the VDS work and how this model could be used for specific childhood obesity interventions, we conducted a scoping review. The search strategy included EBSCO and PubMed (using the terms “VDS” (TEXT) OR “Salud” (TEXT) AND “Mexican” (TEXT)) and was complemented by a request to the Director of the VDS in the United States for key literature (gray and academic) linked

to the program. Fifty-one articles were reviewed, and data from eight documents were analyzed and extracted following key concepts of the CEB framework.

5.2 | Results

The scoping review revealed that the VDS offers three types of services: (i) healthy lifestyles information and counseling; (ii) immunizations and early detection based on free basic screening tests; and (iii) referral to community clinics with affordable prices.^{38,40,41} In this sense, the VDS model acknowledges the self-identity and traditions of migrants, as well as the structural influences that shape beliefs and health-seeking behaviors. In terms of the information and counseling services, these are provided in Spanish, in a trusted physical environment and through culturally sensitive means. The model responds to different structural barriers such as lack of insurance, fear of deportation, and stigma. Approximately 70% of its users are uninsured and are more likely to be undocumented.⁴⁰ Referrals to affordable community clinics are significant service as the anti-migrant rhetoric, and the new public charge rules have increased fear while making health services access more difficult.^{42,43} Hence, getting a referral from a trusted source is crucial. In 2015, about 300,000 annual referrals were performed, corresponding to about 20% of those visiting the VDS.⁴⁰

While these services are mainly individually-based, the VDS have increasingly been partnering with local community outreach organizations that extend to other layers of the ecological model working with migrant households and the communities in which they are embedded.^{44,45} Such partnerships allow combining the outreach capacity of the community organizations and the cultural sensitiveness and trustfulness of the VDS.

Notably, the VDS have seldom been used to target childhood programs. A successful example aimed at children was documented in New York City, where the VDS partnered with the Memorial Sloan-Kettering Cancer Center to promote HPV vaccination for Mexican-American children whose parents had visited the VDS.⁴⁶ This study exemplifies the potential of the VDS partnering with local organizations to deliver additional services, including the promotion of healthy lifestyles for childhood obesity prevention among migrant families (e.g., breastfeeding promotion, responsive feeding,⁴⁷ family nutrition, physical activity), as well as partnering with local outreach organizations to culturally support interventions at the household and community level.

5.3 | Implications

From the CEB framework perspective (see Figure 1), childhood obesity prevention initiatives through the VDS can be identified as a powerful outlet. Although delivered at the individual and family-level, they account for the contexts or environments where migrant families live. However, based on the current obesity prevention and control literature,⁴⁸ the success of the VDS as an outlet contributing to tackle

childhood obesity among migrants will also depend on its sustained effort to partner with local outreach organizations which are more likely to have strategies targeted at modifying obesogenic environments through families and communities. The VDS address only one part of the multilevel interventions suggested by the CEB framework, and only by partnering with other organizations they could influence other layers. The role of the VDS can be very relevant in reaching a distrustful population as well as in help tailoring culturally sensitive interventions. Research on this binational model could be adapted and disseminated by diplomatic missions from other countries with large proportions of migrant uninsured populations in the United States or other host countries.

6 | DISCUSSION

Migration is an important determinant and consequence of the social determinants of health. It can exacerbate health vulnerabilities and risk behaviors, but can also be an enabler for achieving better health trajectories. Hence, migration is an important element influencing childhood obesity in both originating and host communities that need to be better understood due to the complexity and dynamism of the migration process.

When migrants settle in host communities, they usually face social isolation, lack of social protection that can compromise access to food and healthcare, and fear, especially in light of anti-migrant rhetoric and policies. Migrant children are an important part of this migration flow, particularly due to the magnitude of their numbers and their vulnerability. Important gaps remain in research describing migration patterns in the LAC region and their impacts on both the health and wellbeing of children.

The current research addressed this gap by studying the relationship between such migration flows and childhood obesity. We did so by examining two examples through the CEB framework. These examples highlight the challenges of intervening in migrant populations to prevent and combat childhood obesity and the need for further research to inform interventions and policy. The CEB framework contributes to understanding the complexity of this issue and suggests effective interventions. In this context, migration patterns are dynamic processes influencing the lifestyles in host and origin communities, which affect childhood obesity risk in the host country through complex processes of acculturation and structural inequities, and in the origin communities through social network mechanisms. The first example emphasizes how porous borders are, both physically as well as socially, and how migratory networks contribute to interchanges of material and cultural resources that reshape lifestyles, food choices, and contextual interactions. This underscores the need for cross-border approaches to promote healthier lifestyles for children. An important area that needs further inquiry is the specific role of extended networks in these complex and dynamic interchanges.

The second example poses an innovative binational model that is culturally sensitive and accounts for some of the structural

inequalities that impose barriers for healthier choices among migrants. This model, the VDS, could be an effective approach to address childhood obesity among Mexican migrant communities in the United States and beyond, which acknowledges self-identity, barriers to access, discrimination, fear, and language barriers, among others. In addition, it offers trusted health promotion alternatives to primarily vulnerable populations of uninsured migrants. An important area of research that emerges from this scope is how to tailor childhood obesity programs for migrant families through this kind of community outlets.

The current study highlights the need for further research, particularly oriented toward a better understanding of the migration flows within the LAC region. There is limited data to understand this process and the impacts it will have on the health, nutrition, and wellbeing of children.

Additionally, the two applications of the CEB framework emphasize addressing the dynamic and cross-national nature of the association between migration and childhood obesity. There is a need to explore binational and cross-country interventions targeted at the prevention of childhood obesity due to: (i) its life course determinants, as prior studies have documented that early determinants of health and nutrition of migrants can have substantial effects on obesity risk later in life⁴⁹; (ii) the fluid and dynamic interchange of aspects that affect lifestyles of families in origin and host communities, and (iii) the need to have culturally sensitive and trustful approaches to gain access to migrant families. How to address these long-term mechanisms and their impact on successful childhood obesity interventions still needs to be better understood. There is a substantial scarcity of research documenting how to enable migrants' families to access health and social protection services, which can in turn reduce the burden of childhood obesity. Implementation science can have an important role in this area.⁵⁰ For example, human-centered design approaches supported by sound implementation frameworks such as "Discover, Design and Build, and Test"⁵¹ and RE-AIM⁵² can be used to find out how best to design and target effective food assistance and health care programs tailored to the needs of diverse groups of immigrants, perhaps in partnership with the consular services from their countries of origin (e.g., The Mexican Consulate "VDS" program discussed in this article), community outreach organizations and local health authorities.

7 | CONCLUSIONS

Effective interventions to improve the dietary habits of migrant populations, particularly children, can be successful at reducing health disparities and obesity. This paper found that the CEB framework is useful to understand how migration is a factor that contributes to the risk of childhood overweight and obesity in migrant households. This relationship can be strengthened by multiple pathways connected to international migration, from the additional income from remittances to the social dietary habits exported from host to origin countries. New health promotion programs that adapt to the needs of migrant

populations, such as VDS, show the potential of innovative health promotion interventions focused on vulnerable populations, with the aim of tackling childhood obesity in transnational households.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of this article.

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