Structural responses to the obesity epidemic in Latin America: what are the next steps for food and physical activity policies?

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The Lancet Regional Health - Americas 2023;21: 100486

Published Online xxx
https://doi.org/10.1016/j.lana.2023.100486

Summary

Obesity is among the most complex public health challenges, particularly in Latin America, where obesity rates have increased faster than in any other region. Many countries have proposed or enacted comprehensive policies to promote adequate diet and physical activity under a structural framework. We summarize articles discussing the scope and impact of recently implemented obesity-related interventions in the light of a structural response framework. Overall, we find that: (1) market-based food interventions, including taxes on *junk* food, nutrition labelling, and marketing restrictions, decrease the consumption of targeted foods, (2) programs directly providing healthy foods are effective in reducing obesity, and (3) the construction of public areas for recreation increases the average frequency of physical activity. Although obesity-related interventions in the region have somewhat improved health behaviours, obesity prevalence remains on an upward trend. We discuss some opportunities to continue tackling the obesity epidemic in LATAM under a structural framework.

Keywords: Obesity; Food policy; Physical activity; Latin America; Structural responses

Introduction

Current obesity trends threaten global health in virtually every country.[1] Moreover, obesity is expected to continue rising in the next decades.[2] In Latin America (LATAM), obesity affects roughly a third of the population and is one of the leading health concerns.[3] As a response to the current challenges, the implementation of diet-related policies has become a priority in LATAM.[3,4] The focus of such policies has been on enacting strict regulations to shape local food systems.[5,6] Such policies include restrictions on advertising and sales of unhealthy food (food high in sugar, saturated fat, sodium, or calories), mandatory front-of-package (FOP) warning labels, and taxes on *junk* food (i.e., high in calories but low in nutritional content). In addition, public food provision, such as student feeding programs (SFPs), have adapted their nutritional guidelines to tackle obesity. Similarly, many countries in the region have developed and implemented programs to access and promote physical activity.[7]

As more countries worldwide are considering similar policy efforts to tackle the obesity epidemic, it is critical to examine the effectiveness and implementation of current measures. To fully understand the tradeoffs and opportunities among the different policy options, a system-wide assessment of nutritional health challenges is needed.[8] In particular, a structural framework is key to navigating from obesogenic to health-promoting environments. By *structural*, we emphasize the idea of a wide-range set of policies designed and implemented as a coordinated and comprehensive strategy to tackle obesity, rather than sparse programs implemented by local agencies in an asynchronous manner due to contextual factors.

In this article, we extensively review the implementation and outcomes of existing regulations under a structural approach (Fig. 1). The outcomes of complementary efforts that garnered less attention are also considered, such as promoting access to healthy foods and creating systemic changes in the built environment to enhance physical activity.

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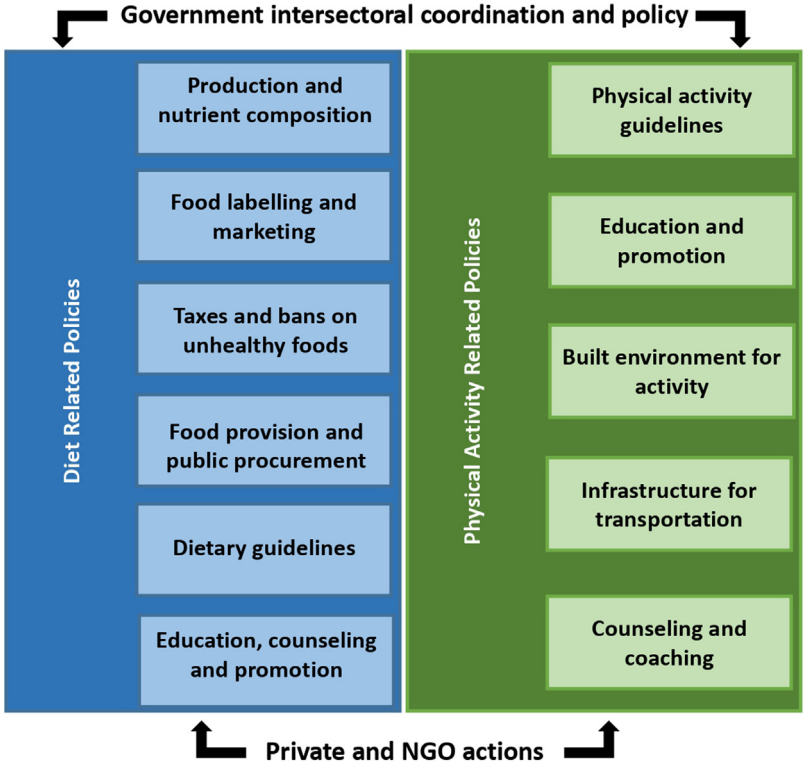

Fig. 1: Types of existing policies differentiated by focus (diet or physical activity) in Latin America.

This review aims to (a) discuss the associations between obesity-related interventions and outcomes of diet and physical activity, (b) present recommendations to strengthen ongoing policy efforts in the future, and (c) describe the main challenges that can affect the effectiveness of policy efforts, such as those challenges related to differences in physical environments across socioeconomic groups. We build on the strategies discussed in the Latin American Action Plan for Prevention of Child and Adolescent Obesity,[9] and aim to reinvigorate the discussion by focusing on a structural, comprehensive, and multilevel approach to undergird focused national efforts to combat obesity and maximize nutritional health. This review differs from previous work,[10,11] by focusing on the structural aspects of food and nutrition policies while leveraging missed opportunities to exploit given the complementary elements of different strategies in a concerted effort to tackle the obesity epidemic, which is a critical risk factor in viral pandemics.

Search strategy and selection criteria

(1) Peer-reviewed publications; (2) studies evaluating interventions in LATAM regarding labeling or marketing regulations, physical activity, taxes and subsidies, and food access and distribution; (3) observational or intervention studies quantifying policy effects; and (4) articles from 2012 to 2022 in English. Studies were excluded if they were (1) conference proceedings without the full paper published online and (2) opinions, editorials, newspaper articles, forms of popular media, and any other articles not presenting original research or reporting policy impacts.

The rest of the paper is organized as follows. First, we provide a background of existing policies and their estimated effects. Next, we discuss new opportunities and main challenges that can affect the effectiveness of policy efforts. And lastly, we provide an overview of the discussion and a conclusion.

Obesity-related policies in LATAM

The global obesity prevalence among adults doubled between 1980 and 2014 and will likely reach 17% by 2030.[3] In LATAM, obesity affects one-fifth of the population,[3] and is projected to continue to increase in the next decades.[2,12]

As a response, governments in LATAM have implemented a comprehensive set of programs and policies. Policies range from taxes on sugar-sweetened beverages (SSBs) and junk food consumption to labeling and marketing regulations targeting children. Programs related to the distribution and access to healthy foods (e.g., school meals) and improvement of physical activity levels have also been considered at the local and national

levels. Causal studies on these policies are scarce, although evidence suggests positive effects of such policies, thus suggesting they could have prevented a steeper increase in obesity rates in LATAM.[13,14] Such policies may produce more substantial results in the future. Yet, given the scale of the problem (Fig. 2), additional efforts should be considered to reduce the health and economic burden of obesity.

We can broadly classify LATAM's existing food and physical activity policies into four main categories (Table 1): (1) policies related to food production, distribution, and retail, thus focusing on consumer physical access to safe and nutritious food while restricting the availability of *junk* food; (2) policies designed to change the relative prices of different foods in the market via taxes or subsidies; (3) strategies aimed at regulating food information and marketing exposure to consumers often focus on nudges to influence their purchasing decisions; and (4) policies and programs focus on increasing accessibility and promoting physical activity, which are crucial for nutritional health.

Programs that facilitate access and distribution of nutritious food

In contrast to other regions, countries in LATAM possess geographic and weather conditions that allow producing affordable and nutritious food.[1] Still, many families do not have enough access to food in the quantity, quality, and variety recommended to ensure a proper diet. Inadequate access, often associated with nutritionally deficient nourishment,[15] is persistent among people living in low-income and distant areas with limited access to affordable healthy foods.

As a response, programs that improve production and physical access to healthy food have become part of the policy agenda in LATAM. SFPs are one of the region's most important policy efforts. Nearly 85 million children annually receive some school meal at zero cost or reduced price.[1] These meals are healthier than a meal brought from home,[16] mainly when they are based on robust nutrition standards. Thus, it is not surprising that SFPs have been associated with decreased obesity prevalence among children.[17] However, more well-designed research is still needed to establish further the effectiveness of school feeding for obesity reduction, especially in low- and middle-income Countries (LMIC).[18] Similarly, policies to regulate the distribution and marketing of less healthy food have been widely implemented. Countries like Ecuador, Peru, Chile, Brazil, Uruguay, Mexico, and Costa Rica have set strict nutrition standards for SFPs and restrictions on unhealthy foods. Chile, for example, restricted the sale of *junk* food in educational establishments. Qualitative evidence indicates that the youngest children have a positive attitude toward these regulations, becoming promoters of a healthy diet in their homes.[19]

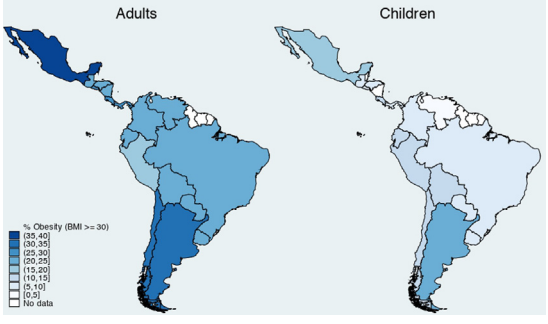

Fig. 2: Percentage range of obesity in adult and child population in Latin America.

SFPs and the restrictions on selling less healthy foods at school are part of the Latin American Action Plan for Prevention of Child and Adolescence Obesity.[9] Thus, it is not surprising that such policies have received the most attention and support. For instance, in many low and middle-income LATAM countries, SFPs are supported through the World Food Program and FAO (Global Food Research Program UNC 2021).[20] Recently, SFP implementation has faced significant challenges, especially amid COVID-19. School attendance decline in many countries prevented children from benefiting from SFPs. Those children who could eventually attend saw a decrease in the nutritional quality of foods provided in schools because; the established nutritional guidelines were not always followed. Moreover, community engagement declined limiting food distribution.[21] The impact of these issues deserves further investigation.

In various countries like Brazil, Paraguay, Peru, Ecuador, and Honduras, SFPs are being designed to use school food procurement also as an instrument to increase the availability and access to more diversified and nutritious food produced locally by family farmers, beneficiating not only the school children but also, family farmers and the broader community.[22] When adequately designed and accompanied by supportive policies and programs, these initiatives have the potential to enhance access to healthy diets for schoolchildren and contribute to the nutrition of family farmers and their communities through increased and diversified food production, consumption, and better incomes.[23]

In Brazil, for instance, a diversification of demand provided by the SFP to family farmers has been assessed to stimulate production diversification of family farmers,[24,25] leading not only to increased incomes but also to an increase in the consumption by smallholder farmers of fresh, healthy, and biodiverse products.[24,25] This strategy is also being increasingly used in other public food procurement initiatives, such as public universities, hospitals, public canteens, and broader national food purchase programs. Examples include the Brazilian Food Purchase Program – PAA.

Author	Study type	Policy	Method and data	Conclusion	Estimated outcome
Programs that facilitate access and distribution of nutritious food					
Colón-Ramos et al. (2022)	Systematic review	Student feeding programs (SFPs) in Latin America & the Caribbean	Comparative assessment of 11 SFPs during the COVID-19 pandemic. Data: 11 SFPs	All SFPs continued but varied in time length. Nutritional guidelines were not always followed. Deterioration of the nutritional quality of foods and lack of community engagement impeded distribution to the neediest	Except for Puerto Rico and Uruguay, all other cases modified their SFP. Buenos Aires and Puerto Rico extended their programs to anyone who requested it. The frequency of distribution varied
Correa et al. (2019)	Focus groups	2016 Chilean Law of Food Labeling and Advertising	Macrocodes combining an iterative process of deductive and inductive analyses. Quotations representing each category were selected. Data: 9 focus groups of mothers of children were conducted in July 2017 in Santiago, Chile	After the first year, the regulation was well known by mothers of diverse SES and different children ages. The degree of use of warning labels was heterogeneous. Children have positive attitudes toward the regulation	Young children accepted school environment changes while teens/ preteens resisted them. Mothers perceived that schools have become key promoters of food behavioral change. The regulation was changing the perceptions, attitudes, and behaviors toward healthier eating patterns
Maluf et al. (2015)	Systematic review	Nutrition-sensitive agriculture (NSA) approach in Brazil related to food & nutrition sovereignty & security (FNSS)	Look into Brazilian food procurement programme, national school meal programme, intersect oral strategy against obesity and overweight, and bio-fortification	For promoting FNSS policies must be intersectoral, decentralized and framed in order to allow for institutional coordination	Highlight the advantages of family farming and rapid food production, distribution, and consumption cycles in order to promote access to an affordable, diversified, and more adequate diet
Taxes and subsidies					
An (2013)	Systematic review	Field interventions on the effectiveness of monetary subsidies in 7 countries: USA, New Zealand, France, Germany, Netherlands, South Africa, and United Kingdom	Study quality of each article was assessed using predefined methodological criteria. Data: Twenty-four articles on twenty distinct experiments were included	Subsidizing healthier foods tends to be effective in modifying dietary behavior.	All but one study found subsidies on healthier foods to significantly increase the purchase and consumption of promoted products.
Caro et al. (2018)	Longitudinal	Sugar-sweetened beverage tax in Chile (2014)	Pre-post analysis for changes in prices and purchases, with the latter examined by volume and calories. Data: Longitudinal data collected between 01/01/2013 and 12/31/ 2015. 2000 households	The modifications of Chile's SSB tax were small, and observed changes in prices and purchases of beverages after the tax were also small	Posttax household purchases of high-sugar sweetened beverages decreased in both volume and calories. The volume of household purchases of low- or no-sugar sweetened beverages increased 10.7% relative to the counterfactual
Colchero et al. (2015)	Longitudinal	2014 excise tax to sweetened sugar beverages in Mexico	Fixed-effects model. Data: National Institute of Statistics and Geography from 2011 to 2014	SSB tax passed along to consumers for all SSBs and a over shifting for the carbonated SSBs	Prices increases close to 1 peso per liter since January 2014. Price changes were higher among the beverages with smaller package sizes
Colchero et al. (2017)	Longitudinal	2014 excise tax to sweetened sugar beverages in Mexico	Estimates ordinary least squares models to assess changes in per capita sales of SSB and plain water adjusting for seasonality and global indicator of economic activity. Data: Monthly Surveys of the Manufacturing Industry from 2007 to 2015	Adjusting for variables that change over time and that are associated with the demand for SSB, tax is associat with a reduction in per capita sales of SSB. The effectiveness of the tax should be evaluated in the medium and long term	Model 1 shows a decline in sales of 7.3% for the 2 years post-tax (2014–2015). Model 2 shows a decline of 6.2% in 2014 and 8.7% in 2015. For plain water, model 1 shows an increase of 5.2% in sales (2014–2015) whereas model 2 shows a significant increase of 11.8% in 2015 only
Cuadrado et al. (2020)	Time series	Sugar-sweetened beverage tax in Chile (2014)	A quasi-experimental design was employed to evaluate the effect of the SSB tax policy in Chile. Data: Nationally representative consumer price index data of 41 soft drinks within 6 beverage categories between 2009 and 2016	The fiscal policy was effective in increasing prices and there are some signs of reduced affordability. Results varied substantially among categories directly affected by the tax policy	Carbonate prices increased by 5.60% after the tax implementation. There was a 5.77% reduction in the affordability of carbonates. For bottled waters, a small significant price increase of 2.55% upon tax implementation
Gračner et al. (2022)	Time series	National tax on non-essential high calorie foods in Mexico	Fixed-effects model. Data: Monthly price data between 2012 and 2016	Prices of taxed foods increased on average, but differentially across foods	Prices increased by 12.2% for packaged pastries, 3.3% for cakes, 5.8% for cookies, 7.03% for fresh pastry, and 8.1% for candy. Within savory snacks, prices increased by 5.8% for chips and 4.6% for crackers. Prices of chocolate decreased −3.6%, while prices of ready-to-eat cereal 2.2%

(Table 1 continues on next page)

Author	Study type	Policy	Method and data	Conclusion	Estimated outcome
(Continued from previous page)					
Hernández et al. (2019)	Longitudinal	An 8% tax on non-essential energy-dense foods (energy density≥275 kcal/100 g) in Mexico	A two-part model that accounts for households with no reported expenditure on the food group of interest and households with a positive and continuous expenditure on the food group of interest. Data: National household income and expenditure surveys for pre-tax implementation periods (2008, 2010, and 2012) and post-tax implementation periods (2014 and 2016)	After the implementation of the tax, there was a reduction in the purchases of non-essential energy-dense foods in Mexico. However, there were heterogeneous reductions across food groups and households. Moreover, after the tax implementation, there was an increase in purchases of untaxed foods.	An overall reduction in the purchases of non-essential energy-dense foods by 5.3%. For stratified analyses, there were only significant reductions for cereal-based sweet foods (6.8%)
Hernández and Ng (2021)	Longitudinal	2014 excise tax to sweetened sugar beverages in Mexico and a set of sugar taxes following the design in South Africa and the United Kingdom	Structural model of demand and supply	Compared to the existing volumetric SSB tax in Mexico, larger reductions in sugar from SSB are expected in case Mexico adopts a sugar tax as in South Africa that encourages reformulation. However, tax revenue will be lower under the latter tax design due to the lower tax burden linked to reformulation	Reductions in SSB purchases in terms of volume and sugar by 19%. Moreover, the tax was over-shifted to SSB prices. The largest tax revenue is expected under the existing volumetric SSB tax in Mexico
Information, advertising and social marketing					
Alé-Chilet and Moshary (2022)	Cross-sectional	2016 Chilean Law of Food Labeling and Advertising	Structural model of cereal demand. Data: nutritional content and packing information of cereal products was gathered from Mintel's Global New Product Database, manufacturer and diet websites, and in-person visits to grocery stores	Reformulation tends to reinforce the intent of the reform, in particular, by lowering the calorie content of cereal purchases	Reformulation contributed to modest reductions in calorie consumption from the breakfast cereals in Chile, on the order of 4%
Barahona et al. (2020)	Cross-sectional	2016 Chilean Law of Food Labeling and Advertising	Equilibrium model of demand for food and firms pricing and nutritional choices. Data: Walmart-Chile and Instituto de Nutrición y Tecnología de los Alimentos	Consumers substitute labeled with unlabeled products. On the supply side, substantial reformulation of products. Food labels increase consumer welfare	Average own-price elasticity of −3.09. an average consumer is willing to pay 10% and 7.6% of the average price of cereal to reduce the sugar and calories, while keeping the taste constant. An intra-nest correlation of $\rho = 0.96$, which suggests that there is little substitution from inside goods to the outside good
Barahona et al. (2022)	Cross-sectional	2016 Chilean Law of Food Labeling and Advertising	Several empirical exercises to unpack the mechanisms through which labels affect consumer and firm behavior to inform policy design. Data: the universe of Walmart transactions in Chile (2015–2018). The nutritional data collected by the Institute of Nutrition and Food Technology at the University of Chile and post-policy data collected and digitized by the authors	No noticeable substitution of products across food categories and most of the demand effect of the regulation comes from within-category substitution. Substantive portion of the overall effect comes from product reformulation.	An overall decrease in sugar and caloric intake of 7–9%
Carpentier et al. (2020)	Longitudinal	2016 Chilean Law of Food Labeling and Advertising	Hours and channels of television use were linked with the amount of high-in food advertising observed to estimate changes in exposure to food ads from these channels. Data: Television use by preschoolers and adolescents was assessed via surveys in the months prior to implementation and a year after implementation (2016)	Preschoolers and adolescents exposure to high-in food advertising in total decreased. Exposure to high-in food advertising with child-directed appeal, also decreased.	On average, preschoolers' total high-in advertising exposure dropped by 44%, and child-directed high-in advertising exposure dropped by 35%. Adolescents' total high-in advertising exposure decreased by an average of 58%, while child-directed high-in advertising exposure decreased by 52%
Correa et al. (2020)	Longitudinal	2016 Chilean Law of Food Labeling and Advertising	Data gathered was analysed for product nutrition and child-directed marketing. Data: Food advertisements shown between 6 am and 12 am on the 4 primary broadcast and 4 cable channels during 2 random weeks in April and May 2016 and 2017	Children in Chile are now less exposed to unhealthy food advertising. However, television originating from national and international outlets should still be monitored for compliance	The percentage of ads for foods high in energy, saturated fats, sugars, or sodium (HEFSS) decreased from 41.9% before the regulation to 14.8% after the regulation. This decrease occurred in programs intended for children (from 49.7% to 12.7%) as well as general audiences (from 38.5% to 15.7%)

(Table 1 continues on next page)

Author	Study type	Policy	Method and data	Conclusion	Estimated outcome
(Continued from previous page)					
Jensen et al. (2021)	Cross sectional	2016 Chilean Law of Food Labeling and Advertising	Television use was assessed concurrently and links to analyses of food advertisements on broadcast and paid television to derive individual level estimates of exposure to high-in food advertising. Data: Dietary data from 24-h diet recalls was collected in 2016 and 2017 (n = 721)	Following the policy implementation, high-in advertising exposure was significantly reduced	Ranging from a mean decrease of 0.2 min/week for high sodium ads to a decrease of 4.6 min/week for any high-in ad
Perez-Escamilla et al. (2017)	Systematic review	Obesity prevention policies in Latin America	Complex Adaptive Health Systems framework to identify components that explained successful implementation and sustainability using the. Data: Policies were selected based on their level of implementation, visibility and potential impact to reduce childhood obesity	Well-coordinated, intersectoral partnerships are needed to successfully implement evidence based anti-obesity policies. Prospective policy research may be useful for advancing knowledge translation	Scientific evidence and evaluation played an important role in achieving tipping points for policies' launch and sustain effective implementation
Sandoval et al. (2019)	Longitudinal	2013 technical regulation for the labeling of packed processed food products in Ecuador	Non-linear Almost Ideal Demand System where the demand for high sugar and low sugar carbonated soft drinks were modeled. Data: Monthly aggregated purchase data of carbonated soft drinks from January 2013 to December 2015 obtained from Kantar World Panel, Ecuador	The introduction of the traffic light supplemental nutrition labelling did not have the expected effect of reducing purchases of carbonated soft drinks during its first year of implementation	An overall downward trend in the quantity purchased of (–0.010 LPCM) and expenditures (-$0.008/month) on high-sugar CSD and an upward trend in the quantity purchased of (0.002 LPCM) and expenditures ($0.002/month) on low- and non-sugar CSD
Taillie et al. (2020)	Longitudinal	2016 Chilean Law of Food Labeling and Advertising	Fixed-effects model with beverage purchases linked to nutritional information. Data: Monthly longitudinal data from urban-dwelling households (n = 2383) participating in the Kantar WordPanel Chile Survey from 1/1/2015 to 12/31/2017	Purchases of high-in beverages significantly declined, these reductions were larger than those observed from single, standalone policies, including sugar-sweetened-beverage taxes	The volume of high-in beverage purchases decreased 22.8 ml/capita/day, postregulation or 23.7%. Calories from high-in beverage purchases decreased 11.9 kcal/capita/day or 27.5%. Calories purchased from beverages classified as "not high-in" increased 5.7 kcal/capita/day, or 10.8%. Calories from total beverage purchases decreased 7.4 kcal/capita/day, or 7.5%
Taillie et al. (2021)	Longitudinal	2016 Chilean Law of Food Labeling and Advertising	Fixed-effects model to examine the mean nutrient content of purchases in the post-policy period compared to a counterfactual scenario bases on pre-policy trends. Data: Longitudinal data on food and beverage purchases from 2381 Chilean households from 1/1/2015 to 12/31/2017	Phase 1 was associated with reduced high-in purchases, leading to declines in purchased nutrients of concern. Greater changes might reasonably be anticipated after the implementation of phases 2 and 3	Overall calories purchased declined by 16.4 kcal/capita/day or 3.5%. Overall sugar declined by 11.5 kcal/capita/day or 10.2%, and saturated fat declined by 2.2 kcal/capita/day or 3.9%. The sodium content of overall purchases declined by 27.7 mg/capita/day or 4.7%
Structural incentives for physical activity					
Godoy-Cumillaf et al. (2020)	Systematic review	Physical fitness test batteries in Latin America	Meta-analyses, with subgroup analyses. Data: Articles published up to April 2021. Eligible studies include both descriptive and analytic study designs	The lack of homogenised information highlights the need to systematically review and potentially meta-analyse the available scientific literature	Subgroup analyses and/or meta-regression may be performed considering potential main factors causing heterogeneity.
Hoehner et al. (2013)	Systematic review	Physical activity interventions in Latin America	Articles were evaluated using US community guide methods. Data: 2010–2011, community-level, physical activity intervention studies based on the peer-reviewed literature or Brazilian theses published between 2006 and 2010	Several physical activity interventions have been identified as promising for future research and implementation in Latin America	Thirteen articles met inclusion criteria, yet no additional interventions could be recommended. By applying the expanded evidence rating typology, one intervention was classified as evidence-based, seven as promising, and one as emerging
Montes et al. (2012)	Longitudinal	Cliclovia programs of Bogota and Medellin in Colombia, Guadalajara in Mexico, and San Francisco in the USA.	Local surveys conducted in each of the programs between 2005 and 2010	From a public health perspective for promoting physical activity, these Ciclovía programs are cost beneficial	The cost-benefit ratio for health benefit from physical activity was 3.23–4.26 for Bogotá, 1.83 for Medellín, 1.02–1.23 for Guadalajara, and 2.32 for San Francisco

Table 1: **Review of studies of actual obesity-related interventions in Latin America.**

Despite the increasing interest in these programs and their great potential, implementation still poses fundamental challenges. Reports by FAO, PAHO, WFP, UNICEF, and IFAD,[26] show that properly implementing these programs requires a set of conditions linked to demand- and supply-side factors and to the policy, legal, and institutional enabling environment, which are not always easy to implement.

Three primary considerations can be made regarding programs that facilitate access and distribution of nutritious food, such as SFPs based on evidence: (1) SFPs are essential instruments to facilitate access to nutritious food for school children, but there are still evidence gaps on the direct impact of these programs on the obesity rates in LMIC, including in LATAM; (2) SFPs differences exist and may explain different possible impacts on obesity-related outcomes. Differences include variations in the nutrition composition of meals and snacks provided by different SPFs; whether programs are coupled with food and nutrition education; whether robust nutrition standards support them; and whether they also adopt a broader strategy for sustainable and inclusive school food procurement. More research analyzing these different possibilities and their possible impacts on obesity-related outcomes are needed; and (3) additional instruments, such as those that regulate the sale and marketing of unhealthy food, as well as policies and programs that support family farmers in the production and commercialization diversified and nutritious food to public institutions, are essential instruments to complement SFPs. Nevertheless, evidence of the combined impact of such initiatives remains unknown.

Taxes and subsidies

From the policymakers' perspective, tax programs present the advantages of being relatively easy to implement—compared with food/nutrition policy options—while also providing a potential source of revenue for governments.[27] Chile and Mexico were among the earliest countries to implement a tax on sugar-sweetened beverages (SSBs). Panama, Ecuador, and Peru shortly followed.[28]

Reductions in SSB purchases in urban Mexico after the excise tax implementation (one Mexican peso per liter) in 2014 occurred.[29,30] Likewise, SSBs prices increased to an extent around the amount of the tax (i.e., a 10% price increase).[30,31] Mexico also implemented an 8% ad-valorem tax on calorie-dense foods. Studies showed reductions in *junk* food purchases[32] and increases in junk food prices by 5%.[33]

Chile modified its existing SSBs tax by creating an 8-percentage point spread between beverages in 2014.[34] That is, an 18% ad valorem tax on high-sugar SSBs with >6.25 g sugar per 100 ml and a 10% ad valorem tax on low-sugar SSBs with <6.25 g per 100 ml, which decreased calorie intake from SSBs.[5]

Simulation studies for LATAM suggest that taxing nutrients directly instead of products could be more effective in curbing *junk* food and SSB consumption.[35] Similarly, a simulation-based study in Mexico showed that a sugar-based tax might reduce sugar purchases from SSB by twice upon reformulation compared to the current tax.[30] Reinforcing the findings from simulation studies for LATAM, observational studies on these sugar-based taxes show these taxes reduce sugar purchases to a more significant extent compared to reductions in overall SSB purchases due to a potential production reformulation.[36] Further evaluations of these policies are needed to determine whether tax impacts remain long-term. However, existing evidence suggests that taxation alone might not be enough to reduce the obesity burden.

Subsidies for increasing healthy food consumption have been less popular among policymakers. Recent research proposes using fiscal revenues from tax policies to promote purchasing healthy food options.[37] Simulation studies in LATAM also suggest that in combination with taxes, food subsidies effectively improve diet and create transfers from wealthy to poor households.[38] Based on a revision of subsidy experiments worldwide, consuming fruits and vegetables (FVs) increases following diet-related interventions.[39]

We highlight three key points in this policy area: (1) the estimated reductions in SSB purchases in some countries (e.g., Chile) might be below levels for curving obesity and overweight; (2) additional empirical studies are needed to elucidate the effectiveness of the current tax rates in improving health outcomes; (3) simulation studies and few empirical studies worldwide support the implementation of nutrient taxes, and (4) simulation studies' recent focus is the combined implementation of taxes and subsidies.[38] However, there is a need for causal studies based on natural experiments to investigate the impact of such price policies on actual consumer behavior.[37]

Information, advertising, and marketing

Stakeholders encourage the provision of nutritional information to support healthy food choices,[40] suggest that the effects of labeling and marketing restrictions could be practical and could complement taxes.

FOP labeling, in particular, has become a prevalent regulatory practice in the region.[41] For example, Ecuador introduced traffic light labels indicating fat, sugar, or salt levels in processed foods, significantly affecting consumption of targeted and nontargeted SSB products.[42] Chile, in 2012, was the first country in the region to approve the use of FOP warning labels on all packaged foods and drinks high in critical nutrients while restricting the promotion of these foods to children under 14 years old.[43] Following the first stage of the implementation, there was a decrease in caloric intake from SSB purchases,[6] and the intake of key nutrients

from ready-to-eat cereals,[44] and targeted and nontargeted (perceived as substitutes of targeted foods) breakfast foods and beverages.[45] Peru, Uruguay, and Mexico approved a labeling policy in 2019, using warning logos on processed products. Moreover, Peru modified its SSBs tax in 2021 to match the requirements of the recently introduced front-of-package labeling Law.[4] After 2020, Brazil, Colombia, Venezuela, and Argentina joined other countries by approving similar labeling policies.[46,47] Despite the popularity of such measures, identifying these efforts' effect on households' dietary quality is complex.[48] For instance, regarding nutrient labeling, while experiments based on self-reported behavior and online experiments are promising,[49] causal evaluations of national-level policies are challenging.[44,45,50,51] Prior work agrees that nutrient labeling, particularly warning labeling, induces food composition modifications and improves the nutritional quality of foods and beverages.[44,51]

In light of the recent implementation of nutrient labeling, evidence of its impact on actual health outcomes such as obesity is limited, particularly in LATAM.[52] Qualitative evidence indicated that nutritional labels increased self-reported use of nutritional information and influenced the healthy food choices of most study participants.[19] Yet, only some participants reported that they modified their choices because of the presence of nutrient labels.[11,53]

Compared to labeling interventions, implementing restrictions on *junk* food advertising are less common in LATAM. Chile was the first country in the region to implement a ban on *junk* food advertising to children, followed by Uruguay, Peru, and Brazil.[54,55] Recent studies indicate that the exposure of pre-school children and adolescents to television food advertising decreased by an average of 44% and 58%, respectively.[56,57] Fewer studies evaluate the simultaneous impact of both labeling and marketing restrictions.[58] Preliminary evidence indicates a small association between changes in advertising and a reduction in targeted food consumption of adolescents in Chile.

Experimental research indicates that the combined effect of tax and nutrition labeling, although with limited effects on "good" nutrients, could reduce the intake of critical nutrients such as sugar, sodium, and saturated fat.[59] However, a concurrent implementation might impose an additional cost on consumers as the labels can be perceived as "emotional" taxes.[60] Nonetheless, the Chilean labeling policies estimated an increase in consumer welfare.[61] Pairing a *junk* food tax with nutrient labeling on unhealthy foods could further stimulate industry food reformulation efforts.

Causal studies on the impact of labeling policies worldwide indicate that nutrient labeling influences purchase behavior; however, it might not lead to an increase in the consumption of healthy foods in general.[62–64] Relying on these policies alone may not be sufficient, even when the food industry's adaptation strengthens labeling effects to policies, such as product reformulations,[65] and price adjustments.[66,67]

On that note, four discussion points remain: (1) since consumers do not easily substitute taxed food categories (e.g., SSBs) for tax-exempted foods, comprehensive labeling measures are likely to have unintended consequences as consumers have fewer products for substitution.[44] One exception is the cross-category substitution between targeted drinks (sugary drinks) and nontargeted drinks (waters)[68]; (2) there is insufficient evidence on the long-term effects of implementing comprehensive labeling programs. Experimental evidence indicates that consumers intentionally ignore nutrient information for various reasons, including high preferences for hedonistic goods, low food budgets, and high prices of healthy foods,[69] suggesting the effects of labeling and marketing regulations by disclosing information diminish over time; (3) evidence of the long-term effect of labeling programs through mechanisms other than information such as product reformulation or price adjustments is needed; and (4) effectiveness of policies would likely depend on the proportion of targeted foods and the number of healthy substitutes available.

Structural incentives for physical activity

LATAM has the highest levels of sedentarism worldwide, which have been rising steadily in the last decades.[70] According to 2017 data from Chile, most of the population does not engage in 30 min of physical activity at least three times per week.[66] Among adolescents in LATAM, only 15% do daily at least 60 min of moderate or vigorous physical activity.[71] Patterns in physical activity levels vary by gender and across socioeconomic status. Women are less physically active than men, while higher socioeconomic status and higher maternal education positively affect physical activity levels among boys and adolescents.[72]

While during the last decades, there has been a substantial focus on food markets as a space to tackle obesity with structural policy approaches, physical activity has been largely overlooked and rarely considered part of the same policy toolbox.[73] This is somewhat surprising since, from a scientific perspective, the mechanisms underlying food choices are remarkably similar to those influencing physical activity decisions, including (relative) price or cost and the relevant information set. Indeed, the imbalance between the intake of energy content of food eaten and the energy required by the body to maintain a healthy lifestyle (including physical work) is associated with the observed rise of the average adult BMI in virtually every country during the recent decades.[74]

Policies aiming to incentivize physical activity are scattered and scarce in LATAM.[75] A recent review identified some promising interventions focused on

information, education, and changes to the built environment.[76] This can be particularly important in the region where obesity is remarkably more prevalent in lower educational groups.[77] One area of expansion has been cycling infrastructure. A recent study showed a massive increase in the construction of bike paths in major cities across LATAM. Still, those models implemented to date are unlikely to be sustainable or equitable in the long run.[78]

The potential impact such strategies might have on nutritional health for LATAM countries may be limited in its current level of implementation, but other collateral health benefits should be highlighted. There were health and medical cost reductions when implementing cycling path networks in Bogota and Guadalajara (among other cities).[79] To enhance the impact of these strategies, changes in the built environment should be accompanied by regulations to incentive active mobility options (i.e., walking and cycling) while promoting safe and accessible spaces for these modalities (e.g., parking spaces near subway stations).

In terms of green space, evidence describing the effect of access to public areas and health is far more limited. As noted in recent research, there is some evidence of a small but statistically significant negative correlation between distance to parks and body mass index, especially among low-income groups. While some countries, like Chile, have spent considerable resources on improving and promoting access to public spaces for physical activity, no formal impact evaluation of such strategies is available.[80] A recent natural experiment in Chile showed that people living in neighborhoods with adequate access to public gymnasiums had higher chances of being physically active.[81] However, as previously noted, there is a significant concern that green space investments are not distributed in an equitable fashion.[82]

Evidence regarding the effect of information and educational strategies on LATAM promotes physical activity is more abundant. A recent review shows that physical activity promotion is often a component of dietary interventions (especially at the school level).[83] Their analysis showed that physical activity combined with nutritional education (but not alone) could reduce BMI among children and adolescents. The results align with previous research in school settings, suggesting that physical activity alone is unlikely to produce long-term weight reduction.[84] Similarly, models to promote physical activity in LATAM should focus on both comprehensive strategies at the individual level (nutrition and physical activity) and across different levels of intervention (household, community, and built environment).[85]

While available findings from research on traditional education and information strategies indicate minimal impacts, the emergence of new models using cognitive behavioral therapy and assistance provided by wearable technologies and smartphone apps can be pretty effective.[86,87] Strategies to increase access to public spaces are often found to be ineffective as they rely on technologies that assume access to resources that are not available for low-income individuals.[88]

Overall, there are three main conclusions in this area: (1) the lack of evaluation designs integrated into physical activity interventions is a significant limitation to understanding the benefit of changes to the built environment and related policies; (2) interventions should consider integrated models targeting food choices and physical activity access across all levels, from consumers/users (and their social support networks) to the built environment. Participatory processes in designing and implementing such interventions should be a key component, as they ensure optimizing adequacy and adherence; and (3) actions should consider implementing behavioral strategies embedded into the relevant setting. This could be supported by the emergence of new technologies that combine behavioral approaches with timely prompts (e.g., gamification). However, more training is required to develop the skills of researchers and practitioners in the use of such technologies to avoid the potential risk of health inequalities.[89] Therefore, a system-based approach that promotes equitable access to physical activity is needed,[90] as described by the Global Action Plan on Physical Activity 2018–2030.

Missed opportunities and future challenges

The upward trends of obesity in LATAM present a severe risk for non-communicable diseases. However, effectively responding to these challenges requires a better understanding of the dynamics of these phenomena. A system-wide assessment is needed to fully understand the tradeoffs and synergies across the different policy options. To take advantage of the existing regulatory framework in LATAM, we propose some new avenues which stakeholders might consider (Fig. 3).

Regarding price policies, tiered nutrient taxes at rates equivalent to the nutrient content of products could be highly effective if properly implemented. Furthermore, complementary gains could be achieved by matching taxes to target foods and beverages already affected by existing labeling measures, as proposed by recent studies.[91] Despite being highly unpopular, this approach creates a salient effect due to the presence of labeled and taxed foods.[92] Moreover, it provides further incentives for the food industry to reformulate.[93] Stakeholders should also openly discuss and pre-commit on how to use generated fiscal resources to incentivize healthy eating and a healthy lifestyle further. Indeed, tax policies alone could be regressive to low-income families, which can be alleviated by introducing subsidies (e.g., 0% value-added tax or food vouchers) on unprocessed foods,

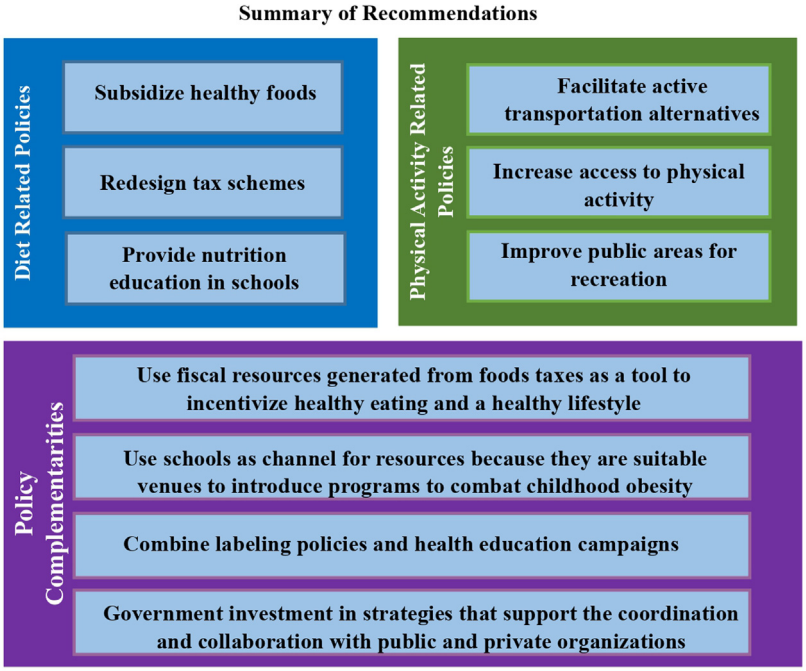

Fig. 3: Summary of recommendations for Latin America.

such as fruits, vegetables, legumes, and fish.[38] Tax resources can also be used to support programs that have been ignored. For instance, the development of healthy spaces to promote a cultural shift towards physical activity and exercise,[94] including user-friendly equipment in public areas as well as adequate school facilities and resources (e.g., trained teachers and consistent schedules).

Schools are also a critical environment for tackling childhood obesity. A systematic review of studies in low-income and middle-income countries pointed out that school initiatives positively affect physical activity, diet, or both.[95] These findings support childhood nutrition-related initiatives to support obesity-related interventions.[96] In this line, initiatives such as Creating Active Schools Framework,[97] and promoting physical activity through schools,[98] are excellent starting points for assessing local needs and guiding the implementation of physical activity promotion from the early stages of development. In addition, adopting a sustainable and inclusive food procurement strategy for SFPs can constitute an opportunity to generate positive social and economic outcomes for the broader community. There are many challenges SFPs still need to address, such as unbalanced breakfast, highlighting the need for robust implementation and evaluation in this area.

Finally, combining labeling policies and health education campaigns can have positive effects,[99,100] suggesting missed opportunities that deserve further attention exist. Thus, government investment in strategies that support the coordination and collaboration with public and private organizations, particularly the academic sector, is essential to generate policy-driven and context-specify systems that are adequate for the population considering institutional barriers, multi-sectorial government agency coordination, public resources available, and scaling-up challenges.[101]

Overall, this Personal View discusses robust evidence of policies that improve diet and physical activity. Nonetheless, it is based on a selected pool of evidence and, therefore not exhaustive. The points discussed here should be viewed in light of several limitations. This Personal View: (1) may suffer from publication bias as studies with better implementation/evaluation and reporting effects were more likely to be published in English and therefore considered in this review; (2) excludes case studies documenting the implementation of policies, including regional official documents (e.g., PAHO reports); and (3) does not discuss long-term impacts (e.g., health effects) mainly because many policies are yet to be evaluated. These limitations point out that the results discussed may understate or overstate actual effects, represent only the reviewed studies, and mainly reflect short-term impacts (e.g., food purchases).

Conclusion

Latin-American countries have implemented large-scale interventions mainly focused on improving diet through food taxes, labeling, and marketing restrictions

to address the obesity epidemic. In parallel, policy efforts to reduce and prevent obesity have targeted schools and local communities through school feeding programs and physical activity promotion. While causal studies indicate that policies enhance diet quality to some extent, recent national statistics suggest that they are insufficient to address obesity in the LATAM.

In turn, programs and policies focused on providing and accessing healthy foods and a mobility-friendly built environment are cost-effective approaches to mitigate the obesity epidemic, particularly among children. Education and counseling and accessibility are essential to sustainable behavior change that can break the intergenerational cycle of obesity.[102]

Furthermore, pursuing complementarities and synergies among current and new policies that could leverage the existing regulatory framework is critical. For instance, the use of tax resources as credit for agricultural food production to create price incentives or integrate behavioral interventions with food provision to promote behavior change. In many cases, the right components already exist, although often at a pilot scale. With additional resources, these components can be scaled-up to successful strategies without introducing new regulations. Lastly, coordination across governmental sectors and collaboration with public and private organizations, particularly research groups, is essential to designing and introducing structural strategies that support adequate diets and recommended physical activity levels.

Contributors

GM, JCC, and ELB wrote the first manuscript of the article. GM, JCC and LC developed the graphs and tables. LC assisted in the literature review. ELB, JCS, MAM, LS, and NAF improved the first draft of the manuscript based on areas of expertise. All authors revised and approved the final report.

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Declaration of interests

None of the authors have a conflict of interests of any type with respect to this manuscript to declare. The opinions and conclusions expressed herein are solely those of the authors and should not be construed.

Acknowledgments

GM is supported by the Texas A&M AgriLife Institute for Advancing Health Through Agriculture. NAF is supported by the Universidad de La Frontera through the FRO19101 project of Research Leaders. JCS is supported by the Mexican National Council of Science and Technology through the fellowship "Investigadores por Mexico". The authors thank Sofia Boza for their review of an early version of this manuscript.

Funding: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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