

Effectiveness, barriers, and facilitators of overweight and obesity prevention strategies in Latin America; a scoping review and qualitative study in Colombia

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Summary

Background This project aimed to synthesize the quantitative/qualitative evidence on the effectiveness of overweight/obesity prevention strategies implemented in Colombia and their barriers and facilitators.

Methods A scoping review was conducted by searching PubMed, SciELO, Scopus, and the grey literature (2012–2023). In-depth interviews were also conducted among key stakeholders on their perception of these strategies' effectiveness, barriers, and facilitators.

Findings 26 records were included; four studies found positive changes in weight/body mass index, five found positive changes in physical activity, two found positive changes in food intake, and four found positive changes in healthy lifestyle knowledge, perception, attitudes, and habits. The main barrier reported was the obesogenic environment, and the facilitators were program flexibility and community engagement. Eighteen interviews were conducted (one interview per strategy); the main barriers reported were political, lack of evaluation access, economic situation, and lack of articulation; the main facilitators were incorporating the strategy into policies, articulation with stakeholders, and strong oversight.

Interpretation Moderate evidence indicates that these strategies positively impact outcomes related to overweight/obesity in Colombia, but more long-term studies are needed for overweight/obesity reduction. Lack of (1) evaluation and resources (barriers), (2) incorporation into policies (facilitators), and (3) strong stakeholder coordination (facilitators) was identified.

Funding Global Health Consortium, Department of Global Health, FIU.

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Keywords: Colombia; Overweight; Obesity; Prevention; Strategies; Effectiveness

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Introduction

Overweight and obesity are a public health problem worldwide, with a general trend towards an increase in all countries.¹ It has a multifactorial origin in which genetic susceptibility, lifestyles, and the environment are involved, with the influence of various underlying determinants such as globalization, culture, economic condition, education, urbanization, and socio-political conditions.^{2,3} Overweight and obesity are also known risk factors for multiple non-communicable diseases



The Lancet Regional Health - Americas 2024;29: 100656
Published Online xxx
<https://doi.org/10.1016/j.lana.2023.100656>

Research in context

Evidence before this study

This study includes a scoping review and qualitative analysis through in-depth interviews to provide comprehensive evidence on the effectiveness of the overweight and obesity prevention strategies implemented in Colombia and to provide an overview of barriers and facilitators of their implementation. A systematic search was conducted in PubMed, SciELO, and Scopus databases, as well as in relevant sites, to identify grey literature such as reports and theses/dissertations. An example of search terms used for PubMed includes (Colombia) AND (School Feeding Program) OR (Food Label) OR (Families in Action) OR (Strategy for a healthy environment) OR (Cycleways) OR (Recreovia) OR (Healthy Food Stores) OR (Healthy educational environment) OR (Healthy eating) OR (Promotion healthy lifestyle) OR (Promotion healthy eating) OR (Reducing excess weight) OR (Healthy cities, environments, rural areas). The search was limited from 2012 until the search date in 2023 for studies published in Spanish and English, but it was not restricted by methods or population. Studies were considered for inclusion if conducted in Colombia and included any implementation, evaluation, impact assessment, barriers, or facilitators of programs, initiatives, or interventions targeting obesity prevention. A total of 185 records were identified, and 18

interviews with key informants were conducted in person or via video call.

Added value of this study

Due to the lack of systematic evaluation of outcomes to assess the effectiveness of these strategies, as well as barriers and facilitators related to implementing these strategies in Colombia, this study addresses this research gap through various qualitative and quantitative data sources. We found 26 records in the scoping review search, with some indication of a positive impact on weight status and physical activity. The stakeholder interviews highlighted barriers, such as lack of evaluation and resources, and facilitators, such as incorporation into policies and strong stakeholder coordination.

Implications of all the available evidence

These findings indicate that although some current evidence demonstrates the potential positive effects of overweight and obesity prevention strategies implemented in Colombia, more research and infrastructure are needed to monitor and evaluate these strategies properly and identify key barriers and facilitators in their implementation.

such as cardiovascular disease, diabetes, hypertension, and chronic kidney disease and also contribute to mortality rates and a high economic impact due to rising healthcare costs and reduced productivity.⁴

In Latin America, overweight and obesity rates are among the highest in the world. Although there are many contributing variables, the rising rates can be attributed to factors such as a significant shift in dietary patterns with increased consumption of ultra-processed foods that are more energy-dense vs nutrient-dense, as shown in various studies in Latin America.^{5–8} Also, high intakes of sodium, refined grains, starchy vegetables, fast foods, and/or snacks are associated with overweight and obesity.^{9–12} Similarly, low physical activity and a sedentary lifestyle are also associated with overweight and obesity in the region.^{5,8,10,12–14} Other documented determinants of overweight and obesity in Latin America include high exposure to food advertisements for children and their families,¹⁵ number of mobile food vendors located around the public schools and the number of stores inside of schools,¹⁶ distance between the school and the nearest fast-food restaurant, among other factors.¹⁷ Given the magnitude of these public health issues, various country-wide overweight and obesity prevention strategies, often led by the Ministry of Health, have been implemented in Latin America. Such strategies include regulations such as interventions for the school environment or nutrition

education in schools, front-of-package labeling, physical activity promotion, and sugar-sweetened beverage taxation.¹⁸

In Colombia, the prevalence of current overweight in children under 18 years of age is 17.5%, equivalent to 2.7 million people affected.^{19,20} Also, data from Colombia has shown that obesity increases with age, from childhood and continuing in adulthood, peaking around 40–50 years.²¹ Among adults, obesity rates are higher among women compared to men,²¹ higher among those with lower socioeconomic levels,^{22,23} lower education,²¹ and in individuals living in urban areas.^{8–10,13,14,21,24,25} Although the rising prevalence of overweight and obesity has been demonstrated along the lifecycle in Colombia, there is a lack of published research on dietary determinants that may be impacting the rates of overweight and obesity country-wide.

Colombia has designed and implemented several efforts to address overweight and obesity. However, these have not been systematically reviewed by the level of the strategy and by the available guidelines, as suggested by the World Health Organization (WHO)^{26–28} and the Pan-American Health Organization (PAHO).²⁹ These guidelines emphasize implementing strategies at various levels, from governmental structures, policies, regulations, or laws to general population-level guidelines and community-based programs or initiatives. Also, in a country in which there are also high rates of

undernutrition (such as stunting and wasting) alongside overweight and obesity,³⁰ it is important to evaluate the effectiveness of these strategies. Furthermore, this type of study is also lacking in other countries in Latin America.

Therefore, this project was conducted to synthesize the quantitative and qualitative evidence on the effectiveness of the different overweight and obesity prevention strategies implemented in Colombia, nationally, regionally, and locally, and the barriers and facilitators related to their implementation. The specific aims were to (1) Identify the different strategies implemented in Colombia to prevent overweight and obesity at the population level and conduct a scoping review of studies that have evaluated the effectiveness of these strategies nationally, regionally, and locally and the barriers and facilitators related to their implementation; and (2) Conduct qualitative research involving key stakeholders on their perception of the effectiveness, barriers, and facilitators of the different strategies identified in Aim 1 to complement the existing evidence.¹⁸

Methods

Methods for Aim 1 (Identify the different strategies implemented in Colombia to prevent overweight and obesity at the population level and conduct a scoping review of the studies that have evaluated the effectiveness of these strategies locally, regionally, and nationally and what are the barriers and facilitators related to these strategies)

This work was built on our previous scoping review, which identified all the overweight and obesity prevention strategies in several countries in Latin America, including Colombia.¹⁸ For this project, we first updated this list to ensure it included all the current strategies implemented in Colombia. This update was done in March–October 2022 by searching electronic search engines, governmental webpages, professional association webpages, non-governmental organization webpages, national and regional large organizations, and local investigators. The search used specific keywords at the following four levels as suggested by WHO/PAHO: governmental structures for overweight and obesity prevention, regulations to support healthy diets and physical activity, standards and guidelines for promoting healthy behaviors, and population-wide or community-based programs or initiatives, following a similar method used in our previous scoping review.¹⁸ The keywords used for each strategy level are detailed in Table 1. Key members of the Ministry of Health and other governmental agencies at the national and regional levels were also contacted to obtain additional information about these strategies and to ensure that all the strategies implemented in Colombia were identified; this list was also reviewed when the stakeholder interviews were conducted.

Based on this list with all the current overweight and obesity prevention strategies implemented in Colombia, a scoping review was followed to identify relevant literature that included an evaluation component and/or identification of barriers and facilitators on these strategies. The research question for this scoping review was: *What evidence exists on the effectiveness of the strategy identified, and what are the barriers and facilitators related to such strategy, nationally, regionally, or locally?* The protocol for this scoping review was based on methods by Arksey and O'Malley³¹ and adapted as appropriate. It also followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement³² and adhered to the PRISMA for scoping reviews checklist.³³ Local investigators and content experts were consulted during the development of the search plan. The search included only strategies that were able to be implemented either nationally, regionally, or locally and may potentially have been evaluated for their effectiveness, barriers, and/or facilitators. The search was conducted between October 2022 and July 2023 in PubMed, SciELO (Scientific Electronic Library Online, <https://scielosp.org>), the main collection of peer-reviewed journals in Latin America, and Scopus databases. An example search strategy can be found in Supplementary Figure S1. The strategy names reflect the commonly used names for these strategies implemented at a national level. Due to limited published literature on this topic in indexed journals, grey literature was also included. This type of literature may reduce publication bias and provide a more comprehensive and balanced picture of the studies available in Colombia.³⁴ For this, a thorough hand search was conducted to include grey literature for relevant local studies not indexed in these databases, such as theses, dissertations, and other reports, by preparing a list of the different universities with public health and nutrition programs or departments and searching their online libraries for available studies. The search was done for publications between 2012 and 2023 and included studies conducted in any age or gender groups and of any study design; the inclusion/exclusion criteria details are outlined in Table 2. All records from the systematic searches were uploaded into a screening software called Rayyan (<https://www.rayyan.ai/>) for the pre-screening process, in which the titles and abstracts were first screened to determine if they met the inclusion/exclusion criteria. This screening was done by two reviewers who are also authors (GVP and LMRM). A third author resolved discrepancies. After duplicates were removed, the pre-screened records (from both the systematic search and hand search) were then divided among two reviewers to perform a full-text screening to ensure they met the inclusion/exclusion criteria before data extraction. Once the final list of included records was obtained, the data was extracted into a data extraction sheet explicitly prepared for this project. The data extraction

Level	Strategy
Governmental level	"government" "department" "office" "committee" "monitoring system" "surveillance system" "national plan" "national policy" "leadership" "partnerships" "prevention" "promotion" "obesity" "overweight" "healthy behaviors" "healthy eating" "physical activity" "non-communicable diseases".
Regulations, standards, or guidelines to support healthy diets and physical activity	"front of package labeling" "food label" "traffic light labeling" "nutritional labeling" "food labeling"; "tax" "sugar-sweetened beverages" "sugary beverages" "sugary foods"; "regulation" "marketing" "advertisement" "publicity" "foods" "food supply"; "regulation" "school" "nutrition" "foods" "meals" "lunch" "health" "cafeteria"; "promotion" "regulation" "physical activity" "physical education" "sports"; "regulation" "elimination" "fats" "trans-fats" "trans fatty acids" "saturated fats"; "regulation" "plan" "reduction" "restriction" "sodium" "foods" "meals"; "regulation" "law" "plan" "nutrition education" "school curriculum"; "plan" "policy" "law" "food security", "guidelines" "dietary" "diet" "nutrition" "nutritional" "food" "physical activity" "healthy behaviors" "healthy lifestyles" "health promotion" "children" "population" "treatment"
Population-wide or community-based programs or initiatives	"program" "school meal" "school feeding" "school breakfast" "food assistance" "food for people" "glass of milk" "community meals" "complementary food" "healthy schools" "nutrition education" "physical activity" "healthy eating" "physical activation" "family agriculture" "community gardens" "healthy environments" "treat obesity" "nutritional environment"

Table 1: Literature search by 'keyword(s)' search and level for overweight and obesity prevention strategies implemented in Colombia.

sheet with the variables extracted is shown in [Supplementary Figure S2](#). The extractions were split between two study team members (LMRM and NSA) and reviewed by a senior team member (CP) for accuracy. The critical appraisal of the methodological quality of qualitative, quantitative, and mixed methods studies was conducted using the Joanna Briggs Institute (JBI) Manual for Evidence Synthesis,³⁵ a tool specifically designed for systematic reviews ([Supplementary Figure S3](#)).

Methods for Aim 2 (Conduct qualitative research involving key stakeholders on their perception of the effectiveness, barriers, and facilitators of the different strategies identified in Aim 1 to complement the existing evidence)

Based on the identified strategies currently being implemented in Colombia (this was part of Aim 1), we conducted in-depth interviews with key informants to learn about their perception of those strategies' effectiveness, barriers, and facilitators. At least one interview was conducted for each strategy. Approval for these interviews was obtained from the Institutional Review Board at Florida International University and

Universidad de los Andes. Stakeholders were selected if they were actively involved in implementing or evaluating these strategies at various levels (leadership/supervisory or direct implementors) to allow for varied perspectives. These interviews asked key stakeholders about their perception of the effectiveness and barriers and facilitators encountered in their implementation and how to address these in the future. The key stakeholders were identified with the help of the local investigators to support both the selection and coordination of individuals related to the identified strategies but did not have a close relationship with the study team members who conducted the interviews. Before conducting the interviews, the team organized a kick-off presentation in Bogotá (at Universidad de los Andes) in July 2022 to provide an overview of the study's justification, objectives, and methods. For this presentation, all the key stakeholders identified were invited. This presentation was open to other researchers and individuals in the university, with 70 individuals participating either in person (n = 20) or through video call (n = 50) in this kick-off presentation. Following this presentation, in-person interviews were conducted by three female study team members: CP, LMRM, and

Criteria	Inclusion criteria	Exclusion criteria
Setting	Any setting that impacts the general population- community, hospital, school, etc.	Any setting outside of the inclusion criteria
Population	General population in Colombia- any age, gender, etc.	Any population outside of the inclusion criteria
Programs, program plans, proposals, Interventions, and Initiatives	Any implementation, evaluation, impact assessment, barriers, facilitators, etc. of programs, initiatives, interventions, etc. for obesity prevention	Any program or initiative that is not specific to nutrition, diet, physical activity, or weight management or does not mention the implementation, evaluation, barriers, or challenges of the program
Study design	Systematic reviews, guidelines, randomized controlled studies, randomized trials, cohort studies, cross-sectional studies, longitudinal studies, qualitative studies, case studies, dissertations/theses, editorials, expert opinion, etc.	None
Date	2012 until 2023 (date of search)	Anything beyond the search date
Language	English and Spanish (main languages used in Colombia)	Any language other than English and Spanish
Countries	Colombia- national, regional, local.	Any country other than Colombia

Table 2: Inclusion/exclusion criteria of overweight and obesity prevention strategies in Colombia.

GVP. CP has extensive nutrition experience in Latin America, LMRM has extensive public health experience, and GVP is a dietitian with nutrition and qualitative research experience. A student volunteer was present during some of the interviews to assist with interview coordination while the study team members conducted the interviews and took field notes. Interviewees were contacted to participate through phone or email, and interviews were conducted in Spanish in either the stakeholder's office or a neutral location (café) and ranged from 30 to 90 min. Other interviews with individuals outside Bogotá and those unavailable during the visit were coordinated through video calls. Before conducting the interview, the authors explained the objectives of the research study as an extension of what is known regarding the evaluation and impact of obesity prevention strategies in Latin America, with a specific evaluation in Colombia. The participants were provided the IRB-approved informational letter (no written consent was required) and all participants gave verbal consent to conduct and record the interview. Using grounded theory to build categories from interview data,³⁶ a semi-structured interview guide was used to encourage the participants to respond freely and comfortably about their current role in the overweight and obesity prevention strategy and its effectiveness, as appropriate, following the interview guide (the guide is shown in [Supplementary Figure S4](#)). Although the interview guide was not pilot-tested, it was reviewed by public health experts with knowledge of the local context. Although a purposeful sampling method was used, during the interviews, other potential key stakeholders were referred, and these were contacted for an interview until data saturation was reached for all the strategies of interest.³⁷ No repeat interviews were conducted. The recordings of the interviews were transcribed verbatim (not returned to participants for correction), and coding was done through an inductive coding approach³⁸ by two study team members with experience in Colombian policies and interventions (MJA) and qualitative research and nutrition expertise (GVP). Due to the wide breadth of strategies included, after a general review of the interviews, the two coders developed a codebook based on two categories of strategies: strategic interventions that are used as guiding documents, policies, etc., and operational interventions that are more specific and implementable in a regional and local level. For each strategy category, codes were organized by evaluation, barriers, and facilitators, with various sub-codes developed based on common evaluation aspects and barriers and facilitators mentioned. Although member checking with interviewees was not done, the study team reviewed and approved the full codebook (see [Supplementary Figure S5](#)). All interviews were coded using Dedoose software (Dedoose Version 9.0.90, 2023. SocioCultural Research Consultants, LLC. Los Angeles, CA). The two coders (MJA, GVP) first

coded two interviews (~11%) independently to pre-test the codebook and align with coding. A third study team member (CP) resolved any discrepancies between coding. The two coders then coded an additional interview to calculate interrater reliability (IRR) with Cohen's kappa set at +0.8.³⁹ After coding, pooled Cohen's kappa was calculated as 0.92, indicating a 92% agreement or substantial agreement in coding. Kappa was estimated with binary variables pooling 20 kappa estimates. Pooled Cohen's kappa was estimated with a code application test in the Dedoose software⁴⁰ and used methods outlined by De Vries et al. in which the mean observed and expected agreement are calculated and used in the kappa formula.⁴¹ Interviews were then divided between the two main codes (strategic vs operational) for coding for prevalence identification to create the graphical projection of the gathered information. Codes were then tallied to identify code counts by strategy and coding category. The most common quotes and code counts from stakeholders were organized by coding category.

Triangulation

A within-study synthesis or data triangulation was also done on the findings from the scoping review and qualitative evidence on the effectiveness, barriers, and facilitators of the different overweight and obesity prevention strategies implemented in Colombia. The triangulation process was done to highlight similarities in the themes identified for the effectiveness, barriers, and facilitators between methods (scoping and interviews). The approach was to first familiarize with the data from both sources, identify key themes and concepts emerging from both sources, index, chart, and map the themes, and then interpret the data.

Role of the funding source

The funder (Global Health Consortium) was involved in the study design, data collection, data analysis, interpretation, and report writing.

Results

Results for Aim 1

[Table 3](#) shows the list of strategies implemented in Colombia. Those marked with "*" were included in the scoping review search (these are strategies implemented in Colombia). Those marked with "***" were included in the interviews for Aim 2 (these are the strategies currently being implemented, and we were able to identify stakeholders involved in those strategy).

The scoping review search resulted in 163 records identified from PubMed, SciELO, and Scopus and 22 records identified through hand searches. After multiple rounds of screening, 26 records from 24 different studies (19 peer-reviewed articles and seven theses) were included in the scoping review. The main reasons for exclusion were no intervention or program

Governmental level

National Council for Economic and Social Policy 113 (<i>Consejo Nacional de Política Económica y Social, CONPES</i>)
National Food and Nutrition Security Plan (<i>Plan Nacional de Seguridad Alimentaria y Nutricional, PNSAN</i>) 2012–2019**
Intersectoral Commission for Food and Nutrition Security (<i>Comisión Intersectorial de Seguridad Alimentaria y Nutricional, CISAN</i>)
Food and Nutrition Security Observatory–Colombia (<i>Observatorio de Seguridad Alimentaria y Nutricional, OSAN-Colombia</i>)
National Food and Nutrition Education Plan (<i>Plan Nacional de Educación Alimentaria y Nutricional</i>)**
National Recreation Plan (<i>Plan Nacional de Recreación</i>) 2020–2026
Group physical activity for health, sport and recreation (<i>Grupo actividad física para la salud deporte y recreación</i>)
Guidelines for the Promotion and Counseling of Physical Activity and Exercise by Health Human Resource Personnel (<i>Directrices para la Promoción y Consejería de Actividad Física y Ejercicio por Personal de Talento Humano en Salud</i>)
National School Health Survey (<i>Encuesta Nacional de Salud Escolar</i>)
Comprehensive Care Route for the Promotion and Maintenance of Health and Comprehensive Health Care Route for the Maternal Perinatal Population (<i>Ruta Integral de Atención para la Promoción y Mantenimiento de la Salud y la Ruta Integral de Atención en Salud para la Población Materno Perinatal</i>)
Ten-Year Breastfeeding Plan (<i>Plan Decenal de Lactancia Materna</i>) 2021–2030**
Ten-Year Public Health Plan (<i>Plan Decenal de Salud Pública</i>) 2012–2021 and 2022–2031
National Survey of the Nutritional Situation in Colombia (<i>Encuesta Nacional de la Situación Nutricional en Colombia</i>)**
National Demographic and Health Survey (<i>Encuesta Nacional de Demografía y Salud, ENDS</i>)
Law 1355- Obesity Law (<i>Ley de Obesidad</i>)**
School Feeding Program (<i>Programa de Alimentación Escolar, PAE</i>)*, **
Resolution 810 of 2021–Front of pack labeling (<i>Etiquetado frontal</i>)*, **
Decree 2771 of 2008–Intersectoral National Commission for the coordination and superior orientation of the promotion, development, and measurement of the impact of physical activity (<i>Decreto 2771 de 2008 (Comisión Nacional Intersectorial para la coordinación y orientación superior del fomento, desarrollo y medición de impacto de la actividad física)</i>)
Decree 642 of 2016–World Physical Activity Day (<i>Día Mundial de la Actividad Física</i>)
Law 2120 of 2021–Healthy Environments (<i>Entornos Saludables</i>)
Law 400 of 2021–Law for the Comprehensive Management of Overweight and Obesity (<i>Ley de Manejo Integral del Sobrepeso y Obesidad, MISO</i>)
Regulations, standards, or guidelines to support healthy diets and physical activity
Implementation of healthy preparations gastronomy sectors (<i>Implementación de preparaciones saludables sectores de gastronomía</i>)
Clinical Practice Guideline for the prevention, diagnosis and treatment of overweight and obesity in adults (<i>Guía de Práctica Clínica para la prevención, diagnóstico y tratamiento del sobrepeso y la obesidad en adultos</i>)*, **
Food-based Dietary Guidelines for pregnant women, lactating mothers and children under 2 years of age for Colombia (<i>Guías Alimentarias basadas en Alimentos para mujeres gestantes, madres en período de lactancia y niños y niñas menores de 2 años para Colombia</i>)**
Food-Based Dietary Guidelines for the Colombian Population over 2 years of age (<i>Guías Alimentarias Basadas en Alimentos para la Población Colombiana Mayor de 2 años</i>)**
Healthy Eating Guide (<i>Guía Alimentación Saludable</i>)
Promotion of the consumption of fruits and vegetables, ABC (<i>Promoción del consumo de frutas y verduras, ABECÉ</i>)**
Handbook How to implement a fruit and vegetable distribution point? (<i>Manual ¿Cómo implementar un punto de distribución de frutas y verduras?</i>)
Guidelines for the territorial management of the promotion of physical activity (<i>Orientaciones para la gestión territorial de la promoción de la actividad física</i>)**
Population-wide or community-based programs or initiatives
Cycleways/Recreovías (<i>Ciclovías/Recreovías</i>)*, **
Families in Action (<i>Familias en Acción</i>)*
Healthy cities, environments and ruralities (<i>Ciudades, entornos y ruralidades saludables</i>)*, **
Healthy eating strategies (<i>Estrategias de alimentación saludable en Colombia</i>)*
Healthy Educational Environment Strategy (<i>Estrategia de Entorno Educativo Saludable</i>) ^a [withing this strategy, there were several local programs, such as Program 40 × 40, SI! Program, and Muévete Escolar]
Healthy Environment Strategy (<i>Estrategia de Entorno Saludable</i>)*, **
Healthy School Stores (<i>Tiendas Escolares Saludables</i>)*, **
Modes, conditions, and healthy lifestyles (<i>Modos, condiciones, y estilos de vida saludable</i>) ^a
Strategies to promote healthy lifestyles (<i>Estrategias de promoción de estilos de vida saludable</i>)*, **
Strategies to reduce excess weight (<i>Estrategias para la reducción del exceso de peso</i>)*, **
Strategy for the promotion of healthy eating (<i>Estrategia de promoción de la alimentación saludable</i>)*
The Truth About Your Weight (<i>La Verdad de su Peso</i>)*

^aThe original name of the strategy was translated to English to the best of our ability. The acronym is shown after the strategy name in Spanish for those strategies with acronyms. Those marked with “**” were included in the scoping review search (these are strategies implemented in Colombia) while those marked with “***” were included in the interviews for Aim 2 (these are the strategies currently being implemented, and we were able to identify stakeholders involved in those strategy).

Table 3: Strategies related to overweight and obesity prevention implemented in Colombia.

evaluated, no evaluation or data on effectiveness, barriers, or facilitators, or not related to overweight and obesity or nutrition. Details are described in the PRISMA flow chart (Fig. 1).

Among the studies included, 14 were based in urban settings, 8 in rural settings, and 2 in urban and rural settings; 6 were in children, 10 were in adults, and eight were in both children and adults. Each study intervention was categorized based on the national obesity prevention strategies it aligned with. Nine studies were related to cycleways or Recreovías (none were randomized clinical trials, RCTs). These programs are implemented in Colombia by the District Institute of Recreation and Sports. While these programs complement each other and both promote physical activity, cycleways have dedicated spaces to encourage movement through bicycles, while Recreovías are strategies that use open public areas like parks to promote exercise through physical activity classes. There were eight studies (2 RCTs) on strategies related to promoting healthy lifestyles (which include a broad set of strategies led by the Ministry of Health and Social Protection that included both nutrition and physical activity components). One of these studies combined both the Recreovía and promoting healthy lifestyles. There were four studies (2 RCTs) on strategies related to a healthy educational environment (which are strategies to improve the nutritional and physical activity environment within the schools). There were two studies (no

RCTs) on strategies related to healthy eating (which are strategies such as community programs for children that provide health and nutrition services with a focus on healthy eating). Lastly, there was one study on Families in Action (a conditional monetary transfer program) and one on the School Feeding Program (a program to provide school meals). The studies found varied in study designs, including cross-sectional, clinical trials (randomized-control, RCT, and non-randomized), natural experiments, ecological studies, participatory action research, qualitative studies, and mixed methods. Among the outcomes assessed, they included changes in body mass index (BMI), physical activity, diet, and knowledge, perception, attitudes, and habits related to healthy eating and living. Some studies reported on more than one outcome. A detailed description of the studies included is shown in [Supplementary Figure S2](#). Concerning the quality of the studies ([Supplementary Figure S3](#)), 17 studies received strong quality ratings in all the applicable criteria. Among the qualitative studies, all failed to report on the researcher’s influence on the research and vice-versa. Among cross-sectional studies, five failed to report if confounding factors were identified and strategies to deal with them. Two RCTs failed to report on the randomization, allocation, and blinding.

[Table 4](#) shows the results of the effectiveness of the outcomes assessed and the barriers and facilitators related to these strategies from the scoping review. Four

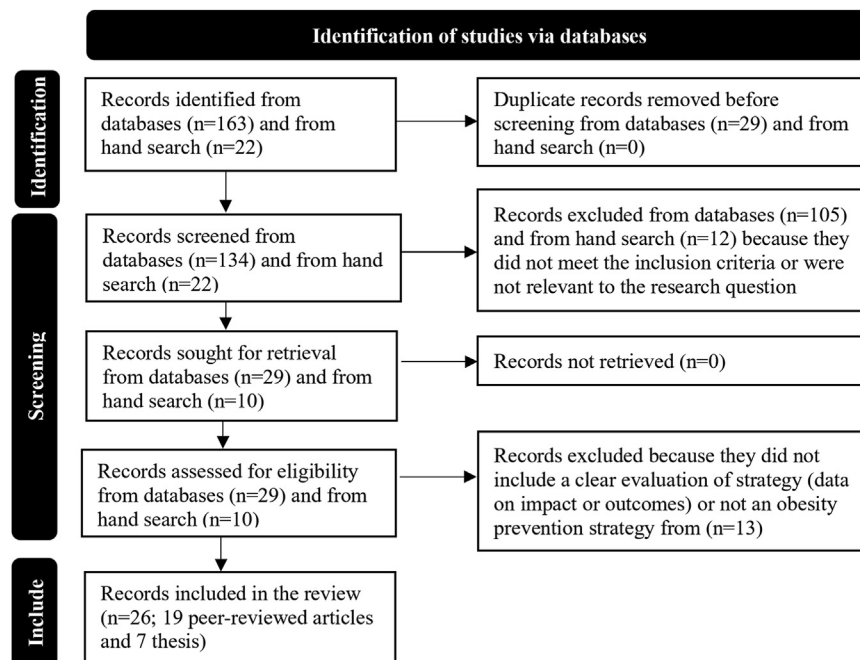


Fig. 1: Preferred reporting items for systematic reviews and meta-analysis (PRISMA) flow chart for the studies identified in the scoping review related to overweight and obesity prevention strategies in Colombia.

Author (s)	Strategy ^a	Study design	Population & setting	Outcomes results	Barriers	Facilitators
Bonilla-Ibáñez CP. 2019 ⁴²	Strategies to promote healthy lifestyles	Quasi-experimental study	Children Rural	NEUTRAL change in BMI, PA, and perceptions survey for diet and PA.	No barriers mentioned	No facilitators mentioned
Carrillo Cubides R et al. 2015 ⁴³	Healthy Educational Environment Strategy	Cross-sectional study	Children Urban	NEUTRAL change in BMI, WC, and VO2	No barriers mentioned	No facilitators mentioned
Carvajal-Carrascal G et al. 2022 ⁴⁴	Strategies to promote healthy lifestyles	Ecological study	Children and adults Rural	POSITIVE change in knowledge, attitudes, and habits	Low level of commitment and motivation of teachers; disarticulation between the different sectors of the school community.	Continuity over time to close the gap between the progress achieved; desired scenarios to improve health and inclusion of public policy and the media.
Céspedes J et al. 2013 ⁴⁵	Strategies to promote healthy lifestyles	Cohort Study	Children and adults Urban	POSITIVE change in PA and BMI	Not enough information on children's habits (physical activity and dietary habits).	No facilitators mentioned
Céspedes J et al. 2013 ⁴⁶	Strategies to promote healthy lifestyles	Cluster, RCT	Children and adults Urban	POSITIVE change in knowledge, attitudes, and habit scores; NEUTRAL change for BMI	No barriers mentioned	Active participation of the entire educational community; integrating the "fun while learning" concept into its various activities.
Diaz Del Castillo A et al. 2017 ⁴⁷	RecreoVia and Strategies to promote healthy lifestyles	Mixed methods (qualitative and cross-sectional)	Adults Urban	No outcomes assessed	Insufficient participation; lack of trained personnel; budget reductions over time; PA was not addressed as public policy; limited capacity to translate policy into action.	Creation of an academy and design of a training program for aerobics instructors; program flexibility; funding diversification (government, civil society, community, and private companies); political legitimization
Duarte-Ruge EZ. 2012 ⁴⁸	School Feeding Program	Cross-sectional study	Children Urban and Rural	POSITIVE change in weight status.	Lack of consideration of food security factors, only 4 of the 12 factors were considered (education in food and nutrition, health services, consumable water, and biological quality of the foods).	Local food production; school gardens; food and nutrition education curriculum
Fernandez AC et al. 2021 ⁴⁹	Strategies to promote healthy lifestyles	Cross-sectional study followed by an intervention	Children and adults Rural	Results were related to participation in the activities only	No access to the internet or living in rural areas without internet to connect to the online PA class.	Multidisciplinary team (nutritionist, psychologist, social worker, family defense)
Fernández-Jiménez R et al. 2020 ⁵⁰	Healthy Educational Environment Strategy	Cross-sectional assessment followed by a community-based cluster RCT	Children Urban	NEUTRAL change in knowledge, attitudes, habits toward healthy lifestyle, and CVD score (BMI, blood pressure, body weight, glucose, lipids, PA, and diet)	Prolonged period (7 years) without the intervention; short intervention, delivered only at community centers (not multilevel); lost children that moved from the school; family-related issues (illness, scheduling issues, change of family contact, low attendance, vacation period, schoolwork)	Those with higher adherence had greater benefits
Gutiérrez-Martínez L et al. 2018 ⁵¹	Healthy Educational Environment Strategy	RCT	Children Urban	POSITIVE change in PA; NEUTRAL change in adiposity	Difficulties in receiving text messages, lack of interest, perceptions of inadequate physical environment	The intervention was delivered by the District Institute of Recreation and Sports with alternative plans
Guzman BL et al. 2019 ⁵²	Healthy Educational Environment Strategy	Mixed methods (cross-sectional and qualitative)	Adults Rural	No outcomes assessed	About 80% did not have access to drinking water, yet 80% of the foods are cooked in the schools. The interviews evidenced the lack of tools to promote healthy behaviors in schools	A total of 69% of parents participate in activities organized by the schools, 80% of teachers have received training on health education.
Paez DC et al. 2015 ⁵³	RecreoVia	Qualitative study	Adults Urban	No outcomes assessed	Poor quality of classes and instructors, weather conditions, lack of diffusion channels, and unsafe public spaces	Parks with aerobics classes
Paredes Prada ET al. 2021 ⁵⁴	RecreoVia	Cross-sectional	Children and adults Urban	POSITIVE change in participation	Lack of evaluation before the start of the program	Safe space for the activity with extensive walking or biking area; high land use mix; commercial activities; use of popular parks
Pérez-Idarraga A et al. 2015 ⁵⁵	Strategies to promote healthy lifestyles	RCT	Adults Rural	POSITIVE change in BP, strength, body composition, diet, and CVD risk	No barriers mentioned	Inclusion of short-term cumulative goals; feedback on achievements; education for self-monitoring; linked theoretical teaching to practice; use of communication and motivation channels strengthened empathy

(Table 4 continues on next page)

Author (s)	Strategy ^a	Study design	Population & setting	Outcomes results	Barriers	Facilitators
(Continued from previous page)						
Romero RF. 2017 ⁵⁶	Families in Action	Qualitative study	Children and adults Urban and Rural	NEUTRAL change in nutrition knowledge	Money not spent on education and nutrition for the children but spent on household needs; poor knowledge of the importance of nutrition, education, and health for the children; lack of interest in participating in activities	Easy to enroll in the program; children must attend school to be able to receive the funds
Rubio MA et al. 2022 ⁵⁷	Recreovia	Participatory action research	Adults Urban	No outcomes assessed	Lack of urban settings that could provide safe environments to engage in PA for populations with special needs; poor infrastructure	Park's cleaning, safety, and appropriate use; participants' leadership skills for PA promotion strategies; dialogue among program users and stakeholders fostered the sustainability and expansion of the program; self-sustained; residents are aware of their ability to leverage urban settings and create a healthy "culture".
Rubio MA et al. 2021 ⁵⁸	Recreovia	Mixed methods (qualitative and cross-sectional)	Adults Urban	POSITIVE change in PA	Poor trash management (including animal waste) and recycling practices; lack of safety and limited interactions among neighbors; presence of homeless population; use of parks for sale/use of illegal drugs.	Availability of outdoor fitness equipment; maintenance of green areas/courts and their diversity; local support; expertise of the PA instructors; receiving data-driven feedback from the community to improve
Sarabia Perez D. 2018 ⁵⁹	Healthy eating strategies	Cross-sectional study	Adults Rural	No outcomes assessed	Nutrition follow-up: lack of documentation for anthropometric measures. Menu Cycling: community moms lacked knowledge of the amounts needed per meal per child.	No facilitators mentioned
Sarabia Perez D. 2018 ⁵⁹	Healthy eating strategies	Longitudinal	Adults Rural	Only results on participation were provided	No barriers mentioned	No facilitators mentioned
Sarabia Perez D. 2018 ⁵⁹	Strategies to promote healthy lifestyles	Qualitative study	Children and adults Rural	No outcomes assessed	Scheduling of activities conflicted with parent's work so participation was low	No facilitators mentioned
Torres A et al. 2016 ⁶⁰ Barradas et al., 2017 ⁶¹ Sarmiento O et al., 2017 ⁶²	Recreovia	Natural experiment	Adults Urban	POSITIVE change in BMI, PA, and participation	A prolonged period for the strategy integration into the community.	Strong community participation
Triana CA et al. 2019 ⁶³	Cycleways	Cross-sectional study	Children Urban	POSITIVE change in PA participation and the perception of a safe environment for PA; NEUTRAL change in BMI	A small number of cycleway users did not allow for assessment; parents did not report on time spent on cycleways.	Innovative, inclusive, recreational space
Varela MT et al. 2021 ⁶⁴	Healthy Educational Environment Strategy	Qualitative study	Children and adults Urban	No outcomes assessed	Schools had ultra-processed foods but limited fruits. Lack of school health policies on healthy eating and low compliance with Law 1355/2009.	Presence of healthy eating promotion policies and activities was associated with the importance of nutrition in schools with high socioeconomic level
Zieff SG et al. 2018 ⁶⁵	Recreovia	Qualitative study	Adults Urban	POSITIVE change in the perception of safety environment for PA	Open streets are often community-based with limited funding and resources to support programming and activities.	Higher safety (having crossing guards available)

Abbreviations: PA: physical activity; BMI: body mass index. ^aThe name of the strategy was translated verbatim to the best of our ability.

Table 4: Results on effectiveness, barriers, and facilitators from the studies included in the scoping review.

studies reported a significant reduction in weight or BMI (one RCT), while five had no significant change (three RCTs). Seven studies found significant increases in physical activity (one RCT), while two did not (one RCT). In relation to changes in diet, one study found significant improvements in diet (one RCT) while one did not (one RCT). Lastly, four studies reported a

positive significant change in knowledge, perception, attitudes, and habits related to healthy eating and living (two RCTs), while two studies did not find such a positive change (one RCT). In relation to barriers reported to the implementation of the intervention, the following were mentioned in the scoping review: budget (n = 2), obesogenic environment (n = 6), lack of education

(n = 3), lack of access (n = 3), and lack of engagement (n = 3). Facilitators included program flexibility/engagement (n = 4), community engagement (n = 4), incorporation into existing strategies/programs (n = 3), changes to the built environment (n = 2), starting the intervention early in life (n = 1), funding diversification (n = 1), and nutrition importance (n = 1). Five studies did not report on barriers and six on facilitators.

Results for Aim 2

There were 18 interviews (five conducted in person and 13 conducted by video call) between July and October 2022, with no individuals contacted refusing to participate. The interviews included 22% men and 78% women. Three interviews had more than one individual. Also, some interviews discussed more than one strategy as they were members of the Ministry of Health or other governmental agencies that oversaw several strategies (see [Supplementary Figure S6](#) for the number of interviews conducted per strategy). Therefore, within the 18 interviews conducted, the 20 strategies identified were discussed. Due to the wide breadth of strategies included, these were divided as “Strategic” for strategies related to guiding documents, policies, etc., and “Operational” for strategies implemented nationally, regionally, or locally. Also, the coding was done separately for the evaluation of strategies and the identification of barriers and facilitators related to the implementation of these strategies. For strategic interventions, the main themes identified for evaluating the strategies were following up and discussing future changes that can be made to the strategy ([Table 5](#)). The main strategic barriers identified were political barriers, such as corruption or lack of political will, and lack of evaluation/access to the evaluation of these strategies. For example, in one of the interviews about Front of Pack Labeling, the following was mentioned: *“The obstacles, let’s say, are of a political nature, which has also been difficult, because we have governments where the people that make the decisions, well, they are people who have a conflict of interest.....who obviously have no interest in regulating certain things from which they profit.”* The main strategic facilitators identified were incorporating the strategy into policies and having good coordination or program flexibility. For example, one of the interviews mentioned: *“We have had interesting cases in some territories where these food guides are already being implemented, and they are differentiated by region. They already take their local foods to adapt to the healthy plate of the Colombian family...”* For operational interventions, the main themes identified for the evaluation components were following up and monitoring the strategy and indicators included in the strategy implementation. One of the individuals mentioned: *“The goal for the city is to have the intervention impact at least 5% of the children to have positive results ... We have accomplished to shift these figures in 62% of the children, in a positive way just with a decrease*

in z score...” The main themes for operational barriers were participant characteristics that negatively impact participation, such as age, economic situation, lack of articulation with other stakeholders, and lack of human and financial resources. For example, one of the interviews mentioned: *“The infrastructure is a problem...they take classes and sit on the floor, and they eat lunch there....”*. Finally, the main themes identified for operational facilitators were articulation with stakeholders, strong oversight entities, and strategy adaptation. One of the individuals mentioned: *“I have also noticed that the simpler and more applicable you make the program, the better results you will get.”*

Results for triangulation

The triangulation allowed us to identify common themes between the scoping review and the interviews. As shown in [Fig. 2](#), common themes between both methods in the evaluation component were related to measuring outcomes (body weight and behavioral change) to determine the effects of strategies on these and how these strategies may influence the participants’ beliefs and perceptions about diet, physical activity, body composition, and general health. Common themes for the facilitators were coordination of these strategies between the different stakeholders and being flexible when implementing these strategies in the population. Common themes for the barriers were the lack of resources or budget allocated to these strategies, the obesogenic environment, which makes implementing these strategies difficult, and the lack of coordination in some strategies.

Discussion

The scoping review included 26 records (from 24 studies, most with strong quality ratings), in which four found significant decreases in weight/BMI, five found significant improvements in physical activity, one found significant improvements in diet, and four found significant improvements in healthy lifestyle knowledge, perception, attitudes, and habits. The main barrier reported was the obesogenic environment, and the facilitators were program flexibility and community engagement. The in-depth interviews showed that the main barriers to implementing these strategies were political, lack of access to evaluation, economic situation, and lack of articulation, while the main facilitators were incorporating the strategy into policies, articulation with stakeholders, and strong oversight.

Overall, most of the findings of the scoping review were reinforced by the qualitative component. For example, the scoping review showed that several studies found a positive impact on behaviors (changes in physical activity and intake of food) and on the knowledge, perception, attitudes, and habits related to healthy eating and living, which was highlighted in several of

Code category	Code	Code count (n = 509)	Interview mention count (n = 18)	Memorable phrases
Strategic type of strategies				
Evaluation	Follow-up and monitoring of strategy	23	7	<p>Strategy: National Food and Nutrition Education Plan We are at this moment coordinating the follow-up with the Early Childhood Directorate...we did a small exercise to see how the implementation was going. So, for example, salads and vegetables can be difficult so they try to add vegetables in stews...So we are now coordinating this process to be able to do this at the end of the year and have a clearer picture of how the implementation is going.</p> <p>Strategy: National Food and Nutrition Security Plan 2012–2030 So, how do we do the follow-up? Number of technical support sessions, how it has been promoted in the territories, and we do a spotlight process: green, yellow, and red to know how we are doing and how we can improve. We are doing this process annually and we have been doing it for two years and in those two years, we have been improving...it helps us know what we are not doing well in, for example in terms of implementation, we need more mass communication strategies for the population.</p> <p>Strategy: Front of Pack Label The obstacles, let's say, are of a political nature, which have also been difficult, because we have come from governments where the people that make the decisions, well, they are people who have a conflict of interest. They are linked to the business sector, which is financed, so they are people who obviously have no interest in regulating certain things from which they profit.</p> <p>... it was very difficult basically because all of these policies are attacked with a lot of lies, that the shop owners are going to go out of business, the people will be left with nothing to feed themselves, that in the poorest areas where there is no drinking water, it is necessary for them to consume sodas, well that is going to cause damage in the most vulnerable populations.</p>
Evaluation	Future changes to strategy	21	8	
Evaluation	Indicators included	8	4	
Evaluation	Results of the evaluation	2	2	
Barriers	Political barriers (corruption, lack of will, environment, conflicts)	30	5	
Barriers	Lack of evaluation or access to evaluation	23	7	
Barriers	Lack of reach	10	5	
Barriers	Lack of resources (financial, human)	10	3	
Barriers	Other barriers	9	5	
Barriers	Difference in implementation by territory	7	4	
Barriers	Pandemic impact on implementation or evaluation	6	3	
Barriers	Armed conflict	3	1	
Facilitators	Incorporation into policies	41	8	<p>Strategy: Intersectoral Commission for Food and Nutrition Security ... We have had interesting cases in some territories where these food guides are already being implemented and they are differentiated by region. They already take their local foods to adapt to the healthy plate of the Colombian family, these have six food groups, they adapt them to their territories...</p> <p>Strategy: Front of Pack Label... So, we also did a network campaign called "Don't donate junk". We also sent and demanded from the Ministry that Colombia adopt some guidelines for the donation of food...</p>
Facilitators	Coordination/flexibility	40	7	
Facilitators	Evidence	8	6	
Facilitators	Good Reach	8	4	
Operational type strategies				
Evaluation	Follow-up and monitoring of the strategy	38	10	<p>Strategy: Healthy Environment...Well, it is a departmental strategy so we created it...so with our resources, we will reach 60 educational institutions in the department.... we hired a chef, nurses, social marketing specialists, and technicians and additionally, we did a training process on measuring anthropometrics which is one of the components that the strategy so that afterward, and in a systematic way, the instructors can begin to do an annual follow up on the nutritional status of the children.</p> <p>Strategy: Promotion of Healthy Lifestyles in Colombia The goal for the city is to have the intervention impact at least 5% of the children to have positive results ... BMI z score would be shifted...We have accomplished to shift these figures in 62% of the children, in a positive way just with a decrease in z score. But if you count the children that maintained their weight, we are reaching close to 80% of achievement through the intervention.</p> <p>Strategy: Promotion of Healthy Lifestyles in Colombia ... the people that have been part of this program have certain characteristics; they are not disciplined, they have various issues at a personal and family level and have mental health issues that must be addressed ... anxiety, depression, intrafamily violence ... issues with willpower but also mental health.</p> <p>Strategy: School Nutrition Program ... the infrastructure is a problem for all the programs, and also the educational institutions...they take classes and sit on the floor, and they also eat lunch there...If you go to do a workshop and the child is on the floor eating, because there is nowhere else and one says, what do I do? It is difficult but, in my opinion, they are programs that help...It is difficult because not everyone accepts it like it they should. So, the community is able to eat for free and I do what I can with them but it is also difficult.</p>
Evaluation	Indicators included in the strategy	32	9	
Evaluation	Results of the evaluation	24	10	
Evaluation	Acceptability and adherence	23	7	
Evaluation	Future changes to the strategy	20	8	
Barriers	Lack of engagement/coordination	23	9	
Barriers	Lack of resources (financial, human)	17	5	
Barriers	Lack of evaluation or access to evaluation	13	7	
Barriers	Political barriers (corruption, lack of will, environment)	12	5	
Barriers	Unhealthy environment	7	6	
Barriers	Difference in implementation by territory	7	4	
Barriers	Lack of reach	4	4	
Barriers	Pandemic impact on implementation or evaluation	4	4	
Barriers	Armed Conflict	2	1	

(Table 5 continues on next page)

Code category	Code	Code count (n = 509)	Interview mention count (n = 18)	Memorable phrases
(Continued from previous page)				
Facilitators	Coordination/flexibility	21	8	<p>Strategy: School Nutrition Program ... We invite parents, students, and instructors so they get to know and understand how the program works ... They have workshops for parents with a chef. The chef teaches the parents how to cook and if there are low resources in the house, how to be resourceful with the little they may have to promote healthy eating...We invite the parents to guided visits to the school cafeterias and they understand more about how the cafeteria works...And we also invite the parents to tour the food preparation areas and the committees ... we look to promote parent participation so that they can both understand and also help us publicize the program...</p> <p>Strategy: Promotion of Healthy Lifestyles in Colombia Well, it is two months, one initial assessment and then a month follow-up to review any anthropometric changes...So we here identified body mass. We also identify changes in waist circumference.... I have also noticed that the simpler and more applicable you make the program, the better results you will get.</p>
Facilitators	Adaptation	8	5	
Facilitators	Incorporation into policies	2	2	
Facilitators	Good Reach	2	1	
Facilitators	Evidence	1	1	

Table 5: Code category, code, code count, and interview mention count of each type of overweight and obesity strategy in the interviews with key stakeholders.

the interviews. The scoping review also showed moderate evidence for a significant reduction in weight or BMI with the strategies evaluated, which was also highlighted as such in the interviews. In particular, the strategies with more positive significant changes in the outcomes assessed were those promoting healthy lifestyles, including diet components, physical activity, and other healthy behaviors. The other strategy that showed positive results was the Recreovia/Cycleway programs. A recent scoping review was conducted in Colombia to identify the different interventions related to improving nutrition and physical activity in the population.⁶⁶ However, the data was not extracted, so no information on effectiveness, facilitators, or barriers was provided. Other reviews on obesity prevention strategies in Latin America have evaluated different strategies not implemented in Colombia, such as the taxes on sugary drinks, the regulation of advertising, and the front-of-package labeling.⁶⁷ That review found that the sugar drinks tax reduced consumption, purchase, and sale. Another review of strategies implemented to modify the food and built environments within and around schools in Latin America found that only two out of the nine interventions showed significant improvements in weight over time.⁶⁸ However, to our knowledge, this is the first study to evaluate the effectiveness of all the overweight and obesity prevention strategies implemented in a Latin American country using a scoping review and qualitative methods.

In relation to the barriers and facilitators related to implementing the overweight and obesity prevention strategies in Colombia, there were some differences between the results found in the scoping review and the results from the interviews. The scoping review found some barriers mentioned in the interviews, such as lack of resources, which can include financial or personnel, lack of reach and coordination between stakeholders for program implementation, as well as an obesogenic environment that can negatively impact participant

outcomes. In relation to facilitators, both methods identified that having flexibility within the program to fit with various lifestyles and strong coordination to influence the program's success were key facilitators. Interestingly, coordination was considered both a barrier and a facilitator, depending on the strategy implemented. However, the data triangulation highlighted that, although the stakeholder interviews were able to provide more in-depth details regarding barriers and facilitators when implementing these strategies, they did not have access to or knowledge about the impact of these strategies on the main outcomes assessed (body measurements, physical activity, food intake, or knowledge, perception, attitudes, and habits related to healthy eating and living). This could be because the program did not have a formal evaluation by those implementing the strategies, the evaluation was confidential, or others, such as researchers from local universities performed the evaluation. Additionally, barriers such as political will or corruption, the impact of the pandemic, armed conflict, and industry interference were mentioned in the interviews but not in the scoping review. Other facilitators, such as incorporating the program into policies, were unique to the interviews. Lack of receptiveness by participants was also more commonly mentioned in the scoping review as a barrier. Although this was occasionally mentioned in the operational interviews, it was rarely mentioned in the strategic interviews, most likely due to some stakeholder's lack of role in the day-to-day implementation of the strategies. Finally, although mentioned rarely in the interviews, the scoping review highlighted the need for community engagement to facilitate the success of the strategies implemented.

Other systematic reviews have also highlighted barriers and facilitators related to the implementation of obesity prevention strategies in other countries in Latin America. For example, a 2021 systematic review of the policies recommended by PAHO to prevent childhood

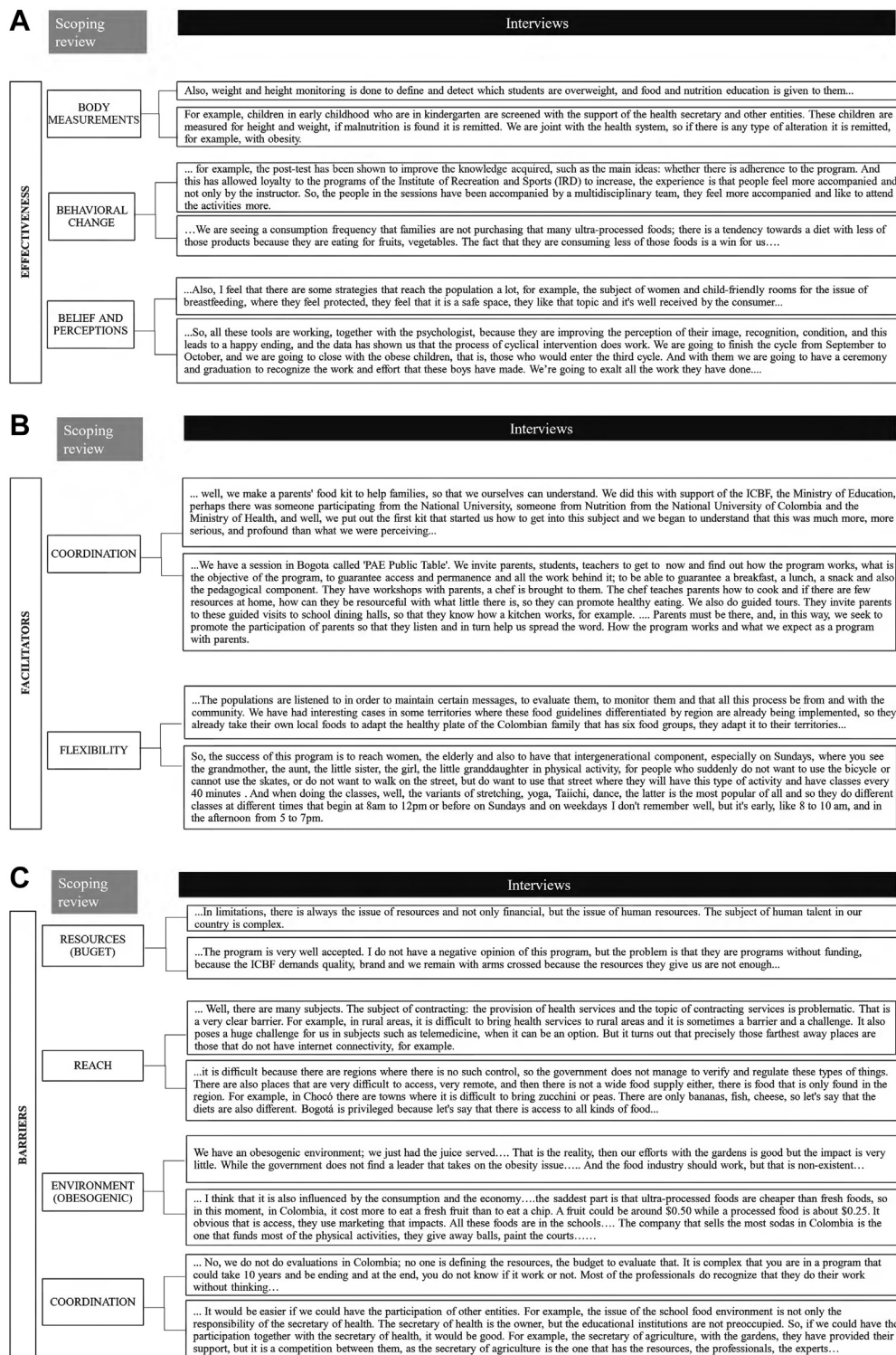


Fig. 2: Data triangulation of the findings from the scoping review with the findings from the qualitative evidence. Panel A shows the results of effectiveness; Panel B on Facilitators; and Panel C on Barriers.

obesity in Latin America, including Colombia, found 10 qualitative studies evaluating this.⁶⁹ Among the most frequently assessed policies were school nutrition programs and fiscal and marketing policies. These studies identified the following barriers when implementing these policies: low acceptance of healthy foods, healthy foods being perceived as challenging to cook, these policies not being perceived as enough to prevent obesity, and general lack of knowledge of these policies. This lack of understanding was also found in the qualitative component of the present study. Among facilitators, the 2021 systematic review⁶⁹ found that policies considered socio-cultural features and increased awareness, which is somewhat similar to the main facilitator found in the present study. More studies are needed to evaluate the barriers and facilitators related to the implementation of population-based strategies to help inform the implementation of similar strategies in other countries of the region.

This study had various limitations and strengths. A potential limitation, specifically for the key informant interviews, was the timing. The interviews took place after a recent national election with uncertainty regarding the continuity of programs and personnel. This could have contributed to the several comments about politics in the interviews and the hesitation in sharing results from the strategies. Some stakeholders also mentioned sharing results with the investigators after the interview, which did not occur after several follow-up emails. Related to the scoping review, there was also a lack of peer-reviewed research evidence with rigorous methodologies (systematic reviews, meta-analyses), and 32% of the included studies were not peer-reviewed (theses). Although the search was purposely broad to capture all available evidence, a scoping review also does not include a risk of bias assessment, which means there could be some bias in the included studies introduced by the researchers during study implementation, analysis, or publication. Additionally, only three databases were included in the systematic search, potentially limiting some peer-reviewed evidence from other databases.

Some strengths of this project were that the study team included local collaborators who could identify and coordinate stakeholder interviews related to all the strategies of interest. The interviews were done both in person and virtually to allow for more flexibility in scheduling. Additionally, the stakeholders not only shared their experiences but sometimes recommended specific people to contact for further details about a strategy. They shared contact information, and follow-up interviews were then scheduled. Although some limitations were mentioned above, the scoping review also had various strengths. A comprehensive search was conducted utilizing databases (PubMed, SciELO, Scopus) and hand searches for local studies published as theses and dissertations. The local team with expertise

in the nutrition landscape in Colombia advised on the different universities and local programs that should be included in the hand search. They also provided directions for which governmental documents should be reviewed and considered.

The main public health policy implications of this work are that this information may help those involved in the implementation of similar strategies to improve, strengthen, or continue such public policy strategies in Colombia and other countries in Latin America. Given the alignment with various overweight and obesity prevention strategies in Latin America,¹⁸ the methodology applied in the present study could be used in the future to evaluate the overweight and obesity prevention strategies in other countries in the region. Also, the findings from this study could be used to help inform further research on potential barriers and facilitators for similar overweight and obesity prevention strategies implemented in other countries in Latin America. More studies are needed by those implementing strategies on their effectiveness to improve the outcomes related to overweight and obesity prevention. Those who have evaluated these strategies should share the results so others can learn about their effectiveness and lessons learned when implementing such strategies.

In conclusion, the present study highlighted a comprehensive list of the strategies implemented in Colombia related to overweight and obesity prevention. The scoping review found moderate evidence of the effectiveness of some strategies to reduce weight or BMI, increase physical activity, improve diet, and improve knowledge, perception, attitudes, and habits related to healthy eating and living. The qualitative interviews generally confirmed these results. However, more studies are needed to understand if these strategies lead to a reduction of overweight and obesity in Colombia. In relation to the main barriers identified related to the implementation of these strategies, both the scoping review and qualitative interviews found that the main barriers were lack of resources (financial or personnel), lack of reach and coordination in the implementation, and obesogenic environment. The main facilitators identified for implementing these strategies were flexibility within the program to fit with various lifestyles and strong coordination to impact the program's success positively. The interviews highlighted the lack of access or knowledge about the effectiveness of these strategies on the main outcomes assessed (in some cases, the results were confidential) and highlighted barriers such as political will or corruption, the impact of the pandemic, armed conflict, and industry interference and facilitators such as the incorporation of the program into policies. The knowledge of the main barriers and facilitators identified in the present study could help those currently implementing these strategies for improvements. This information could also be used by key stakeholders when implementing new strategies.

Contributors

GVP: Data curation, Formal Analysis, Investigation, Writing—original draft, Writing—review & editing; LMRM: Data curation, Formal Analysis, Investigation, Writing—original draft, Writing—review & editing; MJA: Data curation, Formal Analysis, Investigation; NSA: Investigation, Writing—review & editing; CE: Conceptualization, Funding acquisition, Methodology, Writing—review & editing; RC: Conceptualization, Funding acquisition, Methodology, Writing—review & editing; LJHF: Conceptualization, Funding acquisition, Methodology, Writing—review & editing; CP: Conceptualization, Data curation, Formal Analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Supervision, Writing—original draft, Writing—review & editing.

Data sharing statement

The data used for this study will be made available on request to the corresponding author.

Declaration of interests

Cristina Palacios is a consultant for the World Health Organization on the use of digital interventions in obesity treatment in children. All other authors declare no competing interests.

Acknowledgements

This study received funding from the Global Health Consortium, Robert Stempel College of Public Health and Social Work, Florida International University.

Members of this consortium are authors, so they were involved in conceptualization and writing the manuscript.

Appendix A. Supplementary data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.lana.2023.100656>.

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