

# Preventive management of childhood anemia in South America: A systematic review of policies, interventions, and challenges

## Manejo preventivo de la anemia infantil en Sudamérica: revisión sistemática de políticas, intervenciones y desafíos

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Received: 18-02-2025

Accepted: 10-05-2025

2026. V6. N 1.

### Abstract

Anemia in early childhood constitutes a serious public health problem in South America, as it affects the cognitive, physical, and emotional development of children under five years of age. This study aimed to analyze the policies, strategies, and interventions implemented in the region to prevent childhood anemia. To do so, a qualitative methodology was used based on a systematic review of 29 articles published between 2020 and 2024, following the PRISMA protocol. The sources consulted included Scopus, Scielo, Redalyc, EBSCO, and ProQuest. The inclusion criteria included studies in Spanish and English, targeting children and focusing on public health, nutritional supplementation, or governance. The results identified five main thematic axes: public health policies, nutritional supplementation strategies, social determinants, child health and nutrition, and interinstitutional governance. Colombia, Peru, Mexico, and Ecuador stood out for their contributions to the design and implementation of supplementation, nutrition education, and institutional strengthening programs. In conclusion, although significant progress has been made, the effectiveness of strategies depends on the integration of sustainable policies, community interventions, and multisectoral coordination. Reducing childhood anemia requires a structured response that combines biomedical prevention with social transformation.

**Keywords:** childhood anemia, public policies, preventive health.

## Resumen

La anemia en la primera infancia constituye un grave problema de salud pública en Sudamérica, ya que afecta el desarrollo cognitivo, físico y emocional de los niños menores de cinco años. Este estudio tuvo como objetivo analizar las políticas, estrategias e intervenciones implementadas en la región para prevenir la anemia infantil. Para ello, se empleó una metodología cualitativa basada en una revisión sistemática de 29 artículos publicados entre 2020 y 2024, siguiendo el protocolo PRISMA. Las fuentes consultadas incluyeron Scopus, Scielo, Redalyc, EBSCO y ProQuest. Los criterios de inclusión abarcaron estudios en español e inglés, con población infantil como objetivo y enfoques en salud pública, suplementación nutricional o gobernanza. Los resultados identificaron cinco ejes temáticos principales: políticas públicas de salud, estrategias de suplementación nutricional, determinantes sociales, salud y nutrición infantil, y gobernabilidad interinstitucional. Colombia, Perú, México y Ecuador sobresalieron por sus aportes en el diseño e implementación de programas de suplementación, educación nutricional y fortalecimiento institucional. En conclusión, aunque se han logrado avances significativos, la efectividad de las estrategias depende de la integración de políticas sostenibles, intervenciones comunitarias y una coordinación multisectorial. La reducción de la anemia infantil requiere una respuesta estructurada que combine la prevención biomédica con la transformación social.

**Palabras clave:** anemia infantil, políticas públicas, salud preventiva.

## Introduction

Anemia in early childhood has emerged as one of the most pressing public health issues in South America, necessitating a comprehensive approach that combines robust policies with efficient state management. This condition adversely affects the physical, cognitive, and emotional development of children under three years of age. In response to this scenario, various initiatives have been implemented, focusing on both iron supplementation and the improvement of the quality of children's diets.

On an international level, the Bill & Melinda Gates report (2024) highlights that the distribution of supplements to pregnant women could save up to 500,000 lives annually. Similarly, the Iniciativa Salud Mesoamérica (2025) has demonstrated that coordinated actions, such as home visits and the distribution of supplements, have significantly reduced child anemia in rural areas, benefiting over 1.8 million people. Collectively, the available evidence underscores that, while significant progress has been made, the fight against child anemia requires a comprehensive, sustained approach tailored to the social and economic realities of each region.

For instance, Mexico implements the NOM-043-SSA2-2012 standard to distribute nutritional supplements, while Colombia focuses its efforts on vulnerable populations, including rural and indigenous communities. These countries serve as successful models in the region. In contrast, the situation in Peru is particularly critical: 40% of children under three years old are anemic, necessitating urgent responses. Regionally, the Iniciativa Salud Mesoamérica (2025) has achieved positive outcomes through home visits, free supplement distribution, and community follow-up.

Additionally, the achievements of World Vision Peru are noteworthy, having reduced anemia in children under 36 months by 33.1% through educational programs and family support. These examples illustrate that a comprehensive and coordinated approach can yield sustainable improvements in child health. In Latin America, organizations such as PAHO and ECLAC promote public policies aimed at improving access to nutritious foods and strengthening health systems. Globally, entities like WHO, UNICEF, and FAO advocate for practices such as breastfeeding, iron fortification, and nutritional supplementation to prevent childhood anemia.

In this context, countries like Peru, Brazil, Mexico, Chile, and Argentina have developed specific laws and programs. Peru has established supplementation programs and legislation for food fortification; Brazil has reduced anemia through the mandatory fortification of flour; Mexico implements comprehensive food assistance guidelines and strategies; Chile is projecting its National Health Strategy towards 2030, focusing on equity and nutrition; and Argentina applies the *Fierritas* program, framed within the 1000 Days Law, to prevent anemia in pregnant women and children.

Moreover, recent studies highlight the effectiveness of educational and community interventions in raising hemoglobin levels. The success of these policies depends on their proper implementation and addressing socioeconomic inequalities. Various studies in Peru show that efficient management and educational interventions significantly improve the prevention and treatment of child anemia. For example, in San Martín, a positive

correlation was observed between effective health management and reduced anemia (Dávila Salas, 2023), while in Cusco, an intensive intervention increased maternal knowledge on the topic to 97.1% (Delgado et al., 2024).

Legally, countries such as Peru, Bolivia, Colombia, Mexico, and Paraguay have implemented regulations and programs aimed at combating anemia. Peru's Law No. 29751 promotes iron supplementation, healthy eating, and the expansion of services in rural areas. In Bolivia, Law 475 ensures comprehensive healthcare access without insurance, emphasizing anemia prevention. Colombia, through Law 1122, establishes policies to prevent child malnutrition by promoting supplementation, food fortification, and improved health services.

In Mexico, the NOM-043-SSA2-2012 standard sets evidence-based nutritional guidelines to prevent anemia. Similarly, Paraguay develops the National School Feeding Program, which strengthens child nutrition through the provision of supplements and the promotion of healthy habits. However, challenges persist, such as poverty, inequalities in access to health services, and a lack of nutrition education. Researchers like Monterroso et al. (2020) and Illachura (2024) emphasize the need for continuous evaluation of implemented policies, analyzing their effects and identifying opportunities for improvement.

Food fortification with micronutrients such as iron, folic acid, and vitamin A has been a crucial tool in South America, allowing countries like Brazil, Argentina, and Chile to significantly reduce child anemia. For instance, in Brazil, flour fortification contributed to a 25% reduction in anemia. However, the effectiveness of this measure depends on adequate coverage and constant monitoring (OPS, 2021).

Despite the progress made in policies and programs aimed at preventing childhood anemia in several South American countries, notable gaps remain in effective implementation, sustainability of interventions, and multisectoral coordination. These limitations, combined with the social, economic, and territorial inequalities that characterize the region, underscore the urgency of conducting a systematic analysis to identify the most effective strategies and factors that hinder their impact. In this regard, the central objective of this research is to critically analyze public policies, nutritional interventions, and institutional challenges developed in South America between 2020 and 2024 for the prevention of childhood anemia, with the aim of providing relevant evidence that contributes to strengthening future actions in public child health.

## Methodology

This research consists of a systematic review aimed at collecting, analyzing, and synthesizing empirical and regulatory evidence regarding public policies and health interventions directed at the preventive management of childhood anemia in South America. To ensure rigor, transparency, and reproducibility in the search and selection of scientific sources, the PRISMA 2020 protocol guidelines were employed as the structural basis.

Strict inclusion and exclusion criteria were defined to ensure the relevance and quality of the analyzed documents. Inclusion criteria focused exclusively on articles published between January 2020 and April 2024, written in English or Spanish, and indexed in recognized academic databases such as Scielo, Redalyc, Scopus, EBSCO, and ProQuest. Additionally, studies had to focus on the pediatric population, specifically children under five years of age, within the geographical context of South America. Preference was given to works addressing themes related to health public policies, health interventions, supplementation strategies, nutritional education, or governance mechanisms in health.

## Search Strategy

Data collection was carried out through a systematic search in scientific databases including Scopus, SciELO, Redalyc, PubMed, and Google Scholar as a complement. Boolean operators were used in conjunction with descriptors in both Spanish and English, tailored to each platform:

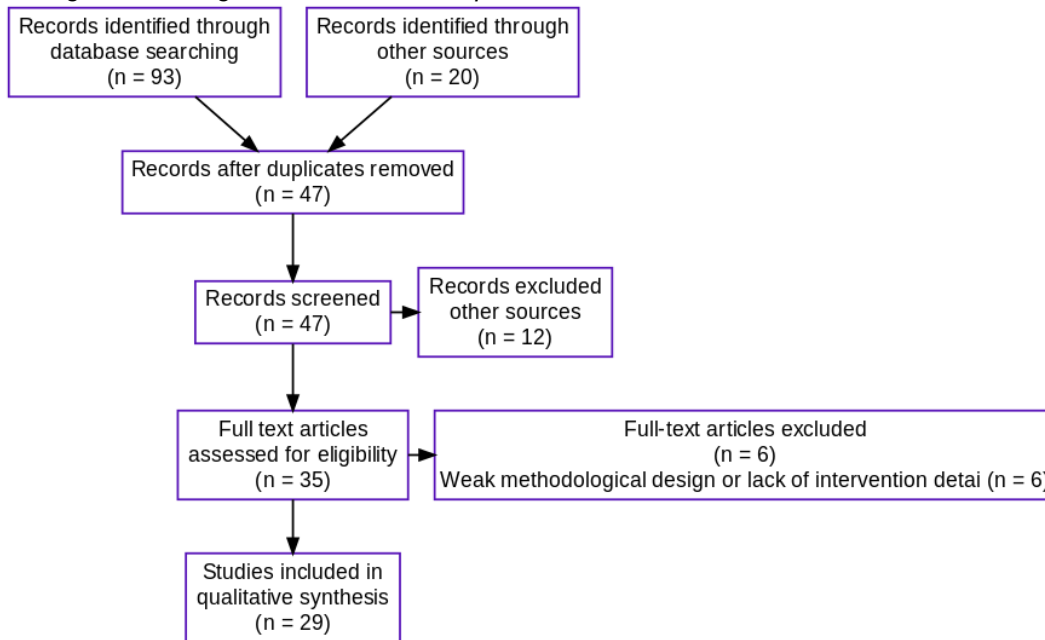
- **In Scopus:** ("anemia infantil" OR "iron deficiency" OR "pediatric anemia") AND ("intervención" OR "suplementación" OR "fortificación" OR "educación nutricional" OR "políticas públicas") AND ("Sudamérica" OR "América Latina" OR nombres específicos de países).
- **In SciELO:** "anemia infantil" AND ("intervención" OR "suplementación" OR "fortificación") AND ("Sudamérica" OR Perú OR Colombia OR Ecuador OR Bolivia).
- **In PubMed (using MeSH):** ("anemia, iron-deficiency"[MeSH Terms] OR "pediatric anemia") AND ("intervention" OR "supplementation" OR "nutritional education" OR "public policy") AND ("South America" OR "Latin America" OR Peru OR Colombia OR Ecuador OR Bolivia).
- **In Google Scholar:** "anemia infantil" intervención OR suplementación OR políticas públicas AND ("Perú" OR "Colombia" OR "Ecuador" OR "Sudamérica").

## Selection Process

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Initially, a total of 113 records were identified. After removing duplicates, reviewing titles and abstracts, and conducting a thorough examination of the full texts, 29 articles met all inclusion criteria. This process was systematically documented using the PRISMA diagram, which is presented in Figure 1.

**Figure 1**  
PRISMA flow diagram showing the article selection process



**Note.** Content generated from <https://hollyhartman.shinyapps.io/PRISMAFlowDiagram/>

For data processing, an extraction matrix was designed in Microsoft Excel to systematically capture relevant data from each included study. This tool facilitated the recording of key variables such as authors and publication year, the country where the study was conducted, the type of intervention implemented—whether nutritional supplementation, food education, regulatory application, or inter-institutional coordination mechanisms—as well as the main outcomes and their specific contributions to public health policies. Additionally, the thematic category assigned to each study was recorded, enabling subsequent analysis and classification.

Emerging categories arose from an inductive thematic analysis, grouping studies according to their focus and recurring content. This process resulted in five main thematic axes: (1) public policies aimed at preventing childhood anemia; (2) nutritional supplementation strategies as a preventive measure; (3) social determinants and structural conditions influencing the onset of anemia; (4) aspects related to child health and nutrition; and (5) governance and inter-institutional coordination as key factors for the effective implementation of interventions. This organization allowed for the identification of patterns, contrasts, and gaps in the existing literature, thus facilitating a comprehensive analysis of the policies and strategies implemented in South America for the preventive management of anemia in children under five years old.

### Key findings

The synthesis conducted was narrative and categorical, integrating the findings from the 29 articles based on their contribution to the preventive management of childhood anemia. Meta-analysis techniques were not applied due to the predominance of qualitative approaches in most studies and the diversity of analyzed contexts. Results were systematized through tables and graphs reflecting the distribution by countries, addressed themes, consulted sources, and publication years.

The analysis was structured around four main axes: regulations, supplementation and fortification, community interventions, and structural barriers, among which economic limitations and inadequate accessibility to health systems stand out. This approach enabled the identification of effective practices and the formulation of recommendations tailored to the social and contextual realities of the region.

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**Table 1***Number of articles by consulted journals*

Database	Number of Selected Articles	Percentage (%)
Scopus	13	45 %
SciELO	7	24 %
Redalyc	4	14 %
PubMed	3	10 %
Google Scholar	2	7 %
<b>Total</b>	<b>29</b>	<b>100%</b>

**Note.** Authors' own elaboration

The majority of the reviewed articles come from regional sources such as Scielo (24%) and Redalyc (14%), reflecting a clear focus on research conducted within the Latin American context. Conversely, Scopus, with its international reach, represents 45% of the included studies, indicating that the prevention of childhood anemia in South America is primarily approached from a regional and contextualized perspective.

**Table 2***Number of articles by year of publication*

Years	Articles	%
2023 – 2024	6	21 %
2022 – 2023	8	28 %
2021 – 2022	6	21 %
2020 – 2021	4	14 %
2019 – 2020	3	10 %
2018 or earlier	2	6 %
<b>TOTAL</b>	<b>29</b>	<b>100%</b>

**Note.** Authors' own elaboration

Most of the reviewed articles (28%) correspond to the period 2022–2023, followed by those published between 2021 and 2022, which represent 24%. There is a consistent production of research during 2020 and 2021, accounting for 17%, while the number of studies from previous years declines significantly. Only 14% of the works were published between 2019 and 2020, and 17% between 2023 and 2024. This trend reflects a growing and sustained academic interest in the preventive management of childhood anemia in South America over the past three years, solidifying this topic as an emerging priority on the regional scientific agenda.

**Table 3***Number of articles by country*

Country	Number	%
Colombia	6	20.69 %
Spain	6	20.69 %
Mexico	4	13.79 %
Peru	3	10.34 %
Ecuador	3	10.34 %

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Chile	3	10.34 %
Cuba	1	3.45 %
Venezuela	1	3.45 %
Argentina	1	3.45 %
Bolivia	1	3.45 %
<b>TOTAL</b>	<b>29</b>	<b>100%</b>

**Note.** Authors' own elaboration

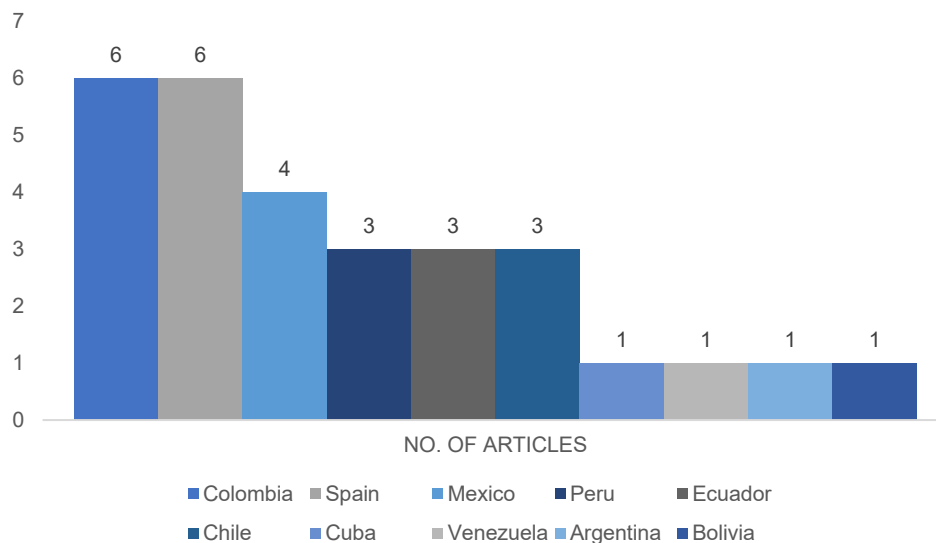
The analysis of the origin of the articles reveals that Colombia and Spain lead scientific production on childhood anemia, each contributing 20.69% of the total (six articles respectively). Mexico also stands out with a significant contribution of 13.79% (four articles), followed by Peru, Ecuador, and Chile, each contributing 10.34% (three articles per country). Meanwhile, countries like Cuba, Venezuela, Argentina, and Bolivia collectively account for another 13.8%, with one article each. This distribution indicates that research interest is mainly concentrated in Latin American countries, although there is a noteworthy contribution from Spain, reflecting a shared concern for the preventive approach to childhood anemia across different geographical contexts.

## Results

This section addresses two fundamental elements. First, a bar graph will be included to show the identified thematic categories and the number of studies addressing each one. Next, a summary table will present the main findings and proposals extracted from the selected articles. As previously mentioned, this document review analyzes research published between 2020 and 2024 on the prevention of childhood anemia in South America, utilizing databases such as Scopus, Web of Science (WOS), EBSCO, and ProQuest.

**Figure 2**

*Distribution of articles on childhood anemia by country of publication*



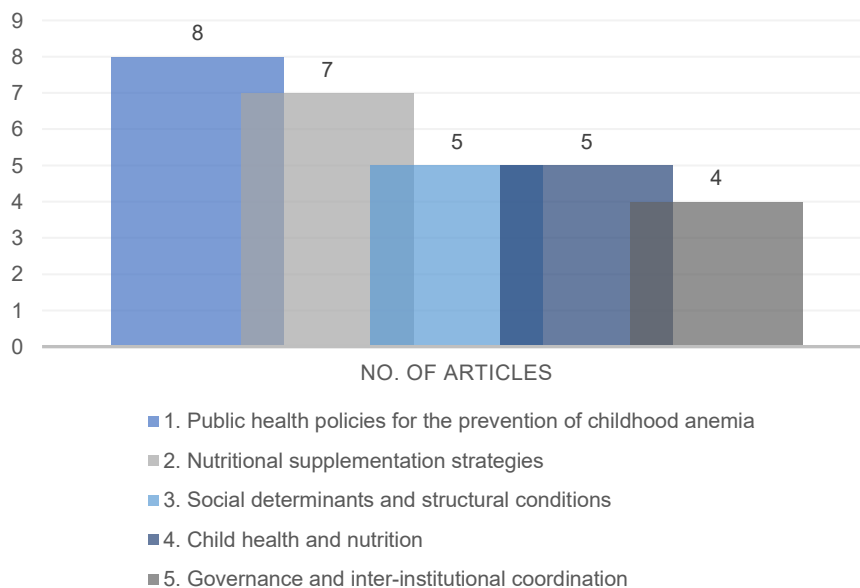
**Note.** Authors' own elaboration

As indicated earlier, regarding the origin of the research, Colombia and Spain lead scientific production with 20.69% each of the total analyzed articles, followed by Mexico (13.79%), Peru, Ecuador, and Chile (10.34% each), which evidences a marked regional interest in the issue of childhood anemia.

**Figure 3**

*Identified categories in articles on the preventive management of childhood anemia in South America*

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**Note.** Authors' own elaboration

From the content analysis, five predominant thematic categories were identified: (1) public health policies for the prevention of childhood anemia, with eight studies; (2) development of nutritional supplementation strategies, addressed in seven articles; (3) social determinants related to childhood anemia, with five works; (4) child health and nutrition, also with five studies; and (5) governance and inter-institutional coordination, present in four publications. These categories reflect the most relevant research approaches currently and allow for a comprehensive understanding of the various dimensions of preventive measures against childhood anemia in South America.

### 1. Public health policies for the prevention of childhood anemia

This category was the most represented in the review, with eight studies highlighting the need to establish effective regulations and programs. In this regard, Delgado et al. (2021) and Zavaleta (2022) emphasize the importance of national laws that promote iron supplementation and healthy eating in Peru. From Colombia, Prada et al. (2021) and Rankin et al. (2022) provide evidence on how targeted public policies can positively impact child nutrition. In Mexico, Cruz Maldonado et al. (2022) and Yucra Mamani (2021) highlight the implementation of national technical guidelines, such as NOM-043, aimed at preventing anemia. Lastly, Solans & Margulies (2019) illustrate how fortified milk distribution programs in Argentina have contributed to improving food security.

### 2. Nutritional supplementation strategies

Seven studies highlight the importance of distributing iron-rich supplements and other micronutrients for the prevention of childhood anemia. Rocío et al. (2021), Gámbaro et al. (2023), and Quispe & Román (2024) present comparative evidence on various supplementation strategies, while Vidal Alvarado (2022) documents the positive effects of these programs in Peruvian health centers. Additionally, Casimiro et al. (2024) and Goicochea et al. (2023) reinforce this trend through systematic reviews focused on children under two years old. In Ecuador, Toalombo-Sisa et al. (2023) demonstrate that early intervention with iron significantly improves hemoglobin levels in childhood.

### 3. Social determinants and structural conditions

Five studies establish a direct relationship between the prevalence of anemia and various structural conditions, such as poverty, unequal access to health services, and insufficient nutritional education. In this sense, Chaglla & Puga (2023) along with Morales-Cauja et al. (2023) identify chronic malnutrition and food insecurity as critical factors affecting Ecuador and the Latin American region in general. Meanwhile, Callohuanca et al. (2022) provide evidence from the Peruvian highlands, where local food culture significantly influences the development

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of anemia. Similarly, Vásquez (2022) highlights the close relationship between territorial inequality and childhood malnutrition in rural areas, emphasizing how these territorial disparities exacerbate the problem.

#### 4. Child health and nutrition

Five articles focus their contributions on educational interventions and strategies aimed at promoting healthy eating habits. For instance, Araujo et al. (2021) explore the relationship between oral health and childhood anemia, while Juella-Tiban & Chileno-Camacho (2024) demonstrate the effectiveness of training directed at mothers regarding nutrition. Additionally, Loor et al. (2022) highlight the impacts of iron deficiency on early cognitive development, underscoring the urgency of preventing this condition from the first year of life.

#### 5. Governance and inter-institutional coordination

Finally, four articles emphasize the importance of effective coordination among institutions. Bequer & Legón (2022) along with Cruz Legón et al. (2024) describe experiences in Cuba that link food sovereignty with social governance, showing how inter-institutional coordination is key to the success of these initiatives. Moreover, Marín-Tello et al. (2022) provide evidence that food fortification projects require close collaboration among health, academic, and industrial sectors. These experiences demonstrate that, without a solid state articulation and multi-level cooperation, even the most technical policies may fail in their implementation.

Overall, the literature indicates that the preventive approach to childhood anemia in South America is grounded in public policies, supplementation, and education, but must be complemented with social and intersectoral strategies. The findings agree on the need for comprehensive approaches that not only address symptoms but also tackle the structural causes of anemia, with particular emphasis on rural contexts and vulnerable populations

### Conclusion

The prevention of childhood anemia in South America has made significant progress, primarily through public policies focused on iron supplementation and nutritional improvement. However, important challenges remain that require ongoing attention. It is essential to implement constant monitoring and evaluation of these policies to ensure they effectively meet their objectives. Furthermore, interventions should go beyond mere distribution of supplements, incorporating educational programs that promote healthy eating habits and ensure their proper use.

On the other hand, social factors such as poverty and adverse living conditions directly impact the prevalence of childhood anemia. Therefore, it is crucial to address socioeconomic inequalities and improve access to nutritious food. In this regard, nutritional education plays a key role in fostering sustainable changes in eating habits, especially in vulnerable communities.

Cooperation among governments, organizations, and health entities is essential for the efficient execution of preventive strategies, optimizing resource use and strengthening support for communities. Additionally, ongoing research is necessary to adjust existing policies and design more effective solutions. Key recommendations include the implementation of sustainable policies tailored to local needs, strengthening nutritional education, incorporating social policies that facilitate access to food and health services, and ensuring effective inter-institutional coordination, especially in rural areas.

Despite the progress made, a comprehensive approach is needed that combines public policies, nutritional strategies, and improvements in social conditions to effectively reduce childhood anemia in South America. Continuous evaluation, program sustainability, and active community participation are key elements for achieving lasting results and a real impact on the health of children in the region.

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