

Key Elements in Elementary School-based Nutrition Interventions to Reduce Obesity in Mexico and the United States: A Systematic Review



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ABSTRACT #P13

Objective: To identify and compare elements in school-based nutrition intervention programs that improved dietary habits and anthropometrics in populations of Hispanic children in the United States and Mexico

Study Design, Setting, Participants, and Intervention: Articles, between 01-2005 and 12-2015, were extracted from PubMed, PsycINFO, and Web of Science using key words: school-based interventions, diet/nutrition, overweight/obesity, 6-12 year old children, Hispanic, Latino/a, and United States/Mexico. A 9- and 7-point inclusion and exclusion criteria, respectively, were established. Two researchers independently extracted articles, applied exclusion/inclusion criteria to titles and abstracts, and assessed the quality of included articles using the AND Evidence Analysis Manual.

Outcome, Measures, Analysis: Diet quality improvement included increased consumption of whole grains and fruits/vegetables, and reduction of total fats, added sugars, and salt. Anthropometric measurements included BMI, waist circumference and skin fold.

Results: A total of 149 articles were found, of which 40 articles were examined after exclusion/inclusion criteria. Ten articles (Mexico= 6; US=4) were included in the study based on quality assessment. Seven studies reported improvements in children's anthropometric measurements. All studies reported improvement in at least one of the dietary behaviors. Elements associated with larger improvements in outcomes across countries and programs were: using a behavior change framework, using multiple frameworks, active community participation during design and implementation of intervention, and uniform messaging from school members and parents.

Conclusions and Implications: The evidence supports that efficacious elementary school-based interventions to reduce obesity included several behavior change frameworks and the active participation of stakeholders. Further research needs to examine the optimal combination of frameworks and specific elements that result in improved outcomes.

INTRODUCTION

Childhood obesity among Hispanic children is a public health issue in the United States and Mexico¹. In the United States, an estimated 39% of Hispanic children are overweight/obese² and in Mexico, an estimated 33% of children are considered overweight/obese³. An alternative to reduce overweight/obese children in the United States and Mexico is to implement school-based nutrition intervention programs framed within behavior change theories⁴⁻⁶.

METHODS

- A 3-stage process was used to identify the articles that met the inclusion criteria of: (1) were published in peer-reviewed journals, (2) were issued during 2005-2015, (3) had an experimental design, (4) involved children between the ages of 6-12 years, (5) included overweight and/or obese children, (6) at least 50% of the population were Hispanic, (7) were conducted in a school, (8) were conducted in the United States and Mexico, (9) the outcomes included diet and/or nutrition, and (10) the outcomes included anthropometric measurements.
- Articles meeting this criteria were then assessed for quality using AND's Evidence Based Manual⁷ for relevance and validity. Validity scores ranged from 0 (poor quality) to 10 (high quality). Articles were deemed of high quality with a score between 9-10.

RESULTS

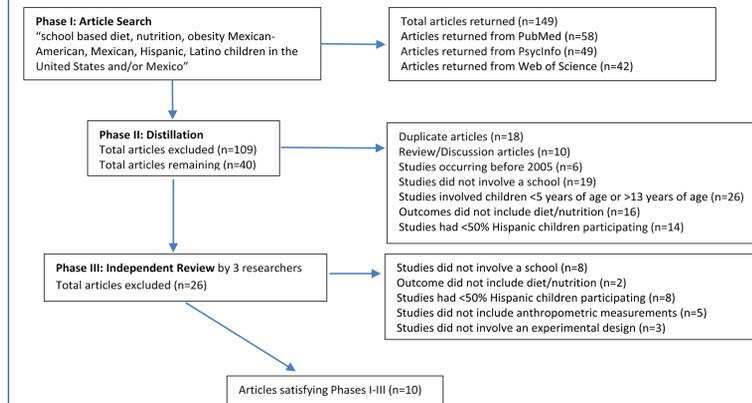


Figure 1. Schematic of article review and extraction.

- 10 articles were included in this systematic review (Fig. 1), Mexico (n=6) and US (n=4)
- Average internal validity scores for studies were 9.2 ± 0.24 out of a total of 10 (Table 1).
- The objectives for most of the studies were to determine the effectiveness of their programs on modulation of obesity associated indicators.
- Most, 6/10, studies used the ecological framework or the community-academic participatory (CAP) framework.
- 4 studies used a combination of theories that included either the ecological or CAP frameworks.
- 2 studies used either ecological or CAP frameworks solely.
- 3 studies did not specify a theory, but used attributes within the ecological or CAP frameworks
- 1 study used the peer learning theory

Table 1. Summary of Results of Systematic Analysis (n=10)

Quality Score	Country	Population	Theoretical Framework	Diet Intake	Anthropometrics
9.6	Mexico	1 st – 3 rd grades Intervention: n=816 Control: n=408	Ecological Framework Health Belief Model Social Cognitive Theory	Decreased total kcals (p<0.05); decreased bread consumption (p<0.05); decreased fat intake (p<0.05); decreased sugar consumption (p<0.001)	Decreased risk of obesity (p<0.01)
9.4	Mexico	4 th -5 th grades Basic intervention: n=262 Basic Plus intervention: n=264 Control group: n=360	Health Belief Model Social Cognitive Theory Theory of Planned Behavior	No significant change	No significant change
9.4	Mexico	5 th grade Intervention: n=510 Control: n=509	Peer learning theory	No significant dietary changes Nutrition knowledge increased (p =0.000)	Decrease in obesity: 1%
9.1	Mexico	1 st -5 th grades N=96	No specific theory, utilized support from family and school	Decreased calories (p<0.01); consumed appropriate amounts of macronutrients	Decreased obesity risk (57%)
9.1	Mexico	2 nd -3 rd grades Treatment group: n=280 Control group: n=252	Brofenbrenner's ecological model	Vegetable intake increased (p = 0.007), decreased consumption of fat and salt (p=0.03)	Decreased BMI (p=0.0001)
9.1	Mexico	3 rd -4 th grades Treatment Group, RESCATE: n=304 Control Group, Control: n=315	No specific theory, but incorporated school and parents	Decreased sodium intake (p<0.001)	No significant change in BMI
9.6	USA	K-2 nd grades Family only group= n= 198 Family + Community: n=165 Community only: n=218 Control: n=227	Health Belief Model Social cognitive theory Structural model of Health Behavior/Socioecological framework	Family only increased fruit and vegetable consumption (+0.41 avg.)	No significant change in BMI
9.3	USA	4 th -5 th grades Treatment Group, 4 schools: n=3032 Control Group, 1 school: n= 737	No specific theory, used community involvement: multi-sector, multi-agency collaboration	No significant dietary changes	Decreased BMI (p=0.007)
9.0	USA	3 rd -6 th grades Treatment group: n=165 Control group: n=140	Community-academic participatory research	Increased intakes of vegetables (p=0.03), 100% fruit juices (p=0.05) and fruits (p=0.001), increased self-efficacy healthy behaviors (p=0.03)	Decreased BMI (p=0.04)
9.0	USA	4 th grade Basic Plus: n=554 Basic Plus + Community: n=553	Social Cognitive/Ecological Theory Theory of Reasoned Action	BPC group improved diet intake (p values of 0.001 - 0.02)	BPC decreased BMIs (p<0.001)

RESULTS & DISCUSSION

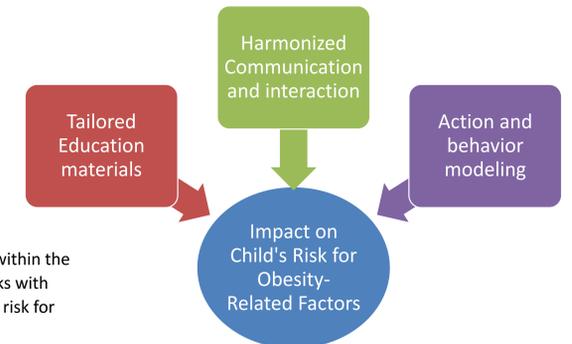


Figure 2. Common elements within the Ecological and CAP frameworks with associated impact on a child's risk for obesity-related factors.

- Results indicate that by using a community-based framework (i.e. ecological and CAP frameworks) it was more likely to elicit improvements in participant's BMIs compared to those programs that did not include a framework or use a community-based framework.
- Similarly, implementation of either Ecological or CAP framework in combination with other theories resulted in improved children's diet behaviors (e.g. less consumption of fats and more consumption of vegetables).
- Improvements were seen as a result of components within each of the community frameworks; interactive communication, education, and action modeling. Both parents and schools' staff were involved in communicating nutrition information to children, providing tailored educational materials to improve a child's dietary behaviors, and practicing proper nutritious behaviors at homes and schools (Fig. 2).
- Importantly, regardless of the type of framework or where the study was conducted (i.e., Mexico or the U.S.), having a program that included nutrition education helped to improve children's nutrition knowledge and behaviors to consume more fruits and vegetables and less calories, fats, and sodium.

CONCLUSION

Childhood obesity among Hispanics is on the rise in both the United States and Mexico. Implementing school-based interventions is an ideal option as children spend at least 50% of their time in school. However, children needs support from parents, caregivers, schools, and other members of the community to promote a positive change in dietary behaviors. The Ecological model or Community-based framework encompass several key elements that could be more effective in promoting behavior change through school-based nutrition programs, and therefore, monitor, prevent, and control childhood obesity. Efforts and resources should be directed at addressing childhood obesity, especially among Hispanics.

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