

# Nutrition education in Chilean primary schools

Sonia Olivares, Isabel Zacarías, Margarita Andrade, Juliana Kain, Lydia Lera, Fernando Vio, and Cecilio Morón

## Abstract

*The purpose of this study was to incorporate nutrition education in Chilean primary schools. The baseline information included nutritional status, food consumption and physical activity of 1,701 children from 3rd to 7th grade in ten urban and rural schools. Main results showed a high prevalence of obesity (15.4%) and overweight (19.6%), low consumption of vegetables, fruits, and dairy products, high intake of snacks and a low level of physical activity, especially in girls. Because the Ministry of Education does not allow the incorporation of new programs into the curriculum, the educational strategy was based on the development of a text book, a teacher's guide, five practical guides for students from third to eighth grade and a CD-Rom. These materials were validated by 36 teachers in six schools through an educational intervention. Teachers and students considered the educational materials useful, motivational and easy to understand. This program is being implemented in 57 schools.*

**Key words:** Nutrition education, school children

## Introduction

According to the Population Census carried out in 2002, Chile had 15,116,435 inhabitants, an annual growth rate of 1.2%, 86.5% of the population living in urban areas, and a literacy rate of 95.8% among those 10 years of age and older. The per capita income was US

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\$4,590 and 20.6% of the population was living under the line of poverty.

Approximately 2 million children attend 10,621 primary schools, 92.2% of whom attend public schools. Up until 2003, 8 years of mandatory education were required in Chile, but starting in 2004 this has been increased to 12 years [1].

During the last 25 years, important changes have occurred in the epidemiologic profile of the Chilean population. Life expectancy rose from 60 years in 1970 to 73 years in 2001 for men, and from 65 to 80 for women during the same period. The country simultaneously experienced a demographic and epidemiologic transition, resulting in an aging population and a shift from infectious to chronic diseases. A sedentary lifestyle and consumption of processed foods rich in fats, sugars, salt, and low in dietary fiber, all known risk factors for obesity, have also risen considerably [2].

Between 1987 and 2000, the prevalence of obesity (defined as BMI percentile  $\geq$  95 of the CDC 2000 reference) among schoolchildren entering first grade at public schools across the country increased from 5.1% to 14.7% for boys and from 4.0% to 15.8% for girls, [3, 4]. On the other hand, the prevalence of stunting (defined as height/age  $<$  2 SD of the National Center for Health Statistics (NCHS/WHO) reference declined from 5.9% in 1993 to 3.1% in 2002, whereas weight deficit (defined as weight/height  $<$  2 SD of the same reference) was very low, 1.6% in 2002 [5].

Considering that obesity is the main nutrition problem among Chilean children and that it has been demonstrated that being obese in childhood almost doubles the risk of having this condition during adulthood [6], various initiatives are being developed to address this problem [7, 8].

In 1997, the Ministry of Health changed the traditional maternal and childhood policies for new health and nutrition intervention priorities, based on cardiovascular disease, obesity, cancer, hypertension, diabetes, osteoporosis, and anemia. In order to confront the risk factors of these diseases, the Ministry of Health published the Chilean Dietary Guidelines (1997) and

an inter-sector organization, the National Board for Health Promotion, VIDA CHILE, was created in 1998, with the specific goal of reducing the prevalence of obesity in first grade schoolchildren from 16% in 2000 to 12% in 2010 [7].

In addition, a new strategy in the country, known as "Health-Promoting Schools," has been implemented since 1999 with the purpose of creating positive environmental conditions to promote more healthful eating habits and physical activity among schoolchildren. In the country, currently 3,100 schools (29%) are working in health promotion.

Another specific initiative was to improve the diet quality of low-income schoolchildren who are beneficiaries of the School Feeding Program (SFP) [9,10]. This program started in Chile in 1929, is administered by the National Board of Assistance and Scholarships (Junta Nacional de Auxilio Escolar y Becas or JUNAEB) and will benefit 875,531 primary schoolchildren daily in 2004, with a fiscal annual budget of US \$89 million.

The main goal of the SFP is to promote school attendance by providing free meals to children who might otherwise drop out of school. The meals have different nutrition contents (250, 700, and 1000 kcal) and are distributed 178 days per year [5, 9, 10].

In 2000, JUNAEB, with the technical support of the Institute of Nutrition and Food Technology (INTA) of the University of Chile and the Ministry of Health, improved substantially the nutrition quality of meals. Breakfasts now include milk 5 days a week (instead of the milk substitute delivered before). During lunch, the frequency of salads has increased from 4 to 8 times per month, and fruits from 6 to 10 times per month. The new program allows a maximum of 10% of calories from saturated fat, which has been accomplished by changing the type of meat. **Table 1** shows the nutrition characteristics of the basic program (700 kcal/day) provided by private food companies that deliver the meals after receiving a licence from JUNAEB.

Although the quality of the meals has improved, they are still deficient in terms of frequency and amount of low-fat milk, vegetables, and fruits offered. Budget constraints and logistic difficulties for handling fresh

foods limit the optimization of the program.

Additionally, each year JUNAEB carries out a census on the weight and height of all first grade children in all public schools throughout the country. This information on the national and regional levels is available on the Internet (nutrition map, <http://www.junaeb.cl>) [5].

## Nutrition education in Chilean primary schools

It is clear that appropriate nutrition is essential for children's growth and the changes in eating and physical activity habits must occur at the earliest age possible. Therefore, the school represents the best opportunity to adopt a healthy lifestyle through knowledge, attitudes, and behavior [11–13]. However, the primary school curriculum of the Chilean Ministry of Education does not yet include nutrition education [1].

The main barriers to implement nutrition education programs for primary schoolchildren in Chile are the teachers' lack of nutrition knowledge, insufficient education materials, and the difficulty in obtaining government support to address these issues with an adequate methodology [14]. Taking these barriers into consideration [15], INTA and the Ministry of Education requested the Food and Agriculture Organization of the United Nations (FAO)\* to jointly design and implement a technical cooperation project, the specific objectives of which were the following:

- » To promote the integration of nutrition education for 3rd to 8th grade curriculum of Chilean primary schools, based on present food habits and nutrition status.
- » To design and validate appropriate learning materials for primary schoolteachers and children.
- » To develop and validate a training program for teachers, to be replicated in the whole country.

The project was developed in 10 public schools located in low-income neighborhoods from three different regions representing the geographic variability of the country: North (Region I), Center (Metropolitan Region), and South (Region X). In each region, schools with a minimum of 30 students per grade and from both rural and urban settings were selected. **Figure 1** shows the model followed during the development of the project.

### Baseline information

Students from one class (grades 3rd to 7th) from each of the 10 schools participated in the study, totaling 1,701 children between the ages of 8 and 13. The proportion of boys and girls was similar, while the average

TABLE 1. Nutrition content of meals offered by the Chilean School Feeding Program and its coverage of the US RDA [10]

Nutrition content	Elementary schools <sup>a</sup>	% Coverage of RDA <sup>b</sup>
P% (daily, minimum)	11%	60%
F% (daily, minimum and maximum)	20–25%	36%
SFA% (daily, maximum)	10%	35%
Free sugars	25 g	50%

RDA, Recommended Dietary Allowance; P, protein, F, fat; SFA, saturated fat

a. Contents for breakfast and lunch (700 Kcal)

b. Considering a 2000 Kcal daily requirement

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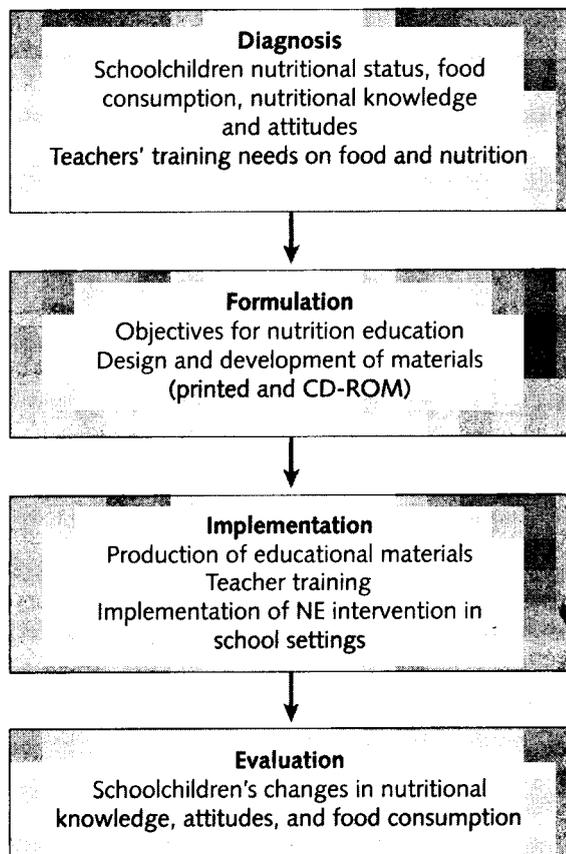


FIG. 1. Nutrition education (NE) strategy

age was exactly the same, ( $10.6 \pm 1.4$  years) for both genders. Data were analysed according to gender and by three age groups (8–9, 10–11, and 12–13 years) [16].

In each city, three trained interviewers (nutritionists or teachers), evaluated the nutrition status and inter-

viewed the children on their dietary and physical activity habits. Anthropometric measurements and surveys were performed between April and June of 2001.

Nutrition status was determined using body-mass index (BMI,  $\text{kg}/\text{m}^2$ ). For each child, BMI was estimated by age and sex and compared with the CDC/NCHS reference 2000 [4]. This has been recently recommended for evaluating Chilean children from 6 to 18 years of age. The cut-off percentiles used to classify the nutrition status of the children were those recommended by the North American Committee of Experts in Childhood Obesity [17]; underweight: BMI percentile  $< 10$ ; normal weight: BMI percentile  $\geq 10$  to  $< 85$ ; overweight: BMI percentile  $\geq 85$  to  $< 95$ ; obese: BMI percentile  $\geq 95$ .

The data analyses showed no significant differences when comparing nutrition status among the three geographic regions, or between urban versus rural settings. Thus, results represented the sample as a whole.

Figure 2 shows the nutrition status in both boys and girls by age group (8–9, 10–11, and 12–13 years). Overall, boys showed a higher rate of obesity than girls. Significant differences in nutrition status were found according to age, with the highest prevalence of obesity among the younger boys ( $p < .05$ ). In girls, no differences were observed according to age.

To evaluate daily food consumption, a quantified food frequency questionnaire (FFQ) [18] was applied by trained interviewers on all children. We obtained information on those foods recommended by the Chilean Dietary Guidelines [8], that is, dairy products, fruits, vegetables, and also bread because its consumption is extremely high in the country. In addition, we collected data on energy-dense foods such as snacks and beverages.

The average daily food intake of the total sample was expressed in grams/day (mean  $\pm$  SD), by age and gender (table 2). Intake of dairy products was low. Boys

TABLE 2. Selected food intake by Chilean schoolchildren, by group and gender (mean  $\pm$  SD in grams/day)

Food groups	8–9 y, n = 611		10–11 y, n = 654		12–13 y, n = 436		Recom- mended <sup>a</sup>
	Boys n = 324	Girls n = 287	Boys n = 365	Girls n = 289	Boys n = 238	Girls n = 436	
Milk and yogurt	308.3 $\pm$ 192.2	299.3 $\pm$ 182.3	281.7 $\pm$ 180.6 <sup>b</sup>	242.5 $\pm$ 167.5	267.1 $\pm$ 171.1 <sup>b</sup>	240.9 $\pm$ 155.9	750 mL
Fruits and vegetables	197.4 $\pm$ 135.9	220.4 $\pm$ 149.9 <sup>c</sup>	237.2 $\pm$ 153.7 <sup>c</sup>	210.7 $\pm$ 129.7	271.3 $\pm$ 183.6 <sup>c</sup>	238.1 $\pm$ 145.7	400 g
Bread	269.6 $\pm$ 97.6 <sup>b</sup>	232.1 $\pm$ 94.1	295.8 $\pm$ 112.7 <sup>b</sup>	255.4 $\pm$ 112.2	324.6 $\pm$ 133.2 <sup>b</sup>	270.1 $\pm$ 117.8	200 g
Snacks (sweet and salty)	113.0 $\pm$ 79.7	111.3 $\pm$ 81.3	118.6 $\pm$ 85.4 <sup>c</sup>	106.7 $\pm$ 70.1	135.4 $\pm$ 99.7 <sup>c</sup>	124.2 $\pm$ 94.0	—
Beverages	218.3 $\pm$ 167.1	219.3 $\pm$ 176.2	279.0 $\pm$ 184.8 <sup>c</sup>	250.9 $\pm$ 173.0	301.1 $\pm$ 199.9 <sup>c</sup>	295.8 $\pm$ 229.4	—

Source: Adapted from [16]

a. Dietary Guidelines, Chilean Ministry of Health

b.  $p < .001$  for higher statistical differences between boys and girls.

c. Student's *t*-test  $p < .05$

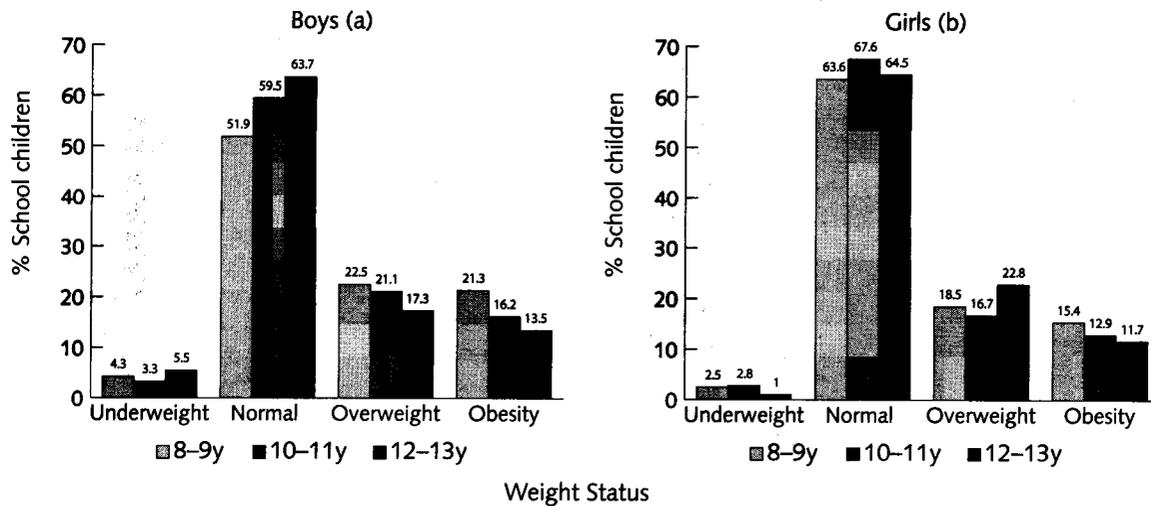


FIG. 2. Nutrition status of Chilean schoolchildren, by age group

consumed significantly more of these products in both 10–11 years and 12–13 years age groups. Intake of fruits and vegetables was also low in all age groups. Other studies have found similar results [19, 20]. Ironically, Chile is not only a fruit exporting country, but fruits are relatively inexpensive. This shows the urgent need to implement nutrition education programs which address the importance of consuming these foods.

Intake of bread was significantly higher in boys across age groups. This has been found consistently in other studies performed in the country [19, 20]. Based on the Chilean Food Pyramid, the Ministry of Health recommends a total daily intake of cereals (apart from bread, this group includes pastas, rice, potatoes, corn) of 350 g and 300 g for 6- to 9-year-old boys and girls, respectively, whereas for children 10–13 years old this recommendation is 375 g and 325 g, respectively. In this study, bread alone accounted for around 80% of the total recommendation; adding other foods from this group, which constitute the staple of our diet, obviously increases the calorie intake.

Intake of snacks rich in fat and sugar was very high and similar for boys and girls in the younger groups. In the older groups, boys consumed significantly more than girls. The intake of snacks represents 450 to 600 kcal extra daily. This is similar to the figures found in schoolchildren by Yáñez et al. [19], whereas Kain et al. [21] reported approximately the same among preschoolchildren (350–500 kcal). In addition, a study about food advertisement and preferences in this age group showed that the products most often remembered and purchased by the children were French fries, sweet and salty snacks, soft drinks and fast foods [22].

When we compare intake of each food group and nutrition status, only the consumption of dairy products was significantly greater among non-obese children for both genders across age groups ( $p < .005$ ). This

result is similar to several epidemiologic studies where an inverse association has been found between dairy consumption and risk of being overweight [23].

To estimate the physical activity habits (PA), students were asked about the number of hours spent watching television (TV) during a school day and a typical weekend day, and about the frequency of after-school PA, such as running, jumping, jogging, bicycle riding, or playing soccer. TV viewing was calculated adding the total number of shows watched on a daily basis, as has been done in previous studies [22].

Figure 3 compares total TV viewing during a school day and a typical weekend day. During a school day, 10% of the children reported never watching TV, and 22.3% watched more than 3 hours. During the weekend, the proportion of children who watched more than 3 hours per day increased considerably, to 47%. The difference in TV viewing between a weekend day and a week day was highly significant ( $p < .0001$ ). No differences were found by gender.

The time children spent in after-school PA varied according to age and gender. Although boys were significantly more active than girls, only half of the boys were physically active four or more times a week. Between 7% and 9.5% of boys and between 14% and 21% of girls never engaged in PA. In boys, no differences were noted across age groups. Younger girls were significantly more active than older girls ( $p < .03$ ) (not shown).

When examining the distribution of TV viewing in relation with after-school PA (fig. 4), the analysis showed an association between these two variables, that is, the more time children spent in PA, the less time they devoted to TV watching ( $p < .03$ ).

When analyzed for an association between after-school PA and nutrition status according to age and gender, an association was found only among the

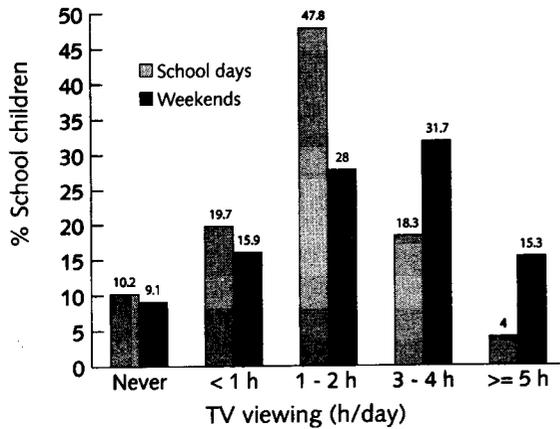


FIG. 3. Comparison of TV viewing during school days and weekends by Chilean schoolchildren (n = 1,701)

younger boys ( $p < .02$ ), where non-obese boys were more active than obese boys (not shown).

### Nutrition education strategy

This background information, plus other complementary studies on teachers' needs and training interests, constituted the core to defining the education strategy on nutrition education for primary schoolchildren, oriented toward modifying their behavior and eventually also that of their families.

Because the Ministry of Education doesn't allow the incorporation of new programs to the curriculum, the education strategy of the project was based on design and validation of a set of learning materials (fig. 5), which include a text book, a teacher's guide, five practical guides for students from third to eighth grade and a CD-ROM. All these materials are also available on the Internet [24].

The contents are presented in five modules: Healthy Eating; Nutrition Requirements; Nutrition and Health, with a description of the reason of the main health problems and their prevention; Safe and Healthy Foods; and Household Food Security, focused on the availability, access, and utilization of food by the low-income population.

Before the first version was published, the materials were submitted for revision by nutritionists and 16 primary schoolteachers. The revised materials were published to be used during the teachers' training process and also for the implementation of the nutrition education intervention with students from six schools. The training process was carried out at the beginning of 2002, lasted 3 days, and included 45 primary schools teachers from the three regions of the project. This training

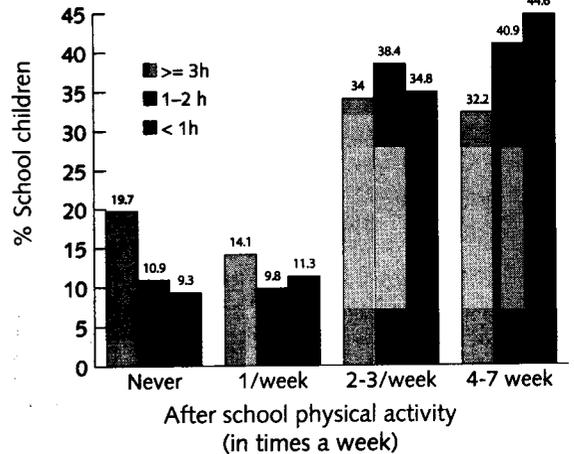


FIG. 4. Frequency of after school physical activity and TV viewing by Chilean schoolchildren

program was highly motivational and it allowed those involved to appreciate the usefulness of the education materials. Some of the participants spontaneously trained other colleagues interested in participating in the project, reflecting the importance of the education material in carrying out this task, and meaning that the teachers viewed the nutrition education as an activity for the whole school.

Each text and activity was validated by the teachers when they implemented the education intervention during 5 months. The most successful activities were those that included preparations of healthy foods, where parents also participated.

Among the most important results of this phase, were the teachers' indications that the program and education materials were useful, motivational, and easy to understand. After the education experience, the teachers suggested that they needed at least 2-3 hours weekly during the school year to implement this intervention.



FIG. 5. Nutrition education (NE) strategy

## Evaluation results of school experiences

The objectives of this project, which are to promote the incorporation of nutrition education into the school curriculum through the design and validation of a model and education materials for teachers and schoolchildren, were fully achieved.

Although the education intervention only lasted 5 months and we did not expect significant changes in nutrition status and food intake, we nevertheless compared knowledge in food and nutrition and food intake of the intervention group (812 children) versus the control group (540 children). With regard to knowledge, a significant increase was observed among the initial and final scores in children from intervention schools, with the exception of 5th grade. No differences were observed among the control group. The comparison of food consumption before and after the intervention showed a significant increase in the consumption of dairy products among the younger groups of the intervention schools. No increase was noted in the control group. Intake of fruits and vegetables only increased significantly in 10- to 11-year-old girls of the intervention group. The consumption of bread declined significantly among girls of the intervention group. Intake of snacks increased in both groups, but it was significantly higher in the control group. Soft drinks increased significantly in 8- to 9-year-old children from both intervention and control groups.

Because snack foods are very inexpensive and sold at kiosks within and right outside of schools, the increase in the consumption of snacks in both groups makes us conclude that nutrition education will only produce significant changes in food habits if certain initiatives are carried out. Specifically, health and education authorities should regulate what is sold inside the schools and establish some regulations for the food industry. In addition, advertisement for children should not only be regulated, but required to promote healthful foods. It is important to point out that approximately 73% of low-income children take money to school, which is largely spent on snacks. The children should be given the opportunity to spend their money on healthful foods. These initiatives would surely contribute to halting the rapid increase in childhood obesity.

## Implementation and follow-up activities

Given the successful experience of this project, the Chilean Ministry of Education assigned the responsibility of incorporating nutrition education in the curriculum of public schools to the JUNAEB. JUNAEB began a new pilot project with 47 schools from 10 regions in 2003, which in its first phase included

collecting baseline information on nutrition status, attitudes, and feeding practices of the schoolchildren, as well as teachers' training, which was carried out by INTA. Further education interventions with the schoolchildren will be implemented in 2004 and evaluated at the end of the year.

During the year 2003, INTA carried out four training courses for 122 teachers from 10 regions of the country. Additionally, 31 supervisors of JUNAEB, who will carry out the follow-up of the nutrition education activities at regional level, were trained by INTA.

Presently, every public school in the country has received a CD-ROM, which includes all the teaching materials (which are also available on the Internet). It is estimated that starting in 2005, the Ministry of Education will incorporate these contents into the official text books used by schoolchildren attending public schools.

In addition, FAO has distributed this program to every Latin American country, some of which have already submitted similar projects to be implemented in their respective school systems. This education material with only small modifications can be easily adapted to local realities.

## Conclusions

In August 2003, a workshop was organized by FAO and INTA, with the goal of evaluating the entire experience from the participating teacher's perspective. The following conclusions were reached:

The designed and validated nutrition education materials for teachers and primary schoolchildren, developed by this project, proved to be effective and highly motivational, and can be used as part of the general primary curriculum or in independent nutrition education programs.

The nutrition education training program for teachers was successful and motivational, and can be replicated throughout the entire country. The teachers highlighted the usefulness of the education material for their own training, especially their capacity to motivate the participation of the children, which is an outstanding aspect of the learning process.

In summary, this project has provided the basis to carry out systematic nutrition education interventions in primary education, validating a methodology, instruments, and education materials as well as a teachers' training program that is applicable at the national level. This nutrition education strategy represents a significant contribution for developing healthy eating habits and also a means to diminish the prevalence of overweight and obesity among Chilean schoolchildren.

## References

1. República de Chile. Ministerio de Educación (2003). Santiago, Chile. <http://www.mineduc.cl> Accessed 12 January 2004.
2. Uauy R, Albala C, Kain J. Obesity trends in Latin America: transiting from under to overweight. *J Nutr* 2001;131:893S-9S.
3. Kain J, Uauy R, Vio F, Albala C. Trends in overweight and obesity prevalence in Chilean children: comparison of three definitions. *Eur J Clin Nutr* 2002 ;56:200-4.
4. CDC/NCHS. CDC growth charts: United States. <http://www.cdc.gov/growthchart>. Accessed 30 October 2000.
5. Ministerio de Educación. Junta Nacional de Auxilio Escolar y Becas (JUNAEB 2003). Nutrition status of schoolchildren in first grade. <http://www.junaeb.cl> Accessed 9 February 2004.
6. Dietz WH. Health consequences of obesity in youth: Childhood predictors of adult disease. *Pediatr* 1998; 101(Suppl 3):518-25.
7. Salinas J, Vio F. Promoción de la salud en Chile. *Revista Chilena De Nutricion* 2002;29(S1):164-73.
8. Castillo C, Uauy R, Atalah E, eds. *Guías de Alimentación para la población chilena*. Santiago, Chile: Imprenta Diario La Nación, 1997.
9. National Academy of Sciences/National Research Council. *Recommended Dietary Allowances*, 10th edition. Washington, DC: National Academy Press, 1989.
10. Kain J, Uauy R, Taibo M. Chile's school feeding programme: targeting experience. *Nutr Res* 2001; 22: 599-608.
11. WHO. *Healthy nutrition: an essential element of a health promoting school*. WHO Information Series on School Health. Geneva: WHO, 1998.
12. Lytle L. Nutrition education for school-aged children: a review of research. In: Contento IR, Balch G, Bronner Y, Paige D, Bisignani L, Lytle L, Maloney S, White S, Olson Ch, Sharaga S. *The effectiveness of nutrition education and implications for nutrition education policy, programs, and research: a review of research*. *J Nutr Educ* 1995;27:298-310.
13. Centers for Disease Control and Prevention. *Guidelines for school health programs to promote lifelong healthy eating*. *Morbidity and Mortality Weekly Report* 1996;45(RR-9):1-41.
14. Olivares S, Snel J, McGrann M, Glasauer P. Nutrition education in primary schools. *Food Nutr Agric* 1998;22:57-62.
15. FAO/Ministry of Education/Institute of Nutrition and Food Technology (INTA), University of Chile. *Nutrition Education in Primary Schools*. TCP/CHI/0065. Santiago, Chile: FAO, 2003.
16. Olivares S, Kain J, Lera L, Pizarro F, Vio F, Morón C. Nutrition status, food consumption and physical activity among Chilean schoolchildren: a descriptive study. *Eur J Clin Nutr* 2004; 58:1278-1285.
17. Barlow S, Dietz W. Obesity evaluation and treatment: expert committee recommendations. *Pediatrics* 1998;102:E29-36.
18. Thompson F, Byers T. Dietary assessment resource manual. *J Nutr* 1994;124(11S):2245S-317S.
19. Yáñez R, Olivares S, Torres I, Guevara M, Díaz N. Consumo de alimentos de escolares chilenos. Su relación con las guías y la pirámide alimentaria. *Revista Chilena de Nutricion* 2001;28(8):422-8.
20. Kain J, Olivares S, Castillo M, Vo F. Validación y aplicación de instrumentos para evaluar intervenciones educativas en obesidad de escolares. *Revista Chilena de Pediatría* 2001;72(4):308-18.
21. Kain J, Andrade M. Characteristics of the diet and patterns of physical activity in obese Chilean preschoolers. *Nutr Res* 1999;18:1825-35.
22. Olivares S, Albala C, García F, Jofré I. Publicidad televisiva y preferencias alimentarias en escolares de la Región Metropolitana. *Rev Méd Chile* 1999;127:791-9.
23. Zemel MB, Shi H, Greer B, Dirienzo D, Zemel PC. Regulation of adiposity by dietary calcium. *FASEB J* 2000;14(9):1132-8.
24. Olivares S, Zacarías I, Andrade M, Morón C. *Educación en alimentación y nutrición para la enseñanza básica*. Santiago: FAO/Ministerio de Salud/Universidad de Chile, INTA, 2003. Texto general; Guía del Profesor; Guías de Alumnos de 3° a 8° básico; CD-Rom. <http://www.inta.cl/educacionennutricion/index.asp>. Accessed 5 January 2004.