

## Eating Habits and Physical Activity in School children: A Comparison Before and After Summer Vacations

Perez-Lizaur AB\*

Health Department, Universidad Iberoamericana, Mexico

\*Corresponding author: Perez-Lizaur AB, Health Department, Universidad Iberoamericana, Universidad Iberoamericana, Health, Prolong Reforma 880, Col Lomas de Sta Fe, Mexico DF, DF 01219, Mexico, Tel: 525554017959; E-mail: [anabertha.perez@ibero.mx](mailto:anabertha.perez@ibero.mx)

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### Abstract

In the last two decades the prevalence of childhood obesity has increased considerably and has become one of the biggest challenges for Public Health in Mexico. Childhood obesity causes a wide range of adverse health effects, including chronic diseases that frequently result in premature death. According to the National Survey of Nutrition and Health-2006 (ENSANUT 2006) the combined prevalence of overweight and obesity in schoolchildren has increased from 18.6% to 26% in a period of 7 years, whereas at present one out of three adolescents are overweight or obese.

Although obesity is multi-causal, there are more environmental variables which have been linked to the increase in its prevalence. 6-7 Childhood is an excellent opportunity for the prevention of overweight and obesity, as in this period, the habits and lifestyles that largely condition the eating behavior in adulthood are established. For this reason, and due to the fact that children spend many hours in school, has caused big interest in establishing educational programs to help in the prevention of overweight and obesity in children. However, its effectiveness is still controversial; some authors have blamed the schools for causing weight gain in the students by providing processed foods with high energy content and insufficient time for physical activity.

In contrast, other studies suggest that school environment is not the most influential factor on the state of child nutrition, especially in urban areas where limitations on sports infrastructure and public insecurity limit outdoor physical and recreational activities, replacing them with the passive entertainment like watching TV or using computers or video games. In addition, the incorporation of women into the professional world has changed the eating habits of the family because the home-cooked meals have been replaced by fast food, which tend to have high energy

**Keywords:** School children; Eating habits; Diet; Food life styles

### Introduction

Over the last two decades the prevalence of childhood obesity has increased considerably and has become one of the biggest challenges for Public Health in Mexico [1,2]. Childhood obesity causes a wide range of adverse health effects, including chronic diseases that frequently result in premature death [2-4]. According to the National Survey of Nutrition and Health-2006 (ENSANUT 2006) the combined prevalence of overweight and obesity in schoolchildren has increased from 18.6% to 26% in just 7 years, whereas at present one out of every three adolescents is overweight or obese [5].

Although obesity has many causal factors, environmental variables are intimately related to the increase in its prevalence [6,7]. Childhood is an excellent opportunity for the prevention of overweight and obesity, since this is when the habits and lifestyles that will largely condition eating behavior in adulthood are established [8]. For this reason, and due to the fact that children spend many hours in school, the implementation of educational programs to help prevent overweight and obesity in children has generated great interest [9,10]. However, their effectiveness is still controversial; some authors have blamed the schools for encouraging weight gain in students by

providing processed foods with high energy content and insufficient time for physical activity [11].

In contrast, other studies suggest that the most influential factor on the status of child nutrition is the non-school environment [12], especially in urban areas where the lack of sports infrastructure and public insecurity limit outdoor physical and recreational activities, replacing them with passive entertainment such as watching TV, the use of computers or video games. Likewise, the incorporation of women into the professional world has changed the eating habits of the family since the home-cooked meals have been replaced by easy-to-prepare meals, which tend to have high energy content and few vegetables and fruits [13-15].

Throughout the school term, students are exposed to a combination of factors both in school and family environments [6,7]. However, we don't know much about the influence of vacations on the nutritional status of schoolchildren, as this is an ideal time to evaluate all those factors that can contribute to childhood obesity when children are in a relatively less structured environment and under less supervision [16]. There are few studies which show that schoolchildren tend to gain weight during the summer. The explanation has been associated, in part, with a decrease in physical activity [17,18]. However, the potential contribution of changes in eating habits and behavior over

the vacation period to the nutritional status of school-age children remains unknown.

Therefore, this study aims to assess the difference in the nutritional status of school children before and after going on vacation, vis-à-vis the changes in their eating habits and physical activity.

## Methodology

This is an observational longitudinal study that includes a total of 193 self-selected schoolchildren aged between 8 and 13, in second to sixth grade from a public elementary school in Mexico City. The sample size was determinate by the children who decide to participate in the study, and whose parents signed the informed consent letter, based in a convenience sampling. The study consists of two assessments, carried out with an interval of three months. The first corresponds to the month of June 2009, before the vacation period (period 1) and the second to the month of September of the same year, when classes were resumed (period 2). Eating habits and physical activity were assessed by two surveys, while the nutritional status was assessed through weight and height measurements. The survey for the children included 45 open and closed questions, stated through guided group readings, self-administered and answered individually, with an average duration of 30 minutes.

Before starting the study, both students and parents invited to participate in the study were given a letter of informed consent that was signed by the parents; children confirmed their participation verbally.

In order to take anthropometric measurements, four previously trained female nutrition students, took anthropometric measurements supervised by a licensed nutritionist. Three previously trained interviewers applied the questionnaires. Each student was assigned a folio number, which was later used in the survey for parents and in the anthropometric measurements form. In all schools, family members were dealt with first and students later.

The anthropometric measurements entailed the assessment of weight, height, waist and arm circumference. Students were asked to take off their shoes and to wear the school uniform only. To obtain their height and weight, we used Seca 876 (Seca GmbH & Co. Hamburg, Germany) electronic scales and Seca 214 (Seca GmbH & Co. Hamburg, Germany) portable stadiometers.

All measurements were taken in duplicate and with previously calibrated equipment, using the techniques recommended by Lohman et al. [19].

Subsequently, the body mass index (BMI) expressed in (kg/m<sup>2</sup>) was calculated, categorizing the schoolchildren according to the percentiles of the World Health Organization (WHO) [20], and the cut-off value recommended by the International Obesity Taskforce (IOTF) [21]. Since the original number of schoolchildren with malnutrition was very low (3.9%), they were eliminated in order to avoid a difference in habits due to health conditions. Likewise, out of the original sample, 30 students between period 1 and 2 abandoned the school and were therefore excluded from the study.

## Statistical Analysis

All statistical calculations were carried out with the support of the SPSS 15.0 (SPSS IC: Chicago, IL) statistical package. A descriptive analysis for continuous and categorical variables was performed. The

absolute frequency comparison was performed with the Chi-squared test; the Student t test was used for paired samples and comparison of means. The significance level considered for all tests was  $p < 0.05$ .

In accordance with the nutritional status of the schoolchildren, we compared the 54 variables that were measured in period 1 with those measured in period 2 by means of the Student t test. The dependent variable (Nutritional Status) was dichotomous and included schoolchildren with a normal weight and those that exhibited overweight or obesity. The cut off value was established pursuant to the NCHS 2000 tables, considering overweight in percentile  $>85$  and obesity in percentile  $>95$ .

## Results

A total of 193 students paired with mother/father participated in the study.

The average age of the 193 participants was  $9.7 \pm 1.0$ . Out of the total number of schoolchildren in this study, 50.8% were girls; 68.3% were in 4th and 5th grade and more than 80% had at least one brother/sister. The reported average age of the children's mothers was  $37.2 \pm 6.3$  and 33.9% of them mentioned having a paying job.

Overall, the percentage of schoolchildren with overweight or obesity in period 1 (before school vacations) was 51.8%, while upon going back to school it was 50.8%. The difference is not statistically significant (Table 1). Upon comparing the BMI of both sexes, no differences were found either. However, upon analyzing boys and girls separately, we found that the BMI changed significantly between the above mentioned periods for both the sexes: ( $20.1 \pm 4.0$  vs.  $20.3 \pm 3.8$ ) and ( $20.0 \pm 3.8$  vs.  $20.2 \pm 4.0$ ), respectively. Nonetheless, upon categorizing according to the CDC percentiles and IOFT cut off value, said disparity disappeared.

First assessment	Period 1 (N=193)	Period 2 (N=193)	p Value
	Mean $\pm$ DE	Mean $\pm$ DE	
BMI (Kg/m <sup>2</sup> )	20.06 $\pm$ 3.87	20.22 $\pm$ 3.98	0.62*
Diagnosis	%	%	p Value
Normal	48.2	49.2	0.96**
Overweight	25.9	25.9	
Obese	25.9	25.9	

**Table 1:** Differences in the nutritional status of the schoolchildren comparison between both periods

BMI = Body mass index, \*Student-t test, \*\*Chi-squared test

The comparison between periods for sedentary habits is shown (Table 2).

Although the rate of use of TV, video games and computers is higher during the vacation period ( $\geq 3$  hours/week), no significant differences were observed. Children with normal weight and those who are overweight spend similar periods engrossed in such activities.

As regards the physical activity of schoolchildren, we found that approximately 75% of them reported practicing some kind of sport. However, they only practiced them for an hour or less during the week. No differences were identified between periods. In view of the

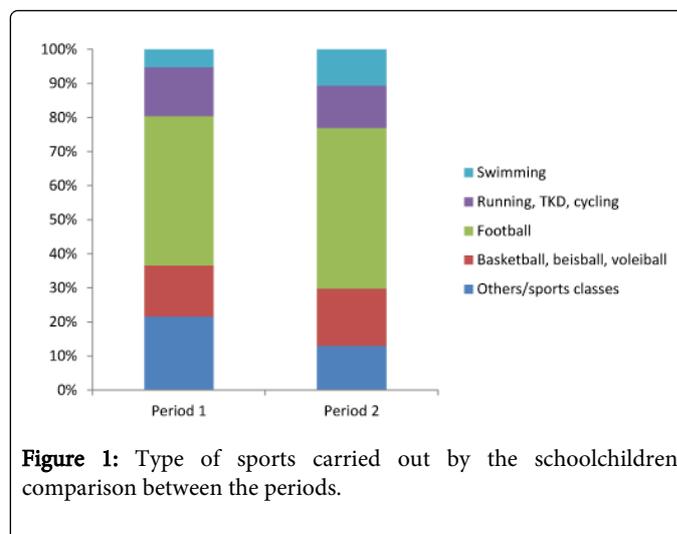
fact that the time spent by schoolchildren playing video games ( $\geq 3$  hours/week) -in both of the periods- is higher for boys than for girls (22% vs. 9%,  $p < 0.01$ ), and considering that girls tend to spend more time in front of the television set during vacation periods, we had expected to find a gender-based difference regarding the time they devote to carry out some kind of physical activity. However, both boys and girls spent the same amount of time practicing sports in both periods.

Habits	Period 1 n (%)	Period 2 n (%)
Time watching TV/week:	49 (25.8)	43(23)
≤ 1 hr.	57 (30)	53 (28.3)
2-3 hrs.	84 (44.2)	91(48.7)
≥ 3 hrs.	n=190	n=187
Use of computer/week:	134 (72)	125 (66.5)
≤ 1 hr.	23 (12.4)	33 (17.6)
2-3 hrs.	29 (15.6)	30 (16)
≥ 3 hrs.	n=186	n=188
Use of video games/week:	96 (59.3)	92 (55.1)
≤ 1 hr.	25 (15.4)	18 (10.8)
2-3 hrs.	41 (25.3)	57 (34.1)
≥ 3 hrs.	n=162	n=167
School children who practice some sport:	139 (72)	150(78.1)
Yes	54(28)	42(21.9)
No	n=193	n=192
Hours devoted to sports:	69 (41.8)	71 (40.6)
≤ 1 hrs.	44 (26.7)	56 (32)
2-3 hrs.	52 (31.5)	48 (27.4)
≥ 3 hrs.	n=165	n=175

**Table 2:** Sedentary habits of the schoolchildren comparison between both periods

Concerning sports activities (Figure 1), no significant differences were found between periods. However, it is important to note that 18% of students reported not having practiced any sports during the vacation period, while in period 1 only 7% answered that they had not participated in any sports activity. During the school term, children are more involved in structured activities like dance, gymnastics or swimming classes, compared to summer activities, which are practiced outdoors and under less supervision. By comparing the activities with the nutritional status of the children, we noted that during the summer, the children with normal weight are more sedentary and are involved in relatively more structured activities than their classmates with excess weight problems (16.6% vs. 7.4%,  $p = 0.03$ ).

Regarding the schoolchildren's favorite activities, these vary between periods. For example, during recess students usually use the time to eat, run or remain seated, while during the summer the children spend their free time playing video games or with friends or using the computer. The most popular sedentary activities for this group were the use of electronic games.



**Figure 1:** Type of sports carried out by the schoolchildren comparison between the periods.

TKD=Taekwondo, Sports classes=dance, gymnastics, swimming, etc.

Among the favorite foods of schoolchildren we found all types of meat (21.85%), traditional dishes (20.5%) and bread/pasta (17.9%) and even though their consumption increases during the vacation period, there was no significant change compared to the school period.

To evaluate the influence of vacation periods on schoolchildren's routines, they answered some questions regarding their schedules and eating habits (Table 3).

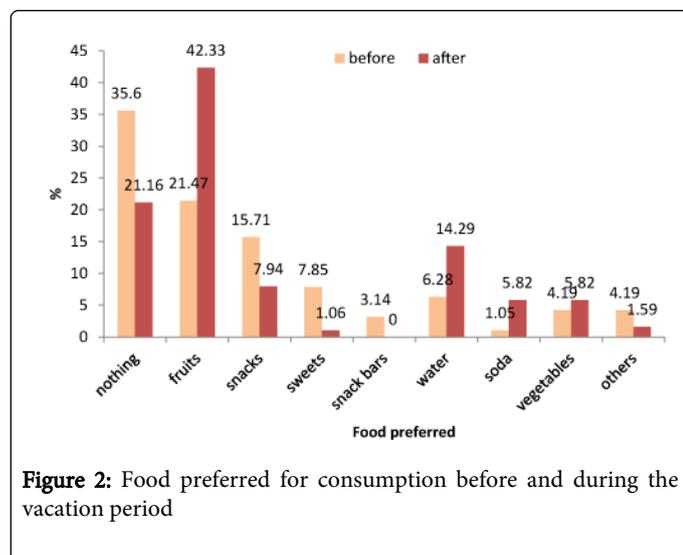
We found that when they go to school most of them get up before 9 am, while over 60% of the children tend to wake up later when they are on vacation. In both periods, the percentage of children who eat breakfast is low, i.e., less than 40%. The ones, who do eat breakfast, usually do so while watching TV during the vacation period. Eating lunch is a more prevalent habit when the students are in school (55.4% vs. 27.6%) and it is during this meal time that children with normal weight prefer to drink a sweetened beverage, compared to those with overweight and obesity problems (15.5% vs. 9.8%,  $p = 0.04$ ). Overall, we found that this group does not eat out often, breakfast being the only meal of the day in which changes were observed. Regarding lunch and dinner times, they varied between periods; schoolchildren have lunch and dinner later (after 4pm. and after 8 pm., respectively) during the vacation period, and they usually go to sleep later when they don't have to go to school the next morning. Despite changes in the habits of schoolchildren between the periods, these differences did not influence their nutritional status.

As far as their nutrition is concerned, schoolchildren have a very similar pattern in both periods. Irrespective of the period evaluated, over 70% of the group prefers to take sweetened drinks (water-based drinks infused with fruit, juices and soft drinks) rather than drink plain water (22%) or milk (4%).

We also found that they have a healthier pattern during the vacation period in terms of preferred snacks (Figure 2). Schoolchildren eat more vegetables (5.82%), fruits (42.33%) and drink more water (14.27%). However, they drink more soft drinks (5.82%), but less candy (1.06%) and snacks (7.94%) than when they are in school. Likewise, overweight or obese schoolchildren tend to favor a school lunch consisting of vegetables and fruit, as opposed to their peers with normal weight (58.5% vs. 41.5% respectively,  $p < 0.05$ ).

Habits	Period 1 n (%)	Period 2 n (%)	p Value
Wake-up time	157(83.5)	69 (36.3)	0.00
Before 9 am.	31 (16.5)	121 (63.7)	
After 9 am.	n= 188	n= 190	
Schoolchildren who have breakfast	134 (35)	154 (39.6)	0.06
Yes	10 (2.6)	8 (2.1)	
No	49 (12.7)	31 (8)	
Sometimes	n=193	n=193	
Eat breakfast watching TV	51 (26.4)	69 (35.8)	0.00
Yes	97 (50.3)	51 (26.4)	
No	45 (23.3)	73 (37.8)	
Sometimes	n=193	n=193	
Breakfast (not at home):	83 (43.0)	87 (45.5)	0.03
Never	83 (43.0)	59 (30.9)	
1-2 times/week	27 (14.0)	45 (23.6)	
≥ 3 times/week	n=193	n=191	
Schoolchildren who eat lunch	107 (55.4)	52 (27.6)	0.00
Yes	37 (19.2)	103 (54.8)	
No	17 (8.8)	33 (17.6)	
Sometimes	n=161	n=188	
Dinner time	42 (23.7)	25 (14.6)	0.03
Before 20 hrs.	135 (76.3)	146 (85.4)	
After 20 hrs.	n=177	n=171	
Bedtime	19 (12.6)	6 (3.1)	0.00
Before 20 pm.	131 (87.4)	185 (96.9)	
After 20 pm.	n=150	n=191	

**Table 3:** Eating habits of the schoolchildren comparison between the periods



**Figure 2:** Food preferred for consumption before and during the vacation period

## Discussion

The combined prevalence of overweight and obesity (BMI>85<sup>th</sup> percentile) in this group was high in keeping with the growing trend of childhood obesity in Mexico and worldwide [5,22]. Although no significant gender differences were found, higher obesity prevalence was identified in boys. (BMI>95<sup>th</sup> percentile). The data matches the findings of school populations nationwide [1,23]. It must be pointed out that this is a low socioeconomic level urban population, two factors that have been closely associated to increased prevalence of obesity [24].

Similar to that reported in Latin American school populations [25], we found that the studied population has a high level of sedentarism, regardless of the period during which we evaluated their physical activity. Consequently, no differences were identified upon making comparisons between the two periods. Although 70% of the schoolchildren reported practicing some sport, it is more common for children to spend over three hours a week watching television or playing video games than practicing sports, especially during the vacation period. This same sedentary trend in schoolchildren during the summer vacations coincides with that reported by Tovar et al., where urban children who spend more time at home during the vacation period are involved in less demanding or sedentary activities. Moreover, they tend to practice unhealthy eating habits more often, such as: increased consumption of processed foods, low intake of fruits and vegetables and watching television during meals [26]. Other authors have also found this pattern of physical inactivity and bad habits in urban children and have associated it with the increasing inclusion of both parents in the professional world, thus decreasing their attention to the activities of the children due to lack of time [27]. In the present study, the proportion of economically active mothers is low (33.9%), so the changes in eating habits of schoolchildren, in general, are associated more with the fact of being on vacation, when parents and the rest of family members tend to be more flexible in the schedules and activities of the children.

An important finding of this study was proving that the daily routine of the schoolchildren changes during the vacation period and, contrary to what was expected, the lack of physical activity and changes in some habits did not influence the schoolchildren's nutritional status negatively. These results were quite similar to that observed in an adolescent population in the State of Morelos, where no relationship between overweight and obesity and the time spent watching television, forms of physical activity and sedentarism was identified [28]. Despite these results, it is important to mention that the use of television and video games in schoolchildren has been closely associated with weight gain so it should be considered as risk factor for the occurrence of overweight and obesity [29]. Additionally, we can observe other risk factors in this population, such as the large percentage of children who do not usually eat breakfast, whether going to school or on vacation. It was expected that children would eat breakfast more often when their schedule is less rigid; however, it was only observed that children tend to watch more TV while eating breakfast during the summer. It is worth mentioning that skipping breakfast is associated with weight gain in children and adolescents. Likewise, people who do not eat breakfast tend to eat a lot at dinner, thus promoting weight gain [30,32]. Another unhealthy habit and recently identified as a risk factor in developing childhood obesity, is reduced sleep time. The same pattern was observed during the vacation period, when schoolchildren's bedtime is altered [33].

Concerning the eating habits of schoolchildren, the high consumption of sweetened drinks, especially soft drinks, compared to water consumption and low intake of milk are astounding. Currently, Mexico is one of the countries with the highest consumption of energy drinks, which replace milk consumption and contribute significantly to the energy intake of children and adolescents, subsequently causing overweight and obesity [12,34]. Furthermore, it has been mentioned that the characteristics of public schools throughout the country, promote the consumption of energy drinks within the school and its surroundings [35]. It is interesting to observe that the consumption of sweets and snacks is also more frequent during the school period, suggesting that children have access to them just as they have access to sugar-sweetened beverages. Regarding their eating patterns, something very similar to that observed in other school populations was noted: meat consumption is excessive while the intake of fruits, vegetables, milk and dairy products is inadequate [36,37]. An important fact worth underscoring is that normal-weight children were those who practiced less healthy physical activity and eating habits more often than children classified as overweight and obese, contrary to what other studies have reported where obese children practice more sedentary activities and eat less fruits and vegetables [38,39]. However, it is important to consider that individuals with obesity problems tend to underestimate their consumption of food [40,41]. In theory, this could limit the results of this study, since we employed self reporting and not the direct observation of food consumption.

The study has another shortcoming: sample size. It is relatively small and did not allow us to identify the influence of changes in certain habits of schoolchildren regarding their nutritional status. Another factor to be taken into consideration is the difficulty in measuring the dietary habits of schoolchildren. Therefore, it is advisable to apply multiple-choice surveys to facilitate answers and data collection, instead of open questions as used in this study.

Despite these limitations, this study proved that summers do influence the habits of schoolchildren. However, it is a period that has not been studied enough. So far, controversy on the success of school programs for the prevention of childhood obesity still prevails, and the explanation might be partly due to the fact that most of them have not taken into account the vacation period as part of the intervention. Assessments of the eating habits and activities of children while they are purely influenced by a family environment are essential to understand all the factors involved in the development of overweight and obesity in schoolchildren. In order for school interventions to be effective, they should not only consider providing nutritional education and encouraging the schoolchildren engage in physical activities; they must also focus on parents in order to create a healthier environment at home. Some variables which are linked to "parental education, nutrition and promoting exercise", are also closely related both, to parental education, cognitive levels and neuro-endocrinological roots [42]. That is why those interventions that succeed in changing the lifestyle of children, even when they are outside the classroom, will be able to prevent and stop the huge public health problems brought about by obesity in schoolchildren.

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