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Association between household socioeconomic level and consumption of fast food and soft drinks: a cross-sectional assessment of the Young Lives cohort in Peru

Asociación entre el nivel socioeconómico de la vivienda y el consumo de comida rápida y bebidas azucaradas: análisis transversal de la cohorte Niños del Milenio en Perú

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## ABSTRACT

**Introduction:** The consumption of fast food and soft drinks is a risk factor for developing overweight and obesity. This study aimed at assessing if there is association between household socioeconomic level and the consumption of fast food and soft drinks among children.

**Material and Methods:** A cross-sectional assessment of the data from the third round (2009-2010) of the youngest cohort of the Young Lives study in Peru was conducted. Sampling was conducted in three stages: in the first one, the country was divided into equal geographical regions, excluding the 5% of the richest district; in the second stage, 20 sentinel sites were chosen and an area within each sentinel site was selected. Finally, in the third stage, eligible children were selected. Outcomes were the self-reported consumption of fast food and soft drinks (never, sometimes, and always), whereas the exposure was household socioeconomic status (in quintiles). Crude and adjusted models were created between variables of interest using Poisson regression models, with robust variance, to report prevalence ratios (PR) and 95% confidence intervals (95% CI).

**Results:** Data of 1901 children, of which 942 (49.6%) were girls, with a mean age of 7.5 (SD: 0.5) was analyzed. A total of 24.1% (95%CI: 22.2% – 26.1%) reported always consuming fast food, whilst this number was 22.4% (20.5% – 24.3%) for soft drinks. Compared to the lowest socioeconomic quintile, those who were in higher socioeconomic status had more probability of consuming fast food and soft drinks (Chi-squared for trends < 0.001). The highest socioeconomic quintile had a greater probability to always consume fast food (PR = 1.42; 95%CI: 1.08 – 1.88) and soft drinks (PR = 1.71; 95%CI: 1.24 – 2.37).

**Conclusions:** This study shows that there is a significant association between the household socioeconomic level and the consumption of soft drinks and fast food.

**Keywords:** Fast Foods; Sugar-Sweetened Beverages; Obesity; Social Class.

## RESUMEN

**Introducción:** El consumo de comida rápida y bebidas azucaradas es un factor de riesgo para el desarrollo de sobrepeso y obesidad. Este estudio evaluó si existe asociación entre el nivel socioeconómico de la vivienda y el consumo de comida rápida y bebidas azucaradas en niños.

**Material y métodos:** Evaluación transversal de los datos de la tercera ronda (2009-2010) de la cohorte más joven del estudio Niños de Milenio en Perú. El muestreo fue realizado en tres fases: en el primero, el país fue dividido en regiones geográficas iguales excluyendo al 5% de los distritos con mejor nivel económico; mientras que en la segunda fase se escogieron 20 sitios de vigilancia y un área dentro de ellas. Finalmente, en la tercera fase, se escogieron a los niños elegibles. Las variables fueron el auto-reporte del consumo de comida rápida y bebidas azucaradas (nunca, algunas veces y siempre), mientras que la exposición fue el nivel socioeconómico de la vivienda (dividido en quintiles). Se crearon modelos crudos y ajustados entre las variables de interés usando modelos de regresión de Poisson, con varianza robusta, para reportar razones de prevalencia (RP) y sus intervalos de confianza al 95% (IC 95%).

**Resultados:** Los datos de 1901 niños, de los cuales 942 (49,6%) fueron mujeres, con una media de edad de 7,5 (DE: 0,5), fueron analizados. Un total de 24,1% (IC 95%: 22,2% - 26,1%) reportó siempre consumir comida rápida, y este número fue 22,4% (IC 95%: 20,5% - 24,3%) para bebidas azucaradas. Comparado con el nivel socioeconómico más bajo, aquellos niños en el nivel socioeconómico más alto tuvieron mayor probabilidad de consumir comida rápida y bebidas azucaradas (Chi cuadrado de tendencias < 0,001). El más alto quintil socioeconómico tuvo mayor probabilidad de consumir comida rápida (RP = 1,42; IC 95%: 1,08 – 1,88) y bebidas azucaradas (RP = 1,71; IC 95%: 1,24 – 2,37).

**Conclusiones:** Este estudio muestra que existe una asociación significativa entre el nivel socioeconómico de la vivienda y el consumo de comida rápida y bebidas azucaradas en niños.

**Palabras clave:** Comida Rápida; Bebidas Azucaradas; Obesidad; Clase Social.

## INTRODUCTION

Obesity, a condition that can appear at any stage of life, is considered the 21st century pandemic, affecting countries with different economies [1]. Additionally, obesity among children is considered a new challenge for public health [2]. Obesity has been associated with other chronic conditions such as type 2 diabetes mellitus, stroke, myocardial infarction, fatty liver disease, hypercholesterolemia, several cancers, among other diseases [3]. According to the World Health Organization (WHO) report [4], overweight and obesity in children under 5 years old increased globally from 0.8% in 1975 to 6.8% in 2016. In Peru, children under 5 years with overweight and obesity were 7.4% and 1.9% in 2014, whereas children aged between 5 and 9 years with overweight and obesity represented 17.5% and 14.8%, respectively [5].

The increased rates of overweight and obesity can be attributed to the high intake of energy-rich foods, high in sugar and saturated fats, mainly fast food and ultra-processed foods [6]. Fast food are products that are precooked or cooked, served in restaurants, usually highly caloric, poor in nutrients, and potentially harmful to health [7]. On the other hand, soft drinks are carbonated drinks whose main component is sugar, making them very energy enriched [8]. Some studies conducted in the United States have reported that individuals who consumed fast food and soft drinks more frequently had excess weight and unhealthy habits [9,10]. Another study, conducted in adults, showed that people who consume fast food once a week had 20% higher risk of developing coronary heart disease compared to those who never consumed, and this risk increases to 50% and 80% for those who consume fast food two or three times a week and more than three times a week, respectively [9,10].

Among children this picture seems to be similar. Thus, a systematic review found that children and adolescents with obesity were five times more likely to continue with this condition in adulthood [11]. There are several factors associated with the consumption of fast food and soft drinks, mainly focused on the individual and the community. Among the individual factors are the taste for this type of food and the knowledge about appropriate nutrition habits [12]; whilst among those at the community levels are the habit of family consumption [13], economic development [14], and urbanisation [15,16]. Among the latter, the socioeconomic factor may play an important role in the access to unhealthy food. However, the impact of socioeconomic position may vary according to the nutritional transition stage in which the country is going on.

Thus, in some countries, high socioeconomic position is associated with high unhealthy food consumption, whereas there is a negative association in other societies [17].

Therefore, this study aimed at determining whether there is association between household socioeconomic level and the consumption of fast food and soft drinks among children of the Young Lives Cohort in Peru. Our hypothesis is that high socioeconomic position would be associated with greater fast food and soft drink consumption.

## MATERIALS AND METHODS

### Design and study population

This is a cross-sectional assessment of the Young Lives Cohort Study, a longitudinal study conducted in four developing countries: Ethiopia, India, Peru and Vietnam [18]. This study started in 2002 with two base groups: infants from 6 to 18 months (younger cohort) and children from 7 to 8 years (older cohort) who were chosen at random. At present, the follow-ups have been carried out for a period of almost 15 years, 2006-2007 (second round), 2009-2010 (third round), 2012-2013 (fourth round) and 2016-2017 (fifth round) for both cohorts.

### Selection of participants

The original study was undertaken in three stages. In the first stage, the country was split into equal geographical regions, based on the national poverty map of Peru developed in 2000 by the National Compensation and Social Development Fund (FONCODES in Spanish) [19]. Aimed at over-representing the poorest areas, the 5% of the wealthiest districts (i.e. those with the highest socioeconomic status) were excluded and a systematic sample of the remaining districts was carried out. In the second stage, 20 sentinel sites were chosen and an area within each sentinel site was selected using table of random numbers. Once the census areas were selected, a random sample of blocks was selected. In the third stage, the children who were within the selection parameters (6 to 18 months) and those who were in the chosen blocks were selected. The objective was to survey 100 children for each sentinel site.

For the present manuscript, Peruvian children from the younger cohort were included, using data from the third round (2009 – 2010) of the Young Lives Study. The information was taken from the household survey, available at the official webpage of Young Lives. The household questionnaire was completed by the head of the family and includes questions about household composition, characteristics of the child caregiver, socioeconomic status, child health (including eating habits), anthropometrics, etc. Only those with complete information on the variables of interest (socioeconomic level, consumption of fast food and soft drinks) were analysed.

### Sample size

Regarding the sample size, estimations were conducted assuming a significance level of 5% and a power of 80%, a total of 948 individuals were needed to find a difference of 5% in the

proportion of children consuming fast food in the highest and lowest quintile of socioeconomic status, based on results of a previous study [20]. Since 2052 children were enrolled at the study baseline, and 92 were lost to follow up until the third assessment, 1940 were available for analyses. However, of them, only 1901 had complete data with the variables of interest and were included in the manuscript. Nevertheless, this sample size was enough to find the association of interest.

#### Definition of variables

Two outcome variables were used. The first one was the consumption of fast food, defined based on the question "During the past 30 days, how many times have the child eaten salty and fatty foods?" Peruvian examples were used to clarify this question including well-known products such as fries, burgers, pizza, grilled chicken, etc. On the other hand, the second outcome was the consumption of soft drinks, evaluated through the question "During the past 30 days, have the child taken soft drinks?" Similarly, some examples of sodas were used to clarify this question. Both questions had six response options: daily, two to three times a week, once a week, every two weeks, less than every two weeks, and never. For analyses purposes, these options were categorised into three groups: always (including the options "daily" and "two to three times a day"); sometimes ("once a week", "every 2 weeks" and "less than every fortnight") and never.

The exposure variable was the household socioeconomic level measured by using a wealth index, a variable constructed by the Young Lives study based on three measures: quality of housing, access to services, and assets possession at home. These measures were obtained from the questions asked to the family head using the household survey and carried out face to face. The indicator of the quality of housing was obtained through the simple average of the quality of the material of the floor, ceiling and walls, and also included household density. Access to basic services was obtained through the simple average of possession of electricity, water, sanitation and cooking fuel; while, for the calculation of the assets index, the simple average of the list of possession of domestic articles was estimated. Finally, the calculation of the wealth index was the result of the simple average of the three indexes, obtaining a value between 0 and 1, where a number closer to one indicates a higher socioeconomic status. For analyses purposes, this variable was divided into quintiles, with the first quintile being the poorest and the fifth quintile the wealthiest.

Other variables were taken into account to evaluate the association of interest including: sex (male vs. female), age (7 and 8 years), geographical area (urban vs. rural), **mother's education** level (<7 years, 7-11 years, and  $\geq$  12 years), **father's educational level** (<7 years, 7-11 years, and  $\geq$  12 years), physical activity of the child in the last 7 days, based on the mother self-report of physical activity of at least one hour per day (<7 days a week and 7 days a week), number of meals in the last 24 hours (5 times a day, <5 times a day, and >5 times a day), presence of excess of weight according to the child's body mass index (yes or no). Body mass index (BMI) in the child was calculated based on the Z-score taken from the World Health Organization (WHO) reference tables. Finally, the BMI of the mother (normal, overweight and obese) was also used, obtained from the weight and height data and the use of international standards.

### Procedures

All the interviewers were trained to comply with the protocol of collection, data entry, data cleaning, and storage of the information. Each team collecting data in each sentinel site was comprised by a researcher, a fieldworker and a psychologist [17]. For the anthropometric data collection, an anthropometrist was trained according to the techniques of the WHO. For the evaluation of height, a stadiometer was used, and standing height information was collected; whereas calibrated digital scales were utilised for weight (in kg). Data was entry and processed using Microsoft Access.

### Statistical analysis

Data was analysed using STATA 13.0 (Stata Corp, College Station, TX, US). Initially, the description of quantitative variables was conducted using means and standard deviations (SD) and, in the case of categorical variables, proportions. Then, a descriptive analysis of the characteristics of both child and parents according to the household socioeconomic level, and subsequently, according to fast food and soft drinks consumption was conducted. Chi square test was used to evaluate these comparisons. Finally, crude and adjusted models were created to assess the association between household socioeconomic level and fast food and soft drinks, using Poisson regression models with robust variance, reporting prevalence ratios (PR) and 95% confidence intervals (95% CI). In these latter models, the first (lower) quintile of socioeconomic level was used as the reference group as our hypothesis expected to have an increasing consumption of unhealthy food with higher socioeconomic status. Finally, the variance inflation factor was used to avoid collinearity in the final model.

## Ethics

The initial study was approved by the Social Sciences Ethics Division of the University of Oxford (18). In addition, the study was approved by each country where it was developed. Thus, in Peru, the original study was approved by the ethics committee of Instituto de Investigación Nutricional. This research protocol and analysis were approved by the Ethics Committee of the Universidad Peruana de Ciencias Aplicadas – UPC, in Lima, Peru.

## RESULTS

### Characteristics of the study population

From 2052 subjects originally enrolled at the baseline of the study, 112 (5.5%) children were lost to follow-up and 39 (1.9%) children did not have complete data. Thus, data of 1901 children, of which 942 (49.6%) were girls, with a mean age of 7.5 (SD: 0.5) was further analyzed.

The description of participants according to the household socioeconomic level is shown in Table 1. Of note, as household socioeconomic level increases, mother's and father's **education level** also do so. On the contrary, at higher household socioeconomic level, children tend to perform less physical activity and have a higher prevalence of excess of weight.

Table 1. Characteristics of the study population according to household socioeconomic level.

	Socioeconomic level					p-value
	Quintile I N = 389	Quintile II N = 389	Quintile III N = 391	Quintile IV N = 389	Quintile V N = 385	
Sex						
Male	199 (47.3%)	210 (53.6%)	183 (51.3%)	187 (50.8%)	180 (49.6%)	0.49
Female	222 (52.7%)	182 (46.4%)	174 (48.7%)	181 (49.2%)	183 (50.4%)	
Age						
Mean (SD)	7.5 (0.5)	7.4 (0.5)	7.5 (0.5)	7.5 (0.5)	7.4 (0.5)	0.82
Geographical area						
Urban	122 (28.5%)	218 (54.9%)	327 (89.8%)	351 (95.4%)	364 (99.2%)	< 0.001
Rural	306 (71.5%)	179 (45.1%)	37 (10.2%)	17 (4.6%)	3 (0.8%)	
<b>Mother's educational level</b>						
< 7 years	337 (80.4%)	268 (68.9%)	141 (39.6%)	64 (17.7%)	39 (10.7%)	< 0.001
7 – 11 years	76 (18.1%)	99 (25.5%)	166 (46.6%)	186 (51.5%)	164 (45.2%)	
12+ years	6 (1.4%)	22 (5.7%)	49 (13.8%)	111 (30.8%)	160 (44.1%)	
<b>Father's educational level</b>						
< 7 years	254 (64.3%)	198 (52.9%)	105 (29.8%)	44 (12.1%)	28 (7.9%)	< 0.001
7 – 11 years	124 (31.4%)	151 (40.4%)	197 (56.0%)	197 (54.1%)	154 (43.4%)	
12+ years	17 (4.3%)	25 (6.7%)	50 (14.2%)	123 (33.8%)	173 (48.7%)	
Physical activity						
<7 times / week	255 (59.4%)	271 (68.3%)	236 (64.7%)	257 (69.8%)	270 (73.6%)	< 0.001
7 times/week	174 (40.6%)	126 (31.7%)	129 (35.3%)	111 (30.2%)	97 (26.4%)	
Number of meals in 24 hours						
5 times/day	175 (40.8%)	194 (48.9%)	193 (52.7%)	203 (55.2%)	189 (51.5%)	< 0.001
<5 times/day	188 (43.8%)	146 (36.8%)	87 (23.8%)	76 (20.7%)	70 (19.1%)	
>5 times/day	66 (15.4%)	57 (14.4%)	86 (23.5%)	89 (24.1%)	108 (29.4%)	
Excess of weight						
Without excess weight	371 (87.0%)	330 (83.1%)	264 (72.1%)	234 (64.8%)	192 (53.0%)	< 0.001
With excess weight	56 (13.1%)	67 (16.9%)	102 (27.9%)	133 (36.2%)	171 (47.1%)	
<b>Mother's BMI</b>						

Normal	211 (53.4%)	161 (41.8%)	83 (23.9%)	97 (27.8%)	88 (25.1%)	< 0.001
Overweight	139 (35.2%)	167 (43.4%)	169 (48.7%)	163 (46.7%)	149 (42.6%)	
Obesity	45 (11.4%)	57 (14.8%)	95 (27.4%)	89 (25.5%)	113 (32.3%)	

## Fast food and soft drink consumption

Overall, 24.1% of children reported having always consumed fast food, while only 20.1% reported never having to do so. The prevalence of fast food consumption increases with higher household socioeconomic level, reaching a maximum in the fourth quintile and decreasing after that (See Table 2). In addition, children who always consumed fast food were concentrated in the urban area, had less physical activity levels, ate more than 5 meals a day, had overweight mothers, and had greater excess of weight.

In the case of soft drinks, 22.3% of children reported having always consumed this kind of beverages, while only 13.0% reported never having to do so. The prevalence of soft drink consumption increases with higher household socioeconomic level, and similar to fast food, reached a maximum in the fourth quintile and decreasing after that (See Table 2). Children who always consumed soft drinks were concentrated in the urban area, ate more than 5 meals a day, and had overweight mothers.

Table 2. Characteristics of the study population according to fast food and soda consumption.

	Fast food consumption			p-value	Consumption of soft drinks			p-value
	Never N = 384	Sometimes N = 1058	Always N = 248		Never N = 248	Sometimes N = 1228	Always N = 425	
Sex								
Male	191 (49.7%)	549 (51.9%)	125 (50.4%)	0.31	125 (50.4%)	615 (50.1%)	219 (51.5%)	0.88
Female	193 (50.3%)	509 (48.1%)	123 (49.6%)		123 (49.6%)	613 (49.9%)	206 (48.5%)	
Age								
Mean (SD)	7.4 (0.5)	7.5 (0.5)	7.4 (0.5)	0.77	7.4 (0.5)	7.5 (0.5)	7.4 (0.5)	0.43
Geographical area								
Urban	196 (51.3%)	808 (76.4%)	136 (54.8%)	< 0.001	136 (54.8%)	870 (71.0%)	356 (83.8%)	< 0.001
Rural	186 (48.7%)	249 (23.6%)	112 (45.2%)		112 (45.2%)	355 (29.0%)	69 (16.2%)	
<b>Mother's educational level</b>								
< 7 years	258 (67.5%)	416 (39.7%)	171 (69.5%)	< 0.001	171 (69.5%)	543 (44.5%)	135 (32.1%)	< 0.001
7 – 11 years	94 (24.6 %)	415 (39.6%)	53 (21.6 %)		53 (21.6 %)	443 (36.3%)	195 (46.3%)	
12+ years	30 (7.9%)	218 (20.8%)	22 (8.9%)		22 (8.9%)	235 (19.2%)	91 (21.6%)	
<b>Father's educational level</b>								
< 7 years	189 (52.1%)	312 (30.3%)	126 (53.8%)	< 0.001	126 (53.8%)	385 (32.3%)	118 (28.4%)	< 0.001
7 – 11 years	138 (38.0%)	478 (46.4%)	79 (33.8%)		79 (33.8%)	546 (45.9%)	198 (47.6%)	
12+ years	36 (9.9%)	240 (23.3%)	29 (12.4%)		29 (12.4%)	259 (21.8%)	100 (24.0%)	
Physical activity								
< 7 times/week	257 (66.9%)	745 (70.5%)	168 (67.7%)	< 0.001	168 (67.7%)	837 (68.2%)	266 (62.6%)	0.10
7 times/week	127 (33.1%)	312 (29.5%)	80 (32.3%)		80 (32.3%)	390 (31.8%)	159 (37.4%)	
Number of meals in 24 hours								
5 times/day	172 (44.8%)	555 (52.5%)	114 (46.0%)	< 0.001	114 (46.0%)	626 (51.0%)	205 (48.2%)	< 0.001
<5 times/day	147 (38.3%)	286 (27.0%)	104 (41.9%)		104 (41.9%)	352 (28.7%)	99 (23.3%)	
>5 Times/day	65 (16.9%)	217 (20.5%)	30 (12.1%)		30 (12.1%)	250 (20.4%)	121 (28.5%)	
Excess of weight								
Without excess weight	321 (83.6%)	737 (70.0%)	204 (82.3%)	< 0.001	204 (82.3%)	902 (73.6%)	265 (62.8%)	< 0.001
With excess weight	63 (16.4%)	316 (30.0%)	44 (17.7%)		44 (17.7%)	323 (26.4%)	157 (37.2%)	

<b>Mother's BMI</b>								
Normal	152 (41.6%)	333 (33.2%)	103 (44.6%)	0.002	103 (44.6%)	419 (35.8%)	109 (27.3%)	< 0.001
Overweight	159 (43.6%)	439 (43.8%)	98 (42.4%)		98 (42.4%)	509 (43.4%)	171 (42.9%)	
Obesity	54 (14.8%)	231 (23.0%)	30 (13.0%)		30 (13.0%)	244 (20.8%)	119 (29.8%)	
Household socioeconomic level								
Quintile I	125 (32.5%)	173 (16.4%)	87 (35.1%)	< 0.001	87 (35.1%)	245 (20.0%)	41 (9.7%)	< 0.001
Quintile II	125 (32.5%)	194 (18.3%)	76 (30.6%)		76 (30.6%)	246 (20.1%)	59 (13.9%)	
Quintile III	64 (16.7%)	220 (20.8%)	44 (17.7%)		44 (17.7%)	248 (20.2%)	89 (20.9%)	
Quintile IV	41 (10.7%)	205 (19.4%)	16 (6.5%)		16 (6.5%)	255 (20.7%)	116 (27.3%)	
Quintile V	29 (7.6%)	266 (25.1%)	25 (10.1%)		25 (10.1%)	233 (19.0%)	120 (28.2%)	

### Association between socioeconomic status and consumption of fast food and soft drinks

In multivariable model and compared with the first socioeconomic quintile, those in the fourth ( $p = 0.001$ ) and fifth ( $p = 0.01$ ) quintile were more probable to always consume fast food after controlling for different confounders (See Table 3). In addition, an increase in the strength of association was reached up to the fourth socioeconomic quintile and then decreased after that. The same pattern was found in those who reported eating fast food sometimes, though results were not significant.

On the other hand, compared to the first socioeconomic quintile, those in the third ( $p = 0.001$ ), fourth ( $p < 0.001$ ) and fifth ( $p < 0.001$ ) quintile were more probable to always consume soft drinks after controlling for different confounders (See Table 3). Similarly, an increase in the strength of association was evident up to the fourth quintile and then reduced in the highest quintile. The same pattern was found in those who reported consuming soft drinks sometimes, although they were only significant in the fourth and fifth quintiles.

Table 3: Association between household socioeconomic level and fast food and soft drinks consumption: crude and adjusted models

	Crude Model	Adjusted model
	PR (95%CI)	PR (95%CI)
Fast food consumption		
<i>Sometimes vs. never</i>		
Quintile I	1 (Reference)	1 (Reference)
Quintile II	0.96 (0.90 – 1.02)	0.95 (0.89 – 1.01)
Quintile III	1.00 (0.95 – 1.06)	0.99 (0.93 – 1.07)
Quintile IV	1.08 (1.02 – 1.14)	1.08 (1.00 – 1.16)
Quintile V	0.95 (0.90 – 1.01)	0.94 (0.87 – 1.01)
<i>Always vs. never</i>		
Quintile I	1 (Reference)	1 (Reference)
Quintile II	0.89 (0.68 – 1.17)	0.83 (0.63 – 1.10)
Quintile III	1.61 (1.29 – 1.99)	1.30 (1.00 – 1.69)
Quintile IV	2.07 (1.70 – 2.51)	1.54 (1.19 – 1.99)
Quintile V	1.98 (1.60 – 2.44)	1.42 (1.08 – 1.88)
Consumption of soft drinks		
<i>Sometimes vs. never</i>		
Quintile I	1 (Reference)	1 (Reference)
Quintile II	1.04 (0.95 – 1.13)	1.01 (0.93 – 1.11)
Quintile III	1.15 (1.06 – 1.25)	1.09 (0.99 – 1.20)
Quintile IV	1.28 (1.19 – 1.37)	1.19 (1.09 – 1.31)
Quintile V	1.22 (1.13 – 1.32)	1.12 (1.02 – 1.24)
<i>Always vs. never</i>		
Quintile I	1 (Reference)	1 (Reference)
Quintile II	1.36 (0.99 – 1.87)	1.22 (0.88 – 1.68)
Quintile III	2.09 (1.58 – 2.76)	1.58 (1.15 – 2.18)
Quintile IV	2.74 (2.11 – 3.56)	2.01 (1.48 – 2.74)
Quintile V	2.58 (1.99 – 3.36)	1.71 (1.24 – 2.37)

Bolded estimates are significant ( $p < 0.05$ )

\* Adjusted for sex, age, geographic area, mother's education level, physical activity, number of meals in 24 hours, excess of weight, and mother's BMI.

## DISCUSSION

### Main findings

Our cross-sectional analysis shows a positive relationship between household socioeconomic level and the consumption of soft drinks, a finding that is almost similar to that of fast food. In addition, the strength of the association increases up to the fourth socioeconomic quintile, and after that, drops in the fifth socioeconomic quintile. Finally, about a quarter of the children evaluated reported always consuming fast food and soft drinks.

### Comparison with previous studies

Up to our knowledge, no previous studies in Peru have comprehensively reported the association between household socioeconomic status and the consumption of fast food and soft drinks. Moreover, no studies were found that have studied the prevalence of fast food and soft drinks consumption in our context. A longitudinal study using data of the younger cohort of the Young Lives reported that daily consumption of soft drinks was 22%, 30%, and 48% for the low, medium and high socioeconomic level, respectively [21]. For this latter report, the authors used information from the third and fourth round of assessments of the cohort, but the models were not controlled for potential confounders. On the other hand, other studies assessing the relationship between socioeconomic status and the consumption of soft drinks and fast food were very heterogeneous. A study conducted during the economic transition in South Korea showed a positive association between the consumption of soft drinks and fast food [22]; thus, as the population showed a higher wealth index, the consumption of soft drinks and fast food also increased. The increase in consumption was consistent up to the last quartile of wealth, a result very similar to our study. This finding is, however, contrasted with subsequent studies in the same country, in which as the local economy improved, the eating behavior of the adolescent population also improved, measured as higher consumption of fruits and vegetables and a decrease in the consumption of fast food and soft drinks [23,24].

Regarding the consumption of soft drinks, a study conducted in Colombia aimed at finding socioeconomic differences associated with the consumption of soft drinks among children and adolescents [25]. This report found that children coming from homes of medium and high socioeconomic status had more probability of consuming soft beverages compared to those who came from lower socioeconomic levels. Of note, our findings as well as other from scientific

literature, reflects how the trend of consumption of fast foods and soft drinks varies according to the socioeconomic gradient in each particular country. Thus, as the income of the population increased, also increases the consumption of fast food and soft drinks in developing countries; but, on the contrary, in developed countries, the poorest present a greater consumption of this type of products. For example, in Canada, children who belonged to a lower socioeconomic level were more likely to consume soft drinks compared to those who were from the higher socioeconomic status [26].

### Relevance in public health

As the economy of developing countries improves, individuals will adopt unhealthy behaviours belonging to developed countries, including their lifestyles and eating habits, many of which lead to problems of excess of weight [27,28]. This study reports that children from higher socioeconomic status tend to consume more fast food and soft drinks. Fast foods and soft drinks may have deleterious effect due to the additional caloric intake provided, which could trigger an excess of weight in children [29]. This process has been previously described by Popkin [10,16] as nutritional transition. As countries are in different stage of this nutritional transition, findings of the association between socioeconomic position, including but not limited to income, socioeconomic status, educational level, assets, etc, and unhealthy diet may vary. This is the main reason why this association needs further scrutiny at the country and regional level. Thus, our results suggest the need to implement interventions aimed at reducing the consumption of fast food and soft drinks. Interventions may have a greater impact if they adopt education strategies [30-33], as well as government policies such as the control of the advertising of these products [34], increase in the tax on soft drinks and fast food [35,36] in this way regulate their consumption and address the problem of obesity and other comorbidities.

### Strengths and limitations

To our knowledge, this is one of the first studies conducted in Peru to assess a potential association between household socioeconomic level and the consumption of fast food and soft drinks. However, this study has also limitations. First, the study design, a cross-sectional study in nature, cannot determine causality but the only association between the variables of interest. Second, some information bias may arise as questions were responded by mothers instead of children. On the other hand, only one question was used to collect information regarding fast food and soft drinks consumption; as a result information bias may arise as a concern. Similarly,

recall bias may be present since the questions were based on the last 30 days before the interview, and moreover, 30 days may not be enough time to detect all the unhealthy food consumption as this can change according to seasons of the year. Finally, the instrument evaluated the consumption of soft drinks and fast food as frequency and not quantity (volume in the case of drinks).

## CONCLUSION

This study evidenced an association between household socioeconomic level and the consumption of soft drinks and fast food: the consumption of these products increased with higher socioeconomic level. These results suggest the need of implementing comprehensive policies that regulate the consumption of these products, which may include food education, the regulation of advertising to children and taxation.

## CONFLICT OF INTEREST

Authors state that there are no conflicts of interest in preparing the manuscript.

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