

## Short Communication

# Preferences of healthy and unhealthy foods among 3 to 4 year old children in Mexico

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**Objective:** To evaluate the preference of healthy and unhealthy foods among pre-school children attending day-care and its association with that of their parents, body mass index and socio-demographic variables. **Methodology:** We asked children and parents to depict their food preferences through 54 pictures of different food items. The association between the preferences and socio-demographic variables was done using the Phi correlation, chi-squared, Fisher's correlation, as well as univariate and multivariable logistic regression. **Results:** Two-hundred and sixty-five parent-child pairs participated in the study. Ice cream, potato chips and lollipops were the foods most preferred by children. On the other hand, quince jelly, coffee and avocado were the least preferred. Overweight and obese children had a higher preference for quince jelly, preserved fruits, and vegetable soup. With univariate logistic regression, children of low-income homes (OR= 2.56,  $p=0.007$ ) and attending public daycare centers (OR= 6.2,  $p=0.0001$ ) preferred less healthy fruits. When the father's education was added in a multivariable model including family income, only children whose fathers had  $\leq 9$  years of education showed a higher preference for less healthy food. When parent's education, family income, and parent's preference for healthy foods were included to the model only children attending public daycares were more likely to prefer healthy foods. **Conclusion:** The foods most preferred by children have a high caloric density. The children's body mass index, their parent's monthly income, the father's education and the type of daycare they attended were associated with the preference of healthy or unhealthy foods.

**Key Words:** food preferences, preschool children, over-weight, obesity, Mexico

## INTRODUCTION

Obesity has increased in an alarming manner and it has turned into a worldwide public health problem. In Mexico, an overweight prevalence of 11% has been reported and obesity among 0-2 year old children was 8%.<sup>1</sup> Childhood obesity impacts the overall health of children, increases the risk of metabolic diseases in teens and adults and is associated with pediatric hypertension and to the high concentration of lipids and insulin among children between the ages of 6 and 13 years of age.<sup>2-4</sup>

The preferences and consumption of foods high in fat and sugars develop during the first years of life and could be the biggest contributors to overweight and obesity.<sup>5-7</sup> Feeding is a central part of the learning process where the interactions between parents and children play a fundamental role, which in turn contributes to the formation of children's eating habits.<sup>8</sup> Usually, parents select the method and type of foods consumed by children depending on cultural patterns, food availability and levels of income.<sup>9,10</sup> Unusan (2005) observed that there exists a positive correlation between childhood nutrition and food preferences during the college years.<sup>11</sup> Different studies have evaluated food preferences among children,<sup>12-18</sup> and the foods selected were high in energy, rich in fats and sugars. Colapinto *et al*, have reported that the portion size

of foods served by children was bigger when they selected foods high in energy (potato chips, meats, snacks) than when they selected vegetables.<sup>17</sup> Some authors have indicated that children of families with overweight or obesity problems prefer foods high in fat, seldom select vegetables and prefer sedentary activities.<sup>19</sup> In Mexico, 10 year old elementary school children show a preference for whole-milk, candies, yogurt, cakes, potato chips and sugary cereals. These preferences are consistent with the preferences observed in the parents, who selected foods rich in carbohydrates.<sup>18</sup> A recent study showed that Mexican children are introduced to the consumption of soft drinks and snacks by the time they reach 6 months of age and that between 12 and 24 months of age, 60% of infants consume these foods at least once a week.<sup>1</sup>

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Nevertheless, we have not found any studies that can determine food preferences and dislikes among pre-school age children.

The objective of this study was to evaluate the healthy and unhealthy food preferences among children between 3 and 4 years of age attending a daycare center in Ensenada, Mexico; and determines the association between the parent's preferences, body mass index (BMI) and socio-demographic variables.

## Methods

### Settings

Ensenada is located in the Baja California peninsula, 140 km from the US-Mexico border. Its population is 550,000 residents and 45% of its economically active or working population is affiliated with the Mexican Institute of Social Security (IMSS).<sup>20</sup> IMSS Ensenada provides 10 daycare centers for working mothers (this information was provided by IMSS, 2010). Ensenada has 26 private daycare centers (this information was obtained from the telephonic list, 2010). Minimum wage in Ensenada is 120.00 dollars per month.<sup>21</sup>

### Subjects

This study was conducted from June to September of 2009 in nine daycare centers subsidized by the IMSS and eight private daycare centers. Participants consisted of parent-child pairs, where the child was between 3 and 4 years of age, who agreed to participate in the study. The project was approved by the ethics committee of the nutrition academic body at UABC. All parents signed a consent form.

### Instruments and data collection

Parents were given a questionnaire that included socio-demographic variables. To determine food preferences (FP), we obtained a list of 54 foods of everyday consumption by children and also those of foods advertised in TV geared towards children.<sup>24</sup> The photographs of 54 real foods were created and presented to the children to evaluate their preferences (CFP). The food was classified in the following food groups: fruits, vegetables, dairy, meats, cereals, and other foods (sweetened drinks, fried foods, candies, lollipops, mayonnaise, ketchup and jello). The child saw each picture and was asked the following questions: What food is this? Do you like this food? Applying the entire questionnaire took approximately 15 minutes. The parent's food preference (PFP) and their perception about their children's food preference (PPCFP) were obtained from the same list of foods. We asked the parents to identify the foods that they and the children preferred.

A test re-test of the questionnaires was performed within a 7 days period. The average correlations were as follows: CFP 0.68 (0.26-0.87), PPCFP 0.83 (0.54-0.99) and PFP 0.84 (0.52-0.99).

The least healthy foods were considered (LHF): quince jelly, preserved fruit, French fries, *petit suisse* cheese, custard, fermented dairy products, ice cream, chocolate milk, sweetened cereals, sweet breads, chocolate cakes, cookies, fried tortilla, pizza, chicken nuggets, hamburgers, hot-dogs, sweetened drinks, coffee with sugar, carbonated sweetened drinks, jello, lollipops, chocolate, mayonnaise

and ketchup. Considered to be healthy foods were (HF): apple, orange, pear, banana, watermelon, grape, avocado, broccoli, vegetable salad, cucumber, vegetable soup, tomato, carrot, regular milk, fresh cheese, tuna, chicken, egg, white bread (bread roll), unsweetened cereal, soup and corn tortilla.

### Anthropometry

Children were weighed, without shoes and wearing light clothes, with the use of an electronic scale brand Tanita (model Scale Plus Body Fat Monitor UM028, Tokyo, Japan) with a capacity of up to 150 kg and a 0.1 kg precision. Children were measured using a portable stadiometer brand SECA (model 214, Hamburg, Germany), with precision of 1 mm. BMI was calculated and compared by age and gender of each child with the corresponding tables of the WHO-2006.<sup>25</sup>

The scores and percentiles of each child were calculated using the parameters provided by the WHO (2006). The parents' BMI categories were established according to the following breakpoints: BMI equal to 18.5-24.9 kg/m<sup>2</sup> as normal weight, greater than or equal to 25 kg/m<sup>2</sup> as overweight, greater than or equal to 30 kg/m<sup>2</sup> as obesity.

### Statistic analysis

We used SPSS version 16.0. We calculated the percentages of food preferences, monthly income, the average ages of both parents and children and the parents' education, and we also determined the BMI classification of parents and children. The phi correlation was conducted between the food preferences (CFP, PFP and PPCFP). The associations between food preferences and the mother's education, the father's education, family income and BMI categories of both parents and children were observed using the chi-square test and the Fisher exact correction for 2x2 tables. The univariate logistic regression test was used to estimate the risk of preferring certain foods based on the factors of overweight or obesity, the daycare attended, the monthly family income, and the parent's education. Multivariable logistic model, using as covariates: demographics variables, children and parent's obesity, and parent's food preferences were used to analyze healthy and unhealthy food preferences.

## RESULTS

### Subjects and settings

The food preferences of 265 mother/father-son/daughter (PC) pairs were obtained, of which 56 were eliminated due to a lack of data or insufficient information. One hundred and three PC pairs were from public daycares and 106 from private ones.

### Demographic characteristics

The children's average age was 44±8 (30-61) months and 50.7% were female. The parents' average age was 30±6 (18-58) years and 90.4% were female. From the adults who answered the survey, 86% were mothers, 9% were fathers and the rest were other relatives such as aunts/uncles or grandparents. The monthly family income was: 36% less than 422 dollars monthly, 30% from 423-841 dollars and 22% more than 842 dollars; 12% did not an-

swer. The average education of the adults was  $13\pm 4$  years. Parents who enrolled their children in private schools had a higher level of education ( $p=0.02$ ).

#### Prevalence of overweight and obesity

According to the criteria set by the WHO, the average z-score of BMI in preschoolers was  $0.97\pm 1.12$ . Twenty-six percent of children were at risk of being overweight, 8% were overweight and 7% obesity. Children enrolled in public daycares had a higher risk of being overweight (z score of BMI  $>1$ ) ( $p=0.025$ ). Among adults, the average BMI was  $27\pm 5$  kg/m<sup>2</sup>. Sixty percent of the adults were either overweight or obesity (BMI higher than 24.99).

#### Children and parent food preferences, and parent perception of children food preferences

CFP and PFP were not consistent. Only moderate but significant correlations ( $\phi$ ) were observed for the CFP-PFP of steak ( $r=0.16$ ,  $p=0.02$ ), pizza ( $r=0.13$ ,  $p=0.05$ ) and mayonnaise ( $r=0.13$ ,  $p=0.05$ ). In contrast to the children, the parent's preferred foods were grapes, sweet bread and fried tortilla (98.6%). The least preferred foods were sweetened drinks (46.9%), quince jelly (65.6%) and fermented dairy product (68.4) (Table 1). It was observed that 26 (48%) foods presented a correlation between the PPCFP and CFP, and 36 (67%) foods preferred by the parents were associated with the parents' perception about their children's preferences (Table 2). Ice cream was the only food item that was perceived by the parents as preferred by all children and all children also stated to prefer it.

#### Food preference by weight status

Overweight children (z score BMI  $>2$ ) showed a greater preference for quince jelly (odds ratio, OR=2.2, 95% CI: 1.2-4.2,  $p=0.016$ ), preserved fruit (OR=2.3, 95% CI: 1.1-4.8,  $p=0.034$ ), and vegetable soup (OR=2.64, 95% CI: 1.09-6.4,  $p=0.03$ ). Overweight children had parents who preferred custards (69%,  $p=0.04$ ), sweetened and carbonated soft drinks (70%,  $p=0.01$ ), milk (68%,  $p=0.01$ ) and eggs (68%,  $p=0.009$ ).

It was observed that obesity parents had 2.7 (1.04-7.4,  $p=0.04$ ) times more risk of preferring LHF. With regard to gender in general, there were no differences in the FP, but girls had a greater preference for salads ( $p=0.04$ ). Also, no differences were found with regard to the FP among the gender of parents. There were no differences observed in the PFP based on monthly income. Nevertheless, hamburgers were preferred the most by parents (97%) who received more than four times the minimum wages per month compared to those who received less than two times the minimum wages per month ( $p=0.01$ ).

#### Food preferences by socio-demographic status

Sixty-nine percent of the children from families earning less than twice the minimum wages per month preferred fruit options that were less healthy, such as quince jelly, preserved fruit and fruit juice, in comparison to 46% of children from families earning more than four times the minimum wages per month (OR= 2.56, 95% IC, 1.3-5.03,  $p=0.007$ ). Children from low income families preferred more LHF (OR= 2.31, 95% IC, 1.12-4.76,  $p=0.023$ ). In relation to the father's or mother's education, fathers with

**Table 1.** Children's food preferences and parents' perception about their children's preferences.

FOOD	CFP <sup>†</sup> %	PPCFP <sup>‡</sup> %	FOOD	CFP %	PPCFP %
Ice cream	100	93	Watermelon	91	86
French fries	100	94	Sweet bread	91	95
Lollypop	100	94	Drinkable yogurt	90	96
Petit suisse cheese	99	99	Cucumber	90	83
Chocolate milk	99	91	Marie biscuits	89	97
Chocolate	98	94	Chicken nuggets	89	85
Orange Juice	97	96	Custard	89	81
Egg	97	95	Pear	88	91
Ham	97	96	Carrot	88	85
Hot-dog	97	95	Fried tortilla	87	89
Soup	96	98	Mayonnaise	86	79
Tortilla	96	94	Mozzarella cheese	85	74
Banana	96	93	Unsweetened cereals	84	60
Sweetened drinks	96	75	Fresh cheese	83	82
Jello	96	95	Sweetened cereals	82	95
Pizza	96	90	Vegetable soup	80	87
Orange	96	96	Broccoli	79	72
Milk	96	96	Chocolate cakes	78	82
Chicken	95	97	Tomato	76	68
Carbonated or sweetened drink	95	84	Mashed potatoes	76	83
Bread roll	94	91	Salad	75	73
Yakult	94	84	Preserved fruit	73	77
Hamburger	94	85	Tuna	70	81
Ketchup	93	88	Avocado	67	57
Apple	93	95	Coffee	61	37
Steak	92	90	Quince jelly	55	45
Grape	91	90			

<sup>†</sup>children's food preferences, <sup>‡</sup>parents' perceptions of their children's food preferences

**Table 2.** Correlations between the PPCFP and CFP, and between PFP and PPCFP

Food	PPCFP-CFP	PFP-PPCFP
	r	r
Ketchup	0.45***	0.24***
<i>Petit suisse</i> cheese	0.40***	0.27
Watermelon	0.36***	0.29***
Carrot	0.32***	0.09
Hot-dog	0.31***	0.13*
Tomato	0.29***	0.03
Mayonnaise	0.29***	0.18***
Grape	0.25***	-0.04
Pizza	0.25***	0.30***
Banana	0.25**	0.04
Coffee	0.24**	0.21***
Pear	0.23**	0.28***
Avocado	0.23**	0.12*
Yakult	0.23**	0.34***
Hamburger	0.23**	0.30***
Chocolate	0.23**	0.27***
Broccoli	0.20***	0.09
Apple	0.19**	0.21*
Orange	0.19*	0.13*
Tuna	0.19*	0.04
Quince jelly	0.18*	0.41***
Marie biscuit	0.17*	0.27***
Cucumber	0.14*	0.15*
Mozzarella cheese	0.14*	0.44***
Mashed potatoes	0.13*	0.20*
Carbonated sweetened drinks	0.13*	0.39***
Fried tortilla	0.04	0.59**
Custard	0.13	0.48***
Preserved fruit	0.10	0.46***
Chicken nuggets	-0.03	0.43***
Chocolate cakes	0.05	0.41***
Sweetened drinks	0.09	0.41***
Unsweetened cereals	0.04	0.38***
Soup	-0.03	0.37***
French fries	-0.02	0.36***
Lollypop	-0.02	0.35***
Ice cream	??	0.30***
Ham	0.10	0.29***
Bread rolls	0.02	0.29***
Chocolate milk	0.04	0.28***
Sweetened cereals	-0.04	0.28***
Jello	0.06	0.25***
Steak	0.02	0.23**

PPCFP: parent's perception of their children's food preferences, CFP: children's food preferences, PFP: parents' food preferences. R:PHI correlation \* $p < 0.05$ , \*\* $p < 0.001$ , \*\*\* $p < 0.0001$ .

$\leq 9$  years of education were 2.92 times (95% CI: 1.3-6.5),  $p = 0.008$ ) more at risk of preferring LHF than the parents who had more schooling. The multivariable model with the father's education and family income as covariates showed that children of parents with less ( $\leq 9$ ) years of education were more likely (OR=3.7; 95% I: 1.3-10.7,  $p = 0.015$ ) to preferred LHF than of parents with more schooling years.

Mothers with less than nine years of education had a lesser preference for salads ( $p = 0.024$ ), tomato ( $p = 0.02$ ), unsweetened cereal ( $p = 0.05$ ), pasta soup ( $p = 0.02$ ), ice cream ( $p = 0.04$ ), fermented dairy predicts ( $p = 0.04$ ), pizza ( $p = 0.05$ ) and jello dessert ( $p = 0.05$ ), compared to mothers with more schooling. Children whose mothers had less

than 9 years of education showed a higher preference for dairy products (OR=1.43-7.39,  $p = 0.005$ ).

Children who went to public daycares were more likely to prefer fruit prepared in less healthy ways (quince jelly, preserved fruit, fruit juice) (OR: 6.2; 95% CI: 3.4-11.4,  $p = 0.0001$ ), and the interaction of children with other low income families resulted in a higher likelihood for preferring less healthy fruits (OR: 8.5; 95% CI: 3.6-19.8,  $p = 0.0001$ ). These children attending public daycares were also more likely to prefer LHF (OR: 2.6; 95% CI: 1.4-4.8,  $p = 0.002$ ), than children who went to private daycares. When the father's education was added to the model, only children whose fathers had had  $\leq 9$  years of education showed a higher preference for LHF (OR: 2.4; 95% CI: 1.16-4.97,  $p = 0.02$ ). Nevertheless, children attending public daycare were more likely to prefer tuna (OR: 6.2; 95% CI: 3.4-11.4,  $p = 0.0001$ ). When the HF were grouped, children who went to public daycares were more likely (OR: 3.6; 95% IC: 1.80-6.98,  $p = 0.0001$ ) to preferred HF when compared to children who went to private daycares. When parent's education, family income, and parent's preference for HF were included to the model, only children attending public daycares were more likely to prefer HF.

## DISCUSSION

Food Preferences: Ice cream was the food most preferred by all interviewed children, followed by lollypops, French fries, *petit suisse* cheese, chocolate milk, chocolate and orange juice, all of which are foods energy dense and rich in carbohydrates. Eleven foods that received the least selection were: vegetable soup, broccoli, chocolate cakes, tomato, mashed potatoes, vegetable salad, preserved fruits, tuna, avocado, coffee and quince jelly. These results are similar to those observed by Wardle *et al* (2001),<sup>13</sup> and by Cooke *et al* (2005),<sup>26</sup> in England. On the other hand, Skinner *et al* (1998), in the US, observed that although the foods selected more often were energy dense, foods selected the least were rich in simple sugars, like maple syrup, chocolate cake and chocolate pudding.<sup>27</sup> Other studies conducted in European countries and the US observed, as in our results, that foods high in fat were the most preferred, while vegetables were the least.<sup>28</sup>

According to the PPCFP, foods with the highest selection were not consistent with CFPs. The high correlation of 36 food items between PPCFP and PFP (Table 2) indicates that PFP might influence the development of children preferences by buying and offering certain foods and drinks. Additionally, parents believe their children like foods that have a better nutritional value, and they reported to provide healthier foods; these results indicate that a window is open to re-enforce these habits in nutrition education programs. The least preferred foods according to PPCFP were vegetable salad, broccoli, tomato, unsweetened cereals, avocado, quince jelly and coffee, which matched with CP. These results are consistent with those observed by Cooke *et al*<sup>16</sup> but not with those found by Skinner *et al*.<sup>27</sup>

## Parents' and children's preferences

A correlation was observed between PPCFP and CFP for a majority of the foods (53%) with an ascending order for

fruits, vegetables, other foods, dairy and cereals. This suggests that parents can identify most of the foods their children prefer in the groups for fruits, vegetables, meats, dairy and other foods, but they ignore their children's preferences in the cereal groups. Also, correlations were observed between CFP and PFP for most foods. This could indicate that parent's preferences have a strong influence on CFP, either by the effect of parents' role modeling or by the availability of food they have at home. Thus PFP might have a beneficial or deleterious effect on the development of healthy food habits. The results are similar to those observed by Skinner I, (1998 and 2002), who described, through parent interviews, that family has a great influence over children's food preferences,<sup>14,27</sup> even though they may not be consistent with the answers given by children. These studies are relevant to establish prevention and evaluation strategies among pre-schoolers.

### BMI and food preferences

Overweight children demonstrated a bigger preference for quince jelly and preserved fruit, while overweight parents also showed a preference for unhealthy foods. Those results are consistent with those observed by Mela *et al*,<sup>30</sup> and with the reported by Wardle *et al*<sup>13</sup> In the latter, it was observed that parents have a higher preference for fat rich foods.<sup>19</sup> However, Hill *et al*, in a longitudinal study aimed at children between the ages of 7 and 9 years, did not identify BMI as an indicator of higher preference for foods rich in sugar and fat, fruits and vegetables.<sup>31</sup> The differences in food preferences reported in our study might be the results of different factors, including the age group, the type of design, location, and socioeconomic status. This is also relevant when considering strategies aimed at the nutrition of children with overweight and obesity parents.

No differences were observed in the preferences according to gender. These results are similar to those observed by Cooke *et al*, among pre-schoolers.<sup>26</sup> However, among older children, Hill *et al* found that boys had a higher inclination for foods rich in fat and sugars than girls,<sup>31</sup> and Caine-Bish and Scheule observed that, among elementary school children, tacos, fish and stews, and meats were preferred by boys, while girls preferred cereals and candies, fruits and vegetables.<sup>23</sup>

According to monthly income, no significant differences were found with regard to the adult's food preferences. Nevertheless, the parents with the highest income preferred hamburgers. In Mexico, hamburgers and other fast-food items from a franchise are, on average, products available at a price higher than the daily minimum wage; therefore, the result might be associated with the low accessibility to these products among people with low incomes. On the other hand, with a lower monthly income more children preferred LH fruits, and the children attending public daycares were six times more likely to prefer them. However, when parent's education, family income, and parent's preference for HF were included to a multivariable model only children attending public daycares were more likely to prefer HF. Consistently, vegetables and yogurt are foods included in public menus, and they are also preferred by children from low-income families. This means that the menus designed at daycares

might play a very important role in the formation of pre-schoolers' eating habits, and also suggests a need for healthier menu designs along with rigorous monitoring. Other authors have signaled the importance of nutrition in daycares for the development of healthier food habits.<sup>32</sup>

Generally, LHF are preferred more by low-income families and less educated fathers. These results do not match those found by Lopez-Alvarenga *et al*, (2007), in a study aimed at private and elementary school children in Mexico City, who did not find differences between socio-economic groups.<sup>18</sup> However, that study was performed among children of different ages, generally more independent from their parents.

Among the strengths of this study are the facts that it was conducted in a Mexican City geographically close to and with strong economic and cultural interrelations with the US, pre-school populations of private and public schools were interviewed, the questionnaire used had a high reproducibility, we used a large variety of everyday foods consumed by Mexican pre-schoolers, we evaluated both parent and child preference, and we analyzed foods individually and in groups. Limitations to the study consist of a lack of national representation, the transversal design, the lack of validity for the preferences through objective methods and the exclusive evaluation of children attending daycare.

We conclude that the children evaluated had a high risk for overweight and obesity, a higher preference for foods high in sugars and fat and for energy dense foods, with a lesser preference for vegetables. Children with a BMI z-score higher than 2 and a low family income showed a higher preference for fruits in the LHF category. Parents with obesity and low levels of education and income showed a higher preference for LHF. These results might be used to establish prevention and evaluation strategies among pre-schoolers in Mexico.

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### AUTHOR DISCLOSURES

No conflict of interest.

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## Short Communication

## Preferences of healthy and unhealthy foods among 3 to 4 year old children in Mexico

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### 墨西哥 3 至 4 歲小孩喜愛的健康及不健康食物

目的：評估日間照護的學齡前兒童喜愛的健康及不健康食物，以及這與他們的父母、身體質量指數及社會人口學變項之相關性。方法：透過 54 張不同食物項目的圖片，詢問兒童及父母親的食物喜好。這些喜好與社會人口學變項的相關性以 Phi 相關、卡方檢定、費雪氏相關以及單變項和多變項邏輯斯迴歸分析。結果：265 對父母親與兒童參與這個研究。冰淇淋、洋芋片及棒棒糖是兒童最喜愛的食物。相反地，椪棗果凍、咖啡及酪梨是最不受歡迎的食物。體重過重或是肥胖的兒童較喜愛椪棗果凍、蜜餞及蔬菜湯。由單變項邏輯斯迴歸分析，顯示低收入家庭(OR=2.56,  $p=0.007$ )和參加公立托兒所(OR=6.2,  $p=0.0001$ )的兒童喜愛低健康的水果加工品。當父親的教育程度加入包含家戶收入的多變項模式中，只有父親受教育少於 9 年的兒童，顯示較喜愛低健康食物。當父母親教育程度、家戶收入及父母親喜愛健康食物一起放入模式中，只有加入公立托兒所的兒童較可能傾向健康食物。結論：最受兒童喜愛的食物都是較高熱量密度的。兒童的身體質量指數、父母親的月收入、父親的教育程度及日間照護的形式，與他們喜愛健康或不健康食物具有相關性。

**關鍵字：**食物喜好、學齡前兒童、體重過重、肥胖、墨西哥