



Reasons For Why School-Aged Children Eat Each Type of Vegetable



Study of the reasons for the consumption of each type of vegetable within a population of school-aged children

Abstract

Background: Several studies have evaluated the existence of factors that influence the consumption of vegetables in children, such as family environment, daily exposure to one or several vegetables, parents' consumption and consumption pattern and the way in which vegetables are prepared in the household, among others. The objective of this study was to investigate the reasons for consumption associated with each vegetable in school-aged children through a survey designed to be answered by the parents.

Methods: A preliminary study with 162 parents was carried out on the consumption of vegetables in children aged 6 to 12 years. Based on the information obtained, a survey was designed with 14 phrases to investigate the reasons for the low consumption of each type of vegetable among school-aged children, which was answered online by 419 parents.

Results: The results obtained allowed us to categorise the vegetables into 6 groups. *Group A* consisted of tomatoes, corn, pumpkin and carrots as the vegetables that children like to eat most. *Group B* contains the vegetables that are consumed mostly camouflaged in other preparations, such as onions and red peppers. *Group C* contains only cauliflower, which was negatively associated with senses, such as colour, smell and taste. This vegetable was never offered to children by a high percentage of parents. *Group D* consists of green vegetables: zucchini, spinach, chard and peas. Vegetables of this group are added to other foods and the child usually ingests them camouflaged or obliged. *Group E* consists of beetroot, lettuce and broccoli. Beetroot and lettuce were the vegetables parents reported were most often rejected by their children. This rejection, they stated, was due to sensory aspects, such as colour, texture and taste.

Conclusions: The reasons for consumption among school-aged children depend on each type of vegetable and cannot be generalized. The sensory characteristics of the vegetable (mainly colour and flavour) and the habits of consumption in the family environment play a major role in children's acceptance or rejection of vegetables.

Keywords: Vegetables, Consumption, Children

Background

Globalization and new lifestyles have led to major changes in eating patterns, which together with reduced physical activity have led to a significant increase in noncommunicable diseases (NCDs) [1]. NCDs are also known as chronic diseases because they are long lasting and usually evolve slowly. The main NCDs are obesity, cardiovascular diseases, cancer, chronic respiratory diseases and diabetes [2].

One of the main risk factors for NCDs, which is modifiable, is diet [3]. As part of a healthy diet, which should be low in fat, sugars and sodium, WHO suggests consuming at least 400 g of F&V per day [4]. In addition, fruits and vegetables are a rich source of vitamins and minerals, dietary fibre and other beneficial substances, such as phytochemicals, flavonoids and other antioxidants [5]. Numerous investigations have shown the positive effects on the reduction of risk factors for NCDs associated with daily vegetable consumption in the recommended amounts [6, 7]. According to WHO data, an estimated 6.7 million deaths were due to inadequate intake of F&V in 2013 [8]. Worldwide, the 5 portions of fruits and vegetables recommended by

WHO are not achieved [9–11]. The consumption in children and adolescents is also worrisome [12]. Children and adolescents in the United States consume 1 serving of fruit and 1.3 servings of vegetables per day [13]. In Germany, the average consumption of these foods in children between the ages of 3 and 17 years is below the recommended quantity. Only 12.2% of girls and 9.4% of boys consume the recommended 5 servings of fruits and vegetables per day [14]. In the UK, only 9% of children between 11 and 18 years of age are consuming the recommended quantities of fruits and vegetables every day, with vegetable consumption being especially low, with an average of one serving per day [15]. In Uruguay, only 24.4% of children and adolescents consume fruits and vegetables 5 or more times a day [16]. This low consumption of fruits and vegetables is consistent with that observed in the general population of the country in other surveys.

During the first years of a person's life, the consumption of vegetables is very important. Their consumption in adequate amounts has been related to a healthier weight in childhood [17, 18] and in adulthood [19]. Secondly, healthy eating habits acquired during childhood tend to persist into adulthood [20–22].

Previous studies have evaluated the existence of factors that influence the consumption of food and in particular the consumption of vegetables. Some of the factors are knowledge, beliefs, cost, convenience and the sensory characteristics of vegetables [23–30].

In children, besides the factors mentioned, it should be added that their consumption is directly related to the family environment, daily exposure to one or several vegetables, parents' consumption and consumption pattern and the way in which vegetables are prepared in the household, among others [31–35]. And in turn, the experience of trying new foods generates fear due to association with a negative sensory experience, and this could be especially important in the case of vegetables, since many of them have bitter tastes [36].

All the research works carried out to date study the factors linked to the consumption of vegetables by children in a generic way, considering vegetables as a homogeneous group of foods. The innovation in the present work is that each vegetable is studied individually, since the factors associated with consumption can differ between one vegetable and another.

The objective of this study was to go deeper into the reasons for consumption associated with each vegetable in school-aged children, through a survey designed to be answered by the parents.

Methods

Preliminary study

406 online invitations were sent to parents of children aged 6 to 12 years old. A total of 185 parents opened the

survey and 162 complete it. The parents were recruited in eight educational centres in the city of Montevideo and its surroundings by means of an invitation sent to them from the school itself. The study was approved by the Human Beings Ethics Committee of the Facultad de Química, Universidad de la República. Written informed consent was obtained from each parent prior to data collection, and each parent was offered a copy of the consent form. The parents who agreed to participate provided a contact email to which they were sent a link to the survey.

The online questionnaire was developed using [Survey-Monkey.com](https://www.surveymonkey.com). The use of online questionnaires has been tested and found to be useful because of the ability to collect information from geographically distributed respondents, and because of the low cost compared with personal surveys. Another important feature is the convenience of the tool that allows access to the survey at any time [37].

A questionnaire with a list of the 18 most-consumed vegetables in the national market (tomatoes, lettuce, carrots, beetroot, eggplant, zucchini, onions, cucumber, pumpkin, spinach, chard, red peppers, cabbage, broccoli, cauliflower, green beans, peas and corn) was sent to the parents who agreed to participate in the survey [38]. They were asked to indicate their own consumption and their child's consumption of each vegetable on the list by means of a structured scale of 7 points (1 = never, 2 = less than once a month, 3 = once or twice a month, 4 = several times a month, 5 = once or twice a week, 6 = several times a week, 7 = every day). For those vegetables which they replied their children 'never consumed', they were asked, through an open-ended question, to explain the reasons they believed their child did not consume them. At the end, the socioeconomic data of each parent (age, sex, marital status, education level, number of persons in the household, number of children in the household and age of the child) were collected.

Design of the survey on reasons for vegetable consumption

Based on the information obtained in the preliminary study, a survey was designed to investigate the reasons for the low consumption of each type of vegetable among school-aged children (6 to 12 years old), consisting of 14 phrases (Table 1). For the construction of the phrases, no complicated terms or rare words were used. Short words were also used, making the questionnaire accessible.

To study whether the information obtained through the parents was representative of the children, individual face-to-face interviews were previously conducted with 15 families where the survey was applied. The children of the families interviewed were between 7 and 12 years old. In each family, the child and the parent were surveyed independently. The survey was conducted in their

Table 1 Phrases used in the survey to explore the reasons for the consumption of each type of vegetable

Phrase 1	My child usually eats:
Phrase 2	My child only eats camouflaged/disguised in other preparations:
Phrase 3	My child just eats when forced:
Phrase 4	My child used to eat it, but does not eat it now:
Phrase 5	I offered it to my child, but he/she never wanted to try it:
Phrase 6	My child does not eat it because I never offered it to him/her:
Phrase 7	My child does not eat it because he/she does not like its colour/appearance:
Phrase 8	My child does not eat it because he/she does not like its texture:
Phrase 9	My child does not eat it because he/she does not like its smell:
Phrase 10	My child does not eat it because he/she does not like its taste:
Phrase 11	I don't know why my child does not like it:
Phrase 12	At home, we do not eat it because someone in the family does not like it:
Phrase 13	At home, we do not eat it because someone in the family has a health problem:
Phrase 14	At home, we do not eat it because I don't know how to prepare/cook it:

own home, which allowed the creation of an atmosphere of trust. It was requested that the parent who answered the survey was the one who was most present in the child's meal instances (lunch/dinner) and/or the one who prepared the meals for the child. Of the 14 phrases, phrases 6, 11 and 14, were eliminated in the interviews made to children because it was not appropriate to ask them such questions. In the same way, the questionnaire was tested until an adapted final version was approved by the researchers.

Survey on the reasons for the consumption of vegetables

The survey was sent online to the 185 parents to whom the exploratory survey had been sent and also distributed through social networks. The list of contacts included the parents who were invited to the preliminary study and also the staff (officials and teachers) of different faculties of the Universidad de la República. In total, 602 people opened the survey sent. At the beginning of the survey, it was stated that only parents of children between the ages of 6 and 12 years old should answer it and, if they had more than one child, they should answer it for only one of their children. The online questionnaire was developed using [SurveyMonkey.com](https://www.surveymonkey.com) and consisted of the 14 phrases shown in Table 1. For each phrase, the parents received the list of the 18 vegetables used in the preliminary study, with the following cue: "CHECK ALL THE VEGETABLES YOU CONSIDER

THIS PHRASE APPLIES TO". At the end, the socioeconomic data of each parent (age, sex, marital status, education level, number of persons in the household, number of children in the household and age of the child) were collected.

Statistical analysis

Preliminary study

An analysis of variance (ANOVA) was conducted on the parent's consumption and child's consumption data regarding the vegetables, the parent and child and their interaction as variation sources. The Tukey test was used to determine statistically significant ($p \leq 0.05$) differences.

The answers obtained in the preliminary study of the open-ended question about the reasons the child 'never' consumed a certain type of vegetable were analysed qualitatively. According to Bengtsson, 2016 [39] and Erlingsson & Brysiewicz, 2017 [40], the analysis procedure of the raw data from the open-ended question of the surveys were transcribed to form categories or themes is a process of further abstraction of data at each step of the analysis; from the manifest and literal content to latent meanings. Analyses were performed individually by each of the members of the research team and the results generated were discussed further in detail by the research team before the final phrases were finally agreed upon by consensus.

Survey

The Chi square test was performed to determine significant differences ($p \leq 0.05$) in the frequency distribution of socio-demographic variables between the participants of the preliminary study and the survey. The frequency of mention of each vegetable was determined for each of the 14 phrases, counting the number of times each vegetable was selected for each phrase. Cochran's Q test was carried out to identify significant differences among vegetables for each of the phrases [41]. A correspondence analysis (CA) was performed on the frequency table considering chi-square distances. CA can be defined as a variant of principal components analysis, better suited for categorical data and especially contingency and frequency tables [42]. A hierarchical cluster analysis was performed on the answers obtained for each phrase to group the vegetables with similar answers. The formation of clusters was based on Ward's aggregation criterion and Euclidean distances [42].

Statistical analyses were performed using XL-Stat 2017 software (Addinsoft, NY).

Results

Preliminary study

One hundred sixty-two parent complete the survey of the preliminary study. Table 2 shows the socioeconomic

Table 2 Socio-demographic data among respondents

		Preliminary study n = 162	Survey n = 419	p-value According to Chi.square test
Parent's age	Mean	41 ± 6	42 ± 6	0.184
	18–30 years	6%	3%	
	30–45 years	88%	89%	
	over 51 years	6%	8%	
Gender	Male	11%	17%	0.072
	Female	89%	83%	
Marital status	Lives in partnership	80%	83%	0.397
	Lives alone	20%	17%	
Level of education	University professionals	57%	58%	0.827
	Tertiary education unfinished	43%	42%	
Persons in the household	2	5%	9%	0.243
	3–4	69%	68%	
	5 or more	26%	23%	
Children in the household	1	47%	45%	0.664
	2 or more	53%	55%	
Child's age	Mean	9 ± 2	9 ± 2	

data of the parents who participated in the preliminary study. Most of the participants are between 30 and 45 years old and have a partner, which corresponds to the profile of parents with school-aged children.

Table 3 shows the consumption of each type of vegetable of the parents and their children. A significant difference ($p \leq 0.05$) was found in the frequency of consumption of the different vegetables, both in parents and in children. Parent consumption was significantly higher in 17 of the 18 vegetables studied. Corn was the only vegetable where the consumption of parents and children was similar. However, there is a great coincidence between the most and least consumed vegetables by both groups. The age and gender of the children did not significantly influence the consumption of vegetables, for which these results are not presented.

Table 4 shows examples of the answers obtained in the open-ended question about the reasons the child did not consume that particular vegetable. For the vegetable *pumpkin*, there were no answers to the question about the reasons for non-consumption.

Survey

In the face-to-face interviews with the 15 families, in order to test the comprehension of the phrases and verify that the parents' responses were representative of the children, more than 95% agreement was obtained between parents' and children's responses.

The survey was opened by 602 parents, and fully answered by 419 parents (69.6%). Table 1 shows the socio-economic data of the parents who participated in the

survey. These participants were also mostly women, between 30 and 45 years old, in a relationship and with university studies finished. According to the Chi square test, no significant difference ($p > 0.05$) was found between the socioeconomic data of the parents who participated in the preliminary study and those who did it in the survey.

All the phrases except number 13 received responses greater than 10% on at least one of the vegetables. Phrase 13 ("at home we do not eat it because someone in the family has a health problem"), was eliminated from the analysis due to its low number of answers (less than 2%).

The results obtained in the survey are described below. The data in parentheses indicate the percent of respondents that marked that vegetable for a particular phrase. For the group of parents surveyed, their children usually consume tomatoes (70%), carrots (53%), pumpkins (59%) and corn (67%) because they like it. Red peppers (37%), onions (41%), zucchini (25%), carrots (24%), spinach (22%) and chard (16%) are consumed if the children are not aware that they are eating those vegetables. Zucchini and carrots are included in this category, but with a lower contribution (25%).

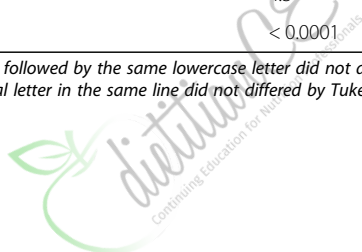
Zucchini (10%) was considered as the only vegetable that the children ate because their parents forced them. There was a very low response rate to this phrase. One might conclude that "obliging" a child to eat a vegetable is frowned upon in today's society, so parents may not have used this phrase much to explain the consumption of some vegetables.

As for those vegetables that their children consumed in the past, but no longer consume, we can find green

Table 3 Average values of the frequency of consumption of each type of vegetable for parent and children

Vegetable	Average parent consumption (7-point scale)	Average child consumption (7-point scale)	p-value
Cauliflower	1.6 ^{a A}	1.4 ^{a,b B}	0.0106
Cucumber	2.2 ^{b A}	1.8 ^{b,c B}	0.0011
Eggplant	2.5 ^{b,c A}	1.7 ^{a,b,c B}	< 0.0001
Green beans	2.5 ^{b,c A}	2.0 ^{c B}	< 0.0001
Broccoli	2.6 ^{b,c,d A}	2.2 ^{c B}	0.0023
Beetroot	2.7 ^{b,c,d A}	2.0 ^{c B}	< 0.0001
Cabbage	2.7 ^{b,c,d A}	2.0 ^{c B}	< 0.0001
Chard	3.1 ^{d,e A}	2.7 ^{d B}	0.0178
Peas	3.5 ^{e,f A}	3.1 ^{d,e B}	0.0035
Spinach	3.6 ^{f,g A}	3.1 ^{d,e B}	0.0004
Zucchini	3.8 ^{f,g,h A}	3.2 ^{d,e,f B}	< 0.0001
Corn	3.9 ^{f,g,h,i A}	3.8 ^{g,h A}	0.2582
Carrot	4.0 ^{g,h,i A}	3.5 ^{e,f,g B}	0.0001
Pumpkin	4.2 ^{h,i,j A}	3.8 ^{g,h,i B}	0.0143
Pepper	4.3 ^{i,j,k A}	3.6 ^{f,g,h B}	< 0.0001
Lettuce	4.6 ^{j,k A}	3.0 ^{d B}	< 0.0001
Onion	4.7 ^{k,l A}	4.1 ^{h,i B}	< 0.0001
Tomatoes	5.1 ^{l A}	4.3 ^{i B}	< 0.0001
p-value	< 0.0001	< 0.0001	

For each column (parent or child consumption), the average followed by the same lowercase letter did not differ by Tukey test at 5% of probability
 For each vegetable, the average followed by the same capital letter in the same line did not differ by Tukey test at 5% of probability

**Table 4** Examples of answers to the open-ended question: Why does your child 'never' eat this vegetable?

Tomato	"because he does not want to try it"
Lettuce	"he says he cannot swallow it", "it has no taste", "because it is green", "he has not developed a taste for it", "because of its colour and texture"
Carrot	"It is not something we usually consume", "I don't often offer it to him because I don't like it", "only camouflaged with pumpkin"
Beetroot	"because of its taste", "because of its strong taste", "the colour makes him reject it", "the family does not eat it"
Eggplant	"we do not usually eat it", "I know only a few preparations that include it", "because it is bitter", "only in 'milanesas'", "its taste is a little spicy"
Zucchini	"he does not accept green vegetables", "he cannot find its taste", "camouflaged, sometimes", "we do not eat it"
Onion	"because of its strong smell", "because of its taste", "only in recipes", "we do not eat it", "if he sees it, he does not eat it"
Cucumber	"because of its appearance", "it is not included in family meals", "we do not eat it", "because of lack of habit"
Spinach	"he does not like green ones", "we do not usually eat it at home"
Chard	"I do not buy it because it produces gas and it's bitter", "we do not usually eat it", "we do not like its taste", "just camouflaged as an ingredient in recipes"
Pepper	"strong taste", "bitterness", "only in recipes", "he eats it by obligation"
Cabbage	"we do not eat it", "very different taste", "someone in the family does not like it", "because it's green"
Broccoli	"it's not included in the diet", "because of its taste", "my daughter used to eat it frequently until she got tired of it", "he does not like it"
Green beans	"because of its taste", "we do not eat it", "because of its appearance", "he has not adapted to it yet", "it is green"
Peas	"I do not buy canned food"
Corn	"because it is sweet", "only in recipes"
Cauliflower	"we do not eat it", "he dislikes its smell and taste", "I do not know how to prepare it", "he does not like its taste or its smell"

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