

Review

# Functional Foods' Consumption in Children and Parents: A Literature Review

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**Abstract:** Among young children, parents are a main factor in children's preferences for food served as they are responsible for purchasing and providing functional foods (FFs) and they are role models for them. This review study was conducted according to PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines and aimed at reviewing the recent data about the consumption of FFs in families as part of a balanced diet. The literature search was conducted via the online academic search engines PubMed, ResearchGate and Google Scholar. The search process was restricted to research papers published in English in reviewed journals from 2012 to 2023. Thirty-six articles were ultimately included in the present review. The findings indicated a relationship between several sociodemographic factors and a higher likelihood of purchasing FFs for children. Higher household annual income, education levels and purchase frequencies among females are all positively correlated with higher levels of nutritional knowledge and confidence in the validity of scientific research on FFs. Also, parents' sociodemographic factors affect the children's fruit/vegetable consumption. This study concludes that parents are role models for their children's eating behavior and eating habits.

**Keywords:** functional foods; parents; children; families; consumption; fruits; vegetables



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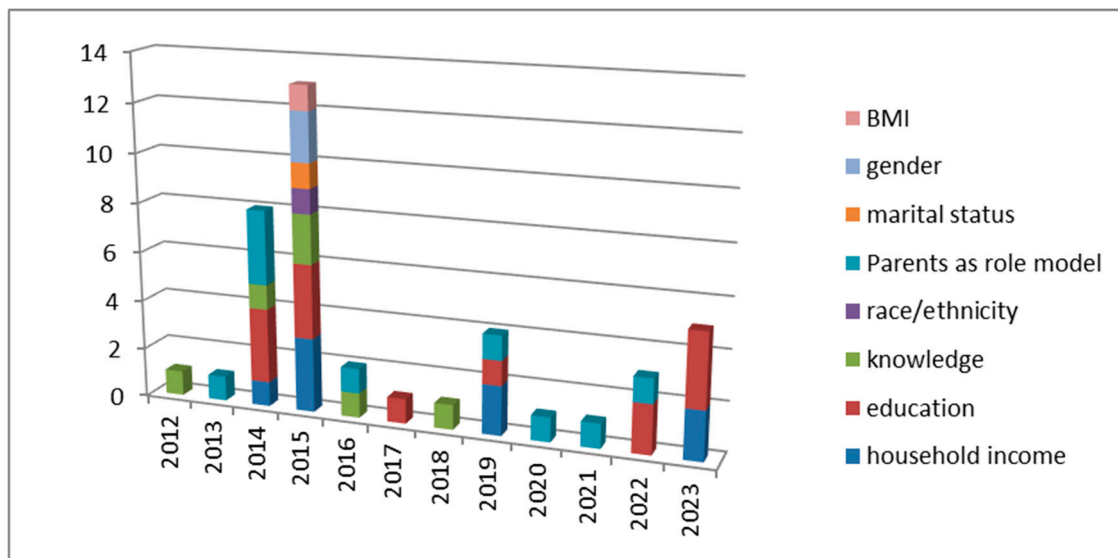
## 1. Introduction

Since ancient times, there has been knowledge of the connection between nutrition and health. The effect of certain foods and dietary patterns in reducing the risk of degenerative and chronic diseases has been the focus of food and nutrition research. In addition, nutrition scientists began to investigate optimal nutrition, which is nutrition that not only provides sufficient nutrients to sustain growth and reproduction but also promotes health and longevity and reduces the risk of various diseases [1,2].

Due to consumers' increased concerns about their health and the belief that nutrition has a direct impact on their health, the consumption of functional foods (FFs) has been more important in promoting beneficial behaviors in recent years [3]. Functional foods are often referred as to "natural health products" or "healthy foods" [4]. Although the term "functional food products" is defined differently all over the world, there is currently no one, officially recognized definition for them [5]. In this review, when we refer to functional foods, we rely on the definitions given by the organizations listed in Table 1 and refer to foods in conventional form and not to pills, capsules or any form of dietary supplements. FFs are essential for preserving a healthy lifestyle and lowering the chance of developing a number of disorders. Preclinical (in vitro and in vivo) and clinical research have produced a wealth of data supporting the hypothesis that consuming functional foods may help avoid chronic illnesses, including neurological, gastrointestinal and urinary tract health, cardiovascular and cancer diseases, anti-inflammatory effects, antibacterial and antiviral activities, help to reduce osteoporosis and have obesity-countering influences [6,7].

There is a plethora of factors that seem to affect an individual's knowledge of FFs and the most important are education, gender and health motivation (Figure 1). The

likelihood of consumers being aware of FFs is higher among those who are highly educated and motivated by their health, whereas the opposite happens when someone has low educational and health status and tends to be less aware of FFs. Increased awareness and knowledge about the benefits of FFs lead to FF purchases [8–10].



**Figure 1.** A graphical summary of the our findings that shows by year the factors that influenced the consumption of functional foods.

**Table 1.** Working definitions of the term functional foods [11,12].

Organization	Definition
Japanese Ministry of Health, Labour and Welfare	“FOSHU [food for specified health uses] refers to foods containing ingredients with functions for health and officially approved to claim its physiological effects on the human body. FOSHU is intended to be consumed for the maintenance/promotion of health or special health uses by people who wish to control health conditions, including blood pressure or blood cholesterol.”
European Commission	“A food that beneficially affects one or more target functions in the body, beyond adequate nutritional effects, in a way that is relevant to either an improved state of health and wellbeing and/or reduction of risk of disease. It is part of a normal food pattern. It is not a pill, a capsule or any form of dietary supplement.”
European Food Safety Authority (EFSA)	“A food, which beneficially affects one or more target functions in the body, beyond adequate nutritional effects, in a way that is relevant to either an improved state of health and wellbeing and/or reduction in risk of disease. A functional food can be a natural food or a food to which a component has been added or removed by technological or biotechnological means, and it must demonstrate their effects in amounts that can normally be expected to be consumed in the diet.”
Academy of Nutrition and Dietetics	“Foods defined as whole foods along with fortified, enriched, or enhanced foods that have a potentially beneficial effect on health when consumed as part of a varied diet on a regular basis at effective levels.”
Food and Drug Administration (FDA)	“The word ‘functional foods’, which is recently being used as a marketing idiom for the group, does not have a legal meaning.”

Several studies have shown that there are gender differences, and these differences appear to be attributable to dietary choices made by women as they are more involved in weight control and place more value on healthy eating than men do [1,3,13–15]. Among other factors, they tend to be more receptive to new foods and more concerned about food safety than men. Most studies have revealed that women (60%) have more knowledge about FFs than men and, therefore, a greater intention to use them. Research by Siro and colleagues concluded that women are the main consumers of FFs in both Europe and the USA [3]. In most families, women still have primary responsibility for feeding children [16].

Parental beliefs, practices, perspectives, attitudes, knowledge and comprehension of the nutritional value and health benefits of food are all significant factors that shape their children's early eating experiences and serve as agents in promoting their health, behavior and education. Specifically, dietary practices and parental knowledge have been identified as key determinants of children's food knowledge. To enhance the quality of children's diets, however, food knowledge might not be sufficient on its own; parental behavior programs might be more successful than conventional nutrition education programs [1,17]. Among young children, parents are a key determinant of children's preferences for food served as they are responsible for purchasing and providing food and they are role models for their children from whom eating behaviors are adopted [18]. Some parental dietary practices are more likely to promote healthy eating patterns in children, while others are more likely to lead to unhealthy or unbalanced diets [19]. For example, dietary habits like family mealtimes emerge as the primary social setting where kids may eat with their parents, who are viewed as their primary role models. Positive effects on children's dietary behaviors have been demonstrated by feeding meals together (parent and child), having breakfast together every day and encouraging children to eat healthy snacks with reasonable limitations [20]. Research has shown that children who are exposed to healthy eating habits and who have restrictions on unhealthy foods tend to eat more fruits and vegetables [21]. The child's family environment has been shown to be the biggest contributor to the development of their eating habits compared to genetic predisposition [22].

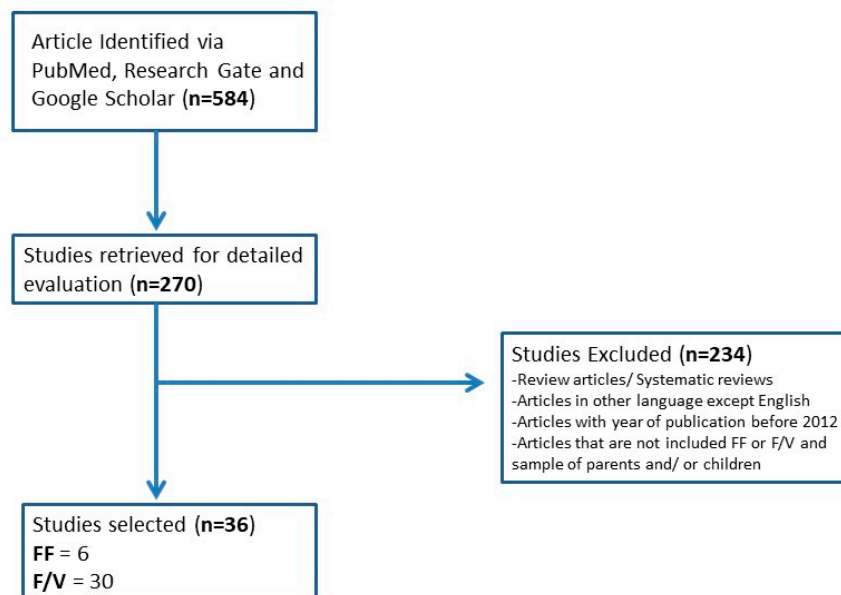
Numerous studies have discovered a positive correlation between gender, higher levels of education and annual family income, as well as better levels of nutritional awareness and trust in the accuracy of scientific findings about FFs. Therefore, the most crucial elements were the parents' income, education and skills [1,23,24]. Internationally, there are a small number of studies dealing with the investigation of parents' and children's knowledge and consumption of FFs. Although there are several studies about eating habits in children, there is not enough scientific data focusing on the consumption of FFs by children and their parents.

The current study's goal was to thoroughly examine parents' and children's FF preferences and consumption and underline the nutritional behaviors of children and parents, the frequency of consumption of FFs and the factors that influence them such as social (educational level, financial situation) and personal (gender, life cycle, family) influences.

## 2. Materials and Methods

The literature search was conducted according to PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines via online academic search engines PubMed, ResearchGate and Google Scholar. The keywords that were used in our search were "functional food" AND "family" OR "functional food" AND "parents" OR "functional food" AND "children" OR "Fruit and Vegetables consumption" AND "children" OR "Fruit and Vegetables consumption" AND "family" OR "Fruit and Vegetables consumption" AND "parents". Figure 2 illustrates the article selection procedure. In total, 270 articles were selected by reading the title and the abstract. The search was limited to research articles that were published in reviewed journals between 2012 and 2023 and that were written in English. Systematic reviews, review articles, articles in another language except English, articles with a year of publication before 2012, articles that did not include FFs or F/V (fruits and vegetables) and a sample of parents and/or children were excluded

(n = 234). Thirty-six articles were ultimately included in the present review. The limited research on functional food consumption in families led to a small number of studies being selected to be included in this study. However, the articles published about F/V and children/parents were many more.



**Figure 2.** Diagram showing the flow of the current review’s article selection procedure.

### 3. Results

#### 3.1. Studies with Children/Parents and FF Consumption

A total of six studies described families’ FF consumption and were published between 2012 and 2023 (Table 2). One study was conducted in Greece, two in Mississippi (USA), one in Australia, one in Italy and the most recent in Malaysia. All of the studies targeted parents and knowledge, preference and consumption of functional foods. The most investigated factors of consuming FFs were nutritional awareness and familiarity with FFs, household income, education, marital status, BMI, gender, self-reported overall health, age of children, preferences of individual family members, parental race/ethnicity and parental role-modeling of FF intake.

Parents are willing to pay reasonable premiums for these products, according to Krystallis and Chrisochou’s 2012 experimental study, which demonstrated that parents perceived functioning as a feature that positively contributed to the image improvement of the (unhealthy) target product. It also revealed that customers’ choice of functional products was mostly determined by their level of prior understanding of functionality. For food with possible functionality, it was more crucial when customers were unaware of it. It was discovered that when parents were informed of FFs, their preferences for each functionality type were stronger and they were prepared to pay higher prices [25].

Rahmawaty et al. conducted a cross-sectional study with the goal of determining the variables that affect the intake of fish and functional foods enriched with omega-3 long-chain polyunsaturated fatty acids (n-3 LC-PUFA). Even though participants in the research were well informed about the health advantages of fish, only 25% of them reported eating fish or seafood at least twice a week, which is recommended for cardiovascular health. Intake of commercially available foods enriched with n-3 was similarly low. Cost was shown to be the main deterrent to eating n-3-enriched foods, but not for canned fish [26].

**Table 2.** Description of the studies with families' FF consumption.

Sources	Year	Country	Method	Sample Size	Main Findings
Krystallis [25]	2012	Athens, Greece	Experimental study	140 parents of 5- to 14-year-old child	<ul style="list-style-type: none"> <li>- The more parents were aware of functional foods, the more they preferred them.</li> <li>- The type of food labeled as a functional food played a role in purchasing it when consumers were unaware of its functionality.</li> </ul>
Rahmawaty [26]	2013	Wollongong, New South Wales, Australia	Cross-sectional study	262 parents who had a child aged 9–13 years	<ul style="list-style-type: none"> <li>- Taste and the preferences of individual family members were the most significant deciding factors for families that eat fish, but not for individuals who do not.</li> <li>- Price was the major barrier to consumption of fresh fish, but not for canned fish and omega-3-enriched foods, in either those who consume these foods or those who do not.</li> </ul>
Deleon [27]	2015	Mississippi, USA.	Descriptive study	191 parents	<ul style="list-style-type: none"> <li>- "Significant relationships in parental age, household income, education, marital status, BMI, gender, self-reported overall health and age of children in the household to including functional foods in their children's diet".</li> <li>- Parental race/ethnicity had the most significant relationship.</li> </ul>
Annunziata [1]	2016	Campania, Italy	Web survey	365 parents of children aged between 1 and 10 years	<ul style="list-style-type: none"> <li>- Parents exhibited great enthusiasm in providing their children with functional nutrition, despite their lack of knowledge about functional foods.</li> <li>- The frequency of buying functional foods targeting children depends not only on parents' sociodemographics but also on their nutritional knowledge, confidence and familiarity with FFs.</li> </ul>
Weiss [8]	2016	Mississippi, U.S.A.	Quantitative analytical cross-sectional study	202 parents	<ul style="list-style-type: none"> <li>- The consumption of functional foods by parents had a greater effect on the consumption of functional foods by children than awareness of functional foods.</li> </ul>
Mohamad [28]	2018	Malaysia	Qualitative Study	44 parents	<ul style="list-style-type: none"> <li>- The ability of the parents to introduce functional weaning foods to their children's diets seems to be well established.</li> <li>- The health benefits of consuming functional weaning foods were recognized by parents, which motivated them to buy them for their infant.</li> </ul>

In descriptive research carried out in 2015, Deleon et al. discovered that parents making USD 100,000 or more gave their children more FFs than parents making between USD 35,000 and USD 50,000 and USD 50,000 and USD 75,000, which is close to or slightly below the median income [27]. In the same year (2015), similar findings to earlier studies were

reported by Annunziata et al., who noted that parents are quite interested in functional nutrition for their children even if they are still not very familiar with these products. They revealed that there is a correlation between several sociodemographics and a higher probability of purchasing FFs for children. Furthermore, they found a significant correlation between female purchase frequencies, greater family yearly incomes, higher levels of education and greater levels of nutritional knowledge and trust in positive scientific evidence regarding FFs [1].

Weiss (2016) demonstrated in a quantitative analytical cross-sectional study that feeding children all functional foods from the six health benefit categories (heart health, weight health, cancer, digestion health, bone health and other health) was associated with parental consumption of functional foods. Bone health was the only health benefit category where child nutrition and parental awareness were connected. The categories of cancer prevention, heart health and other health showed the most positive correlations when it came to the association between parents' eating practices and their children's intake of certain health benefits [8].

The purchase intention of functional weaning foods by Malaysian parents was the subject of a qualitative study that revealed consumers' attitudes towards FFs were mostly influenced by their impression of a health advantage. The parents appeared to have purchased functional weaning foods for their infant according to their perception of the products' potential health benefits. Regardless of whether they were necessary or not, functional weaning foods were healthy for babies, according to half of the parents who planned to buy them. As more parents become conscious of the need to lead healthy lives, they search for products that seem to enhance their children's health. Some of the parents mentioned that they often bought products that support digestive health or brain development since they believed they would aid in their babies' development and growth [28].

### 3.2. Studies with Children/Parents and Fruit/Vegetable Consumption

Due to the fact that fruits and vegetables (F&V or F/V) are natural FFs, we decided to also include in our review surveys with children and parents who consume them.

A total of 30 studies were selected that described children's and parents' F/V consumption, which were published between 2013 and 2023 (Table 3). Three studies were conducted in Greece, six in the USA, two in Canada, one in Italy, one in Australia, seven at the same time in different European countries, one in Thailand, one in Finland, two in Poland, one in Mexico, one in Nepal, two in The Netherlands and two in Portugal. Most of the studies targeted parents and how their F/V consumption was associated with their children's F/V consumption. Some of the studies focused on how parents' income, education and ethnicity affected their children's F&V consumption, while some other researchers checked the children's frequency of F&V intake.

Findings showed that most parents and children were not consuming the recommended amount of fruits and vegetables [29–37]. On the other hand, in Eliason's and Charneca's studies, it appeared that most children, especially the younger age groups, met WHO guidelines for the daily amount of fruit. However, the same was not found for vegetable consumption [38,39].

In addition, there was a higher likelihood that children with similar positive health status markers would have parents with higher Healthy Eating Index scores or who met daily F&V recommendations [31,40–47]. Furthermore, parents with positive health status indicators can teach their children better cooking and food skills. Food skills are the skills that are needed for how to read labels, plan meals, select nutritious foods and prepare healthy meals. The above is confirmed by LeBlanc's research, which found that adolescents who had better cooking and food skills also had healthier eating habits and consumed more F&V [48].

Last but not least, our findings imply that the socioeconomic status (education, work experience and income) of parents is consistently associated with the nutritional status



and F/V consumption of children. In children with low-educated parents compared to their peers, those with higher education levels had a greater daily consumption rate of F&V. Also, children of parents with a high family income had higher odds of consuming more F&V [37,43,49–55]. Nevertheless, in Attorp’s and de Jong’s research, there was nothing similar to the abovementioned studies, as they found that parents’ income and education were not significantly associated with their children’s F&V consumption [56,57].

**Table 3.** Description of the studies with families’ F&V consumption.

Sources	Year	Country	Method	Sample Size	Main Findings
Lazzeri [29]	2013	Italy	Cross-sectional study	3291 students (11-, 13- and 15-years-old)	<ul style="list-style-type: none"> <li>- There was not any correlation between irregular breakfast intake and low frequency of F&amp;V consumption.</li> <li>- There was a significant correlation between infrequent snacking and infrequent fruit eating, but not between infrequent vegetable consumption.</li> </ul>
Lynch [30]	2013	10 countries: Bulgaria, Greece, Germany, Iceland, Finland, Slovenia, Portugal, Norway Sweden and The Netherlands	Cross-sectional survey	8158 children	<ul style="list-style-type: none"> <li>- On average, 53.3% of the children mentioned not eating fruit daily and 44.9% mentioned eating vegetables less than once daily.</li> <li>- Children did not reach the WHO recommendation for F&amp;V intake, with only 23.5% of the whole sample meeting the recommendations.</li> </ul>
Attorp [56]	2014	British Columbia, Canada	Cross-sectional study	773 fifth- and sixth-grade school children and their parents	<ul style="list-style-type: none"> <li>- Parent’s education and income were not significantly associated with child F&amp;V intake.</li> <li>- Race and ethnicity of the parents had the strongest correlation.</li> </ul>
de Jong [57]	2014	Zwolle, The Netherlands	Cross-sectional study	4072 children aged 4–13 years	<ul style="list-style-type: none"> <li>- Children who did not eat vegetables every day were associated with being overweight and having a medium socioeconomic background.</li> </ul>
Draxten [40]	2014	Minneapolis, USA.	Randomized controlled trial	160 parent–child dyads	<ul style="list-style-type: none"> <li>- Parental role-modeling of F&amp;V intake was associated with children who consumed four servings of F&amp;V every day.</li> <li>- Children saw their parents as role models when it came to eating fruit and green salads for dinner.</li> </ul>
Lehto [58]	2014	10 European countries: Greece, Iceland, Finland, Germany, Bulgaria, The Netherlands, Portugal, Norway, Sweden and Slovenia	Cross-sectional study	8159 eleven-year-old children and their parents	<ul style="list-style-type: none"> <li>- Children whose parents had greater education were more likely to eat fruits every day.</li> </ul>

Table 3. Cont.

Sources	Year	Country	Method	Sample Size	Main Findings
Wolnicka [41]	2014	Poland	Cross-sectional study	1255 children (aged 9 years) and their parents.	<ul style="list-style-type: none"> <li>- The children's consumption of F&amp;V was affected by the F&amp;V consumption of their parents.</li> <li>- Only fruit consumption frequency was influenced by parental education.</li> <li>- Parents' knowledge of the recommended consumption was correlated with the frequency of F&amp;V intake by children.</li> </ul>
Jackson [42]	2015	Corvallis, USA	Cross-sectional study	102 children and their parents	<ul style="list-style-type: none"> <li>- Children's eating habits and the family-home nutrition environment (FN) showed a favorable correlation between increased F&amp;V consumption and more frequent F&amp;V intake at meal- or snack-times among children.</li> </ul>
Mantziki [43]	2015	EPHE (EPODE for the Promotion of Health Equity) project: 7 European countries (Greece, Portugal, Belgium, France, Bulgaria, Romania, The Netherlands)	Follow up study	1266 children and their families	<ul style="list-style-type: none"> <li>- In comparison to their peers from lower socioeconomic backgrounds, children whose moms had higher levels of education consumed more F&amp;V.</li> <li>- It appeared that parents were aware of the claimed health benefits of functional weaning foods, which encouraged them to buy them for their infant.</li> </ul>
Schoeppe [44]	2015	Australia	Cross-sectional study	173 parent-child dyads	<ul style="list-style-type: none"> <li>- Support for F&amp;V from mothers, but not from fathers, was positively correlated with children's F&amp;V behavior.</li> </ul>
Yannakoulia [45]	2016	Greece	Observational study	25,309 children (3–12 years old) and adolescents (13–18 years old)	<ul style="list-style-type: none"> <li>- The higher the Family Affluence Scale (FAS score), the greater the percentage of children and adolescents who consumed F&amp;V every day.</li> </ul>
Hong [49]	2017	Nakhon Pathom, Thailand	Cross-sectional study	609 students (grades 4–6)	<ul style="list-style-type: none"> <li>- Higher maternal education levels were significantly associated with total F&amp;V intake.</li> </ul>
Coto [31]	2019	Florida, USA	Pilot study	86 parent-child dyads	<ul style="list-style-type: none"> <li>- Most parents (54%) did not reach the recommendations for F&amp;V and were classified as unhealthy role models.</li> <li>- Children who had parents who were viewed as healthy role models were more likely to consume more F&amp;V.</li> </ul>
Groele [50]	2019	Poland	Observational study	1200 Polish mothers of children aged 3–10 years	<ul style="list-style-type: none"> <li>- Children of mothers who had a lower level of education consumed fruits alone as a dish more often than others.</li> <li>- Vegetable intake was greater in children whose mothers had a higher level of education.</li> <li>- Compared to other children, children of low-income mothers consumed fewer vegetables.</li> </ul>



Table 3. Cont.

Sources	Year	Country	Method	Sample Size	Main Findings
Quezada-Sánchez [51]	2019	Mexico	Observational study	1041 children	<ul style="list-style-type: none"> <li>- Maternal education level was shown to be positively correlated with the likelihood of consuming foods high in micronutrient density such as F&amp;V.</li> <li>- The likelihood that a child would eat vegetables was decreased in children whose mothers worked.</li> </ul>
Benetou [32]	2020	Greece	Cross-sectional study	3525 adolescents	<ul style="list-style-type: none"> <li>- More than 60% of the adolescents did not meet the recommendations for daily F&amp;V consumption.</li> </ul>
Eliason [38]	2020	Phoenix, USA	Cross-sectional study	2229 households	<ul style="list-style-type: none"> <li>- Most children met the daily recommended intake of fruit, particularly those in the younger age groups.</li> <li>- The majority of children across all age and gender groups did not eat enough vegetables.</li> </ul>
Etayo [46]	2020	Six European centers (Belgium, Bulgaria, Germany, Greece, Poland and Spain)	Cross-sectional study	6633 preschool children	<ul style="list-style-type: none"> <li>- Parental role had moderate influence on raising fruit consumption to 19.3% of fruit consumption in European preschoolers and 17.8% vegetable consumption in boys and 21.9% vegetable consumption in girls.</li> </ul>
Malisova [33]	2021	Greece	Cross-sectional study	609 school lunch recipients and 736 control subjects	<ul style="list-style-type: none"> <li>- School lunch recipients reported higher fruit consumption.</li> </ul>
Papamichael [34]	2021	6 European countries: Bulgaria, Hungary, Belgium, Finland, Greece and Spain	Cross-sectional study	Dyads between parents (fathers, n = 10,038) and school children (n = 12,041)	<ul style="list-style-type: none"> <li>- There were positive associations between fathers' F&amp;V consumption and the frequency of children's consumption.</li> <li>- 60% of fathers and less than 50% of children consumed F&amp;V 1–2 times/day, which did not reach the current WHO recommendations.</li> </ul>
Pereira [35]	2021	Portugal	Cross-sectional study	678 children from the fifth and sixth grades	<ul style="list-style-type: none"> <li>- The consumption of F&amp;V was less than the suggested daily intake of "five pieces."</li> </ul>
Barrantes [52]	2022	Six countries: Bulgaria, Hungary, Belgium, Finland, Greece and Spain	Cross-sectional analysis	6705 parent–child dyads	<ul style="list-style-type: none"> <li>- Children's increased consumption of F&amp;V was linked to parental education.</li> </ul>
Boelens [53]	2022	The Netherlands	Cross-sectional study	5010 parents of 4- to 12-year-olds	<ul style="list-style-type: none"> <li>- Low/intermediate educated parents were associated with a higher risk of a low vegetable intake.</li> <li>- Low/intermediate parental education was associated with low F&amp;V intake in children.</li> </ul>

Table 3. Cont.

Sources	Year	Country	Method	Sample Size	Main Findings
LeBlanc [48]	2022	Canada	Cross-sectional study	1054 students (467 boys and 570 girls)	<ul style="list-style-type: none"> <li>- Adolescents with stronger culinary and cooking skills reported eating more fruits and vegetables and adopting healthier eating habits.</li> <li>- More F&amp;V consumption and healthier eating habits were linked to food and cooking skills in both boys and girls.</li> </ul>
Linde [47]	2022	Minneapolis, USA.	Randomized controlled trial	114 children (7–10 years old) and their parents	<ul style="list-style-type: none"> <li>- Children seeing their parents often eating fruit was linked to higher Healthy Eating Index total scores.</li> </ul>
Charneca [39]	2023	Portugal	Cohort study	89 parents/caregivers of one 2- to 6-year-old child	<ul style="list-style-type: none"> <li>- Fruit consumption was higher than vegetable consumption.</li> </ul>
Hamner [36]	2023	USA	Cross-sectional study	18,386 children (1–5 years)	<ul style="list-style-type: none"> <li>- Over 50% of youngsters in 20 US states reported not eating a vegetable every day.</li> <li>- About half (49.1%) and about one third (32.1%) of children aged 1–5 did not consume vegetables or fruit daily.</li> </ul>
Serasinghe [54]	2023	Finland	Cross-sectional study	574 children and their parents	<ul style="list-style-type: none"> <li>- A higher parental education level was positively correlated with the amount of fruit and vegetables that children eat.</li> </ul>
Shrestha [37]	2023	Pokhara, Nepal	Cross-sectional study	352 children	<ul style="list-style-type: none"> <li>- The WHO recommends <math>\geq</math> five servings of fruits and vegetables per day, which none of the kids consumed.</li> <li>- Adequate F&amp;V consumption was considerably higher in children whose parents had a bachelor's degree or above and whose household income exceeded NPR 40,000.</li> </ul>
Siopis [55]	2023	Six European countries: Belgium, Bulgaria, Finland, Greece, Hungary and Spain	Cross-sectional analysis	9576 children-parents pairs	<ul style="list-style-type: none"> <li>- When parents had higher education, families consumed more portions of F&amp;V.</li> <li>- When mothers were fully or partially employed, families consumed more portions of F&amp;V.</li> </ul>
Metoyer [59]	2023	USA (Houston, Austin, Dallas, Washington D.C., New York City and Southwest Florida)	Secondary analysis of cross-sectional baseline data	6074 Hispanic/Latino and African American parent-child dyads	<ul style="list-style-type: none"> <li>- African American children had a significantly higher frequency of FV intake than Hispanic/Latino children</li> <li>- The relationship between home nutrition environment and child FV intake varied by race and ethnicity.</li> </ul>

#### 4. Discussion

In recent years, an increasing number of functional products that target specifically younger consumers has been observed; they are easily accessible in marketplaces and provide health benefits to children and at the same time the possibility of decreasing the risk of diseases. Furthermore, the food and beverage market that specifically targets children is growing at a fast pace. In 2014, it was observed that healthy food and drinks

for children were included in the top 10 FF trends. It is widely accepted that children themselves play a significant role in decision-making about food purchases. On the other hand, parents prefer nutritious food for meals and snacks that can actually be beneficial and rich in nutrients for their child's diet but simultaneously can satisfy their child's hunger. Functional foods may also include improved choices over traditional ones and, in this way, they can support parents' choices as well as children's health. Nevertheless, they cannot replace healthy eating. Simultaneously, recent studies have shown an increase in parents' interest and efforts to add more dietary fiber, probiotics/prebiotics and fish oil/omega-3 into their preteen children's diet [1]. In a study conducted by Rahmawaty et al. in 2013, there was a positive association between young children's parents who believed that foods could be beneficial for health and additionally that foods rich in omega-3 fatty acids were beneficial for their children's health. It was also noticed that the family members of the parents who were conscious of the health benefits had a tendency to consume more fish products [26]. Having this in mind, parents who were aware of calcium's health benefits tended to use more calcium-rich foods in an effort to better and strengthen their children's health [60].

Supporting research correlates parents' healthy eating habits with their child's food intake. The amount of F/V that children consume is positively associated with their parents' serving of F/V at home. Additionally, in an environment where vegetables are served, about 90% of the children consume vegetables, while in families where vegetables are absent from the table, only 50% of the children consume vegetables. Further research has demonstrated that the consumption of fruit by children and the nutrition knowledge of their mothers are positively correlated. Research has shown that parents who care more about nutrition concerns also tend to be more interested in learning about nutrition and, as a result, have a greater level of knowledge than parents who are not concerned with nutrition-related issues [8].

In contrast to parents with lower levels of education, those with higher levels appear to be more health-conscious and follow healthier eating habits. This is probably due to knowledge of the correlation between health, healthy diet, wellbeing and chronic diseases. In addition, parents who have graduated college have an increased Healthy Eating Index (HEI) score in terms of consumption of fruit, vegetables and wholegrain products, in comparison with parents with lower education levels. Several studies have revealed a strong correlation between children's high consumption of fruits and vegetables and their parents' high levels of education. Furthermore, children whose parents have attended at least four years of college seem to consume diets higher in calcium, vitamin C and potassium and lower in trans-, saturated- and monounsaturated fats [27]. Birbilis and colleagues found an inverse relationship between parental education levels and high levels of childhood obesity and BMI. The consumption of high-energy foods by children has been found to be negatively correlated with parents' higher education levels. On the other hand, the intake of fruits, vegetables and wholegrains has been positively associated. Furthermore, greater education levels were correlated with a greater socioeconomic position, which has been linked to healthier eating and physical activity habits and, as a result, weight control in families [61].

In Deleon's study, we can observe the positive influence of parents' education levels on their children's bone health when they consume functional foods. Compared to adolescents from higher-educated homes, adolescents from lower-educated families were 67% more likely to eat a lower-quality diet. Also, multiple studies support that better-quality diets are noticed in children with more highly educated parents [27].

In another descriptive study by Deleon, significant relationships were observed between parental age, gender, education, marital status, household income, BMI, self-reported overall health and age of children in the household and the inclusion of functional foods in their children's diet; however, the most notable correlation appeared to be between parental race and ethnicity [57,62]. In comparison to parents who were white or black, parents who

identified as belonging to another race/ethnicity were found to be more likely to feed their kids functional foods [62].

There might be a number of reasons influencing a parent's knowledge of the health advantages of certain dietary ingredients. According to Weiss' study, parents may be more aware of functional foods that are related to bone health because pediatricians, government health agencies and food manufacturers place a high value on children's healthy growth, and because there is a general consensus about the important role that bone health plays in children's development. It was discovered that parents were well aware of the connection between vitamin D and diets high in calcium and bone health. The study's primary finding was that parents who consume FFs themselves are more inclined to feed them to their kids than parents who are only aware of the health advantages of FFs [8].

The criteria influencing the decisions to purchase FFs were differentiated by the factors of gender, age and education. Observing the research analysis, we noticed that mainly older persons, women and consumers with a university education understood the great importance and connection of the naturalness of the product and food safety. In the field of functional components, clear differences between the two genders are apparent. An important determinant in food choices for women was the content of functional components. Age, gender and education essentially differentiate people's preferences for the base product (carrier) [13]. In a similar view, Campbell et al. noticed a relationship between children's consumption of such foods and the mother's awareness of healthy foods. Feeding children salty snacks and soft drinks was found to be inversely correlated with the mother's knowledge [63].

Furthermore, recent research mentions that female consumers are more likely to use FFs as a result of their increased interest in health issues compared to men. Consumer perceptions of FFs have been found to be significantly influenced by education. Another sociodemographic variable of great importance that affects attitudes toward FFs is households with young children. A few studies have shown that parents with children under the age of twelve had a tendency to buy these foods because they say they are "for their child or children" [1]. In addition, Rex and colleagues found that a parent's and their child's nutritional consumption may be influenced by the home's food environment (HFE). The social and physical environments are part of the HFE. The accessibility and availability of food are referred to as the physical HFE. Policies, family meals, feeding/parenting techniques and role-modeling all contribute to the social HFE. Both are connected to the dietary intake of mothers and children [64].

Consumption of fruits and vegetables as well as general eating habits and behaviors are often acquired from infancy and will most likely continue into adulthood. Childhood is a critical period for influencing these behaviors. Home environment is of special significance for a child; parents are in control of the accessibility and availability of foods (physical environment) and at the same time they are responsible for establishing social standards, providing social support and, of course, modeling healthy eating habits during family meals (social environment) [65].

The findings of the present literature review highlight and emphasize the importance of the presence of improving programs and policies that will support FF consumption in families and the significance of a comprehensive nutrition education that targets parents and schools. It is of the utmost importance to develop such a program that promotes marketed functional foods and at the same time educates families on healthy eating, as family is the key influence in shaping healthy or unhealthy behaviors in children. Future intervention programs should involve children in the cooking process and gardening, which may encourage greater consumption of FFs. Running a vegetable farm for educational purposes could possibly improve children's attitudes toward F/V and increase their consumption. An important aid for low-income families would be to provide free nutrition educational programs, supplemental foods, including fruit and vegetables and traditional natural FFs, and to send nutrition educational messages trying to support positive parental role-modeling behaviors.

## 5. Conclusions

This review study concludes that parents are the role models for their children's eating behavior and eating habits. They play the main role as to what their children learn about food intake and influence their future lives and health. As we have observed, there are not enough scientific data focusing on the consumption of FFs by families with children. For this reason, there is a vital need for more studies on FFs in families and children. Finally, it is necessary to have a deeper understanding of the factors that affect parents' willingness to buy and consume FFs, especially for FFs aimed at their children. This could lead to the design of new nutritional education programs with the aim of increasing FFs in families and promoting human health, and wellbeing.

This study has a limitation. We would like to mention that we added more surveys about fruit/vegetables and children/parents because there were not enough studies about FF consumption and families. This choice was based on the fact that F/V belong to natural functional foods.

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