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Children nutrition in the Mediterranean basin: A comparative case study between Spain and Greece

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ABSTRACT

The present study evaluates students' consumption habits for fruits, vegetables and meat, identifying the main factors influencing parents' choices on these products for their children's nutrition. Additionally, it was assessed whether these factors are influenced by their socio-economic profiles. Based on literature review findings and following the Health Belief Model and Theory of Planned Behaviour rationale, a questionnaire was designed and distributed to a total sample of n=329 parents in Greece (n=197) and Spain (n=132). The major finding reveals that, fruit and vegetable consumption is considered as low in both countries, compared with the minimum recommended quantities. More specifically, it appears that only 24% of children in both countries consume fruits on a daily basis, while more than 1/3 of the total sample states that their children consume fruits on a frequency of less than 3 times a week. Their responses about vegetables verify that only 6.5% of children include vegetables in their meals more than 5 times a week, while more than 80% declared that their children eat vegetables less than 3 times a week. The comparison between them showed increased fruit consumption from the Spanish side. Meat consumption exceeds the upper limits of adequate frequencies, with the responses from parents in both countries to indicate that its consumption may in some cases exceeds nutritionists' recommendations. Pork and chicken are more preferable by Greek and Spanish children, which they are consumed at least once a week, verifying previous surveys on the same topic.

Principal Component Analysis (PCA) was used to identify the most significant factors influencing parents' attitudes about the aforementioned food groups they purchase for their children. According to overall sample results, place of origin and the food safety measures taken, are the most crucial factor affecting parents' choices. Degree of convenience and ease-to-consume (in terms of time and money) are forming the second factor. Social pressure from friends and family for the supply of these foods, nutritional value and health benefits, are additional factors influencing parents' choices. Samples from each country have been analysed separately, reaching to the same factors for both countries. However, the order of importance follows a different order, showing that the country of origin of the respondents formulates the order in which factors appear. Socioeconomic characteristics have been assessed too, in order to verify statistically significant differences between different factors. Number of children, parents' educational level, family income and financial support from relatives should be taken into consideration for parents' final decisions. These results can be utilized so as to clarify parents purchasing attitudes, depending on their demographics, and propose a unique marketing plan focusing on supporting the promotion of healthy nutritional habits to the upcoming European citizens.

Keywords: consumer behaviour, children nutrition, principal component analysis

1 Introduction

Children's nutrition is a particularly important issue over time, for a variety of reasons. perhaps the most important issue is the significance of exploring children'schildren'schildren's nutritional habits, due to the size of their population, focusing on fulfilling their needs and desires more effectively. On the other hand, a long-term approach would suggest that the eating habits adopted by children in adolescence are quite likely to be maintained for the rest of their lives (Movassagh, *et al.*, 2017). For this reason, consecutive evaluation of consuming habits of people at a young age is of particular value, as they significantly determine the food choices that they will acquire as adults. As a ripple effect on the above statement, their food preferences will determine the choices of their own children in the future. Another factor verifynig the importance of proper nutrition from early life stages , but at the same time is of particular concern to scientists, is the increasing rates of childhood obesity. According to recent data from the World Health Organization (WHO), the number of obese children and adolescents worldwide has increased tenfold in the last four decades (WHO, 2018), while according to the World Obesity Federation (WOF), the number of obese children worldwide is projected to exceed 200 million (150 million recorded for 2016) (WOF, 2018). Recent findings of 636,933 children (323,648 boys and 313,285 girls) from 21 EU countries revealed that there is a serious problem of childhood obesity, with higher rates being recorded in southern Europe. Indeed, in the majority of countries participating in this survey, 1 in 4 overweight children displays a high obesity degree and the occurrence of this phenomenon is more likely when the mother's level of education was lower (Spinelli *et al*., 2019). In Greece and Spain, 42% of boys aged 6-9 are overweight, with 20% of them being obese. For overweight girls the percentage is around 40%. In Europe, overweight or obese children aged 5 to 19 where about 41 million in 2016 (WHO, 2018).

A survey conducted in Portugal, collected data on the frequency of consumption of fruits, vegetables and meat among 300 preschool children. Meat, fish and eggs were the foodstuffs they were selected mainly, with the following food category to be fruits and vegetables. A notable finding was about the frequency of consumption (2-4 times a week or more) of fresh fruit, reaching the level of 97.2%, while the relative level of consumption for vegetables was 86.2%. However, the frequency of meat consumption for children participated is this survey was considered as high, with chicken being the most desirable (about 2 times a week) at a rate of 73%, while pork and beef consumption rate was about 45% (Lourenço, *et al.*, 2014). Klepp et al., (2005) conducted a study involving nine European countries (parents with children in an average age of 11 year old). This survey found that there was a high availability of fruits and vegetables in children's dietary patterns, however less than 60% of them consume vegetables daily, and less than 50% eat one fruit per day, suggesting that their inadequate consumption was the choice of the children themselves.

The results of a relevant survey on the consumption habits of 167 Spanish students aged 6-9,highlighted that only 5% of girls and 10% of boys consumed sufficient amounts of vegetables. The results of fruit consumption frequency are a little more encouraging, showing that about 34% of students consume sufficient amounts on a daily basis (Garaulet, *et al.* 1998). Out of 835 Greek primary school students who participated in the research of Piperakis, et al. (2007) 81.4% of them stated that they consume fruits on a daily basis, while 71.7% eat vegetables with the same frequency. Poultry and meat are consumed daily by 43.9% of the sample , with the consumption ratio of the other types of meat to be 52.5%. Reduced consumption of fruits and vegetables and excessive consumption of meat seem to be the main factors contributing to weight gain for children. If such consumption habits maintain, there is a serious risk that the majority of these children will become overweight during adulthood, with increased health risk for diabetes and cardiovascular diseases to accompany them (Korinek, *et al.*, 2015).

Children's preferences and antipathies for different foodstuf are being formulated since their first years of life and remain until their adulthood, while numerous factors affecting eating habits of children. The main factors influencing the formation of these habits derive mainly from the family, the friendly environment, society, and the media. For infants and preschoolers, family plays a key role, as parents and older siblings are ''role models'' (Scaglioni et al., 2018). Coto *et al*. (2019) found that in cases where parents consuming the recommended amounts of fruit and vegetables per day, were ten times more likely to have their children with similar consumption habits. On the other hand, parents with very low levels of fruits and vegetables consumption ratio, tend to transfer this behaviour to their children, proving that parents have a large share of responsibility on their childrens' nutrition. Studies have shown that family meals are continously declining, mainly due to the stressful daily schedule of the family, dining takes place in front of the TV, while time devoted to preparing meals is often insufficient. As a result, children eat less vegetables and fruits and drink more soft drinks, than children who dine properly with their families (Hammons & Fiese, 2011).

At the same time, the social environment of peers seems to be particularly influenced by the

consumption of fruit juices, fruits, and vegetables, instead of the consumption of snacks or junk food (van den Broek, *et al.*, 2020). Another study found that preschoolers have begun to prefer and consume certain vegetables that they did not like before, once they have seen their peers eating them (Nekitsing, *et al.*, 2018). Another study concluded that fruit consumption decreases as children get older, but also displays a negative correlation with the monthly family income augmentation (Wambogo, *et al.*, 2020). Furthermore, family income and parents' social status affect the availability of certain foods in the household, as parents choose to buy food having as criterion their cost and price. The results of Pechey & Monsivais research (2016) state that parents' higher occupational social class was significantly associated with higher food expenditures, which in turn were associated with healthier food purchases.

2 The methodological framework of the study

As mentioned above, the issue of childrens' nutrition has unknown aspects and implications, which can significantly determine their eating habits for the rest of their lives. Thus, it is considered of crucial importance to assess the consumption habits of infants in fruits, vegetables and meat, but also to clarify the factors affecting the frequency of consumption. The plethora of previous studies have shown parents' dietary choices greatly influence their children's eating habits. For this reason, the purpose of this research is to examine the parents' perceptions and formulate their consumer profile, so as to outline all the components influencing them, focusing on food choices for their children.

Three main models/theories were applied to conduct this research. Initially, Stimulus-Organism-Response (SOR) Model has been selected in order to define the type and magnitude of involved factors affecting parents final purchasing decisions, under the influence of cultural, social, demographic and psychological characteristics.The second model applied was the Health Belief Model (HBM), which analyzes the likelihood of an individual to take certain actions and adopt behaviours being beneficial to his/her health. Finally, the Theory of Planned Behaviour (TPB) analyzes the factors that influence the individual's intention to adopt and perform a behaviour.

A 4-part questionnaire was created to assess children's eating habits for fruits, vegetables and meat and their consumption frequencies. Questionnaires have been answered by their parents, due to the fact that they are the ones who greatly control and influence their children's nutrition. This methodological approach enables the evaluation of the principal factors influencing their choices and the final products provided to their children, but also verify their beliefs about the aforementioned food groups.

Questionnaires were answered by Greek and Spanish parents through personal interviews, without any involvement from the interviewer's side. Overall, 197 questionnaires were collected from Greek and 132 from Spanish parents during the first quarter of 2020. The 329 completed questionnaires were checked out for their answers' reliability and then the Factor analysis of collected data was applied using statistical software SPSS26 (IBM, 2020). Principal Component Analysis (PCA) assists in outlining and grouping the factors influencing the consumer decision-making process and provides a deeper interpretation of parental consumer behaviour (Abdi & Williams, 2010).

3 Results and Discussion

As shown in Table 1, the vast majority of parents participating in the survey belong to the 33-42 (47.1%) and 43-52 (52.9%) age groups. The sample is balalnced between the two countries, with similar percentages in the respective age groups. Given that the questionnaires were completed mainly outside of schools, where parents were waiting to pick up their children, about 2/3 of them were answered by women. Regarding their marital status, 50% of the families of the sample have 2 children. Concerning the socio-economic characteristics examined, the largest percentage of respondents stated that they receive a satisfactory income and have completed basic or higher education.

Table 1.

Demographic characteristics of the sample

	Total	Greece	Spain
	329	197	132
Average age	43.05	43.2	42.9
23-32	10 (3%)	4 (2%)	6 (4.5%)
33-42	138 (41.9%)	84 (42.6%)	54 (40.9%)
43-52	155 (47.1%)	94 (47.7%)	61 (46.2%)
>52	26 (8%)	15 (7.6%)	11 (8.3%)
Gender			
Male	105	52	53
Female	224	145	79
Educational level			
Primary school	6 (1.8%)	5 (2.6%)	1 (0.8%)
Secondary/High school	100 (30.4%)	71 (36%)	29 (22%)
University graduate	223 (67.8%)	121 (61.4%)	102 (77.2%)
Number of children			
1	103 (30.7%)	61 (31%)	42 (32.5%)
2	166 (50.5%)	99 (50.3%)	67 (50.8%)
3	50 (15.2%)	30 (15.2%)	20 (15.2%)
4	10 (3%)	8 (4.1%)	2 (1.2%)
5	2 (0.6%)	1 (0.5%)	1 (0.5%)
Monthly income			
Low satisfaction	71 (21.6%)	48 (24.4%)	23 (17.4%)
Moderate satisfaction	245 (74.4%)	145 (73.6%)	100 (75.8%)
High satisfaction	13 (4%)	4 (2%)	9 (6.8%)

Regarding the consumption frequency of the examined products, it is realised that only a relatively small percentage (24% of children in the total sample) consume fruits on a daily basis, while the percentage of children (about 34%) who eat fruit less than 3 times a week is quite high. Questions referring to vegetable consumption, indicate that only 1 in 329 children eat vegetables as part of every main meal (lunch, dinner), while 85% of all students have a consumption ratio of less than 3 times a week. A similar pattern was found for the children of the two countries, with the only existing difference to be for fruit consumption, which is more often among Spanish children. Regarding meat consumption, about 2/3 of the respondents (67.17%) stated that their children consume chicken 1-2 times per week, while more than ¾ of the sample, (75.38%) replied that their children eat pork 1-2 times a week. Finally, it is less common to consume beef or sheep and goat meat.

Principal Component Analysis (PCA) has been applied in order to assess the factors influencing parents on their purchasing decisions, related to their children nutritional habits. PCA requires quantitative or scale values and an adequate number of samples. Responses were given on a 1-5 Likert scale, with 1 to refer to absolute disagreement and 5 to strong agreement (Taherdoost, 2020). KMO and Bartlett's sphericity test has been also tested before proceeding to PCA. KMO index is 0.816, so it is considered as excellent for the analysis of the sample (Table 2).

Table 2.
KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		**.816**
Bartlett's Test of Sphericity	Approx. Chi-Square	11371.684
	df	630
	Sig.	.000

PCA's results of the overall sample (n=329) indicate that the first component illustrates parents'concerns about safety and place of origin of the fruits, vegetables and meat provided to their children. Factor loadings express the contribution to the explanation of the variance for every

question. For this reason, values below 0.5 have not been taken uder consideration, while values above 0.7 are considered as more preferable. 6 main components emerged, reaching 56.66% oftotal variation and factor loadings were all either very satisfactory (> 0.700) or quite satisfactory (> 0.500).

Table 3.
Results of Principal Component Analysis (Overall sample)

	Components						
	H^2 (*)	1	2	3	4	5	6
3.8.2 I confident about the **place of origin** of vegetables I feed my children	.873	.887					
3.9.2 I confident about the **safety** of vegetables I feed my children	.855	.882					
3.9.1 I confident about the **safety** of fruit I feed my children	.836	.865					
3.8.1 I confident about the **place of origin** of the fruit I feed my children	.845	.864					
3.9.3 I confident about the **safety** of meat I feed my children	.771	.789					
3.8.3 I confident about the **place of origin** of meat I feed my children	.716	.786					
3.7.1 It is easy for me (in terms of time) to provide to my children **fruits** on a daily basis	.765		.801				
3.7.2 It is easy for me (in terms of time) to provide to my children **vegetables** on a daily basis	.774		.796				
3.6.1 It is affordable for me to provide to my children **fruits** on a daily basis	.759		.744				
3.6.2 It is affordable for me to provide to my children **vegetables** on a daily basis	.675		.731				
3.7.3 It is easy for me (in terms of time) to provide to my children **meat** on a daily basis	.642		.597				
3.6.3 It is affordable for me to provide to my children **meat** on a daily basis	.552		.571				
3.2.3 It is a **healthy behavior** for my children to eat meat	.600			.711			
3.4.3 My children have **more energy** when they eat meat	.609			.685			
3.3.3 My children's **weight is easily controlled** when they eat meat	.862			.671			
3.12.3 I **feel good** when I provide meat to my children	.625			.666			
3.5.3 I think my children **like** to eat meat	.446			.572			
3.1.3 My children eat appropriate portions of meat	.557			.534			
3.1.2 My kids eat the **adequate portions** of vegetables	.728				.801		
3.1.1 My children eat the **adequate portions** of fruits	.750				.797		
3.5.1 I think my kids **like** to eat fruits	.689				.747		
3.5.2 I think my **kids like** to eat vegetables	.530				.668		
3.10.2 My **family and friends** encourage me to offer my children vegetables	.924					.946	
3.10.1 My family and friends encourage me to offer my children fruits	.912					.938	
3.10.3 My family and friends encourage me to offer meat to my children	.711					.828	
3.2.2 It is a **healthy behavior** for my children to eat vegetables	.873						.844
3.2.1 It is a **healthy behavior** for my children to eat fruit	.868						.830
3.3.1 My kids' **weight is easily controlled** when they eat fruits	.850						.505
3.3.2 My kids' **weight is easily controlled** when they eat vegetables	.862						.526
Percentage of variation of the main components (%)		13.39	11.09	9.13	8.33	7.43	7.29

(*) Communalities

First component depicts parents' confidence about safety and the place of origin for fruits, vegetables and meat being fed to children (Table 3). This component has the highest weight with a rate of 13.39%, followed by the second component (percentage variation 11.09%) which describes the significance of affordability and easiness-to-consume (in terms of time) for the interviewees.

Third factor is exclusively referring to meat consumption regarding parents' knowledge about recommended quantities, preference by their children and subjective evaluation of meat consumption in general. The fourth component is consisted of questions referring to fruit and vegetables´consumption. Specifically, it includes parents' assessment on whether their children consume adequate portions and whether they like or not consuming them. The fifth component reveals parents´ influence by their close environment to offer to their children fruits, vegetables, and meat, while the last factor depicts parents' perceptions whether children eating fruits and vegetables is a healthy habit and if consumption such foodstuff helps avoiding obesity.

Table 4.
Correlation of socio-economic characteristics with the 6 components

	Components					
Socioeconomic characteristics	**1st**	**2nd**	**3rd**	**4th**	**5th**	**6th**
Place of origin		*	**	*	*	**
Age			*			
Gender				*		*
Family income						
Number of adults		*				**
Number of children				**	*	
Employed family member		*				
Educational level				**		
Family income support					**	

* Significant difference in perception (p-value <0.05)

** Very significant perception difference (p-value <0.01)

In the second stage of this analysis, it was tested the significance of socio-economic characteristics of the sample in relation with the six aforementioned components. The analysis of correlation results verified (Table 4) that there is no statistically significant difference regarding the socio-economic characteristics for the first component. Place of origin seems to play a significant role in the rest of the five factors, especially those referring to health issues. The Fourth factor, the one about parents' perception of whether their children consume the right amount of fruits and vegetables, seems to be affected from the participants´ educational level, while the influence from their environment is strongly affected by the family income support.

4 Conclusions

This study was focused on the drivers of consumer behaviour of Greek and Spanish students as reflected in the answers given by their parents. As regards consumption frequencies, children in Spain tend to consume fruits more often than the Greek ones. In both countries vegetable consumptionappears to be below satisfactory levels, while meat consumption is higher than the recommended portions. It should be underlined that fruits are more preferable than vegetables by children, being this finding also confirmed by aforementioned reviews. Moreover, there are differentiations of consumer trends, according to their socio-economicprofile. The most important factor emerged, is a parameter referring to food safety and place of origin, a component equally important for parents in both countries. Convenience of supply -in both financial and time terms- is also an important criterion for the dicision making process. Finally, the number of adults in the family and the number of working members, are factors of high importance.

Adoption of healthy consumption habits derived from the parents' interest, is another key factor influenced by the place of origin and parents´ age. It is remarkable that there is a positive influence and encouragement from close and family environment as well. As thisstudy has highlighted, safety and place of origin play an important role on parents´choices. Emphasis should be given on packaging design, promoting by this way the locality and the adoption of advanced food safety protocols. Also, it would be useful to make a more detailed capture of specific fruits and vegetables, in order to identify in detail the preferences of new consumers,as well as to create a more detailed consumer profile. To conclude, assessment of children's nutritional habits contributes to a better understanding of their needs and desires, seeking ways of establishing healthy eating habits for future generations.

References

Abdi, H., & Williams, L. J. (2010). Principal component analysis. *Wiley Interdisciplinary Reviews: Computational Statistics*. https://doi.org/10.1002/wics.101

Coto, J., Pulgaron, E. R., Graziano, P. A., Bagner, D. M., Villa, M., Malik, J. A., & Delamater, A. M. (2019). Parents as Role Models: Associations Between Parent and Young Children's Weight, Dietary Intake, and Physical Activity in a Minority Sample. *Maternal and Child Health Journal*, *23*(7), 943–950. https://doi.org/10.1007/s10995-018-02722-z

Hammons, A. J., & Fiese, B. H. (2011). Is frequency of shared family meals related to the nutritional health of children and adolescents? *Pediatrics*, *127*(6). https://doi.org/10.1542/peds.2010-1440

IBM. (2020). Kaiser-Meyer-Olkin measure for identity correlation matrix. Retrieved from https://www.ibm.com/support/pages/kaiser-meyer-olkin-measure-identity-correlation-matrix

Klepp, K. I., Rodrigo, C. P., Thorsdottir, I., Due, P., Vaz De Almeida, M. D., Elmadfa, I., … De Bourdeaudhuij, I. (2005). Promoting and sustaining health through increased vegetable and fruit consumption among European schoolchildren: The Pro Children Project. *Journal of Public Health*, *13*(2), 97–101. https://doi.org/10.1007/s10389-004-0095-5

Korinek, E. V., Bartholomew, J. B., Jowers, E. M., & Latimer, L. A. (2015). Fruit and vegetable exposure in children is linked to the selection of a wider variety of healthy foods at school. *Maternal and Child Nutrition*, *11*(4), 999–1010. https://doi.org/10.1111/mcn.12035

Lourenço, M., Santos, C., & do Carmo, I. (2014). Nutritional status and dietary habits in preschool-age children. *Revista de Enfermagem Referência*, *IV Série*(N^{o} 1), 7–14. https://doi.org/10.12707/riii12140

M. Garaulet, F. Perez-Llamas,C.M. Rueda, S. Z. (1998). Trends in the mediterranean diet in children from south-east Spain. *Nutrition Research*, *18*(6), 979–988. https://doi.org/https://doi.org/10.1016/S0271-5317(98)00081-5

Movassagh, E. Z., Baxter-Jones, A. D. G., Kontulainen, S., Whiting, S. J., & Vatanparast, H. (2017). Tracking dietary patterns over 20 years from childhood through adolescence into young adulthood: The saskatchewan pediatric bone mineral accrual study. *Nutrients*, *9*(9), 1–14. https://doi.org/10.3390/nu9090990

Nekitsing, C., Hetherington, M. M., & Blundell-Birtill, P. (2018). Developing Healthy Food Preferences in Preschool Children Through Taste Exposure, Sensory Learning, and Nutrition Education. *Current Obesity Reports*, *7*(1), 60–67. https://doi.org/10.1007/s13679-018-0297-8

Pechey, R., & Monsivais, P. (2016). Socioeconomic inequalities in the healthiness of food choices: Exploring the contributions of food expenditures. *Preventive Medicine*. https://doi.org/10.1016/j.ypmed.2016.04.012

Piperakis, S. M., Papadimitriou, V., Zafiropoulou, M., Piperakis, A. S., & Zisis, P. (2007). Dietary habits of Greek primary school children. *Journal of Science Education and Technology*, *16*(3), 271–278. https://doi.org/10.1007/s10956-006-9041-3

Scaglioni, S., De Cosmi, V., Ciappolino, V., Parazzini, F., Brambilla, P., & Agostoni, C. (2018). Factors influencing children's eating behaviours. *Nutrients*, *10*(6), 1–17. https://doi.org/10.3390/nu10060706

Spinelli, A., Buoncristiano, M., Kovacs, V. A., Yngve, A., Spiroski, I., Obreja, G., … Breda, J. (2019). Prevalence of severe obesity among primary school children in 21 European countries. *Obesity Facts*, *12*(2), 244–258. https://doi.org/10.1159/000500436

Taherdoost, H. (2020). What Is the Best Response Scale for Survey and Questionnaire Design ; Review of Different Lengths of Rating Scale / Attitude Scale / Likert Scale. *International Journal of Academic Research in Management (IJARM)*, *8*.

van den Broek, N., Vink, J. M., Larsen, J. K., Verhagen, M., & Burk, W. J. (2020). Is adolescents' food intake associated with exposure to the food intake of their mothers and best friends? *Nutrients*, *12*(3). https://doi.org/10.3390/nu12030786

Wambogo, E. A., Ansai, N., Ahulwalia, N., & Ogden, C. L. (2020). Fruit and Vegetable Consumption Among

Children and Adolescents in the United States, 2015-2018. *NCHS Data Brief*, (391), 1–8.

WHO. (2018). Childhood Obesity Surveillance Initiative (COSI). Highlights 2015-17. *World Health Organization*, 1–8. Retrieved from http://www.euro.who.int/__data/assets/pdf_file/0006/372426/WH14_COSI_factsheets_v2.pdf

WOF. (2018). Childhood Obesity. Retrieved from https://www.worldobesity.org/what-we-do/our-policy-priorities/childhood-obesity