
The Home Environment: Family Meals, and Food Insecurity in Adolescents from High Schools in Terrassa (Catalonia)

Modality: Quantitative Research

Master Final Project
Master in Nutrition and Health

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Abstract

The world is not on track of achieving food security by 2030. New approaches to understand individual's food insecurity are needed, specially, food insecurity in children and adolescents, as it is associated with serious health and psychosocial problems. Our study aimed to characterize the household environment of a representative sample of adolescents (N = 1017) and their parents (N = 261), from Terrassa (Catalonia, Spain), to understand how the home environment and family meals could be related to household food security. Our findings revealed that 19.2% of adolescents were experiencing food insecurity by 2022, a situation depending on their SES, the parental level of education, and their ethnicity. Adolescents with higher SES, higher parental level of education, and a native ethnicity showed the highest probabilities of experiencing food security. Also, we have proved that food security is associated to characteristics of family dinners. Adolescents who daily shared family dinners, who ate dinners for longer than 30 minutes, and who shared dinners with 4 people maximum, were less likely to experience food insecurity. The quality of family dinners (FDI) was also found to be inversely correlated to food insecurity in adolescents. Based on this, we have discussed possible ways by which family dinners could offer a protective effect, preventing adolescents from experiencing food insecurity. In line with the goal of guaranteeing food security by 2030, we suggest that this knowledge could be incorporated into awareness public campaigns in Catalonia, addressing the work on increasing the frequency and duration of family dinners to promote its protective effect towards food security in Spanish adolescents.

Keywords

Food insecurity; food security; household environment; food environment; family meals; family dinner index; adolescents.

1. Introduction

Food insecurity (FI) is a multidimensional phenomenon related to an individual's inadequate access to sufficient, safe, and nutritious food meeting their dietary needs and food preferences for an active and healthy life, opposite to a situation of food security (1). Food security (FS) is a global objective for a sustainable development of societies that requires physical availability of food, economic and physical access to

food, proper food utilization, and the stability of these components on a periodic basis (1). Worldwide, old and emerging risks (global warming, COVID-19 pandemic crisis, food allergies, and more) are preventing populations from achieving sustainable food systems, and food security to improve their nutrition (2), as established in the second goal of the United Nations 2030 Agenda for Sustainable Development (3). This goal aims to end hunger, achieve food security and improved nutrition, and promote sustainable agriculture. Nevertheless, food insecurity prevalence around the world has been persistently rising since 2019, and close to 40 percent of people were food insecure at severe levels by 2021 (2). Although efforts have been done, the world is not on track of achieving food security and ending hunger by 2030. Hence, new approaches to understand individual's food insecurity are needed, and scientific research on food insecurity must be focused in that way.

At a household environment, food insecurity can be studied regarding any individual member of the house being at risk of not having access to an adequate status of nutrition (4). This approach could be especially relevant to understand the household risk factors of food insecurity in children and adolescents, and further promote actions to prevent food insecurity at a household level. In this stage of life, children are undergoing growth and development (physical and mental), which is associated with greater requirements of nutrients and energy intake (5), meaning that food insecurity at their age could have serious consequences in their adulthood. Scientific studies show that children and adolescents' food insecurity is associated with dietary inadequacies, impaired growth and development, low educational achievement, cognitive deficits, chronic physical and mental health problems, even, death (6,7). Household food insecurity has also been associated in trends of child malnutrition, including stunting and wasting, deficiencies in essential micronutrients and children overweight and obesity (2).

It seems that several socioeconomic determinants of the household could be taking part in adolescents' dietary inadequacies and weight problems, however, the mechanisms implied in adolescents facing food insecurity are not fully studied. For instance, an observational study in American children shows that family incomes and parental nutritional knowledge are involved in children's food insecurity, dietary inadequacies, and children obesity (8). Especially, the availability of food in the home has been explained as dependent on maternal knowledge, thus, mothers with greater nutritional knowledge have healthier foods available in the home (9).

On the other hand, sociocultural determinants of the household have been identified to play a positive role towards adolescents' dietary problems. Recently, a qualitative study on the Mediterranean Diet (MD) shows that the conviviality in family mealtimes is a factor related to the Spanish home environments which benefits the nutrition and health of adolescents (10). From a sociocultural perspective, this study highlights the relevance of conviviality as an element in the MD that involves pleasure and joy when socializing and sharing food (10). They support that family meals with conviviality provide positive outcomes on adolescents' nutrition and health, such as higher intakes of fruits and vegetables, and lower intakes of sugar-sweetened beverages. Similarly, another study reports associations between family meals and lower risk of children obesity - explained by a parent-control of snacking habits and a limited use of television while eating (9). However, family meals and conviviality are eating behaviors related to adolescents' culture and country of origin, as shown in a cross-cultural study carried out in a two sample population (adolescents from Spain and Peru), Spanish adolescents reported higher frequencies of family dinners: more than 75% of the participants in this group eat dinner with their family between 5 and 7 times a week, compared to just over half of Peruvian adolescents (11). In this study, higher frequencies of family meals were associated with a decreased risk of eating disorders, especially in girls.

Even though evidence shows that socioeconomic (family incomes, level of education, etc.) and sociocultural (conviviality, family meals frequency, etc.) components of the home environment are key descriptors of diet inadequacies, weight problems, and eating disorders in adolescents, scarce literature exists explaining the relationship between these components and household food insecurity, even less in young Spaniards. In accordance with the second developmental goal of 2030 Agenda (UN), and moreover, due to the lack of prior research on the home environment, food insecurity, and family meals in young Spaniards from a quantitative research perspective, leading new scientific studies to study their connections is needed. New knowledge may give new perspectives of understanding adolescents' food insecurity and nutritional inadequacies to further preventive actions at a household level.

In this sense, this research is focused on developing new and valuable knowledge from a Spaniard young population to understand the relationship of socioeconomic and sociocultural components - that are part of the home environment - and household food insecurity in adolescents. Specifically, it is expected to describe

associations between adolescents' food insecurity, and their ethnicity, socioeconomic status, level of education, and/or some components of the family meals.

2. Objectives

This research aims to characterize components of the home environment in a sample of adolescents from the secondary schools of Terrassa (Catalonia) and their parents, and exemplify potential associations between these components and the household food security. It is expected that family meal components could be related to the food security in adolescents at a household level, leading to new perspectives of studying and actioning on children and adolescents' food insecurity in Spain. Specifically, this study aims to:

- To characterize the sample according to sociodemographic variables (gender, age, family socioeconomic status, family level of education, and ethnicity), weight status, and household food security
- To study the family meals in this sample through **a.** family dinner components (frequency, duration, and people) and **b.** the Family Dinner Index (FDI).
- To describe how the household food security in adolescents could vary according to these variables.

3. Methods

Design

This research took part of a larger longitudinal study carried out in Terrassa, the third most populous (>200 000 inhabitants) urban industrial city in Catalonia, Spain, (7) to study socioeconomic and sociocultural aspects of eating behaviors in a large representative sample of adolescents from public and private schools. The project was conducted by the research group on Eating and Weight-Related Problems (from Autonomous University of Barcelona) with the support of the Community and Health Service (CHS) of the council of Terrassa. This project was supported by a research grant from the Spanish Ministry of Science, Innovation and Universities (RTI2018-099293-B-I00).

This research aimed to accurately study and describe the data set through a quantitative methodology, while non considering particular cases.

Population and sample

The study included a representative sample of adolescents from public and grant-aided schools of Terrassa and their families (parent or tutors). A representative initial sample of 1674 adolescents, included in 64 classrooms from the four mandatory courses in the Spanish secondary education (one classroom per course), was obtained by using a multistage cluster sampling technique.

Negative parental consent and no answer to consent request were the exclusion criteria, thus, only adolescents with parental informed consent were included in the study (n = 1171). Besides, due to absenteeism, language issues, denial to participate, or failure of the survey attention controls, 157 adolescents more were excluded. Then, the final sample accounts for 1017 adolescents (60.8%). Parent's sample (n = 268) was built of each parent/tutor who individually agreed to participate in the study.

Data collection

Procedure

The schools' participation was reached with the mediation of the CHS of the city council of Terrassa. Questionnaires and surveys were applied to both adolescents and parents. The design of questionnaires and surveys was carried out on a specific online platform by Digital Insights, S.L., including controls for response ranges and interspersed control questions. The surveys were administered by trained technicians in a supervised manner. The confidentiality of the participants was protected by encodings, so that the subsequent analysis process was therefore anonymized. The assessment was carried out in April and May 2022.

Instruments

a. Sociodemographic surveys

Adolescents completed a basic sociodemographic questionnaire which included, but was not limited to, questions about gender, age, and family ethnicity (based on each parent origin). Gender accounted for three categories [boy, girl, and nonbinary (dismissed in the analysis)]. Ethnicity considered six categories [Spanish/Catalan, European, Latin-American, North African, Mixed, and Others], but it was transformed into two categories (Spanish/Catalan or not Spanish/Catalan) for the analysis. Age was a continuous variable ranging from 11 to 17 years old, however, it

was transformed into a categorical variable with three levels [11-12, 13-14, and older than 15 years old].

b. The Hollingshead Two-Factor Index of Socioeconomic Status (SES) (12)

It was used to estimate the socioeconomic status of the family, based on combining the parents' educational level and occupational prestige. Five levels of SES were obtained (low, medium-low, medium, medium-high, high), however, they were transformed into two categories [lower SES (low, medium-low, and medium) and higher SES (medium-high, and high)].

The ILOSTAT classification was applied for the parental level of education. Five categories were obtained (less than basic, basic, intermediate, advanced, and not stated) (13). The parental level of education was also transformed into two categories [higher (intermediate and advanced); lower (basic or less than basic); whilst not stated was dismissed in the analysis].

c. Anthropometric measurements

Adolescents' weight and height were taken privately with portable precision stadiometers and scales following a standardized protocol (14). The Body Mass Index (BMI) was computed as the ratio between weight (kg) and squared height (m²). The weight status was calculated according to WHO criteria, accounting for age and gender (14).

d. The Family Dinner Index (FDI)

Both adolescents and parents completed the Family Dinner Index (FDI) (15) which included questions about family dinners' communication (ex. How much do people talk to each other during family dinners?), enjoyment (ex. How much do you like being with your parent/guardian during family dinners?), logistics (How much do you like chores that go along with dinners - setting or clearing the table, washing the dishes during family dinners?), and presence of digital distractions (ex. How often are people allowed to talk, send messages, or watch something during family dinners using personal devices?). The overall score of the FDI ranges from 0 to 32, computing by reverse-coding the digital distraction items.

Internal consistency of FDI in adolescents and parents' sample was assessed with Cronbach's alpha (α) and McDonald's omega (ω) values (16). Alpha values

reported a bad consistency in both adolescents and parents' index ($\alpha = 0.553$ and $\alpha = 0.562$, respectively). Omega values reported a doubtful consistency for adolescents' FDI ($\omega = 0.671$), whilst an acceptable consistency for parents' FDI ($\omega = 0.709$).

The questionnaire also included questions on the frequency, duration, and people sharing family dinners, which were not computed in the FDI. Family dinners' frequency ranged from 0 to 7 dinners per week, which was transformed into a dichotomous variable [lower than 7, and 7 dinners a week]. Duration ranged from 0 (no dinner) to more than 60 minutes per dinner, and it was also transformed into a dichotomous variable [less than 30 minutes, and 30 minutes or more]. The number of people per family dinner ranged from 0 (no dinner) to ten or more, and has also been transformed into a dichotomous variable [4 or fewer people per dinner, and more than 4 people per dinner].

e. The Spanish adaptation of the Child Food Security Survey Module (CFSSM-S)
(7)

It was used to assess adolescents' household food security status. It contains nine items to get participants' perceptions of food insecurity in their households and their worries on food insecurity (ex. running out of food, eating only cheap food, eating less, etc.). The overall score of the survey range from 0 to 9, with a typical classification as follows; food security (0-1), low food security (2-5), and very low food security (6-9). In this study, participants were grouped into two categories, food security (0-1), and food insecurity (2-9).

Internal consistency of the CFSSM-S in this sample was also assessed with Cronbach's alpha (α) and McDonald's omega (ω) values. Alpha and omega values reported a good consistency ($\alpha = 0.870$; $\omega = 0.888$).

Statistical Analysis

Questionnaires and surveys reliability was assessed through computing Cronbach's alpha (α) and McDonald's omega (ω) values for psychometric studies (16).

The descriptive analysis was carried out mainly with *Jamovi* software for Windows (17). Descriptive statistics were reported as mean (\bar{x}) \pm standard deviations (SD) or median (M) \pm interquartile range (IQR) for continuous variables (BMI Z score, age, and FDI). Normality was assessed by applying the Kolmogorov-Smirnov test in conjunction with distribution plots (histograms) and summary statistics (skewness,

kurtosis, dispersion). On the other hand, relative frequencies were expressed as percentage (%) and used to describe sociodemographics, family meal components, and household food security.

Associations between variables were assessed with both *Jamovi* and SPSS software programs (17,18). Chi-Square tests (X^2) were carried out for qualitative variables, and correlation matrices for ordinal and continuous variables. To confront quantitative variables between groups and subgroups, Student's t-tests were carried out. The p -value to consider significance interaction terms was $p < 0.05$. Graphic methods (tables and figures) were also used to show results visually.

Effect size in this study was estimated through Cohen's d coefficient for mean comparison (low effect size was considered for $|d| > 0.2$, moderate for $|d| > 0.5$ and high for $|d| > 0.8$). Cramer's V coefficient for categorical comparison was estimated (low interaction effect was considered for $V = 0.1$, moderate effect for $V = 0.3$, and high for $V = 0.5$). For categorical comparison between dichotomous variables, odds ratios were calculated.

Ethics

This research had academic purposes, and it was approved by the ethics committees of the Opened University of Catalonia and Autonomous University of Barcelona (CEAAH 3451). The study carried out for data collection was conducted in accordance with the guidelines established in the Declaration of Helsinki of the World Medical Assembly (World Medical Association, 2013) (19).

Work timeline

Project Stage	Duration	Deadline
Proposal	2 weeks	April 12th, 2023
The researching problem was developed. Initial objectives and questions were established. Methods of work were selected.		
Results	1 month	May 15th, 2023
Statistical analysis was done on the data set to obtain initial results. Objectives and methods could suffer small modifications.		
Discussion	1 month	June 19th, 2023

Further analysis will be done and results will be discussed regarding their relevance.

Presentation and

diffusion

1 month

End of June - July

An academic article may be developed.

4. Results

The description of sociodemographic variables, weight status and household food security (HFS), is shown in **table 1**. Gender was similarly distributed between boys and girls, and age ranged from 11 to 17 years old (14 ± 2). Most adolescents were of Spanish/Catalan ethnicity (73.3%), and were mainly from a medium (26.6%), medium-high (30.1%), or high (21.8%) socioeconomic status. Most of their parents had intermediate (27.8%) or high (31.4%) level of education. A high proportion of adolescents were experiencing food security at a household level, whilst food insecurity reached 19.2% of adolescents. Overweight and obesity reached 25.6% at our sample, however, most adolescents were with normal weight (71.1%). Table 1 also shows the distribution of our main studied variables segmented in subgroups based on parents' participation, and excluding those adolescents ($n = 15$) who did not finish the FDI questionnaire. Those adolescents whose parents did not participate in the study ($n = 773$) were more likely to show overweight and obesity, medium-low and low SES, and to experience food insecurity.

Family dinners and the FDI were studied as a representative element of the household environment and eating behaviors. For the FDI analysis, adolescents ($n = 15$) and parents ($n = 7$) who did not completely fulfill the FDI were excluded. **Table 2** shows the distribution of family dinner components for adolescents and their parents, with no differences between them. Most of the adolescents claimed not to share dinners with their families every day (59%), and that their family dinners last less than half an hour (58.8%). Less than one third (30.3%) of adolescents share their dinners with more than 4 people. On the other hand, parents and adolescents' FDI were computed as an index that accounts for several characteristics of family dinners. Differences were obtained between adolescents' and parents' scores, finding lower values for adolescents' FDI. Table 2.1 also reports the distribution of FDI in adolescents' subgroups, showing no differences between their scores.

Table 3 reports X^2 test results for the distribution of weight status among adolescents. Girls were more likely to be with normal weight, whilst boys were prone to show underweight and obesity. Most of the adolescents with underweight and obesity were experiencing food insecurity. The weight status did not vary according to parental level of education, or ethnicity, (data not shown).

Table 4 reports X^2 test results for the distribution of HFS. Odds ratios were obtained to assess the probability of experiencing food security. Sorted by higher odds of experiencing food security were those adolescents at high SES and high parental level of education, those being Spanish/Catalan, and those who shared 7 family dinners a week, who ate dinners for more than 30 minutes, and who shared dinners with a maximum of 4 people. **Figure 1** exemplifies these probabilities, varying the distance of reaching food security depending on the magnitude of odds ratio.

Table 5 shows relationships between adolescents' FDI and food insecurity, BMI Z-score, and age, including segmented analysis for subgroups based on parents' participation (adolescents whose parents participated or not in the study, and parents whose adolescents did or did not participate). An inverse linear correlation was found between adolescents' FDI (all) and food insecurity. **Figure 2** exemplifies this relation, that as adolescents' FDI (all) increased, food insecurity decreased. This relationship did not exist in the subgroup of adolescents with parents' participation, but it existed in the subgroup of adolescents whose parent's data was unavailable. An inverse linear correlation was also found between adolescents' FDI (all) and age. No relation was observed with their BMI Z-scores.

Table 6 reports relationships between parents' FDI and adolescents' BMI Z-scores, or the risk of food insecurity, including segmented analysis for subgroups based on parents' participation. Parents' FDI (all) was inversely correlated with adolescents' BMI Z-scores (all) (**figure 3**), however, this relationship did not exist for the subgroup of parents whose adolescents fulfill the questionnaire.

Table 7 (annex) shows linear correlations between each FDI component and the FDI overall score, for both parents and adolescents.

Tables and figures

Table 1. Descriptive data for adolescents: gender, age, ethnicity, SES, parental level of education, weight status, and HFS

	Adolescents (all)			^a <i>p</i>
	n 1017	Adolescents with parental participation n 229	Adolescent without parental participation n 773	
Gender				0.205
Girl	498 (49.0)	127 (55.5)	365 (47.2)	
Boy	516 (50.7)	102 (44.5)	405 (52.4)	
Non-binary	3 (0.3)	0	3 (0.4)	
Age (years old)				0.358
11 to 12	173 (17.0)	43 (18.8)	128 (16.6)	
13 to 14	504 (49.6)	115 (50.2)	379 (49)	
> 15	340 (33.4)	71 (31)	266 (34.4)	
Ethnicity				0.385
Spanish/Catalan	745 (73.3)	200 (87.3)	536 (69.3)	
Non-Spanish/Catalan	272 (26.7)	29 (12.7)	237 (30.7)	
SES				0.758
Low	46 (4.5)	4 (1.7)	41 (5.3)	
Medium-low	172 (16.9)	28 (12.2)	143 (18.5)	
Medium	270 (26.6)	45 (19.7)	218 (28.3)	
Medium-high	306 (30.1)	88 (38.4)	215 (27.9)	
High	221 (21.8)	64 (27.9)	154 (20)	
Parental level of education				0.404
Less than basic	8 (0.8)	1 (0.4)	6 (0.8)	
Basic	195 (19.2)	34 (14.8)	161 (20.8)	
Intermediate	283 (27.8)	57 (24.9)	224 (29)	
High	319 (31.4)	94 (41)	220 (28.5)	
Not stated	212 (20.8)	43 (18.8)	162 (21)	
HFS				0.116
Food Security	780 (80.8)	190 (86.4)	579 (78.9)	
Food Insecurity	185 (19.2)	30 (13.6)	155 (21.1)	
Weight status				0.805
Underweight	33 (3.3)	1 (0.4)	12 (1.6)	
Normal weight	712 (71.1)	168 (73.7)	546 (71)	
Overweight	135 (13.5)	43 (18.9)	151 (19.6)	

Table 1. Descriptive data for adolescents: gender, age, ethnicity, SES, parental level of education, weight status, and HFS

	Adolescents (all)	^a <i>p</i>	
		Adolescents with parental participation	Adolescent without parental participation
Obesity	121 (12.1)	16 (7)	60 (7.8)

Abbreviations: n: sample size; %: relative frequency; SES: socioeconomic status; HFS: household food security

Table 2. FDI and family dinner components distribution among adolescents and parents

	Adolescents (all)	Parents (all)	t-test / X^2	d / V	^a <i>p</i>
	n (%)	n (%)			
Frequency (dinner/week)			0.5	0.04	0.475
< 7	599 (59)	76 (28.5)			
7	417 (41)	191 (71.5)			
Duration (minutes)			1.58	0.07	0.208
≤ 30 minutes	597 (58.8)	155 (58.1)			
> 30 minutes	419 (41.2)	112 (41.9)			
People (number)			0.240	0.03	0.624
≤ 4	708 (69.7)	236 (88.4)			
> 4	308 (30.3)	31 (11.6)			
FDI; median ± IQR	20 ± 6	23 ± 6	10.7	0.65	< 0.001

Abbreviation: n: sample size; %: relative frequency; ^a*p*: significance of the Student's t-test for continuous variables, and X^2 for categorical variables; FDI: family dinner index; IQR: interquartile range; V: Cramer's V; |d|: Cohen's d.

Table 2.1 FDI among adolescents' subgroups

	Adolescents with parental participation (n 229)	Adolescents without parental participation (n 773)	t-test	d	^a p
FDI; median ± IQR	20 ± 7	20 ± 6	0.49	0.032	0.623

Abbreviations: n: sample size; ^ap: significance of the Student's t-test; FDI: family dinner index; IQR: interquartile range; |d|: Cohen's d.

Table 3. Weight status distribution according to gender and HFS

	UW n (%)	NW n (%)	OW n (%)	OB n (%)	X ²	^a p	V
Gender					17.99	< 0.001	0.13
Boys	26 (5.1)	336 (66.4)	73 (14.4)	71 (14)			
Girls	7 (1.4)	375 (76.2)	61 (12.4)	49 (10)			
HFS					9.15	0.027	0.09
FS	20 (2.6)	549 (71.7)	111 (14.5)	86 (11.2)			
FI	11 (6)	128 (69.6)	18 (9.8)	27 (14.7)			

Abbreviations: n: sample size; %: relative frequency; ^ap: significance of the X² test; V: Cramer's V; HFS: household food security; FS: food security; FI: food insecurity; UW: underweight; NW: normal weight; OW: overweight; OB: obesity.

Table 4. HFS distribution according to ethnicity, SES, level of education, and family dinner components, on adolescents (all)

	FS n (%)	FI n (%)	X ²	^a p	OR
Ethnicity			20.6	<0.001	0.46
Spanish/Catalan	588 (84.1)	111 (15.9)			
Non-Spanish/Catalan	181 (71)	74 (29)			
SES			34.3	<0.001	0.37
Higher	443 (87.7)	62 (12.3)			
Lower	325 (72.7)	122 (27.3)			
Parental educational level			19.8	<0.001	0.41
Higher	490 (85.2)	85 (14.8)			

Lower	130 (70.7)	54 (29.3)			
Frequency: dinners/week			15.6	<0.001	0.49
7	343 (86.8)	52 (13.2)			
< 7	437 (76.7)	133 (23.3)			
Duration: minutes			4.61	0.032	0.69
> 30 minutes/dinner	333 (84.1)	63 (15.9)			
≤ 30 minutes/dinner	447 (78.6)	122 (21.4)			
People: number			4.74	0.030	0.68
≤ 4	557 (82.6)	117 (17.4)			
> 4	223 (76.6)	68 (23.4)			

Abbreviations: n: sample size; %: relative frequency; ^ap: significance of the χ^2 test; OR: odds ratios; HFS: household food security; FS: food security; FI: food insecurity; SES: socioeconomic status

Fig. 1. Factors associated in experiencing food security, ordered according to their modifiability.

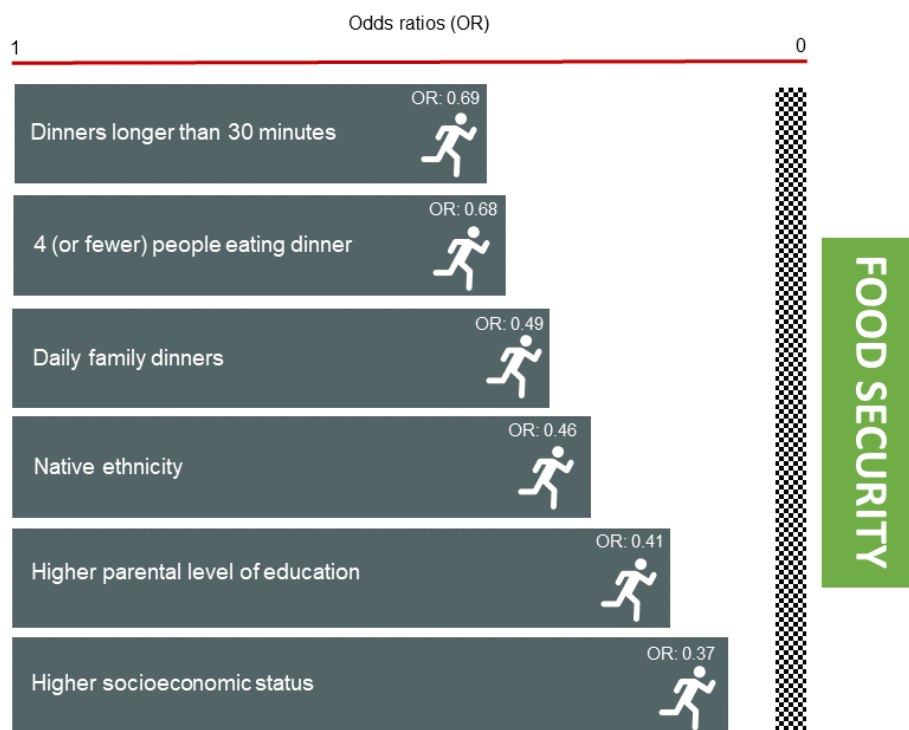
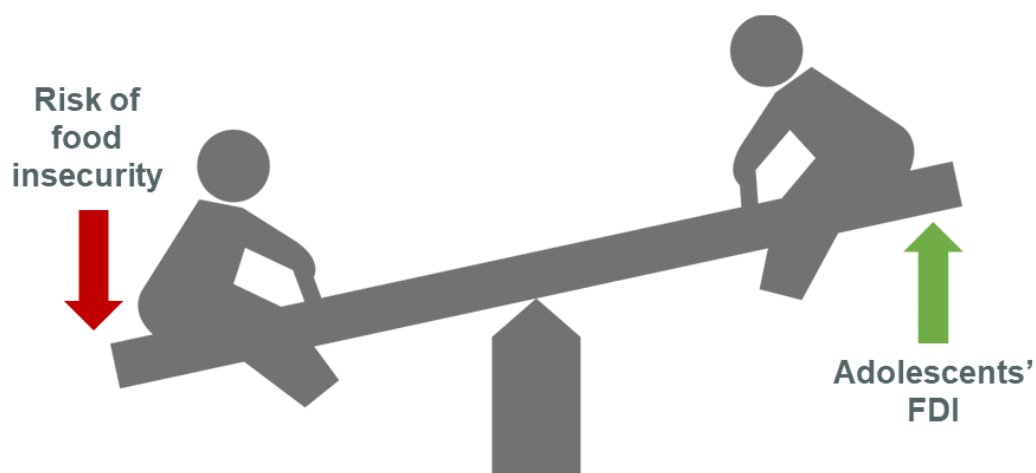


Table 5. Correlations for adolescents' FDI with adolescents' food insecurity, BMI Z-scores and age.

	Adolescents (all)	Adolescents with parental participation	Adolescents without parental participation
	rho (<i>p</i>)	rho (<i>p</i>)	rho (<i>p</i>)
Food insecurity	(n 954)	(n 220)	(n 734)
	- 0.117 (< 0.001)	0.060 (0.378)	- 0.124 (< 0.001)
BMI Z-score	(n 1001)	(n 229)	(n 772)
	0.009 (0.784)	0.050 (0.453)	- 0.007 (0.846)
Age	(n 1002)	(n 229)	(n 773)
	- 0.144 (< 0.001)	- 0.181 (0.006)	- 0.132 (< 0.001)

Abbreviations: n: sample size; rho: Spearman's rho coefficient; *p*: significance of the correlation matrix; BMI: Body Mass Index

Fig. 2. Adolescents' FDI and the risk of food insecurity linear correlation.



Abbreviations: FDI: family dinner index.

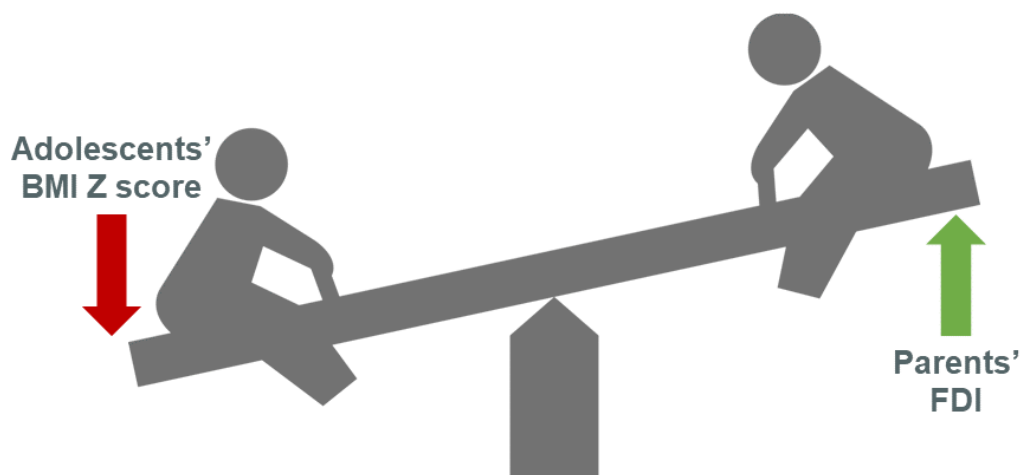
Table 6. Correlations for parents' FDI with adolescents' risk of food insecurity and BMI Z-score

	Parents (all)	Parents with adolescents' participation
	rho (<i>p</i>)	rho (<i>p</i>)
Food insecurity	(n 240)	(n 220)
	- 0.041 (0.532)	0.060 (0.378)

	(n 261)	(n 229)
BMI Z-score	- 0.169 (0.006)	- 0.012 (0.853)

Abbreviations: n: sample size; rho: Spearman's rho coefficient; *p*: significance of the correlation matrix; BMI, Body Mass Index.

Fig. 3. Parents' FDI and adolescents' BMI Z-score linear correlation.



Abbreviations: BMI, body mass index; FDI: family dinner index.

5. Discussion

The present study aimed to characterize the household components of a representative sample of adolescents and their parents from the city of Terrassa (Catalonia, Spain) to further understand how they could be related to the household food security in adolescents. Some socioeconomic factors, as well as, several characteristics of family meals were found to be associated with the experience of household food insecurity.

Firstly, our study revealed that 19.2% of adolescents from this city were likely to experience food insecurity - according to the CFSSM-S. These results are consistent with a previous study based on the same survey, which reported 18.3% of adolescents in a sample of Catalan adolescents experienced low and very low food security by 2018 (7). A more recent report on food security in Spain, showed that 13.3% of Spanish households were facing food insecurity by 2021. Specifically, in Barcelona province, food insecurity ranged from 8% to 23.1% among cities and neighborhoods (20).

Our findings made evident that the household food insecurity in adolescents may depend on socioeconomic factors. Firstly, adolescents from families at higher socioeconomic status showed the lowest probability of experiencing food insecurity at a

household level. This finding leads to explain a well-study context where family incomes are a main indicator of food insecurity, as it has been evidenced during the COVID-19 pandemic crisis, after which the economy of 28% households in Spain were negatively affected, forcing them to change their feeding and nourishment habits (20). Poverty and low incomes, either chronic or transitory, are an underlying cause of food insecurity, however, it should not be considered apart from education, as evidence shows “overcoming food insecurity should not only be based on income growth but also needs to be supported by investment in education and nutrition interventions” (1). In this sense, we have also found the parental education to be associated with food insecurity in adolescents. Adolescents whose parents had higher levels of education showed a lower probability of experiencing food insecurity. In this context, targeting both poverty and nutritional knowledge have been proved to benefit children’s food security, and health (1,9).

From a sociocultural perspective, food insecurity varied according to ethnicity. In our study, 73.3% of adolescents were Spanish/Catalan and 26.7% were foreign-family adolescents. The latter were more likely to experience food insecurity, whilst the former were unlikely. Although ethnicity cannot be modified, it is well known that foreign families in Spain, such as immigrants, are more vulnerable to lack of economic resources and access to sufficient, safe, and nutritious food in order to meet their dietary needs (20). For that reason, many public actions and economic benefits exist. At least 22% of Spanish households receive food aids or economic support from public administrations (20).

Furthermore, our study revealed how some aspects related to family dinners, as a representative element of the household food environment, are associated with food insecurity in adolescents. Differences between adolescents with food security and food insecurity were observed depending on how often they share meals, how long family meals are, and how many people take part. In our sample, the experience of food insecurity was reduced by a half in adolescents who shared family dinners for longer than half an hour, and by about a third in adolescents who ate dinner every day with their families. As far as we know, there are no previous studies exposing the relationship between family dinners and food insecurity, however, other studies on family meals do show that higher frequencies may be positive for adolescents’ physical and mental health. For instance, recommendations of a minimum of 7 family meals per week are based on improvements observed in childhood obesity and eating disorders (10,21), and in higher nutrient-dense intakes and improved balanced diet for children (22).

The present work also assessed the quality of family dinners through the FDI, finding differences between adolescents' and their parents' FDI. Adolescents' lower scores could be explained by differences in their motivations and reasons to eat meals together, as explained by the authors "older children appreciated the time together that family meals afforded, younger children thought more logistically about family meals and found this time important for knowing that they would get fed, whereas parents shared the older children's sentiments of using family meals as a way to connect with their children" (21). This explanation also applies to the inverse associations found between adolescents' FDI, their age and food insecurity. This index scores their perception of family behaviors related to eating dinners together, including communication, enjoyment, participation, and the presence of digital distractions. Considering our results, we could understand these characteristics as indicators of family bonds, which in turn may be affected by and/or involved in adolescents' food insecurity.

On parents' perspective, their FDI was found inversely correlated with adolescents' BMI Z-score. This finding is in line with previous studies which found lower body mass indices (BMI) associated with eating regular family meals (21). This relationship did not exist for the subgroup of parents whose adolescents fulfill the questionnaire, which could be explained due to its smaller sample size, and differences in the distribution of BMI Z- scores between these groups (data not shown).

Previous studies have explained family meals' protective effect on general adolescents' health (weight problems, eating disorders, substance abuse, etc.) (11, 23). A key component of this protective effect has been explained due to a greater communication and interaction between family members as a consequence of eating dinners together more often (24). In Catalonia, the Agency of Public Health (ASPCAT) has already started a campaign to enhance the awareness of family meals' protective effect called "Implica't". This campaign addresses families with children from 0 to 12 years old, launching key messages like "eating at least one family meal a day" surrounded by "quiet and peaceful conversations" could help to develop the protective effect of family meals against eating disorders (25). On food insecurity, the protective effect of family meals has not yet been proposed, but in spite of that, by virtue of our findings, it could be seen that the quality of family dinners, but mostly, higher frequencies of family dinners and its longer duration could offer a protective effect to adolescents by decreasing the odds of experiencing food insecurity at a household level.

Hence, our findings support the household environment acting as a mediator between socioeconomic risk factors (in this case, lower socioeconomic status, lower levels of parental education, or foreign ethnicity), eating behaviors related to family dinners, and adolescents' food insecurity at a household level. Besides, based on our findings, possible mechanisms from the protective effect of family meals could be acting to prevent adolescents from experiencing food insecurity. For that reason, this knowledge should also be considered in the development of public intervention addressing actions on increasing the frequency and duration of family dinners to promote its protective effect towards adolescents' food security, helping to fight for meeting the sustainable developmental goal by 2030. In this sense, new ways of overcoming household food insecurity in adolescents are about to emerge. Finally, new tools to measure the impact of family dinners on food security, as well as, further research on longitudinal studies willing to clarify the mechanisms involved, must be developed.

Limitations and strengths

This study had several limitations. A significant number of families provided a negative consent, no answer, and several losses due to absenteeism, and some other reasons, possibly compromising the representativeness of the initial sample. Besides, parents' participation rate was low, thus, their sample size was smaller than adolescents, which could affect the interpretation of results from statistical analyses where parents' data was used. For that reason, segmented analysis for parents' participation-based subgroups were done. Also, an initial version of the Family Dinner Index questionnaire was applied, then future modifications should be considered in further studies. On the other hand, the main strength of this study is found in the representativeness of adolescent's final sample size (N = 1017), allowing accurate statistical approaches. Moreover, as far as we know, this is the first study in Spain assessing the relationship of food insecurity and the home environment, specially, with family meals, not only accounting for the family meal frequency, but including aspects related to their quality (FDI). Hence, it is discussed for the first time the role of family meals as a relevant aspect for the goal of meeting food security by 2030 in young Spaniards. This study has also counted with adolescents' weight and height data taken *in situ*, and not self-reported as usually in community studies, which enhances its reliability.

6. Conclusion

Based on our findings, food insecurity still challenges the right of young individuals to a safe and sustainable nutrition, reaching 19.2% of adolescents in the city of Terrassa (Catalonia) by 2022. More efforts need to be done in order to guarantee food security and meet the second sustainable development goal by 2030. In this sense, our findings support that family dinners play a role in the experience of food insecurity in adolescents. We showed that adolescents who ate daily family dinners, who ate dinners for more than 30 minutes, and who shared dinners with a maximum of 4 people had lower probabilities of experiencing food insecurity. By virtue of that, new tools to measure the impact of family dinners in food insecurity, as well as, further research on longitudinal studies willing to clarify the mechanisms involved must be developed. In the meantime, we suggest that this knowledge could be incorporated into awarenesses public campaigns, such as Implica't in Catalonia, addressing the work on increasing the frequency and duration of family dinners to promote its protective effect towards preventing food insecurity in Spaniards adolescents.

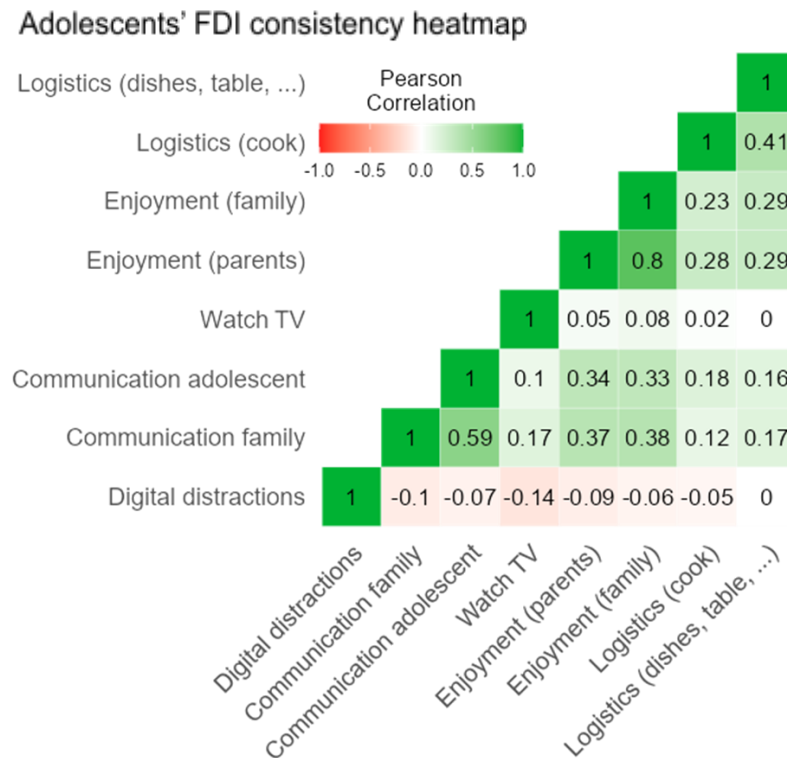
7. Annex

Table 7. FDI linear correlations with its family dinner index components, for parents and adolescents

	Adolescents (all) (n 1002)	Parents (all) (n 261)
	rho (p)	
Presence of digital distractions	0.391***	0.474***
Communication between family	0.589***	0.665***
Communication of adolescents	0.575***	0.677***
Watch TV	0.397***	0.556***
Enjoy to eat with parents	0.656***	0.607***
Enjoy to eat with family	0.631***	0.687***
Enjoy to help cooking	0.541***	-
Enjoy to help with other tasks	0.532***	-
Motivation: share time in family	-	0.447***
Motivation: strength family relationship	-	0.469***

Abbreviations: n: sample size; rho: Spearman's rho coefficient; p : significance of the correlation matrix; FDI: family dinner index. * $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

Fig. 4. FDI consistency heatmap for parents and adolescents' samples.



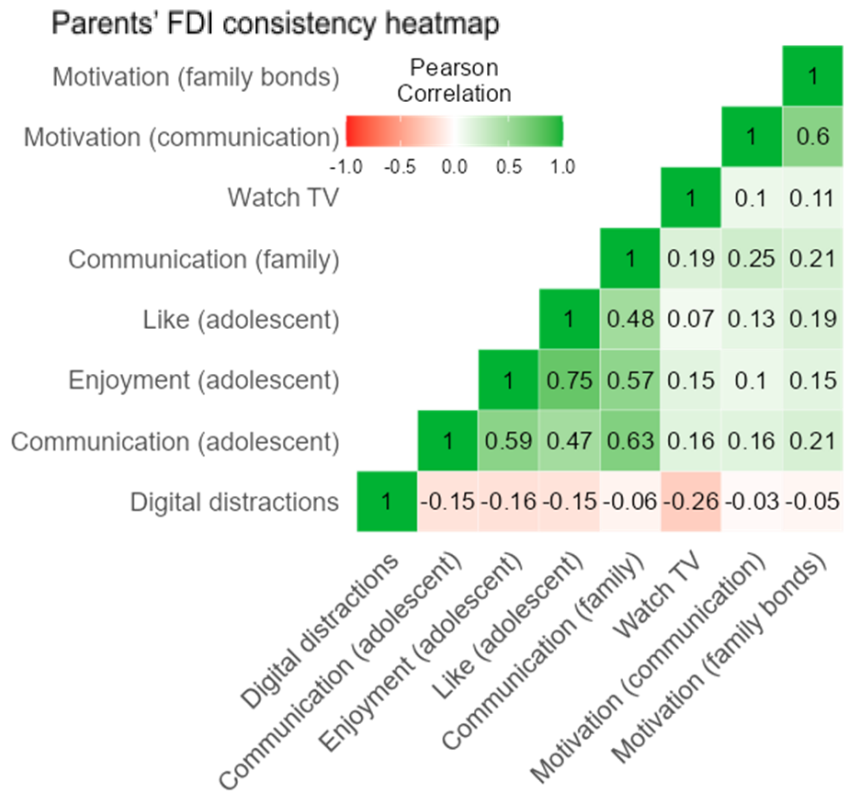
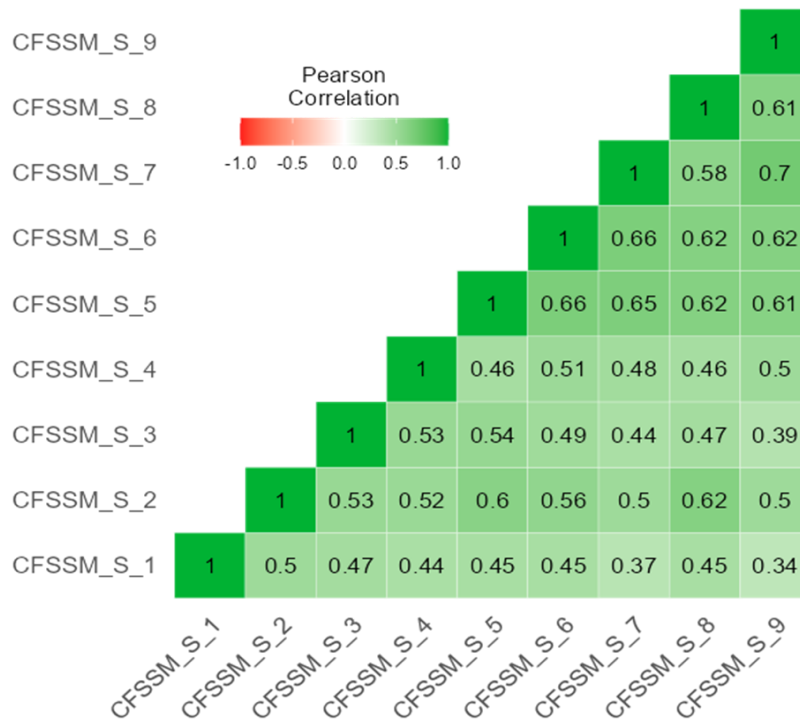


Fig. 5. CFSSM-S consistency heatmap in adolescents' sample



Abbreviations list

BMI: Body Mass Index

CFSSM-S: Spanish Child Food Security Survey Module

CHS: Community and Health Service

FDI: Family Dinner Index

FI: Food insecurity

FS: Food security

HFS: Household food security

ILOSTAT: Statistical of International Labour Organization

NW: normal weight

SES: socioeconomic status

OW: overweight

OB: obesity

UW: underweight

WHO: World Health Organization

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