

School principals' perceptions of adolescents' eating behaviors in two Spanish cities: a qualitative study based on the neo-ecological theory

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ABSTRACT

Understanding of the social and environmental factors that shape adolescents' eating behaviors is a prerequisite for developing effective and evidence-based public health interventions. School principals, given their profound comprehension of the internal and external dynamics of schools, serve as key informants in this context. Our aim was to investigate, through the lens of neo-ecological theory, the perceptions of school principals regarding adolescents' eating behaviors in two Spanish cities. We conducted 12 interviews with key informants –seven women and five men– who worked as school principals of socioeconomically diverse schools in Madrid and Bilbao. The analysis employed a neo-ecological theoretical framework in conjunction with Corbin and Strauss's grounded theory coding strategies. At the microsystem level, the absence of family meals and the social media-driven beauty standards shaped adolescents' eating behaviors. At the mesosystem level, interactions between home and school food environments played a key role. At the exosystem level, schools faced structural barriers to implementing health promotion strategies. At the macrosystem level, the food industry exerted influence through food delivery services and the promotion of unhealthy foods, affecting adolescents' dietary choices both at school and at home. These findings highlight the need for public health interventions to go beyond the school and family environments, addressing the growing impact of virtual environments and the food industry on adolescents' eating behaviors.

1. Introduction

Adolescence is a period of significant physiological, social, and developmental changes that have a considerable impact on health, with the effects potentially extending into adulthood (Neufeld et al., 2022). Adolescents are at a critical stage for making healthy choices, as they are no longer children but are beginning to make conscious decisions about their future and develop thoughts about their role in society (Kim & Kim, 2020). For instance, the adoption of healthy eating habits during adolescence is of paramount importance for optimal development and the reduction of future chronic disease risk, including diabetes, cardiovascular disease, and certain types of cancer (Hu et al., 2016). Nevertheless, previous research has documented a decline in diet quality during this developmental period (Joseph et al., 2023).

Several studies have examined both the obstacles and opportunities

associated with adolescent eating behaviors (Beck et al., 2019; Raghoobar et al., 2024). Additionally, a recent systematic review (Vidal et al., 2024) revealed that many scholars have employed the ecological system theory to investigate the factors influencing adolescent eating behaviors, including gender, time constraints, taste preferences, and the influence of media and the school environment.

In examining the eating behaviors of adolescents, it is beneficial to consider the influence of neighborhood, school, and family contexts, as well as socioeconomic status (SES) (Pechman, Catlin & Zheng, 2020; Authurs, 2021). The school food environment can facilitate the adoption of healthy eating behaviors among adolescents by providing access to nutritionally balanced school menus and snacks (such as fruits and vegetables) or by limiting the availability of unhealthy foods (Garrido-Fernández et al., 2020b). However, research has revealed significant disparities in the consumption of healthy foods, access to

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nutrition education, and the affordability of healthy food options, which vary depending on SES (Miqueleiz et al., 2014).

Prior research has indicated that neighborhoods with a low SES have greater access to unhealthy foods, which can contribute to the prevalence of poor dietary habits, particularly around schools (Londoño-Cañola et al., 2022). Furthermore, parental supervision tends to be more challenging in low SES families (Liu et al., 2023), which may result in fewer opportunities for guidance on healthy eating. In contrast, high SES population groups have been found to possess superior nutrition knowledge (Koch, Hoffmann & Claupein, 2021; Rivera-Navarro et al., 2021), which may serve as a protective factor against the development of unhealthy dietary habits.

1.1. Theoretical background

The present study’s distinctive contribution is the integration of key informant interviews (KII), and a holistic perspective grounded in the neo-ecological theory (Navarro & Tudge, 2023). This approach builds upon Bronfenbrenner’s (1979; 1989) ecological systems theory, offering a novel extension to the field. The main innovation of the neo-ecological theory (Navarro & Tudge, 2023) in comparison to the general theory of Bronfenbrenner is the inclusion of both a physical and a virtual microsystem, as opposed to just one, thus maintaining the vital significance of examining the environments in which individuals reside and mature. Fig. 1 offers an overview of our implementation of the neo-ecological theory along with the following paragraph detailing each of the systems.

In the case of adolescents, the microsystem is divided into two distinct categories: the physical microsystem, which encompasses the family, the peer group, the school, and the neighborhood, and the virtual microsystem, which includes the utilization of social networks, social media and internet-connected devices. The microsystem refers to the pattern of activities, roles, and interpersonal relationships that an individual directly experiences in a specific environment in which they participate.

The mesosystem refers to the set of interactions that occur between two or more microsystems. One example of this would be the coordination between teachers and parents in the education of adolescents.

The exosystem includes one or more environments (one or more) in

which the individual is not directly involved, yet where events occur that indirectly affect the individual immediate setting. Examples of this would be a parent’s workplace or their friend networks.

The macrosystem encompasses the broader cultural or ideological frameworks that shape the functioning of minor systems (micro-, meso-, and exosystems). These frameworks impose a degree of uniformity across systems (e.g., shared norms or economic structures) while also allowing differentiation based on distinct cultural or ideological influences. Key shaping factors include a society’s cultural and political values, economic models and social conditions.

The principal contribution of the neo-ecological theory to Bronfenbrenner’s ecological system theory is that the microsystem encompasses both the proximate physical context (home, school) and the virtual context (digital platforms, social media) where individuals interact (Navarro & Tudge, 2023). In consequence, this approach can contribute to the existing literature on the factors influencing eating behaviors of adolescents.

1.2. Objective

The objective of this study was to investigate the perceptions held by school principals regarding adolescent eating behaviors in two Spanish cities, with the neo-ecological theory serving as the analytical framework.

2. Methodology

This qualitative case study is informed by the interpretivist/constructivist paradigm (Stake, 2005, 2006), which acknowledges the existence of multiple perspectives and emphasizes the researcher’s role in the construction of data interpretations (Charmaz, 2006). The ontological stance underpinning this approach holds that reality is local and specifically constructed (Lincoln & Guba, 2000). This research integrated a case study design with a grounded theory analysis, enabling an in-depth examination of adolescents’ eating behaviors within their sociocultural context. The use of the interpretivist/constructivist paradigm ensured methodological consistency between the grounded theory coding strategies employed and the qualitative case study design.

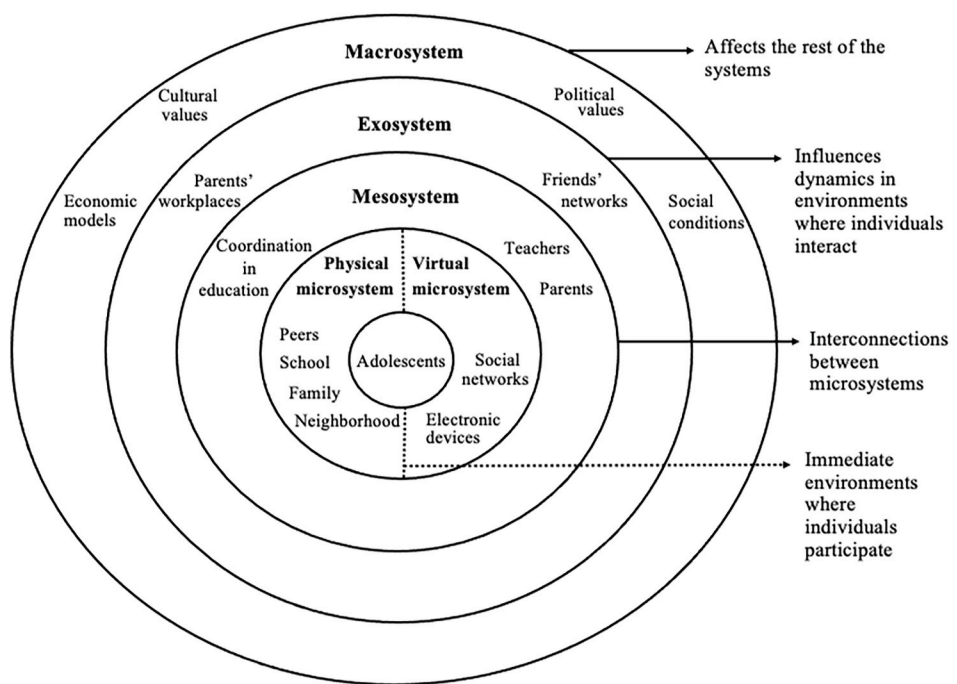


Fig. 1. Graphical representation of the neo-ecological theory as applied in the analytical framework.

Additionally, this paradigm enables the development of new theoretical insights, or the refinement of existing theories related to adolescents' eating behaviors (Lauckner et al., 2012), such as the neo-ecological theory (Navarro & Tudge, 2023).

2.1. Study area

The present study was conducted in two cities in Spain: Madrid and Bilbao. Madrid, Spain's capital, is subdivided into 21 districts and 131 neighborhoods and has a population of approximately 3.3 million. Bilbao, a city in northern Spain with a population of approximately 350,000, is subdivided into eight districts and 40 neighborhoods. As previously described (Rivera-Navarro et al., 2023), this study was conducted in schools in 10 socioeconomically diverse neighborhoods (five per city), selected using a composite SES index. The indicators utilized to construct this index for each city were obtained from publicly accessible secondary databases, specifically the Bilbao City Hall Databank (2021) and the Madrid City Hall Data Bank (2021).

2.2. Participants and sampling

As explained elsewhere (Rivera-Navarro et al., 2023), this qualitative case study employed a two-stage sampling process. In the first stage, neighborhoods were preselected, and schools within those areas were recruited using convenience sampling (Saumure & Given, 2008). The convenience sample included twelve schools willing to participate in the study. In the second stage, we conducted reputational sampling, as outlined by Patton (2015) to recruit school principals considered to be knowledgeable about adolescents' eating behaviors. Only principals from participating schools were interviewed. Six key informants were selected from each city: two from schools in low SES neighborhoods, two from medium SES neighborhoods, and two from high SES neighborhoods. The characteristics of the participating key informants are shown in Table 1.

2.3. Data collection

Previous studies have employed KII to examine adolescents' eating behaviors. This has been done as a standalone method (Davó-Blanes et al., 2013) or in combination with other data collection methods, including questionnaires (Garrido-Fernández et al., 2020a) and focus groups (Darling et al., 2023; Pérez-Wilson et al., 2015). In this research, school principals were considered key informants due to their extensive insights related to adolescents' dietary behaviors in schools and social processes in the neighborhoods where the schools are located (Patton, 2015). Furthermore, it is frequently asserted that the input of key informants is pivotal to the success of a case study (Yin, 2018). In accordance with Blumer's (1969) methodology, the objective of the KII was to challenge the preconceived notions and images that researchers bring to a study (Schwalbe, 2019). The researchers conducted the KII following an interpretivist/constructivist perspective (Mills et al., 2006), viewing

Table 1
Characteristics of key informants from schools studied in Madrid and Bilbao.

Key informant	City	Gender	Age	Neighborhood SES
1	Madrid	Female	35	High
2	Madrid	Female	45	High
3	Madrid	Female	46	Medium
4	Madrid	Male	48	Medium
5	Madrid	Male	33	Low
6	Madrid	Male	43	Low
7	Bilbao	Female	52	High
8	Bilbao	Female	43	High
9	Bilbao	Male	47	Medium
10	Bilbao	Male	35	Medium
11	Bilbao	Female	48	Low
12	Bilbao	Female	42	Low

the interview as a tool for knowledge construction in collaboration with the interviewees, while maintaining reflexivity and flexibility.

The data collection process was conducted between April and October 2022. The duration of the interviews ranged from 35 to 60 min, contingent upon the schedules of the principals in question. The semi-structured interview guide encompassed a range of topics, including the characteristics of the neighborhood and the school, the uses and resources of the neighborhood, adolescents' eating behaviors in different settings, such as home, school, and free time, the types of food shops frequented by adolescents, taste and preferences, and the use of smartphones. The implementation of a semi-structured interview guide was essential in facilitating the research team's capacity for flexibility in their interactions with school principals. This approach enabled the exploration of emergent themes and the articulation of in-depth inquiries beyond the scope of the guide. The interview guide can be found in the supplementary files. The KII were conducted in Spanish, audio recorded and subsequently translated verbatim into English by a bilingual expert. The research team then undertook a review of the translated verbatim to ensure that the meaning had been accurately conveyed. Most of the interviews were conducted by the researchers who are co-authors of this study. However, other team members who are not listed as co-authors also contributed to the fieldwork.

Following the acquisition of informed written consent, all interviews were conducted in private settings within schools. All interviews were audio recorded, transcribed, and anonymized. No form of compensation was provided to key informants for their participation in the study. To ensure the anonymity of the interview excerpts, a numbering system was employed. Each key informant was assigned an ID number (1–12), which was used to identify the source of each excerpt while maintaining confidentiality.

2.4. Data analysis

The researchers employed Corbin and Strauss's grounded theory (GT) coding strategies, including open coding, axial coding, and selective coding (Corbin & Strauss, 2015), to analyze the transcribed KII. The first and second authors conducted the analysis in parallel using Atlas.ti qualitative software. The analysis began with open coding, conducted on a line-by-line basis, with the objective of breaking down and comparing concepts. During this phase, the formation of subcategories and the establishment of relationships between concepts and levels within the data set became evident. Subsequently, the researchers employed axial coding to identify the relationships between concepts and categories, as well as the influences and their direction of effect. This aspect of the analysis was informed by the neo-ecological theory (Navarro & Tudge, 2023). In the final stage of the analysis, the researchers employed selective coding to integrate the concepts, build the subcategories, establish their relationships, and identify the influences. After the completion of the analysis by the first and second authors, a comparison of the results was conducted, and any discrepancies that emerged were addressed through a peer debriefing process involving the other co-authors of the research.

2.5. Credibility and validity

The first and second authors, who concurrently analyzed the transcribed KII and had a sociological background, also conducted peer debriefings with research team members from diverse backgrounds (e. g., social science and public health) and coauthoring this study. Despite the varying expertise of the co-authors of this study, their prior assumptions about the topic, personal characteristics, and professional expertise contributed to a richer research process and more robust results. This diversity enabled the integration of sociological, behavioral, and public health perspectives, which was a key strength of the trustworthiness of the study. Co-authors contributed with their unique perspectives, enhancing the analysis with critical comments based on their

theoretical perspectives and experience in qualitative analysis (Flick, 2019). The contributions made during the peer-debriefings assisted in the co-construction of the findings derived from the analysis of the transcribed KII. These strategies enhanced the credibility and validity of the study by ensuring methodological rigor and incorporating diverse perspectives. Additionally, the incorporation of multiple perspectives further enhances the transferability of the findings to broader contexts.

Authors drew on the SRQReporting guidelines to ensure technical quality of empirical qualitative studies (O'Brien, Harris, Beckman, Reed & Cook, 2014).

2.6. Ethical issues

The qualitative case study obtained ethical approval from the Ethics Committee of the University of the Basque Country (UPV/EHU) on December 20th, 2021, and have the reference number M10_2021_315. This study followed all guidelines of the Declaration of Helsinki. Participants provided written informed consent, which included a guarantee of anonymity and confidentiality, information about the research project, their rights and obligations, and the contact details of the principal investigator in each city.

3. Results

We organized the results into the four different systems from the neo-ecological theory: 1) microsystem; 2) mesosystem; 3) exosystem; and 4) macrosystem. Each system revealed distinct influences on adolescents' eating behaviors, as summarized in Table 2 below.

3.1. Microsystem

3.1.1. The impact of not eating or cooking with parents on adolescents' eating behaviors

Key informants expressed concerns regarding the absence of caregivers (e.g., parents, family members) from the dinner table with adolescents. Additionally, they indicated that the utilization of audiovisual media during mealtimes may have a detrimental impact on family dining experiences and the amount of time adolescents spend with their families at home.

Some families do have dinner together, but I'm surprised that as each one wants to watch something on TV or whatever, they have dinner at a different time, watching their series or whatever on their device. It's just my perception, but I do notice that they have dinner less and less together as a family, at least here in Madrid and in this school. [Madrid key informant 4, male]

The influence of family habits was linked to parents' full-time employment, which was related to limited time at home. This resulted in less healthy cooking and inadequate attention to adolescents' diets. It was observed by key informants that the lack of time at home resulted in a diminished importance being placed on home-cooked meals, leading to an increased reliance on unhealthy options such as pre-cooked meals. It was highlighted by key informants that, despite the availability of healthy time-saving products such as canned chickpeas, some families did not utilize these at home.

I think it's more about the rhythm of work. If you have time at home because of your work, you can be at home and prepare food. You can dedicate time to it and show your children why it's important. If you're short of time because of your work schedule, you tend to look for the quick and easy options. [Bilbao, key informant 7, female]

One of the biggest issues at home is that people aren't taught how to eat properly. You open a can of chickpeas, but if you put it with spinach, you can make a stew. No need to spend three hours cooking! But many families don't even make the effort to make a stew. [Madrid, key informant 6, male]

It was observed by key informants that adolescents were more likely to replicate healthy eating behaviors if they observed such behaviors at home. Conversely, the availability and frequent consumption of unhealthy food options (e.g., pre-cooked meals, processed foods) can contribute to the normalization of unhealthy eating behaviors. The availability of unhealthy foods at home was frequently contingent upon the amount of time families allocated to cooking. This, in turn, influenced adolescents' eating behaviors both at home and at school, with the type of food adolescents brought to school often determined by the availability of such foods at home.

It's true that adolescents will eat what you eat at home. That's just how it is. If you eat fruit, they'll eat fruit and vegetables too. [Madrid, key informant 1, female]

So, we start working with the families a bit. After all, they're the foundation of this. At home, it depends on what's accessible to eat. That's what they're going to bring to school. [Bilbao, key informant 9, male]

Some key informants identified the time-saving nature of pre-cooked meals as a contributing factor to the development of unhealthy eating behaviors at home. Other key informants emphasized the role of fast-food restaurants in situations where parents lack the time to cook and the limited time available for grocery shopping among families in low and medium SES areas. The influence of convenience and time

Table 2
Main results classified by system of influence, subcategory, environment, influence on and influenced by.

System of influence	Subcategory	Environment	Influence on	Influenced by
Microsystem	Impact of not eating or cooking with caregivers	Home	Adolescents	Time, Preferences, eating alone, food quality, full-time job, SES, skipping breakfast
	Differences in adolescents' food consumption based on whether food is homemade or store-bought	Home	Adolescents	Origin of the food, food quality, taste
	Influence of social media	Virtual	Adolescents	Social media, body image, gender differences
Mesosystem	Not including healthy food in adolescents' diet at home	Home	School	Convenience, SES
	Schools as a health asset	School	Home	Local authorities, teachers
	School cafeterias as nutrition centers	School	Home	Communication between school and families, cooperating with families, adapting the menus, fully equipped kitchen, kitchen staff, selling unhealthy food, teachers concerned about eating behaviors
Exosystem	Barriers to the implementation of healthy programs	School	School	Lack of human resources, Lack of facilities
Macrosystem	Food industry interference	Society	School, Home	Food delivery, promotion of unhealthy food

constraints among caregivers was found to affect the development of healthy eating behaviors in adolescents.

Needless to say, what they eat at home also plays a part, as well as how much money they have and how important they think eating well, badly or regularly is. [Madrid, key informant 3, female]

We do see cases where at home they use a lot of precooked food, so that's an easy meal. "There's nothing for dinner today, so we'll go to the pizzeria". [Bilbao, key informant 9, male]

The majority of KII conducted in schools located in areas with low and medium SES indicated that adolescents frequently skipped breakfast. Some adolescents would go more than 8 h without eating during school, which has the potential to negatively impact their academic performance by causing health issues such as dizziness and a reduction in concentration. In some cases, adolescents' skipping of breakfast was associated with the dietary habits and meal organization practices of their parents. The lack of time, food choices, and socioeconomic disadvantage of the family were identified as influencing adolescent eating behaviors that were observed at schools.

Many students tend to skip breakfast and instead drink an energy drink or snack on chips, with little else in between. [Madrid, key informant 6, male]

Yes, we've had a few cases where we've asked about a student's dizziness in class. You also ask about breakfast that morning, and in many cases, they've had very little or sometimes no breakfast at all. [Bilbao, key informant 11, female]

3.1.2. Differences in adolescents' food consumption based on whether food is homemade or store-bought

Key informants identified discrepancies in adolescents' dietary habits depending on whether they consumed meals prepared at home or purchased from nearby food establishments. Subsequently, the researchers divided the adolescents into three categories based on the source of their school meals: 1) those who consumed nutritionally balanced meals prepared at home, 2) those who consumed less healthy meals or snacks brought from home or purchased from stores, and 3) those who consumed the least healthy meals or snacks, including beverages such as fruit drinks or sodas and chips. Most eating behaviors were influenced by their families, either through the provision of home-cooked meals or the financial resources to purchase food.

During the recess time, I've noticed that some people have healthy habits. I see them bringing some fruit to eat, along with a small home-made sandwich. That seems like a healthy habit to me. But I do see some less healthy habits, too. Some people bring industrial pastries, and some prepared juices. [Bilbao, key informant 11, female]

They go out and buy things. There's a small shop that sells bags of chips, and sometimes there are also sandwiches or pizzas that are baked quickly and everything is precooked. It's usually the lunch plan for those who can go out. [Madrid, key informant 4, male]

I'd say a lot of them buy lunch. They don't make the sandwiches at home. They usually go to a nearby bar where lunch is usually a sandwich with a soda. That's what they buy. [Bilbao, key informant 9, male]

In a KII conducted at a school situated in an area with a low SES, it was observed that some adolescents had never consumed fish or vegetables at home. This situation results in adolescents bringing nutritionally deficient home-cooked food to school to avoid consuming healthy foods with which they are unfamiliar, such as vegetables and fish. The development of adolescents' healthy eating behaviors at school is influenced by factors such as taste, preferences, and exposure to healthy foods at home.

I can assure you that there are people who have never tasted fish in their lives. I'll give you the same example with vegetables as I did with fish. On top of that, they've tried to bring food from home on numerous occasions, so they don't have to eat the food we serve here. Of course, we serve them vegetables and fish. We feed them here. [Madrid, key informant 6, male]

3.1.3. Influence of social media

Key informants indicated that social pressure has contributed to an obsession with physical appearance, which is significantly influenced by social media. This phenomenon has been observed to affect eating behaviors. It was also noted that social media platforms have amplified the importance of body image, which may result in distortions and disruptions in adolescents' relationship with food.

"I'm not sure what to eat. I'm worried I'll look fat." I always wear a sweatshirt, and how do you know that? "I have some issues ... " And that's clearly linked to self-image and the need to be accepted and meet certain standards. Social media plays a big part in this. [Madrid, key informant 3, female]

Similarly, key informants observed that adolescents' dietary habits undergo a transformation once they attain the age at which they can utilize smartphones and begin to concern themselves with their physical appearance and body image on social media platforms. This frequently resulted in female adolescents developing eating disorders. The impact of the virtual microsystem on the emergence of unhealthy eating behaviors was discernible at the school level, as teachers in school cafeterias observed these eating disorders.

The girl who never cared about her image lost 10 kilos. She was a little overweight, but she became excessively thin. Some other girls have anorexia issues, and it's up to you how much you want to highlight the eating disorders. There are also girls who've never cared about their image. Since their first or second year of school, they've been on smartphones. That environment makes you feel you must be perfect. So, they seek perfection not just in their grades but also in their body image. [Madrid, key informant 4, male]

Additionally, key informants observed that social media influenced the eating behaviors of male adolescents, albeit in a manner distinct from that observed among females. Participants indicated that male adolescents consume large amount of protein in form of foods or nutritional supplements, due to the perception that it will facilitate the development of more muscle mass in the gym. This behavior seemed to be related to taking care of themselves but might result in a nutritionally unbalanced diet.

They spend more time taking care of themselves and going to the gym than eating, and many of them look for foods that are high in protein to build muscle. There's definitely more interest in that aspect. They're looking for foods that complement their gym routine. [Madrid, key informant 6, male]

3.2. Mesosystem

3.2.1. Not including healthy food in adolescents' diets at home

Key informants perceived that parents sometimes excluded healthy foods (e.g., fish, fruits, and vegetables) from adolescents' diets because these foods were already included in school menus. This perception was twofold. On one hand, it was convenient to rely on schools to provide healthy food. On the other hand, socioeconomically disadvantaged families often rely on school meals because they are unable to provide sufficient nutritious meals at home. This perception exemplified the relationship between two microsystems: home and school.

I think that over the years, parents have basically handed over the responsibility of making sure their kids eat fruit, vegetables, and fish to the school. [Madrid, key informant 4, male]

Yes, we have a cafeteria, and there are students who only have hot meals at school. Some families are struggling with the economic crisis or energy poverty, and food poverty is also a factor. [Bilbao, key informant 12, female]

3.2.2. Schools as a health asset

The relationship between health programs at schools and the family level was based on the premise that such programs play a pivotal role in influencing the eating behaviors of adolescents. Local authorities in both cities promoted and implemented specific health programs in most of the schools under study. Although the programs differed in their specific objectives, many of them were designed with the intention of promoting healthy habits, including, but not limited to, healthy eating, not skipping breakfast, and physical activity. One of the most effective programs encouraged the consumption of fruit during recess and the reduction of processed foods.

The management team have been working with community programs for several years now to get adolescents to eat fruit during recess, and it's been a huge success. [Madrid, key informant 5, male]

The key informants underscored the significance of health programs designed to promote the consumption of breakfast and educate individuals on the principles of a balanced breakfast, including the incorporation of whole fruit instead of juice.

We started serving breakfast in the mornings. Each day, a class would come to the cafeteria, and as soon as they arrived, we would prepare breakfast for them so they could enjoy it. [Bilbao, key informant 9, male]

We've got a food campaign going on. At the end of the school year, we have what we call healthy breakfasts, and we show them what a prototype of a healthy breakfast looks like. [Madrid, key informant 6, male]

The schools under study implemented a variety of initiatives with the objective of fostering healthy habits. These included encouraging outdoor physical activity, monitoring and addressing body weight-related issues, or conducting workshops on healthy eating. Furthermore, teachers incorporated nutrition and health-related content into their lessons of biology or physical education. In one school, a teacher offered incentives to students who consumed fruit during recess.

The Vallecas Activa¹ project offered students who were overweight or obese the chance to be referred to a pediatrician. The pediatrician would then create a report, and students could take advantage of all the activities offered by the City Council at half the price. [Madrid, key informant 5, male]

I believe that in primary school, there is a day dedicated to learning about different fruits. In the third year of secondary school, there is a unit on nutrition, health, and related topics during biology lessons. [Bilbao, key informant 7, female]

I know the physical education teacher, and I've heard that he gives a little better grade to those students who eat some fruit at recess. [Bilbao, key informant 9, male]

Other health-related programs included the development of organic

vegetable gardens and the preparation of the produce in schools. Additionally, students were taken on visits to gardens managed by local authorities, with the objective of learning about the origins of vegetables. Although these programs did not explicitly promote healthy eating habits, key informants perceived they could potentially influence adolescents' eating behaviors.

We use the same products that we plant in the garden in the kitchen workshop for cooking and other educational purposes. [Bilbao, key informant 9, male]

3.2.3. School cafeterias as nutrition centers

The relationship between schools and families was dependent on effective communication to enhance adolescents' diets. Schools bore the responsibility of managing menus for adolescents with allergies, food restrictions (e.g., the exclusion of pork for Muslim students), and offering vegetarian or vegan alternatives. In the interviews, participants emphasized that these adaptations were conducted with respect and in collaboration with families.

The school wants a balanced diet throughout the week. They also consider issues like intolerances, allergies, and health difficulties. We respect different beliefs, too. Some Muslim students don't eat pork, while others don't eat meat or follow a vegan diet. We try to accommodate everyone's needs. [Bilbao, key informant 12, female]

Most schools situated in neighborhoods with a medium or high SES distributed the weekly menu to families in advance. This was done with the intention of assisting families in planning a balanced diet at home. The objective was to prevent adolescents from consuming the same source of protein at both lunch and dinner. This could be, for example, meat for protein, pasta for carbohydrates, or a dinner that is primarily vegetables and fish. However, some schools lacked the necessary kitchen facilities to provide weekly menus, resulting in the sale of alternative food items, including unhealthy products such as bagged crisps.

We always send the menu home so that the parents know what's been given today and can make up a suitable replacement. [Madrid, key informant 4, male]

I think some parents give their kids money and then they go to the cafeteria and buy soda and chips. They buy all that stuff in the cafeteria. I've suggested we prohibit it, but the person in charge of the cafeteria also has a family to support, and it's difficult for us to make those decisions. [Madrid, key informant 5, male]

During the KII, it was noted that fruit was consistently included on school menus and, in some instances, also made available during recess periods. However, key informants underscored that the consumption of fruit was occasionally a challenging endeavor, with adolescents attempting to negotiate with teachers to elude its consumption in designated eating areas.

It's important to make sure school fruit and vegetables get eaten. In my experience, some adolescents even try to hide them or negotiate them. [Madrid, key informant 4, male]

Currently, you can purchase fruit in the cafeteria, but in reality, very few students actually do. [Madrid, key informant 1, female]

The presence of on-site kitchen staff and equipment, a common practice in private and semi-private schools in high SES areas, enabled school cafeterias to prepare meals on-site, rather than relying on external catering services that provided pre-cooked meals. This feature was regarded as a key element of nutritional policy in schools.

One of our school's best-known features is the cafeteria, where a team of staff prepares meals during the morning. There's great variety on offer, everything is very tasty, and I'd say it's very healthy, too. [Madrid, key informant 2, female]

¹ This program was designed to address the specific physical activity needs of the target population, considering their health status or social exclusion. Individuals are referred to the program from primary health care centers or social services in the southeast of Madrid.

Teachers and kitchen staff observed and monitored eating behaviors (on occasion focusing on symptoms related to eating disorders such as anorexia) during lunch periods. If the kitchen staff identified that an adolescent was not eating or consistently developing eating behaviors that were considered abnormal in comparison to other students, they would communicate this with the teachers. Thereafter, teachers would engage in conversation with the school principal and the family to facilitate collaborative efforts to assist the student.

As I've mentioned, we've identified a few kids who've struggled with this. One girl, and one boy, have shown signs of stopping eating. This was first flagged in the cafeteria, so we got involved and worked with the family. We've been trying to intervene as soon as possible. [Bilbao, key informant 12, female]

3.3. Exosystem

3.3.1. Barriers to the implementation of healthy food programs

This subcategory revealed deficiencies in the availability of human resources in the schools studied. In the case of healthy eating programs, schools lacked the human resources necessary to effectively manage fruit distribution, resulting in discarded pieces of fruit on the ground. This illustrated how factors that may not directly influence adolescent dietary habits can nevertheless have an impact on them.

The fruit boxes are delivered to the school, and then at recess, someone hands out the fruit. Is it the janitors, or is there a teacher who's responsible for distributing the fruit at recess? Actually, that's not the case. Who else could it be? Fruit was suddenly everywhere on the playground. [Madrid, key informant 3, female]

3.4. Macrosystem

3.4.1. Food industry interference

The food industry has had an impact on the school level. Key informants expressed concern about adolescents ordering food and energy drinks from delivery companies during school hours, a problem primarily observed in a few schools in medium and high SES areas where students were not allowed to leave school during recess.

It looks like they're ordering through the app from that delivery company, Glovo.² They're ordering, but I'm not sure what or how many. I don't know if it's happening here or through the gate, but they've ordered coffee and energy drinks, for example. [Madrid, key informant 3, female]

One key informant emphasized the role of the food industry in promoting processed foods through marketing campaigns. He observed a pervasive influence of the food industry on healthy habits, noting their presence in major sports. This can mislead society by addressing sedentary lifestyles but not the consumption of unhealthy products. He perceived that the food industry was gradually extending its influence into the promotion of sports activities, portraying itself as a health-conscious entity, despite the incongruence between its products and this image.

These products are tasty, full of sugar, easy to find, and appealing to our eyes. They even manipulate us by telling us that if we don't eat certain cereals for breakfast, we'll run out of energy. [...] The big soda companies say, "The problem isn't us, it's you if you don't move." If we keep thinking the problem is that we're too sedentary, they'll always find a way to get involved. They'll always be in sports,

they'll always try to confuse people with their advertising, and that does a lot of damage. [Madrid, key informant 5, male]

4. Discussion

The perspectives obtained from school principals provided valuable insights into adolescents' eating behaviors in Madrid and Bilbao. To the best of our knowledge, this is the first study in Spain to adopt a neo-ecological framework to explore these behaviors, offering insights into the complex interplay of influences. The findings of the present study suggest that there are a variety of factors that may influence how adolescents eat, and these factors may be present at different levels. At the microsystem level, the absence of shared meals with caregivers had an impact on adolescents' eating behaviors, influenced by time constraints, individual preferences, and socioeconomic status. Additionally, there were differences in food consumption depending on whether meals are homemade or store-bought, with factors such as food origin, quality, and taste playing a crucial role. At the virtual microsystem, social media had the potential to influence adolescents' perceptions of body image and dietary choices, with gender differences.

Within the mesosystem, the interaction between home and school environments becomes evident. The availability of healthy food at home may shape dietary practices at school, often influenced by convenience and socioeconomic factors. Conversely, schools had the potential to function as health-promoting spaces, with teachers and local authorities playing a key role in fostering better nutrition. School cafeterias, when effectively managed through communication with families, menu adaptation, and adequate facilities, have the potential to serve as nutrition centers. However, there were challenges such as the availability of unhealthy food.

At the exosystem level, structural constraints hindered the successful implementation of healthy eating programs in schools, particularly due to a lack of resources and facilities. At the macrosystem level, the influence of the food industry on adolescents' eating behaviors was evident through the promotion of unhealthy food and the use of food delivery services during school time. Addressing these interconnected factors would require a comprehensive approach that considers the interplay between individual, institutional, and societal influences on adolescents' eating behaviors.

Our findings highlight the importance of family meals, cooking together, and spending quality time with adolescents at home in the two cities studied. Additionally, our findings indicate that principals perceived that parents occasionally encounter difficulties in preparing meals for adolescents due to financial or time constraints. This finding is consistent with the results of previous research conducted by [Watson-Mackie et al. \(2023\)](#). Recent changes in family dynamics and traditional roles have resulted in altered eating patterns at home ([Reicks et al., 2019](#)). However, our results did not highlight gender roles. This may be attributed to the limited insight of school principals regarding the reality of adolescents' home environments. Nevertheless, our study corroborates the significance of family meals and parental supervision in Madrid and Bilbao, as evidenced by findings from studies on working families in Hong Kong that underscore the role of family cohesion in fostering healthy dietary behaviors among adolescents ([Liu et al., 2023](#)), despite the challenges posed by parents' full-time employment.

Although studies indicate that adolescents from medium and low SES often skip breakfast ([Mekonnen et al., 2020](#)), another study ([Fox & Timmer, 2020](#)) attributes this pattern to the emancipatory process and the autonomy associated with adolescent development. Prior research has underscored the pivotal role of parental promotion of healthy environments in fostering positive behaviors in adolescents. This aligns with our findings on the influence of the home environment on the school environment ([Cabrera-Ledesma et al., 2023](#)). About SES, our findings from Madrid and Bilbao are consistent with those of a previous study indicating that, in numerous instances, the menu options provided

² Glovo is a Spanish company like Doordash or GrubHub dedicated to the purchase, collection and delivery of orders, especially food.

by school cafeterias in low SES neighborhoods may be more nutritionally balanced than the food available at home (Vernarelli & O'Brien, 2017). In accordance with the findings of our study, the studied schools whose cafeterias operate on a weekly menu cycle can be considered to serve as nutrition centers. This is evidenced by their ability to adapt menus to include healthy food options, collaborate with families on matters of eating behaviors, and send weekly menus to students in advance. In contrast, school cafeterias lacking both weekly menus and a fully equipped kitchen sold unhealthy foods such as crisps and other snacks, a finding consistent with previous studies conducted across Spain (García Padilla & González Rodríguez, 2017; Garrido-Fernández et al., 2020b).

Although the specific role of each digital device is not explicitly delineated in the neo-ecological theory, our findings suggest that eating disorders among female adolescents in Madrid and Bilbao were on occasion identified during school time and are influenced by social media's impact on body perception. This underscores the importance of the virtual microsystem in influencing health behaviors, indicating that social media platforms may contribute to the development of unhealthy eating patterns among adolescents. Prior research (Scully et al., 2023) has documented an association between social media use and eating disorders among female adolescents, corroborating our findings. Our findings also indicate that the studied schools can play a crucial role in the detection of eating disorders among adolescents, particularly females. This is consistent with prior research indicating that school personnel, such as teachers, can assist in identifying early indications of eating disorders, including behaviors such as skipping meals or binge eating (Knightsmith et al., 2013). Nevertheless, it would be beneficial for school personnel to receive enhanced training on this significant health concern (Purseley et al., 2022).

While several previous studies have elaborated on the role of peers in shaping adolescents' eating behaviors (Neufeld et al., 2022; Stok et al., 2016) and the neo-ecological theory acknowledged their importance, our key informants did not provide sufficient information to elaborate on this influence within the microsystem. School principals might not have detailed knowledge about peer group influence on adolescents' eating behaviors, although they might be aware of other unhealthy behaviors such as bullying (Du Plessis & Mestry, 2024). Future studies could incorporate direct interviews with students or teachers to gain deeper insights into peer influences (Fielding-Singh, 2019; Kim & Kim, 2020).

In contrast to practices in the United Kingdom (Rose et al., 2019) Japan (Moffat & Thrasher, 2014), the United States of America (Brouse et al., 2009), and Australia (Hill et al., 2023), where food is typically provided at school, in Spain, adolescents have the flexibility to bring food from home or purchase it at the school cafeteria. This autonomy presents both opportunities and challenges in the promotion of healthy eating habits, as it relies heavily on individual and familial choices. This addresses similar concerns to those identified among Australian parents regarding the inclusion of healthy foods, control over adolescents' food choices, and special dietary needs (Aydin et al., 2023).

The interconnection between schools and the well-being of students has been previously investigated (Murphy & Pallan, 2023). Our findings identified several key elements, including health promotion and the effective implementation of healthy programs in the two studied cities, which, in conjunction with facilities, catering, and teachers, contribute to the conceptualization of schools as a valuable health asset. However, our findings also indicated that the lack of resources constituted a significant obstacle to the implementation of healthy programs in some of the schools. It is vital to address these barriers, and strategies such as securing additional funding, engaging stakeholders, and fostering community partnerships have the potential to enhance the effectiveness of school-based health initiatives. As evidenced by prior research, programs designed to encourage the consumption of healthy foods are more likely to achieve success when a comprehensive approach is employed, engaging the entire school community (Hill et al., 2023).

Macrosystem influences, including the use of online food delivery services, have been observed to impact eating behaviors in schools. While there is a substantial body of literature on the increase in online food delivery services since the onset of the COVID-19 pandemic (Buettnner et al., 2023) and the trend of ordering unhealthy food (Poelman et al., 2020), there is a gap in the literature regarding the use of such services during school hours. A previous study demonstrated that a considerable proportion of adolescents in countries such as the United States, the United Kingdom, Australia, and New Zealand utilized their debit cards to purchase food from online delivery services (Jia et al., 2021). Although food delivery services have been prohibited in North American schools due to their prevalence among students and safety concerns (Stephens et al., 2020), our findings from Madrid and Bilbao indicate that comparable measures might be contemplated in Spain to regulate the accessibility of unhealthy foods during school hours.

This study has both strengths and limitations. A significant limitation is the lack of explicit detail provided by key informants regarding family dynamics (e.g., time spent at home, leisure activities, mealtimes, weekends) and the influence of peers. This study has several notable strengths. Based on recommendations from Hennink and Kaiser (2022), qualitative empirical studies have achieved data saturation within a limited range of interviews (9–17), particularly when involving relatively homogeneous study populations, such as school principals, and narrowly defined research objectives, as in our study. Consequently, this research includes a sample that falls within the recommended parameters to achieve saturation, drawing from key informants in diverse schools across two distinct Spanish cities, Bilbao and Madrid. Involving multiple investigators and incorporating diverse perspectives in the analytical process with peer debriefings not only enhances the rigor of the study but also mitigates potential bias and ensures credibility of the findings (Denzin, 1989). School principals were selected as key informants due to their extensive insights into adolescents' dietary behaviors in schools (Patton, 2015), and their perspectives provided a comprehensive understanding of the interactions among various actors within the school context (e.g., teachers, students), offering insights that might be difficult to obtain from regular participants. Furthermore, key informants are essential to the success of case studies (Yin, 2018), reinforcing the validity of our approach.

5. Conclusions

School principals demonstrated a nuanced understanding of students, teachers, kitchen staff, and families, providing invaluable insights into the ways in which social and environmental factors shape adolescents' eating behaviors. By applying the neo-ecological theory, this study highlights the complex web of influences affecting adolescents' eating behaviors in Madrid and Bilbao, offering a comprehensive framework that can inform future interventions.

Findings revealed that family dynamics, such as the decline of shared meals and increased reliance on pre-cooked and nutritionally poor foods due to time constraints, have a significant influence on adolescents' eating behaviors, which tend to be shaped by SES. The promotion of unattainable body ideals on social media was associated with restrictive diets among female adolescents and elevated protein consumption among male adolescents.

The relationship between schools and families emerged as a crucial factor influencing adolescents' eating behaviors. Schools were positioned as health assets, offering structured meals and health programs that promote fruit consumption, balanced breakfasts, and physical activity. However, despite these efforts, there were challenges, including adolescents' resistance to eating healthy foods (e.g., fruit) and the lack of human resources, which hinder the effectiveness of these initiatives, especially in schools located in socioeconomically disadvantaged neighborhoods. Furthermore, the food industry's adverse influence based on delivery services exacerbates the challenge of maintaining a

healthy diet within schools.

Future public policies should prioritize the promotion of family mealtimes and nutritional education, with the objective of addressing unhealthy eating habits that originate in the home environment. It is crucial to implement initiatives that seek to counteract the negative influences of social media on body image and eating behaviors among adolescents. Moreover, the implementation of regulations limiting the use of food delivery platforms among adolescents during school hours could prove an effective strategy for reducing unhealthy food consumption in Spain. In addition, subsequent studies should examine the impact of digital food environments, particularly the influence of social media and food delivery platforms, on adolescents' eating behaviors and nutritional choices. A future research agenda should examine the intricate interplay among social, cultural, and economic factors that influence adolescents' eating behaviors in various environments, including the home, virtual spaces, and school. By addressing these interrelated factors, stakeholders can work towards the creation of supportive environments that promote healthy eating behaviors among adolescents, which will ultimately contribute to improved health outcomes in this population.

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CRedit authorship contribution statement

Ignacio de Loyola González-Salgado: Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Jesús Rivera-Navarro:** Writing – review & editing, Supervision, Project administration, Investigation, Funding acquisition, Formal analysis, Data curation. **Julia Díez:** Writing – review & editing, Visualization, Supervision, Investigation. **Leyre Gravina:** Writing – review & editing, Validation, Supervision, Investigation, Funding acquisition.

Ethical statement

All authors declare that:

They have seen and approved the final version of the article to be submitted.

The work described has not been published previously except in the form of a preprint, an abstract, a published lecture, academic thesis or registered report.

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The article's publication is approved by all authors and tacitly or explicitly by the responsible authorities where the work was carried out.

If accepted, the article will not be published elsewhere in the same form, in English or in any other language, including electronically, without the written consent of the copyright-holder.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.appet.2025.108013>.

Data availability

Data will be made available on request.

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