FOOD SCIENCE AND NUTRITION CASES

March 2026

Young People in Portugal and the Mediterranean Diet – A Case Study

This case study examines the dietary habits of Portuguese secondary school students, revealing a mismatch between high KIDMED index scores and inadequate adherence to Mediterranean Diet principles. It identifies socio-economic and institutional barriers and proposes multidimensional, evidence-based strategies to improve adolescent nutrition, supporting public health, education, and sustainable development goals. Results may alert health authorities, and results may be used to improve nutrition education in schools.

Authors: **Cristina Carapeto and Maria de Fátima Guimarães**

Affiliation: **Universidade Aberta, Science and Technology Department, Portugal**

DOI: **10.1079/fsncases.2026.0002**

Table of Contents

Abstract

The study assessed the adherence to the Mediterranean Diet (MD) among 467 secondary school students from the D. Afonso Sanches School Group, in Vila do Conde, Portugal, correlating the KIDMED index with data on eating habits, cooking methods, and socio-economic factors, collected through bespoke questionnaires designed by the authors. A high point-in-time adherence to the KIDMED index was observed (52.2% high), although actual eating practices diverged from MD principles: insufficient consumption of fruit (21%) and vegetables (19%), high fast-food intake (65%), and increased sedentary behaviour exacerbated by the COVID-19 pandemic. Identified barriers included the cost of fresh products (78%), limited Mediterranean options in school canteens (84%) and strong advertising influence (90%). It is recommended to articulate assessment tools (KIDMED and food frequency questionnaires), implement culinary workshops, revise school menus, provide incentives for local producers and promote food literacy campaigns, alongside extracurricular physical activity programmes.

Learning Outcomes

After reading this case study, readers will be able to:

1. *Understand* the dietary habits and adherence levels of an example of Portuguese secondary school students to the Mediterranean Diet by interpreting the KIDMED index data and associated food frequency findings.
2. *Identify* some of the key socio-economic, environmental, and institutional barriers that influence young people's adherence to the Mediterranean dietary pattern in a contemporary Portuguese context.
3. *Evaluate* the effectiveness and limitations of the KIDMED index as an assessment tool when compared to complementary dietary data collection instruments, such as food frequency questionnaires.
4. *Propose* evidence-based, multidimensional strategies to enhance adherence to the Mediterranean Diet among adolescents, considering educational, economic, and public health policy interventions.

Which Sustainable Development Goals (SDGs) Does the Case Support?

Sustainable Development Goals (SDGs) impacted and supported

The case study contributes to further understanding and supports the following SDGs:

- **SDG 3:** *Good Health and Well-being* – By promoting healthy eating habits based on the Mediterranean Diet and advocating for school and community-based interventions, the study contributes to alert of the need to reduce the risk of non-communicable diseases (cardiovascular disease, diabetes, obesity) and improve adolescent well-being.
- **SDG 4:** *Quality Education* – The study supports educational initiatives by recommending the implementation of culinary workshops and food literacy programmes in schools, fostering knowledge about healthy, sustainable, and culturally rooted eating practices.
- **SDG 10:** *Reduced Inequalities* – By identifying some socio-economic barriers to accessing fresh, healthy foods and proposing measures such as incentives for local producers and improved school menus, the study addresses dietary inequalities that may affect economically disadvantaged groups.

Background and Context

The Mediterranean Diet (MD) is characterised by high consumption of plant-based products (unrefined cereals, fruits, vegetables, legumes, and nuts), olive oil as the primary source of fat, moderate dairy intake, frequent fish consumption, occasional red meat intake, as well as regular physical activity and conviviality during meals (Serra-Majem *et al.,* 2004). Recognised by UNESCO as Intangible Cultural Heritage of Humanity (RCM 71/2014), the MD has proven to have positive effects in preventing cardiovascular diseases, type 2 diabetes, obesity, and certain types of cancer (Graça, 2014).

However, globalised food systems and market pressures on the pricing of fresh products have altered consumption patterns, especially among younger populations, promoting processed foods and fast meals (Graça, 2020). In Portugal, the National Programme for the Promotion of Healthy Eating (PNAPAS) (DGS, 2012) and the Integrated Strategy for the Promotion of Healthy Eating (PNEIPAS) (Bordalo, 2015) advocate the MD as a public health standard, although effective adherence remains low among adolescents (Pereira and Cunha, 2017).

In this study, tools to assess adherence to the Mediterranean dietary pattern among young people included:

- *KIDMED index*: a 16-item questionnaire scoring from −4 to 12, where values ≥8 indicate high adherence, 4–7 medium adherence, and ≤3 low adherence (Table 1).
- *Questionnaires A and B*: developed by the authors to evaluate eating habits, physical activity, MD knowledge, and family consumption patterns.

Table 1. KIDMED 1.0 index (Serra-Majem *et al.,* 2004).

KIDMED index	
+1	Do you eat a fruit or fruit juice every day?
+1	Eat a second piece of fruit every day
+1	Eat fresh or cooked vegetables regularly, at least once a day
+1	Do you eat fresh or cooked vegetables regularly, more than once a day?
+1	Do you eat fish regularly (at least 2–3 times a week)?
−1	Do you go to fast-food restaurants (burgers) more than once a week?
+1	Do you eat legumes more than once a week?
+1	You eat pasta or rice almost every day (5 or more times a week)
+1	Do you eat cereals or cereal products (bread, etc.) for breakfast?
+1	Do you eat nuts (walnuts, almonds, etc.) regularly (at least 2–3 times a week)?
+1	Do you use olive oil at home?
−1	Do you usually have breakfast?
+1	Do you consume dairy products (milk, yoghurt, etc.) for breakfast?
−1	Eat ready-made products or pastries for breakfast
+1	Consume 2 yoghurts and/or cheese (40 g) daily
−1	You eat sweets or treats several times a day

This study aimed at deepening the analysis of MD adherence among students from the D. Afonso Sanches School Group (AEDAS), articulating the KIDMED index with specific data from the authors' questionnaires, as well as exploring cooking patterns, school food provision, and socio-economic factors.

This case study offers valuable insights into the dietary behaviours of Portuguese adolescents and their adherence to the MD, a culturally significant and scientifically validated dietary model. Its particular interest lies in revealing the paradox between the relatively high KIDMED index scores and the actual suboptimal eating habits among students, highlighting gaps in assessment tools and the influence of socio-economic and environmental factors.

Moreover, the study underscores the structural challenges in promoting healthy eating habits in educational settings, including the limited availability of MD options in school canteens, the financial barriers to accessing fresh produce, and the pervasive influence of food advertising. It also points to opportunities for health promotion through home cooking practices and school-based interventions.

This case study contributes to advancing public health knowledge and provides a framework for the development of integrated, evidence-based strategies for improving young people's nutrition in a sustainable and culturally appropriate manner.

Methodology

This work was conducted as a cross-sectional, observational, and analytical study during the 2020/2021 academic year.

The case study population involved 587 secondary school students (general and vocational education) from the D. Afonso Sanches School Group (ESDAS). In total, 467 students participated, representing 79.6% of the target population. Students' ages ranged from 14 to 20 years, with 53.7% male and 46.3% female.

Instruments

Both questionnaires, A and B, were validated before be passed on to respondents. Validation was done with teachers and students at the same school 3 months before the collection of data.

- *Questionnaire A* (completed in person by students): designed to gather sociodemographic data, food frequency, cooking methods, beverage consumption, physical activity, knowledge about MD and the KIDMED index.
- *Questionnaire B* (completed online by students' guardians): aimed at collecting information on shopping practices, meal preparation, and family lifestyle. Parents who were willing to participate sent their email contact to school, and the questionnaire was later sent to them with the Google forms link. Students did not have access to this questionnaire.

Data processing

- Data was processed using IBM SPSS for Windows, version 22.
- Descriptive statistics (mean, standard deviation, frequencies, and percentages).
- Cross-referencing variables: *statistical comparisons and correlations* among dimensions "demographic," "behavioural," and "socio-economic" to *reveal patterns, discrepancies, or influencing factors* behind students' adherence (or lack thereof) to the MD (variables used were gender, age, KIDMED, eating habits and socio-economic data).

With the cross-referencing variables, data was *not analysed with each variable isolated*, but rather *the relationships among them were considered*. The main *cross-referenced variables* in this study were:

1. *Gender and KIDMED index* – to determine whether boys and girls differed in their adherence to the MD.
2. *Age and KIDMED index* – to verify if older or younger students showed distinct levels of adherence.
3. *Eating habits (fruit, vegetables, fast food, sugary drinks, etc.) and KIDMED index* – to test whether actual dietary practices were consistent with the adherence scores.

4. *Socio-economic factors (family income, perception of cost of fresh products, availability of Mediterranean food in canteens)* and *KIDMED index or eating habits* – to assess how social and economic conditions influenced diet quality.

Results

Demographic profile

Figure 1 shows the distribution of students by academic year. A total of 147 (31.5%) attended the 10th grade, 154 (33%) the 11th grade, and 166 (35.5%) the 12th grade.

The average age of participants was 16.7 ± 1.2 years (ranging from 14 to 20), with 53.7% male, 46.3% female, and 95.7% of Portuguese origin.

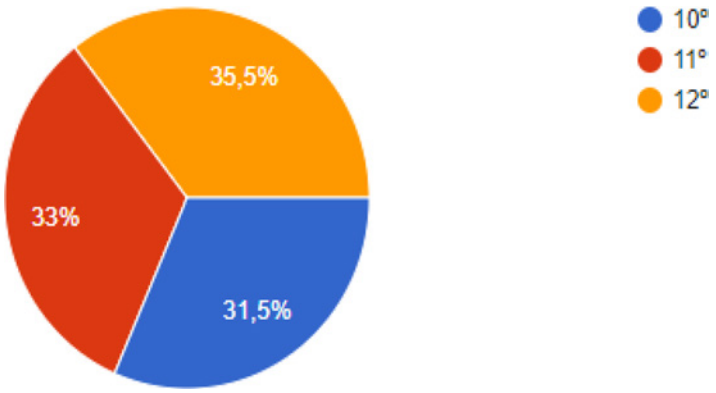

Fig. 1. Distribution of students by school year.

Adherence to the KIDMED index

Adherence to the Mediterranean dietary pattern was assessed using the Mediterranean Diet Quality Index for children and adolescents (KIDMED index). The results are presented in Table 2.

Table 2. KIDMED survey results.

Adherence level	Score	Number	%
High	≥8	244	52.2
Medium	4–7	217	46.5
Low	≤3	6	1.3

Negative aspects revealed by the KIDMED questionnaire included:

- Low daily intake of a second piece of fruit (29% – only 135 students said "yes").
- Consumption of fresh or cooked vegetables more than once a day (37.4% – only 175 students said "yes").
- Consumption of nuts at least 2–3 times a week (18.6% – only 87 students said "yes").
- Consumption of yoghurts and cheese outside breakfast (36.6% – only 171 students said "yes").

Eating habits (Questionnaire A)

From the analysis of responses, it was possible to conclude:

- Fruit: 21% of students consume fruits daily (n = 98).
- Vegetables: 19% of students consume fruits daily (n = 89).
- Legumes: only 15% of students consume legumes >4 days/week (n = 70).
- Fast-food: 65% of students consume ≥1×/week (n = 304).
- Sugary drinks: 48% of students consume ≥1×/day (n = 224).

School canteen meals

Regarding students' opinions about school canteen meals, 114 students (24.6%) did not eat at the canteen, most going home for lunch. Among the remaining, most considered meal quality reasonable (Fig. 2). As for the food sold at the school bar, most students rated it as good (Fig. 3).

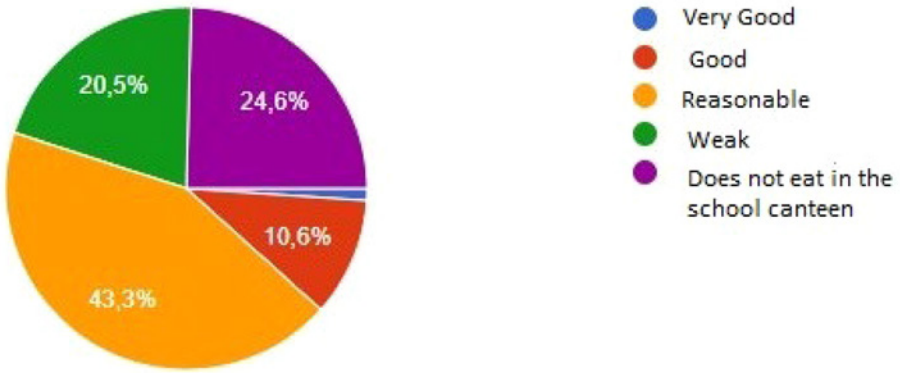

Fig. 2. Classification of the quality of meals served in the canteen.

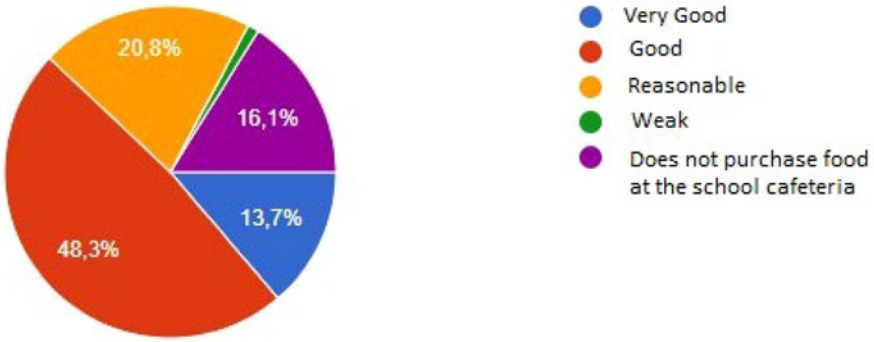

Fig. 3. Classification of food served in the school cafeteria.

Physical activity

Regarding physical activity, 47% (n = 220) of students only took part in the compulsory physical education classes (2×/week); 0.9% (n = 4) were involved in school sports; and 52% (n = 117) claimed to have reduced activity during lockdown.

Cooking methods

Responses from Questionnaire B completed by students' guardians indicated the following methods of meal preparation at home (Table 3), with a predominance of low-fat techniques (grilling, stewing) in 64% of main meals.

Table 3. Cooking methods and frequency of consumption.

Cooking method	2–4×/week	5-6×/week	1×/day
Boiled	21% (n = 19)	4% (n = 4)	4% (n = 4)
Grilled	35% (n = 31)	11% (n = 10)	4% (n = 4)
Fried	20% (n = 18)	—	—
Roasted	26% (n = 23)	6% (n = 5)	1% (n = 1)
Stewed	29% (n = 26)	7% (n = 6)	2% (n = 2)
Sautéed	24% (n = 21)	1% (n = 1)	1% (n = 1)

Socio-economic and environmental factors

Questionnaire B responses also showed that 78% (n = 69) of guardians considered the price of fresh products too high; 84% (n = 75) stated that Mediterranean food options in school canteens were insufficient; and 90% (n = 80) perceived the strong influence of advertising for processed foods on food preferences.

Discussion

The high percentage of "high" adherence to the KIDMED index (52.2%; n = 244) contrasts with actual eating habits, as reflected in Questionnaire A, where consumption of fruit and vegetables was below recommendations (Graça, 2020). This highlights limitations of the KIDMED index, which values isolated items without capturing actual frequency and daily consistency (Serra-Majem *et al*., 2004). Although today there is the KIDMEX Index 2.0 (López-Gajardo *et al.,* 2022), which may be somewhat more adapted to the reality and preferences of young people, at the time of data collection, there was only the first version of this index.

Analysis of cooking methods reveals a preference for healthier techniques (grilling, stewing) in 64% (n = 57) of main meals, indicating a strong potential to promote Mediterranean habits through culinary education (Pereira and Cunha, 2017).

The socio-economic factors analysed in this study were present in questionnaire B, directed to parents (or guardians), and included family income and employment status, level of education, perception of cost of fresh products and availability of Mediterranean food in canteens. The identified socio-economic factors corroborate findings by Santos (2014) and Truninger (2019), with price and access to certain foods emerging as decisive barriers. The COVID-19 pandemic increased reliance on processed foods, exposing weaknesses in urban food systems (WHO, 2015).

School food provision, analysed through students' evaluations, requires restructuring and alignment of menus with the Directorate-General of Health's guidelines in Circular 3097 DGE (2018).

Conclusions and Recommendations

First and foremost, it is necessary to acknowledge certain limitations of the present study, namely the fact that the questionnaires were applied to a single school (which, however, is consistent with the nature of a case study); the possibility that students may have been biased in their responses, either voluntarily or involuntarily; and the likelihood that some questions may have been misinterpreted, even though a teacher was present during the questionnaires application to provide clarifications without interfering with the students' answers.

Having in mind the above-mentioned limitations of the study, we may say that it rigorously characterised the dietary patterns and lifestyle of students from the D. Afonso Sanches School Group, revealing a paradox: although over half the sample achieved a high KIDMED adherence score, actual food habits demonstrated consumption of fruit, vegetables, and legumes significantly below MD recommendations. This discrepancy highlights the need to complement the KIDMED index with more detailed, locally adjusted assessment tools.

Main identified barriers – high cost of fresh products, limited provision of balanced and appealing school meals, and strong influence of food advertising – are key factors undermining consistent adherence to this dietary pattern, particularly in disadvantaged socio-economic contexts. Limitations imposed by the COVID-19 pandemic exacerbated sedentary lifestyles and processed food consumption, exposing structural vulnerabilities in school and family food systems.

Analysis of home cooking methods, however, revealed a positive aspect: the predominance of healthy culinary techniques (grilling, stewing, boiling) in 64% of main meals, offering an important opportunity to promote healthy eating.

Based on these results, it is essential to adopt multidimensional measures integrating public health, education, food economy, and local food culture policies.

Our recommendations include:

- combining the KIDMED index with specific food frequency questionnaires for more consistent dietary assessments;
- introducing culinary workshops in schools, prioritising Mediterranean techniques and recipes adapted to the local context;
- revising contractual food service provision to ensure daily menus aligned with MD principles, supervised by nutritionists;
- creating economic and logistical incentives for local producers, school markets, and short food supply chains;
- reinforcing media campaigns and food literacy programmes targeting youth and families, valuing Portuguese food heritage and countering processed food advertising; and
- Developing extracurricular physical activity programmes, ensuring accessibility for all students.

These integrated strategies are crucial to reversing the trend of distancing younger generations from the MD, while contributing to the preservation of food cultural heritage, public health improvement, and environmental and economic sustainability.

The authors have not yet conducted any follow-up to this study to assess any changes that may have occurred. It is our view that a period of only 2 years would not be sufficient for the implementation of significant modifications in school canteens. Nevertheless, new studies in this field are currently being carried out, particularly within the scope of master's and doctoral dissertations. Furthermore, governmental policies have provided valuable support for food education by introducing restrictions on the sale of certain products in school cafeterias (like crisps and candies) and by promoting the availability of healthier food options both in school bars and in vending machines. The strategy of educating through the selective provision of food is endorsed by both nutritionists and teachers across different educational levels.

Exercises/Group Discussion Questions

1. Analyse the main factors identified in the case study that hinder young people's adherence to the Mediterranean Diet in Portugal. How might these factors be addressed through public health and education policies?
   Bloom's level: Analyse/Evaluate
2. Evaluate the limitations of the KIDMED index as revealed by this case study. What complementary methods would you recommend for a more accurate assessment of adolescents' dietary patterns, and why?
   Bloom's level: Evaluate
3. Propose a multidimensional intervention plan, based on the study's findings, to improve adolescents' adherence to the Mediterranean Diet in schools and at home. Include educational, economic, and institutional measures.
   Bloom's level: Create
4. Discuss the relevance of this case study in relation to the Sustainable Development Goals (SDGs), identifying at least two goals directly supported by the proposed recommendations. Justify your choices.
   Bloom's level: Understand/Apply.

Conflict of interest

The authors have no conflicts of interest to declare.

Acknowledgements

The authors would like to express their gratitude to

- the D. Afonso Sanches School Group in Vila do Conde, in particular to the Headmistress, Professor Doctor Ana Alice Rodrigues, the Deputy Headmistress, Professor Susana Barbosa, and the Coordinator of the Vocational Courses, Professor Luísa Mota, for their availability and essential collaboration in making this project possible;
- the Class and Course Directors for the way they welcomed me and for their involvement in the dissemination, distribution, supervision, and collection of the questionnaires; and
- the students at D. Afonso Sanches Secondary School invited to participate, for their receptiveness and interest. To their parents and guardians, whose collaboration was indispensable to the completion of this work, namely for granting permission for their children to take part in this study and for the time they dedicated to completing the questionnaires.

Supplementary material

The supplementary material is available in the online version of this article.

Further Reading

Bach-Faig, A., Berry, E.M., Lairon, D., Reguant, J., Trichopoulou, A., Dernini, S. and Serra-Majem, L. (2011) Mediterranean diet pyramid today. Science and cultural updates. *Public Health Nutrition* 14(12A), 2274–2284. DOI: 10.1017/S1368980011002515. ➔ Scientific and cultural update of the Mediterranean food pyramid, recognizing implications for health and food cultural heritage.

Dernini, S. and Berry, E.M. (2015) Mediterranean diet: from a healthy diet to a sustainable dietary pattern. *Frontiers in Nutrition* 2, 15. DOI: 10.3389/fnut.2015.00015. ➔ Analysis of the Mediterranean Diet as a sustainable and culturally rooted dietary pattern, relevant to justify multidimensional proposals.

Grosso, G. and Galvano, F. (2016) Mediterranean Diet adherence in children and adolescents: A systematic review. *British Journal of Nutrition* 115(4), 637–644. DOI: 10.1017/S0007114515004895. ➔ Systematic review on children and adolescents' adherence to the Mediterranean Diet, essential to contextualize results such as those of your study.

Willett, W., Rockström, J., Loken, B. *et al.* (2019) Food in the Anthropocene: The *EAT–Lancet Commission on healthy diets from sustainable food systems*. *The Lancet* 393(10170), 447–492. DOI: 10.1016/S0140-6736(18)31788-4. ➔ International reference work on healthy and sustainable eating, aligned with public health and SDGs. Essential for framing the food debate in an ecological and food systems context.

World Health Organization (2015) *Food and Nutrition Policy for Schools: A Tool for the Development of School Nutrition Programmes in the European Region*. WHO Regional Office for Europe, Copenhagen. ➔ WHO technical and policy guidance for improving school food environments — directly applicable to the recommendations in your study.

References

Bordalo, A. (2015) *A Saúde dos Portugueses -Perspetiva 2015*. Direção Geral de Saúde, Lisboa.

DGE (2018) Circular 3097/DGE/2018. Orientações sobre ementas e refeitórios escolares.

DGS - Direção-Geral Da Saúde (2012) *Programa Nacional da Promoção da Alimentação Saudável*. Orientações Programáticas, Lisboa.

Graça, P. (2014) *O Futuro da Alimentação: Ambiente, Saúde e Economia*. Fundação Caloust Gulbenkian, O padrão alimentar do Mediterrâneo e o acesso a alimentos saudáveis, Lisbon, pp. 204–210.

Graça, P. (2020) *Como comem os portugueses – alimentação*. Fundação Francisco Manuel dos Santos e Pedro Graça, Lisboa.

López-Gajardo, M.A., Leo, F.M., Sánchez-Miguel, P.A., López-Gajardo, D., Soulas, C. and Tapia-Serrano, M.A. (2022) KIDMED 2.0, an update of the KIDMED questionnaire: Evaluation of the psychometric properties in youth. *Frontiers in Nutrition* 9, 945721. DOI: 10.1079/PHN2004564.

WHO (2015). Health 2020: A European policy framework supporting action across government and society for health and well-being. WHO.

Pereira, F. and Cunha, P. (2017) *Referencial de Educação para a Saúde*. Ministério da Educação – Direção-Geral da Educação Direção-Geral da Saúde, Lisbon.

RCM - Resolução do Conselho de Ministros n.° 71/2014, de 13 de novembro. *Diário da República n.° 232/2014, Série I.* Presidência do Conselho de Ministros, Lisboa.

Santos, J. (2014) *O Futuro da Alimentação: Ambiente, Saúde e Economia*. Fundação Caloust Gulbenkian uma alimentação com futuro, saudável, sustentável e acessível para todos, Lisbon, pp. 7–16.

Serra-Majem, L., Ribas, L., Ngo, J., Ortega, R.M., García, A., Pérez-Rodrigo, C. and Aranceta, J. (2004) Adherence to the Mediterranean diet and nutritional status in Spanish children and adolescents: The enKid Study. *European Journal of Clinical Nutrition* 58(8), 1184–1190. DOI: 10.1038/sj.ejcn.1601929.

Serra-Majem, L., Trichopoulou, A. *et al.* (2004) Does the definition of the Mediterranean diet need to be updated? *Public Health Nutrition* 7(7), 927–929.

Truninger, M. (2019) *Alimentação em Tempos de Crise: consumo e Segurança Alimentar nas Famílias Portuguesas*. ICS Imprensa de Ciências Sociais, Lisboa.