The impact of COVID-19 lockdown and consumers' risk preference and perceptions on food purchasing and consumption behaviour in Spain

Shanshan li [1, *], Zein Kallas [2, 3, *], Djamel Rahmani [2] and José Maria Gil [2,3]

[1] Institute for Research in Sustainability Science and Technology (IS-UPC), Polytechnic University of Catalonia, 08034, Barcelona, Spain

[2] CREDA-UPC-IRTA, Centre for Agro-food Economy & Development, 08860, Castelldefels, Spain; djamel.rahmani@upc.edu (D.R.); Chema.Gil@upc.edu (J.M)

[3] DEAB (Department of Agrifood Engineering and Biotechnology-Universitat Politècnica de Catalunya), Castelldefels, Spain

* Correspondence: shanshan.li@upc.edu (S.L.); zein.kallas@upc.edu (Z.K.)

Abstract: The COVID-19 pandemic is a big challenge for global food security and it changes consumers' food purchasing and consumption behaviour. This research not only investigates Spanish consumers' food purchasing and consumption behaviour during the lockdown but also from a point of sustainability. Data are collected from a semi-structured questionnaire which is distributed online among 1203 participants. The total food consumption **(C)**, food expenditure **(E)** and purchase food with sustainable attributes **(S)** as three dependent variables are measured and binary logistic models are estimated. Results show that gender, age, employment status and experience are associated with total food consumption and expenditure during the lockdown. In addition, consumers' risk perceptions, shopping places, trust level in information source and risk preference are highly important factors in consumers' preferences and behaviour. Consumers' objective knowledge regarding COVID-19 influences expenditure. Consumers' trust level in information from the health professionals and scientists is higher than that from government and News. Furthermore, family structure is only related to expenditure, while place of residence only influences food consumption. Mood is associated with expenditure and purchase food with sustainable attributes. Household size affects purchasing behaviour towards food with sustainable attributes. This research provides references for stakeholders that helps them to adapt to the new COVID-19 situation.

Keywords: COVID-19; food purchasing behaviour; food consumption behaviour; sustainable purchasing behaviour; binary logistic model

1 Introduction

The novel Corona Virus Disease, named "COVID-19" by the World Health Organization (WHO), was initially reported in Wuhan city, China in December 2019 [1], then it was rapidly spreading around the world, resulting in a global pandemic. Spain took many prevention measures such as lockdown, stay-at-home order, mass quarantine, and transport halt when the COVID-19 virus started to spread in Spain. The Spanish government declared the state of emergency on March 14th 2020 and increased the severity of the state of alarm from March 30th to April 14th 2020, which was a strict lockdown period. People could only leave home when they were working in essential services (health, security, social, and economic wellbeing of citizens) or when they needed to buy necessary products (groceries and medicines) during the lockdown [2]. The COVID-19 pandemic situation caused several economic and social changes. On the one side, the rate of unemployment increased and financial strain became more severe [3], which led to an increase in depression risk, stress, and feelings of helplessness [4]. On the other side, the COVID-19 breakdown created new working and family situations (e.g., teleworking, e-learning, homes with narrow spaces and living spaces without direct access to sunlight), which also induced stress and depression [5].

In this context, a big share of consumers increased their food consumption due to higher anxiety levels [6]. A previous study indicated that consumers in the ten European countries consumed more food, as COVID-19 lockdowns and a rise in homeworking across Europe led to people spending more time at home and impacted their consumption behaviour and food choices [7]. In addition, the COVID-19 lockdown also changed consumers' purchasing behaviour. Individuals focused on buying food items as a behavioural reaction to feelings of stress and uncertainty [8]. Negative feelings (e.g., fear, stress and uncertainty) could cause a panic buying situation [9,10]. Panic buying behaviour exacerbates stock-out situations and often leads to a price increase in food products [9]. Spanish consumers are stockpiling non-perishable food and other supplies during the COVID-19 lockdown [11]. Some people stockpile food items in an attempt to reduce the number of future shopping trips and buying more on each trip to minimize store visits aiming to reduce the risk of infection [12]. According to previous research, 64% of consumers experienced product shortages at stores from which they were attempting to purchase and 50% stocked up on products to avoid deficiencies in the future

during the COVID-19 outbreak in India [13]. Additionally, consumers' food spending increased dramatically during the COVID-19 outbreak [14,15], and another report indicated that grocery spending increased in Spain due to COVID-19 [16]. Besides, the COVID-19 pandemic enabled people to shift to purchase food products online in an attempt to limit their perceived risk of exposure to infection [17].

There is a considerable literature that explores consumers' attitudes, purchasing and consumption behaviour towards food products with sustainable attributes (e.g., organic food, animal welfare food, fair-trade food, environmentally friendly food and local food) before the COVID-19 lockdown [18–21]. However, little research attempts to measure it during the lockdown and it is of great importance and necessity to conduct such a study that ensure the availability of food with sustainable attributes in the market during the lockdown. To date, few studies focused on how COVID-19 affected Spanish consumers' purchasing or consumption behaviour [2,22], and these studies mainly focused on the evolution of people's internet searches, the characteristics of the most-watched YouTube videos about COVID-19 or food consumption. This research includes more comprehensive potential impact factors and, to our knowledge, is the first study that not only investigates Spanish consumers' food purchasing and consumption behaviour during the lockdown but also explores it from a sustainability point of view. In this context, the main objective of this study is to analyze how the COVID-19 lockdown affected the consumers' consumption and purchasing behaviour in Spain. To reach the main objective, three secondary objectives were proposed as intermediate steps. Firstly, to identify ***changes in the determinant factors affecting consumers' total food consumption***. Secondly, to explore ***how consumers' food expenditure changes and find out its impact factors***. Thirdly, to find out ***changes in the purchase behaviour towards food products with sustainable attributes***.

2 Material and methods

2.1 Data collection

A semi-structured questionnaire in an online survey (Qualtrics consumers panels) among 1203 participants during the lockdown situation was conducted in Spain in May 2020. The sample was stratified by gender and age, and a selection criterion to be eligible was selected.

Only consumers who are totally or in part responsible for food purchasing were included in the study. Respondents were volunteered to participate in the survey and received an explanation of the objective of the study, emphasizing that the information requested would be exclusively used for research and that confidentiality was guaranteed. In order to improve the response rate of the questionnaire, we reward the participants. The questionnaire was approved by the Ethics Committee of the Centre for Agro-food Economy and Development and was conducted according to the ethical principles in social science studies.

2.2 Independent variables in this research

2.2.1 MPL Stated Risk preference: The lotteries approach

Risk preference can affect behavioural intention [23]. There are many methods to elicit it, and using the MPL (multiple price list) is a very popular approach in experimental studies in psychology and economics, which is an easy procedure and based on the economic theory of the expected utility [24,25]. In this research, MPL, known as the "hypothetical lottery", was employed to measure consumers' risk preference [26]. As **Table 1** presented, in this MPL experiment, respondents were asked to choose between lottery A and lottery B twenty times. In the first task, they have a 100% chance of receiving €200 under lottery A; under lottery B they have a 50% chance of receiving €200 and a 50% chance of receiving nothing. By that analogy, 20 tasks, until lottery A with 100% chance of receiving €10, lottery B with the same, are asked to measure consumers risk preference. This part of the questionnaire about risk preference will be over when respondents choose lottery B anytime. The payoff of lottery A decreases in turn, while the payoff of lottery B remains unchanged (€100). Lottery A is the "safe" choice whose payoff is more than the potential payoff in the "risky" lottery B among the top ten choices. In the 11th task, the payoff of lottery A is the same as that of lottery B. Starting from the 12th task, lottery A has less payoff than lottery B.

According to the previous literature, only risk-loving people would choose lottery B in the first task and a risk-neutral participant would choose lottery B from A in the eleventh task, which means a risk-neutral person would choose A ten times before switching to B. Risk-averse subjects would choose lottery A in the twentieth task [27]. The number of "safe choices" (choosing Lottery A) or the switching point from choosing A to B is often used to describe risk

preference [28]. According to expected unitality theory, one should choose A from task 1 to 10, choose B from task 11 to 20. The safe choices number of a risk-loving person should be below or equal to 9 and the number of a risk-neutral should be equal to 10. With respect to the number of risk-aversion people should be more than or equal to 11. This research used this method to analyze the risk preference data.

Table 1 Lottery experiment measuring the risk preference.

Task No.	lottery A	lottery B
1	100% of € 200	50% of € 200, 50% of € 0
2	100% of € 190	50% of € 200, 50% of € 0
3	100% of € 180	50% of € 200, 50% of € 0
4	100% of € 170	50% of € 200, 50% of € 0
5	100% of € 160	50% of € 200, 50% of € 0
6	100% of € 150	50% of € 200, 50% of € 0
7	100% of € 140	50% of € 200, 50% of € 0
8	100% of € 130	50% of € 200, 50% of € 0
9	100% of € 120	50% of € 200, 50% of € 0
10	100% of € 110	50% of € 200, 50% of € 0
11	100% of € 100	50% of € 200, 50% of € 0
12	100% of € 90	50% of € 200, 50% of € 0
13	100% of € 80	50% of € 200, 50% of € 0
14	100% of € 70	50% of € 200, 50% of € 0
15	100% of € 60	50% of € 200, 50% of € 0
16	100% of € 50	50% of € 200, 50% of € 0
17	100% of € 40	50% of € 200, 50% of € 0
18	100% of € 30	50% of € 200, 50% of € 0
19	100% of € 20	50% of € 200, 50% of € 0
20	100% of € 10	50% of € 200, 50% of € 0

2.2.2 Risk perceptions

Risk perception plays an important role in consumers purchase intentions [29], and it refers to people's judgments and evaluations of hazards they (or environments) are or might be exposed to. Such perceptions steer decisions about the acceptability of risks and are crucial influences on behaviour before, during, and after a disaster [30]. In this research, three types of risk perceptions were measured, consisting of health risk, food security risk and financial risk.

As for health risk perception, it is elicited by four items. Firstly, to use a 10-point Likert scale ranging from 1 (not serious at all) to 10 (very serious) (*Q9. In case you will contract COVID-19 in the next six months, how serious do you think your health condition will be?*). Secondly, to employ a 5-point Likert scale that ranges from 1 (very unlikely) to 5 (very likely) (*Q10. How likely do you think it is that you will develop or contract COVID-19 in the next six months?*). Thirdly, to ask respondents if they contracted COVID-19 or not (*Q7. Have you contracted the COVID-19 virus?*) and they need to choose one option (*1 = Yes, I tested positive for the COVID-19 virus; 2 = No. I had the symptoms, but the test result came back negative; 3 = No. I did not have the symptoms, so I did not opt for a test; 4 = I do not know. I had the symptoms but did not have access to a test*). Fourthly, to ask participants questions that do they know someone who has been diagnosed or died due to COVID-19 (*Q15. Do you know someone who has been diagnosed or died due to the COVID-19 virus? - members of my family; friends; neighbours; friends of my friends; colleagues; and No, I don't know any person)*. If consumers have a higher score from *Q9* and *Q10*, contracted COVID-19 virus (*Q7*), or know someone who has been diagnosed or died due to COVID-19 (*Q15*), they will perceive a higher health risk. In addition, consumers' perceived food security risk is elicited using a 7-Likert scale ranging from 1 (very unlikely) to 7 (very likely) and the questions are the possibility they perceived food shortages or price increases in the next six months (*Do you think the following scenarios are likely or unlikely in the next six months?*). Regarding the financial risk, a 5-point Likert scale ranging from 1 (not at all) to 5 (a great deal) (*Please indicate how you feel about your current financial situation? – uncertainty; at risk; threatened; worry about it and think about it)* was used to measure their financial risk perception.

2.2.3 Mood states, experience, concerns and shopping places

Negative and positive moods influence food choices [31]. Mehrabian and Riccioni pointed out that a positive mood is related to high appetite levels [32]. COVID-19 brings great pressure and different moods to consumers, which may affect their purchasing and consumption behaviour during the lockdown. Therefore, respondents were asked about the mood status (including a positive mood and negative mood) via a 5-point Likert scale ranging from 1 (none

of this feeling) to 5 (a great deal of this feeling) (*Considering the COVID-19 situation in the country where you currently live, do you feel?- irritated; confident; angry; reassured; annoyed; and aggravated*).

In addition, the COVID-19 pandemic has brought stress and uncertainty for people, which could result in panic buying, thus it is a big challenge to global food security. Consumers' behaviour is sometimes designed to mitigate against the risk of not being able to purchase food, or indeed other items, at a later date for those who have experienced the food shortage or food price increase during the COVID-19 outbreak [33]. As a consequence, experience (food shortage, price increase and neither) as an independent variable is elicited in this research. (*Do you experience the following scenarios? - You faced food shortages in your area during the COVID-19 outbreak; You experienced an increase in food prices; Neither*).

Additionally, previous work indicated that consumers concern related to buying behaviour. For example, health concerns and food security concerns influence consumer attitude ultimately influence purchasing behaviour toward organic food [34]. During the COVID-19 pandemic, people are concerned about safety and health [35], and it may affect consumers' food purchasing and consumption behaviour. Hence, respondents' level of health concerns about COVID-19 is also examined by using a 7-point Likert scale ranging from 1 (not concerned at all) to 7 (extremely concerned) (*Please indicate your level of health concern about COVID-19*). In addition, a previous study indicated that there was a big increase in food shopping online with 45% of consumers doing more in ten European countries during the lockdown [7]. The changes in shopping places may lead to changes in food consumption and purchasing behaviour. Respondents were asked to answer two questions to assess shopping places variable (*Where do you usually buy food products? - Before restrictions due to COVID-19 and Where do you usually buy food products? – Now*) (*1 = hypermarkets, supermarkets; 2 = specialized food stores; 3 = malls; 4 = farmer's Market/Open markets; 5 = retailers' websites; 6 = organic food stores; 7 = others*).

2.2.4 Trust in information sources and knowledge

Consumers look for health information from a wide cluster of sources and channels [36]. Trust in health organizations and government health agencies has been identified as important

correlates of health-related decision-making and behaviour [37]. In public health emergencies (e.g., a flu flare-up), people with high trust in government health agencies react more rapidly and are more likely to comply with the health recommendations given by the agencies [38]. In this context, consumers' trust in information sources is elicited by using a 5-point Likert scale ranging from 1 (not at all trustworthy) to 5 (extremely trustworthy) (*Consider the following sources of information regarding COVID-19. How trustworthy do you feel these sources are? – government; social media such as Twitter, Facebook; health professionals such as doctors; family, friends, colleagues; scientists; News such as papers, TV, radio*).

In addition, knowledge is divided into what individuals perceive they know (subjective knowledge) and what they actually know (objective knowledge) [39]. Earlier studies showed that consumers' subjective and objective knowledge levels are associated with attitudes and behaviour [40]. Hence, the consumers' subjective and objective knowledge are measured to test their influence on consumers' purchasing and consumption behaviour in this research. Specifically, respondents are asked to respond about their perceived subjective knowledge level (*Please indicate how knowledgeable you feel with regards to COVID-19)* via a 7- Likert scale ranging from 1 (not knowledgeable at all) to 7 (very knowledgeable), and its result is presented in percentage terms ranging from 0 (not knowledgeable at all) to 100 (very knowledgeable). The level of the objective knowledge is elicited by asking them to judge whether the symptoms of COVID-19 are right or false by introducing several "non-existing" symptoms (*True or False? These are common symptoms of COVID-19*). Objective knowledge is defined as the percentage of correct answers to questions of knowledge on seventeen statements. In addition, respondents' discrepancy intensity between subjective and objective knowledge is also explored in this research. Knowledge discrepancy has two aspects: subjective knowledge level is higher than objective knowledge (overestimation), or subjective knowledge level is lower than objective knowledge (underestimation) [41].

2.3 Measuring consumers' purchasing and consumption behaviour

Three dependent variables including changes in total food consumption ***(C)***, food expenditure ***(E)*** and purchasing behaviour towards food with sustainable attributes ***(S)*** were measured in this research. Respondents were asked to answer a question (*How has COVID-19*

227 *impacted your consumption of the total food*), reflecting consumers' consumption behaviour
228 during the lockdown. Individual scores from "-3" (decreased a lot) to 3 (increased a lot) of total
229 food consumption ***(C)***. In addition, respondents were asked to respond about a question (*How*
230 *has COVID-19 impacted your food shopping behaviour? - spending money in food purchase*),
231 scoring from "-3" (decreased a lot) to 3 (increased a lot) of food expenditure to measure
232 consumers' purchasing behaviour ***(E)***. Consumers' change in purchasing behaviour towards
233 food with sustainable attributes ***(S)*** was identified, based on the following food selections: local,
234 animal welfare, fair-trade, and organic food to determine consumers purchasing behaviour in
235 the COVID-19 lockdown turned to be more or less sustainable. Respondents were asked about
236 the change in sustainable attributes of food purchasing behaviour ***(S)*** scoring from "-3"
237 (decreased a lot) to "+3" (increased a lot) (*How has the importance of the following attributes*
238 *changed for you during COVID-19? - local; animal welfare; fair-trade; organic*). The
239 independent variables were those noted as potentially relevant factors and were presented as
240 follows:

241 (1) Socio-demographic variables presented in **Table 2**;
242 (2) Mood states;
243 (3) Trust in information sources;
244 (4) shopping places (before and during the lockdown);
245 (5) Experience (food shortage, price increase and neither);
246 (6) Consumers' health concerns level about COVID-19;
247 (7) Knowledge (subjective and objective) regarding COVID-19;
248 (8) MPL stated risk preference;
249 (9) Risk perceptions (including health, financial and food security risk perceptions).

250 **Figure 1** showed the framework of factors affecting consumers food purchasing and
251 consumption behaviour during the COVID-19 lockdown.
252

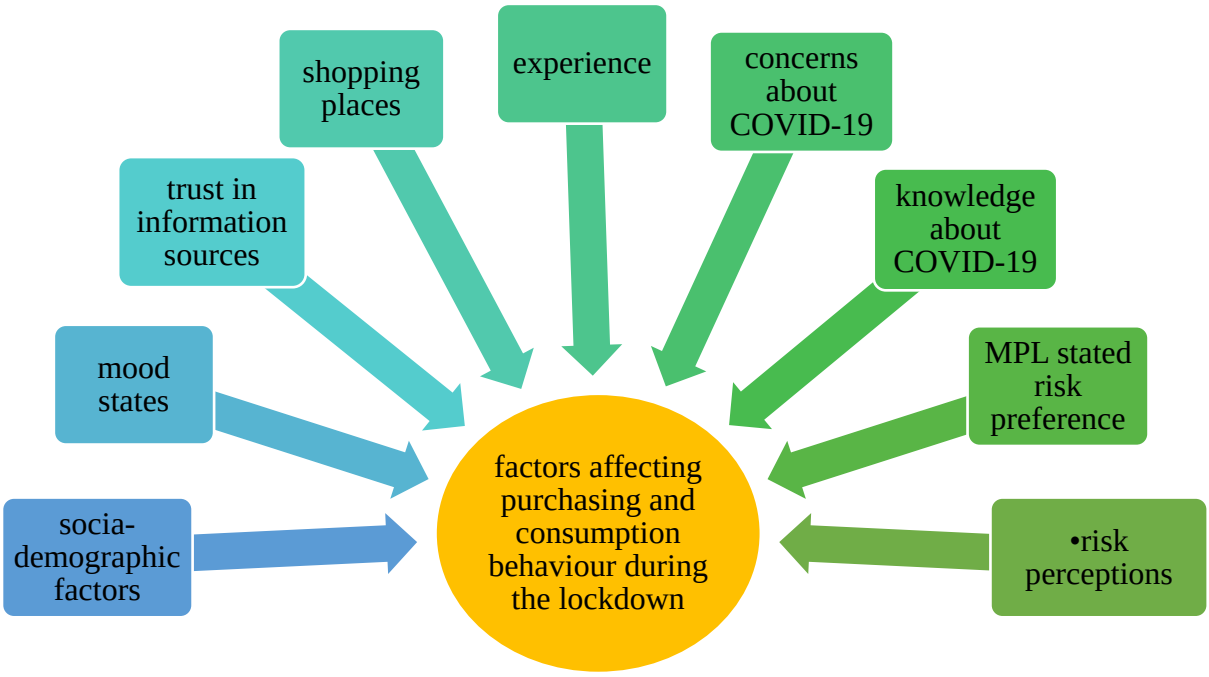

Figure 1 Framework of factors affecting consumers' food purchasing and consumption behaviour during the lockdown.

Table 2 shows participants' socio-economic characteristics. As can be seen, most respondents were female (51%), the average age with 47.3 years, who stated that they were healthy (57%), with an average household monthly income of 1,000-3,000 euro (53.6%), with 2 persons in a household (36.3%), households with no children aged 0-12 years or adults aged over 70 (61.2%), living in urban places (71.8%), and with a full-time job (without variation) (24.4%). According to the gender and age distribution, the sample reflected the population of Spain.

Table 2 Socio-demographic variables in this research (n = 1203).

Socio-demographic variables		Percentage
Gender	Male	49.0
	Female	51.0
Age	18-39 years	28.1
	40-59 years	36.9
	More than 60 years	35.0
	Average age (years)	47.3
Monthly household income before the lockdown	< 999 euros	10.5
	1,000-3,000 euros	56.1
	> 3,001 euros	22.0
Income during the lockdown	< 999 euros	19.0
	1,000-3,000 euros	53.6
	> 3,001 euros	15.9
Stated health status	Unhealthy	43.0
	Healthy	57.0
Household size	1 person	10.7
	2 persons	36.3
	3 persons	26.9
	4 persons	20.3
	5 persons	4.0
	6 persons or more	1.7
Family structure	There are children aged 0-6 years	Yes (13.5), No (86.5)
	There are children aged 7-12 years	Yes (15.5), No (84.5)
	There are adults over 70 years	Yes (14.1), No (85. 9)
	None of the above	Yes (61.2), No (38.8)
Place of residence	Urban place	71.8
	Suburban place	14.8
	Rural place	13.4
Employment status	Student	2.3
	Full time (without variation)	24.4
	Full time (telecommuting)	16.5
	ERTE [a] (partial or total)	10.8
	A homemaker	5.2
	Sick leave	2.1
	Unemployed	15.0
	Retired	21.5
	Unable to work	2.2

Note: [a] refers to a File of Temporary Regulation of Employment (ERTE). It consists of a temporary collective dismissal, in which the company temporarily suspends employment contracts, for reasons of the temporary stoppage of activity or insufficient income.

2.4 Empirical framework

The analysis is based on a binary logistic regression model in the SPSS v.24 software. This model is often used when the dependent variable is a dichotomous variable rather than a continuous variable to check out the factors that influence the odds ratio of the dependent variable [42]. It has the form [43]:

$$\text{Logit}(P) = \text{Log}\left[P_i/ (1 - P_i)\right] \quad (1)$$

where P_i is the probability of the event occurring. It denoted the probability of increasing food consumption, expenditure and purchase more food with sustainable attributes in this research. $1 - P_i$ represents the probability of a respondent not increasing food consumption, expenditure and food with sustainable attributes. The odds ratio (OR) is the ratio of both previous probabilities. In this research, the logistic model of the relationship between the variable of food increase or not and its explanatory variables is specified as follows:

$$\ln\left[P_i/ (1 - P_i)\right] = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \ldots\ldots + \beta_{16} X_{16i} \quad (2)$$

where the subscript i denotes the i-th observation in the sample, P is the probability of the outcome, X_1, X_2, X_3, ..., X_{16} are independent variables. β_0 is the intercept term, and β_1, β_2, β_3….., β_{16} are the coefficients associated with each independent variable. The coefficients do not directly indicate the effect of change in the corresponding explanatory variables on the probability (P) of the outcome occurring. Rather, the coefficients reflect the effect of individual explanatory variables on the OR of the dependent variable [44]. In addition, the model in terms of OR can be written as:

$$P_i/(1\text{-}P_i) = \exp\left(\beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \ldots\ldots + \beta_{16} X_{16i}\right) \quad (3)$$

In this research, the sample was divided into two groups. The first comprised respondents who increased the total food consumption, expenditure or purchased more food with sustainable attributes ***(Y=1)***. The second group was composed of individuals who did not ***(Y=0)***. Hosmer-Lemeshow's goodness of fit and percentage of correct classification were used to test the goodness of fit.

3 Results and discussion

3.1 Results of the independent variables included in the model

Table 3 presented the results of the independent variables: changes in total food consumption ***(C)***, food expenditure ***(E)*** and purchasing behaviour towards food with sustainable attributes ***(S)***, included in the model. Results shows that Spanish consumers' subjective and objective knowledge level regarding COVID-19 is above average (77.26% > 50.00%, 67.44% > 50.00%). In addition, the discrepancy intensity between knowledge is 9.82%, indicating that consumers believed that they know more than they really know (overestimation of their knowledge level). This may be related to the fact that the Spanish government and media publicized a lot of COVID-19 virus knowledge and information, which increased consumers' confidence that led them to believe that they know more than they really know. This is inconsistent with the study which showed that when respondents received sufficient information, their perceived knowledge also increased [45]. Results also show that 65.7% of respondents were risk-averse, 13.6% were risk-neutral, while 20.7% were risk-loving. This result is in line with previous studies that showed the majority of respondents were risk-averse [46], and only a small share of participants was risk-loving [47]. In addition, 29.2% of participants stated that they experienced a food shortage during the lockdown, 60.7% experienced a price increase.

Participants' concern level about COVID-19 is above average (4.77 > 3.5 points on a 7-point scale), which is consistent with the research showing that levels of concern of COVID-19 are relatively high in Spain [48]. The value of the probability of facing a food shortage in the next 6 months is below average (2.34 < 3.5 points on a 7-point scale). With respect to the probability of facing the food price increase, it is above average (5.01 > 3.5 points on a 7-point scale). The news reported that in Spain, fruit and vegetable become between 25 and 30% more expensive due to the increase in transport costs during the COVID-19 pandemic [49], which will increase consumers' perceived food price (food security) risk. In addition, it is supported by the result of experience in this research (as shown earlier), which shows that 60.7% of consumers experienced the food price increase during the lockdown, increasing their food security risk perceptions. Consumers' experience of food insecurity increases their risk perception because direct exposure to risk events usually enhances consumers' memories and

330 imaginations of hazard [50].

331

332 **Table 3** Results of the independent variables included in the logit model.

Variables	Percentage	Scales
Knowledge		
Subjective knowledge level	77.26%	1-100%
Objective knowledge level	67.44%	1-100%
Discrepancy intensity between knowledge	9.82%	
Risk preference		
Risk-loving	20.7%	
Risk-neutral	13.6%	
Risk-averse	65.7%	
Experience		
Experienced a food shortage	Yes 29.2%; No 70.8%	
Experienced a price increase	Yes 60.7%; No 39.3%	
Neither of them	Yes 28.4%; No 71.6%	
	Mean (SD)	
Concerns about COVID-19	4.77 (1.70)	7-point Likert scale
Food security risk perception		
The probability of facing food shortage in the next 6 months	2.34 (1.49)	7-point Likert scale
The probability of facing a food price increase	5.01 (1.61)	7-point Likert scale
Health risk perception		
The severity of health condition will be if contract COVID-19	6.04 (2.40)	10-point Likert scale
The probability of contracting COVID-19	2.65 (0.95)	5-point Likert scale
Q7. Have you contracted the COVID-19 virus?		
Yes. I tested positive for the COVID-19 virus.	1.5%	
No, I had the symptoms, but the test result was negative.	5.1%	
No. I did not have the symptoms, so I did not opt for a test.	71.7%	
I don't know. I had the symptoms but did not have access to tests.	21.7%	
Q15. Do you know someone who has been diagnosed or died due to the COVID-19 virus?		
Members of my family	Yes 19.0%; No 81.0%	
Friends	Yes 26.4%; No 73.6%	
Neighbours	Yes 14.3%; No 85.7%	
Friends of my friends	Yes 25.6%; No 74.4 %	
Colleagues	Yes 6.6%; No 93.4%	
No, I don't know any person	Yes 37.2%; No 62.8%	
Trust in information source		
Government	2.52 (1.27)	5-point Likert scale
Social Media	2.70 (1.09)	
Health professionals (e.g., doctor)	4.27 (0.82)	
Family, friends, colleague	2.91 (1.04)	
Scientists	4.13 (0.91)	

News (e.g., papers, TV, radio)	1.90 (0.94)

SD: Standard Deviation.

As for the severity of the perceived risk, it shows that the severity is above average (6.04 > 5 points on a 10-point scale), which demonstrates that consumers perceived a high health risk. Regarding the probability of contracting COVID-19 in the next 6 months, it indicates that consumers assessed their risk of being infected as high (2.65 > 2.5 points on a 5-point Likert scale). These outcomes converge with the findings that Spain was the second country with the highest risk perception of COVID-19 among ten countries across Europe, America, and Asia [48]. Additionally, results also show that 71.7% of respondents stated that they did not have the symptoms, so did not opt for a test. Only 1.5% of respondents tested positive for the COVID-19 virus. 21.7% of consumers did not know due to no access to a test. 37.2% of respondents do not know anyone who has been diagnosed or died due to the COVID-19 virus. Consumers' trust level in information source from the highest to lowest is health professionals, scientists, family (friends, colleague), social media, government and News. It is in line with the study which concluded that consumers stated information from experts or scientists were the most reliable [2].

3.2 Results of consumers' purchasing and consumption behaviour

3.2.1 Changes in the total food consumption (C) during the lockdown

As reported in **Table 4**, the percentage of the model correct classification was 75.2% and the Hosmer-Lemeshow's goodness of fit was equal to 0.353. The null hypothesis was accepted, denoting there were no differences between observed and model-predicted values [51]. Both tests pointed out that the model fitted well. Results show a significant positive relationship between gender and the increase in total food consumption. The OR of gender was equal to 1.394, which means that females were 1.394 times more likely to increase the total food consumption than males during the lockdown. One possible reason was that many food-away-from-home establishments were closed because of the shutdown restrictions during COVID-19 in Spain, such that an increasing number of working women had to cook at home, who tended to consume more food. Another reason may be that women were more prone to depression,

362 stress and anxiety which results in over-eating than men [52].

363

364

365 **Table 4** Logit model of total food consumption **(C)**.

Significant variables	Base variables	B	Sig.	Exp (B)
Gender				
Female	Male	0.332	0.063	1.394
Age				
40-59 years old	18-39 years old	-0.622	0.003	0.537
More than 60 years old		-0.977	0.001	0.376
Household monthly income				
Income (before the lockdown) > 3,000 euros	< 999 euros	1.086	0.021	2.963
Employment status				
ERTE (partial or total)	Student	-1.061	0.080	0.346
Sick leave		-2.142	0.017	0.117
Unemployed		-1.020	0.087	0.361
Unable to work		-1.979	0.023	0.138
Place of residence				
Living in rural place	Urban	-0.437	0.077	0.646
Risk preference				
Risk-averse	Risk-loving	-0.365	0.085	0.694
Experience				
Did not experience food shortage or price increase	Experienced	-0.785	0.026	0.456
Shopping places				
Specialized food stores (before the lockdown)	Supermarkets	-0.750	0.021	0.473
Farmer's Market/Open markets (before the lockdown)		-1.480	0.052	0.228
Trust in information sources				
A little trustworthy about health professionals	Not at all	-3.078	0.042	0.046
Food security risk perception				
A lot unlikely to face a food shortage in the next 6 months	Very unlikely	0.643	0.003	1.903
Health risk perception				
A lot serious if contracting in the next 6 months	Not at all	1.595	0.003	4.930
Very serious if contracting in the next 6 months		1.596	0.012	4.934
"I know a friend of my friends has been diagnosed or died due to COVID-19"	Do not know	0.564	0.011	1.759
Percentage of correct classification			75.2%	
Hosmer-Lemeshow's goodness of fit			0.353	

366

367 In addition, people aged 40-59 years and more than 60 years were less likely to increase
368 the total food consumption than those aged 18-39 years when compared to the situation before
369 the lockdown. It was in line with the study which showed that old people consumed less than

the younger ones during the COVID-19 lockdown [53]. Results also demonstrate a positive and significant association between income and total food consumption. It means that households whose monthly income before the lockdown was more than 3,000 euros were 2.963 times more likely to increase the total food consumption than those less than 999 euros. Not surprisingly, more income in a household denoted a strong purchasing power to provide food for their members, such that they were more likely to increase the total food consumption during the COVID-19 lockdown. People whose current employment were ERTE (partial or total), sick leave, unemployed and unable to work were less likely to increase their food consumption during the lockdown. It was expected that these people's jobs were suspended or they were unable to work, such that their sources of income were cut off by COVID-19 and they were less likely to increase their consumption level, while there was little change in income (no income) before and during the lockdown for students. Results also indicate that people who live in rural places were less likely to consume more food than those living in urban places. It may be related to several reasons. Firstly, population flow is more frequent in urban areas than that in rural places, resulting in a higher risk to contract COVID-19 in urban areas. Consequently, people living in urban places will feel worried, anxious or negative about themselves, thus they tended to display emotional eating behaviour to avoid these negative feelings by turning their attention to food during the lockdown [54]. Secondly, consumers living in urban areas usually have a higher income than those living in rural places, that is, they have a stronger purchasing power and consumption power.

As for consumers' stated risk preference, it shows that risk-averse persons were less likely to increase their total food consumption than risk-loving persons. The previous study indicated that risk-averse respondents may seek out more insurance after a disaster [55], thus risk-averse people may focus on health insurance, or save money to make themselves feel more secure and use it when there is a health threat in the future. Respondents who did not experience food shortage or price increase were less likely to consume more food than those who experienced them. It could be explained by the fact that subjects who experienced the food shortage or price increase were more likely to shift to stock-up on food to reduce the food security risk, which leads to more likelihood of consuming more during the lockdown. Regarding shopping places, people who went to specialized food stores and farmers' markets to purchase food before the

lockdown were less likely to consume more food than those who went to supermarkets. It may be because specialized food stores and farmers' markets only sell food, while supermarkets have more varieties, not just food, but also other necessities, such as toilet paper, shampoo and pet supplies. Therefore, in order to reduce the number of visits to stores and reduce the risk of infection, consumers who used to buy food from specialized food stores and farmers' markets may prefer to buy food from supermarkets during the lockdown, such that those who go to supermarkets consume more food.

Results also show that consumers were less likely to increase their food consumption when perceived a higher trust about health professionals (e.g., doctor) during the lockdown. Trust in reliable scientific information contributes to reducing unnecessary scares and inappropriate risk perceptions [56]. Hence, consumers who trust health professionals could reduce risk perception and are less likely to panic buy and consume food. Regarding health risk perception, it demonstrates that consumers who perceived a higher health risk were more likely to increase their total food consumption than those who perceived a lower health risk during the lockdown. Similarly, if consumers think it is serious or they know someone who gets infected, they will be worried about themselves and tend to display emotional eating behaviour. As for food security risk perception, it shows that consumers who perceived a higher risk for food shortage in the next six months were more likely to increase the total food consumption than those perceiving the lowest food security risk. It was not surprising that people with a higher risk perception tended to stockpile food products to reduce the risk, thus turned to increase food consumption.

3.2.2 Changes in the total food expenditure (E) during the lockdown

In **Table 5**, the percentage of correct classification was 70.3% and the value of Hosmer-Lemeshow's goodness of fit was 0.311, indicating that the model presented acceptable goodness of fit. Results show that females were less likely to spend more on food than males during the lockdown. The data from the National Statistics Institute in Spain show that the unemployment rates of females and males in the first quarter of 2020 in Spain are 16.24% and 12.79%, respectively. In the second quarter, they stand at 16.72% (female) and 14.13% (male) [57], indicating that females have a higher likelihood of being unemployed than males during

the lockdown. Hence, females were more cautious of their income and less likely to increase food expenditure. Another potential reason was that females were the main meal preparers and "food gatekeepers" in the household [58]. As a result, they were more familiar with the characteristics (e.g., the price and the quality) of food products and always know what food to buy, such that female was less likely to increase the food expenditure. Conversely, males were not usual food buyers and not familiar with food products, therefore, males may increase the expenditure on food.

Table 5 logit model result of food expenditure **(E)**.

Significant variables	Base variable	B	Sig.	Exp (B)
Gender				
Female	Male	-0.458	0.008	0.632
Age				
40-59 years old	18-39 years old	-0.572	0.006	0.564
More than 60 years old		-0.675	0.015	0.509
Employment status				
Sick leave	Student	-1.617	0.054	0.199
Unable to work		-1.485	0.060	0.226
Family structure				
There are children aged 7-12 years in the household	No	0.797	0.079	2.218
Experience				
Experienced food shortage during the lockdown	Did not experience it	0.524	0.017	1.688
Shopping places				
Buy food on retailers' websites during the lockdown	Supermarkets	1.520	0.015	4.574
Mood				
Feel *a little* reassured	None of this feeling	0.794	0.004	2.213
Feel *moderately* reassured		0.582	0.044	1.789
Feel *moderately* angry		-0.859	0.017	0.424
Feel *a great deal* of angry		-0.722	0.095	0.486
Risk preference				
Risk-neutral	Risk-loving	-0.505	0.066	0.604
Risk-averse		-0.528	0.009	0.590
Trust in information source				
A little trustworthy about government information regarding COVID-19	Not trustworthy at all	-0.425	0.092	0.654
Very trustworthy about News information regarding COVID-19		-1.021	0.030	0.360
Food security risk perception				
A little unlikely to face a food shortage in the next 6 months	Very unlikely	0.543	0.036	1.722
Health risk perception				
A lot unlikely to contract COVID-19	Very likely	0.819	0.004	2.268

They did not have the symptoms, so did not test	They tested positive for the COVID-19	-1.265	0.078	0.282
They did not know anyone who has been diagnosed or died due to COVID-19	They know	-0.784	0.002	0.457
Financial risk perception				
Feel threatened *moderately* about financial situation	Not at all	-0.836	0.033	0.434
Feel threatened *considerably* about financial situation		-0.981	0.035	0.375
Feel threatened *a great deal* about financial situation		-1.502	0.009	0.223
Knowledge regarding COVID-19				
Objective knowledge		0.944	0.075	2.570
Percentage of correct classification			70.3%	
Hosmer-Lemeshow's goodness of fit			0.311	

People aged 40-59 years and more than 60 years were less likely to increase the expenditure than those aged 18-39 years when compared to the situation before the lockdown. The elderly were at a high risk of death due to COVID-19, which may increase their worry and further affect their appetite [59]. Therefore, their cost was not likely to increase than younger people during the COVID-19 lockdown. Results also indicate that respondents whose employment status was sick leave and unable to work were less likely to spend more on food during the lockdown, which may be related to the interruption of their income. In addition, households with children aged 7-12 years were 2.218 times more likely to increase the food expenditure than those without that. It was expected that primary schools were closed due to COVID-19, such that children aged 7-12 years have to stay at home, which resulting in more expenditure. Participants who experienced food shortage during the COVID-19 lockdown were 1.688 times more likely to increase the expenditure of food than those who did not face the food shortage. People would spend more expenses and stock up on more food products to reduce the food security risk if they experienced a food shortage in case of possible limitations in the availability of food in the future. As for shopping places, consumers who buy food on retailers' websites during the lockdown were 4.574 times more likely to spend more on food than those who buy food in the supermarkets. It is consistent with the study which found a significant increase in online shopping due to the COVID-19 [7]. It was expected that consumers tended to shop online rather than in supermarkets to minimize store visits aiming to reduce the risk of infection.

In addition, our results demonstrate that consumers with a positive mood (reassured) were more likely to increase the expenditure of food while those with a negative mood (angry) were less likely. This outcome was supported by Mehrabian and Riccioni, who found that positive mood was associated with high appetite levels [32]. Therefore, people with a positive mood during the lockdown tended to purchase more food and increase the food expenditure, while a negative mood will decrease consumers' appetite, thus they were less likely to increase the expenditure. With regard to risk preference, it demonstrates that risk-neutral and risk-averse people were less likely to increase the food expenditure than those with risk-loving during the lockdown. This may be related to risk-averse people's aversion to the uncertainty that risk-averse consumers prefer certainty to uncertainty than risk-loving ones. Due to the COVID-19 outbreak, they may tend to reduce food expenditure and save more money to prevent insufficient money when uncontrollable situations arise in the future. Result also indicates that consumers were less likely to spend more on food when perceived a greater trust in government and News information regarding COVID-19 during the lockdown. It was supported by the study which demonstrated that higher trust in the national government had positive effects such as reducing the likelihood of respondents' fears and worry of food shortages [60]. Consequently, these consumers perceived a lower food security risk and were less likely to stock up on food and increase expenditure.

As for consumers' risk perceptions, result demonstrates that the higher the health risk and food security risk the consumers exhibit, the more expenditure is. It was in line with the study which shows that consumers tend to purchase more stock goods when perceiving a higher risk, and it indicates that a high-risk perception during the COVID-19 pandemic will cause the intention to buy goods leading to a higher probability of increasing the food expenditure[61]. Another research also demonstrates that risk perception of the COVID-19 pandemic has positively affected consumer behaviour to tend to keep stockpiling of food [62]. Result also shows that consumers would not increase the food expenditure when perceiving a higher financial risk, which highlighted the previous research showing that the risk perception negatively affected attitude and purchasing behaviour [63]. It was expected because when consumers feel threatened about their current financial situation, people who perceived a higher financial risk would be more cautious of spending money. Additionally, consumers with a

higher objective knowledge level regarding COVID-19 were found to have a higher likelihood of increasing food expenditure. It was expected that the more knowledge consumers had, the more severity about COVID-19 they perceive, such that they were more likely to increase the expenditure to stock food.

3.2.3 Changes in purchasing food with sustainable attributes (S) during the lockdown

As shown in **Table 6**, the fit was acceptable as indicated by Hosmer-Lemeshow's goodness of fit measures and the percentage of correct classification. Result shows that households with 5 members were 2.551 times more likely to purchase more food with sustainable attributes than those with 1 member when compared to the situation before the lockdown. It is in line with the study which indicates that consumers living in larger households are more likely to purchase organic food products [18].

Table 6 logit model of purchasing food with sustainable attributes **(S)**.

Significant variables	Base variables	B	Sig.	Exp (B)
Household size				
Households with 5 members	1 member	0.936	0.066	2.551
Risk preference				
Risk-averse	Risk-loving	-0.403	0.058	0.668
Shopping places				
Specialized food stores (before the lockdown)	Supermarkets	-0.710	0.028	0.492
Mood				
Feel *considerably* reassured	None of this feeling	0.773	0.036	2.166
Feel *moderately* angry		-0.953	0.010	0.386
Trust in information source				
Very trustworthy about government information regarding COVID-19	Not at all	0.481	0.095	1.618
Food security risk perception				
A lot unlikely to face a food shortage in the next 6 months	Very unlikely	0.369	0.082	1.446
A little likely to face a food shortage in the next 6 months		1.152	0.064	3.163
Health risk perception				
A lot unlikely to contract COVID-19	Very unlikely	0.748	0.015	2.113
Financial risk perception				
Feel threatened *moderately* about financial situation	Not at all	-0.675	0.093	0.509
Feel threatened *a great deal* about financial situation		-1.125	0.051	0.325

Percentage of correct classification	73.0%
Hosmer-Lemeshow's goodness of fit	0.095

In addition, risk-averse consumers were less likely to increase their purchase of food with sustainable attributes during the lockdown. It may relate to the uncertainty consumers feel that when consumers feel uncertain about food with sustainable attributes (e.g., whether organic certification can be trusted), they prefer the certainty of conventional products to the uncertainty that may come from sustainable ones [64]. Result also indicates that people who were used to purchase food from the specialized food stores (before the lockdown) were less likely to buy more food with sustainable attributes than those who usually went to supermarkets. Similar to the previous explanation, one possible reason is that specialized food stores only have food, while supermarkets have a more complete variety (e.g., food, alcohol, toilet paper, and pet supplies). As a consequence, consumers who used to purchase food from the specialized food stores may be inclined to buy food (including food with sustainable attributes) and other necessities from the supermarkets during the lockdown to minimize trips to the store and the risk of infection. Additionally, consumers with a positive mood (reassured) were more likely to purchase more food with sustainable attributes while those with a negative mood (angry) were less likely. One possible explanation is that positive emotions make consumers think organic food is more attractive and eager to purchase and consume healthy food [65].

Our results show that consumers with a higher trust level in government were more likely to increase the purchase of food with sustainable attributes, which was supported by the study indicating that in public health emergencies, people who have high trust in government health agencies are more likely to follow health recommendations (including food choice recommendations) made by the government [38] and they regard sustainable food (e.g., organic food) as healthier food, thus they are more likely to purchase more food with sustainable attributes. Result also shows that consumers with a higher food security and health risk perception were more likely to buy more food with sustainable attributes. Consumers in Spain perceived these products were healthier than conventional ones [66], which contributes to improving their immunity and reducing health risks. Result also demonstrates that respondents who have higher financial risk were less likely to purchase more food products with sustainable

attributes when compared to the situation before the lockdown. Not surprisingly, food products with sustainable attributes were more expensive than conventional food [67], resulting in less purchasing them when consumers perceived a higher financial risk, and they would be more cautious about spending money during the COVID-19 lockdown.

3.3 Practical implications

Firstly, based on the result of the increased expenditure on the retailers' websites, retailers should design a more visually attractive and convenient website taking advantage of this opportunity to retain customers. Secondly, the Spanish government should make efforts to design more effective information communication with people and enhance the quality and level of details of the information that they share in such an emergency because consumers stated a low trust in government and News, while they have high trust in health professions and scientists, inspiring health professions and scientists to share more reliable and trustworthy information about COVID-19 and recommendations of food choice and consumption. Thirdly, households with children aged 7-12 years were more likely to increase food expenditure. As a result, retailers could carry out promotion activities (e.g., children's related food can be given as a gift if spend a certain amount of money in the store), so as to attract families with children. Finally, consumers who live with large households and those who often go to the supermarket to buy food were more likely to purchase more food with sustainable attributes, reminding retailers to focus on these people by using this argument to first place and highlight sustainable items (e.g., organic items) in hotlines in the shelves.

4 Conclusion

This research focused on dealing with the influence of the COVID-19 lockdown on consumers' buying and consumption behaviour in Spain, regarding the total food consumption, food expenditure and purchasing food with sustainable attributes as three dependent variables. Results show that females tended to consume more food but with less expenditure on food than males during the lockdown. Age is found to have a significant association with total food consumption and expenditure when compared to the situation before the lockdown. Result also indicates that consumers with a higher income are more likely to increase their total food

consumption during the lockdown. In addition, when consumers are unable to go to work or take sick leave, their total food consumption and expenditure are less likely to increase during the lockdown. Risk preference, shopping places and trust in information sources have a significant impact on consumers' preferences and behaviour. Results also suggest that experience (food shortage, price increase and neither) is a determinant factor influencing food consumption and expenditure. Results also show that consumers' food security, financial and health risk perceptions are highly important factors in understanding consumers' purchasing and consumption behaviour during the lockdown. Objective knowledge levels regarding COVID-19 influence consumers' food expenditure during the lockdown. Family structure is only related to expenditure, while the place of residence only influences food consumption. Mood is associated with expenditure and purchase food with sustainable attributes. Household size is a statistically significant factor affecting purchasing behaviour towards sustainable attributes. Results do not identify significant impacts of subjective knowledge, concerns or stated health status on food purchasing and consumption behaviour defined in this study.

There are some limitations in this research. For example, the data are based on stated rather than revealed behaviour. In addition, this research explored consumers' behaviour before and during the lockdown but did not measure the changes after the lockdown. Therefore, further research could explore whether this change in consumption and purchasing behaviour is in the long-term in this global crisis, and they can focus on other consumption and purchasing behaviour.

Acknowledgements: The authors thank two anonymous reviewers for their valuable comments which helped to considerably improve the manuscript.

Author Contributions: Conceptualization, S.L., Z.K., D.R. and J.M.; Methodology, S.L., Z.K. and D.R.; Data curation, S.L., Z.K., and D.R.; Formal analysis, S.L.; Software, S.L.; Visualization, S.L.; Writing-original draft, S.L.; Validation, Z.K.; Writing-review & editing, Z.K., and D.R.; Supervision, Z.K.; Project administration, Z.K. and D.R.; Questionnaire design, S.L., Z.K., and D.R.; Investigation, S.L. and Z.K.; Funding acquisition, J.M. All authors have read and agreed to the published version of the manuscript.

Funding: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Declarations of interest: None.

References:

1. Chakraborty, I.; Maity, P. COVID-19 outbreak: Migration, effects on society, global environment and prevention. *Sci. Total Environ.* **2020**, *728*, 138882, doi:10.1016/j.scitotenv.2020.138882.
2. Laguna, L.; Fiszman, S.; Puerta, P.; Chaya, C.; Tárrega, A. The impact of COVID-19 lockdown on food priorities. Results from a preliminary study using social media and an online survey with Spanish consumers. *Food Qual. Prefer.* **2020**, *86*, 104028, doi:10.1016/j.foodqual.2020.104028.
3. Coibion, O.; Gorodnichenko, Y.; Weber, M. *The cost of the covid-19 crisis: Lockdowns, macroeconomic expectations, and consumer spending*; National Bureau of Economic Research, 2020;
4. Wanberg, C.R. The individual experience of unemployment. *Annu. Rev. Psychol.* **2012**, *63*, 369–396, doi:10.1146/annurev-psych-120710-100500.
5. Daniela, D.; Gola, M.; Letizia, A.; Marco, D.; Fara, G.M.; Rebecchi, A.; Gaetano, S.; Capolongo, S. COVID-19 and Living Spaces challenge. Well-being and Public Health recommendations for a healthy, safe, and sustainable housing. **2020**.
6. Scarmozzino, F.; Visioli, F. Covid-19 and the subsequent lockdown modified dietary habits of almost half the population in an Italian sample. *Foods* **2020**, *9*, doi:10.3390/foods9050675.
7. Saskia Nuijten Pandemic impacts on consumer food behaviour. *EIT food* **2020**, 1–24.
8. Ben Hassen, T.; El Bilali, H.; Allahyari, M.S. Impact of COVID-19 on Food Behavior and Consumption in Qatar. *Sustainability* **2020**, *12*, 6973, doi:10.3390/su12176973.
9. Yuen, K.F.; Wang, X.; Ma, F.; Li, K.X. The psychological causes of panic buying following a health crisis. *Int. J. Environ. Res. Public Health* **2020**, *17*, 3513.
10. Lins, S.; Aquino, S. Development and initial psychometric properties of a panic buying scale during COVID-19 pandemic. *Heliyon* **2020**, *6*, e04746.
11. MAPA Spanish Ministry of Agriculture, Fisheries and Food (MAPA). *Press releases, March/April, Madrid, Spain* **2020**, https://www.mapa.gob.es/es/prensa/ultimas-noticias.
12. Cranfield, J.A.L. Framing consumer food demand responses in a viral pandemic. *Can. J. Agric. Econ.* **2020**, doi:10.1111/cjag.12246.
13. Chauhan, V.; Shah, H. An Empirical Analysis into Sentiments, Media Consumption Habits, and Consumer Behaviour during the Coronavirus (COVID-19) Outbreak. *Purakala UGC Care J.* **2020**, *31*, 353–378, doi:10.13140/RG.2.2.32269.15846.
14. Cha, W.M.; Chintagunta, P.K.; Dhar, S.K. Food Purchases During the Great Recession. *SSRN Electron. J.* **2015**, doi:10.2139/ssrn.2548758.
15. Baker, S.R.; Farrokhnia, R.A.; Meyer, S.; Pagel, M.; Yannelis, C. How does household spending respond to an epidemic? consumption during the 2020 COVID-19 pandemic. *Rev. Asset Pricing Stud.* **2020**, *10*, 834–862, doi:10.1093/rapstu/raaa009.
16. World Economic Forum These charts show how COVID-19 has changed consumer spending around the world Available online: https://www.weforum.org/agenda/2020/05/coronavirus-covid19-consumers-shopping-

goods-economics-industry/ (accessed on Apr 6, 2021).
17. Martin-Neuninger, R.; Ruby, M.B. What Does Food Retail Research Tell Us About the Implications of Coronavirus (COVID-19) for Grocery Purchasing Habits? *Front. Psychol.* **2020**, *11*, 1–4, doi:10.3389/fpsyg.2020.01448.
18. Tsakiridou, E.; Mattas, K.; Tzimitra-Kalogianni, I. The influence of consumer characteristics and attitudes on the demand for organic olive oil. *J. Int. Food Agribus. Mark.* **2006**, *18*, 23–31.
19. Rahmani, D.; Kallas, Z.; Pappa, M.; Gil, J.M. Are consumers' egg preferences influenced by animal-welfare conditions and environmental impacts? *Sustainability* **2019**, *11*, 6218.
20. Escobar, C.; Kallas, Z.; Gil, J.M. Consumers' wine preferences in a changing scenario. *Br. Food J.* **2018**, doi:10.1108/BFJ-02-2017-0070.
21. Li, S.; Kallas, Z. Meta-analysis of consumers' willingness to pay for sustainable food products. *Appetite* **2021**, 105239.
22. Romeo-Arroyo, E.; Mora, M.; Vázquez-Araújo, L. Consumer behavior in confinement times: Food choice and cooking attitudes in Spain. *Int. J. Gastron. Food Sci.* **2020**, *21*, 100226.
23. Zhu, H.; Deng, F. How to influence rural tourism intention by risk knowledge during COVID-19 Containment in China: mediating role of risk perception and attitude. *Int. J. Environ. Res. Public Health* **2020**, *17*, 3514.
24. Orduño Torres, M.A.; Kallas, Z.; Ornelas Herrera, S.I. Analysis of farmers' stated risk using lotteries and their perceptions of climate change in the Northwest of Mexico. *Agronomy* **2019**, *9*, 4.
25. Harrison, G.W.; Lau, M.I.; Rutström, E.E. Estimating risk attitudes in Denmark: A field experiment. *Scand. J. Econ.* **2007**, *109*, 341–368, doi:10.1111/j.1467-9442.2007.00496.x.
26. Holt, C.A.; Laury, S. Risk Aversion and Incentive Effects. *SSRN Electron. J.* **2002**, doi:10.2139/ssrn.893797.
27. Andersen, S.; Harrison, G.W.; Lau, M.I.; Rutström, E.E. Elicitation using multiple price list formats. *Exp. Econ.* **2006**, *9*, 383–405, doi:10.1007/s10683-006-7055-6.
28. Lusk, J.L.; Coble, K.H. Risk perceptions, risk preference, and acceptance of risky food. *Am. J. Agric. Econ.* **2005**, *87*, 393–405.
29. Ko, H.; Jung, J.; Kim, J.; Shim, S.W. Cross-cultural differences in perceived risk of online shopping. *J. Interact. Advert.* **2004**, *4*, 20–29, doi:10.1080/15252019.2004.10722084.
30. Rohrmann, B. Risk perception, risk attitude, risk communication, risk management: A conceptual appraisal. *15th Internaional Emerg. Manag. Soc. Annu. Conf. (Vol. 2008)* **2008**.
31. Gardner, M.P.; Wansink, B.; Kim, J.; Park, S.B. Better moods for better eating?: How mood influences food choice. *J. Consum. Psychol.* **2014**, *24*, 320–335, doi:10.1016/j.jcps.2014.01.002.
32. Mehrabian, A.; Riccioni, M. Measures of eating-related characteristics for the general population: Relationships with temperament. *J. Pers. Assess.* **1986**, *50*, 610–629, doi:10.1207/s15327752jpa5004_8.

33. Power, M.; Doherty, B.; Pybus, K.; Pickett, K. How COVID-19 has exposed inequalities in the UK food system: The case of UK food and poverty. *Emerald Open Res.* **2020**, *2*.
34. Basha, M.B.; Mason, C.; Shamsudin, M.F.; Hussain, H.I.; Salem, M.A. Consumers attitude towards organic food. *Procedia Econ. Financ.* **2015**, *31*, 444–452.
35. Pu, M.; Zhong, Y. Rising concerns over agricultural production as COVID-19 spreads: Lessons from China. *Glob. Food Sec.* **2020**, *26*, 100409, doi:10.1016/j.gfs.2020.100409.
36. Chan L. Thai, Anna Gaysynsky, Angela Falisi, Wen-Ying Sylvia Chou, K.B. and B.W.H. Trust in Health Information Sources and Channels, Then and Now: Evidence from the Health Information National Trends Survey (2005–2013). *eHealth Curr. Evidence, Promises, Perils Futur. Dir.* **2018**, 43–67, doi:10.1108/S2050-206020180000015002.
37. Camporesi, S.; Vaccarella, M.; Davis, M. Investigating public trust in expert knowledge: Narrative, ethics, and engagement. *J. Bioeth. Inq.* **2017**, *14*, 23–30, doi:10.1007/s11673-016-9767-4.
38. Freimuth, V.S.; Musa, D.; Hilyard, K.; Quinn, S.C.; Kim, K. Trust during the early stages of the 2009 H1N1 pandemic. *J. Health Commun.* **2014**, *19*, 321–339, doi:10.1080/10810730.2013.811323.
39. Brucks, M. The Effects of Product Class Knowledge on Information Search Behavior. *J. Consum. Res.* **1985**, *12*, 1–16, doi:10.1086/209031.
40. Taufique, K.M.R.; Vocino, A.; Polonsky, M.J. The influence of eco-label knowledge and trust on pro-environmental consumer behaviour in an emerging market. *J. Strateg. Mark.* **2017**, *25*, 511–529, doi:10.1080/0965254X.2016.1240219.
41. Khan, M.N.; Rothwell, D.W.; Cherney, K.; Sussman, T. Understanding the financial knowledge gap: A new dimension of inequality in later life. *J. Gerontol. Soc. Work* **2017**, *60*, 487–503.
42. Serrano-Cruz, M.R.; Espinoza-Ortega, A.; Sepúlveda, W.S.; Vizcarra-Bordi, I.; Thomé-Ortiz, H. Factors associated with the consumption of traditional foods in central Mexico. *Br. Food J.* **2018**, *120*, 2695–2709, doi:10.1108/BFJ-11-2017-0663.
43. Osborne, J.; King, J.E. Binary Logistic Regression. *Best Pract. Quant. Methods* **2011**, 358–384, doi:10.4135/9781412995627.d29.
44. Zakari, S.; Ying, L.; Song, B. Factors influencing household food security in West Africa: The case of southern Niger. *Sustain.* **2014**, *6*, 1191–1202, doi:10.3390/su6031191.
45. Pejman, N.; Kallas, Z.; Dalmau, A.; Velarde, A. Should animal welfare regulations be more restrictive? A case study in eight european union countries. *Animals* **2019**, *9*, 195, doi:10.3390/ani9040195.
46. Weber, E.U.; Milliman, R.A. Perceived risk attitudes: Relating risk perception to risky choice. *Manage. Sci.* **1997**, *43*, 123–144, doi:10.1287/mnsc.43.2.123.
47. Harrison, G.W.; Lau, M.I.; Rutström, E.E.; Sullivan, M.B. Eliciting Risk and Time Preferences Using Field Experiments: Some Methodological Issues. *F. Exp. Econ.* **2005**, 125–218, doi:10.1016/S0193-2306(04)10005-7.
48. Dryhurst, S.; Schneider, C.R.; Kerr, J.; Freeman, A.L.J.; Recchia, G.; Van Der Bles,

A.M.; Spiegelhalter, D.; van der Linden, S. Risk perceptions of COVID-19 around the world. *J. Risk Res.* **2020**, *23*, 994–1006.
49. INFORMACION Producir frutas y verduras cuesta ahora un 25% más que antes de la crisis del Covid-19 - Información Available online: https://www.informacion.es/economia/2020/04/18/producir-frutas-verduras-cuesta-ahora-4692057.html (accessed on Feb 22, 2021).
50. Kasperson, R.E.; Renn, O.; Slovic, P.; Brown, H.S.; Emel, J.; Goble, R.; Kasperson, J.X.; Ratick, S. The social amplification of risk: A conceptual framework. *Risk Anal.* **1988**, *8*, 177–187.
51. Maharjan, K.L.; Joshi, N.P. Determinants of household food security in Nepal: A binary logistic regression analysis. *J. Mt. Sci.* **2011**, *8*, 403–413, doi:10.1007/s11629-011-2001-2.
52. Thompson, S.H. Gender and Racial Differences in Emotional Eat-ing. *Food Addict. Symptoms, Body Weight Satisf. among Undergraduates* **2015**, 1–6.
53. Emerson, K.G. Coping with being cooped up: Social distancing during COVID-19 among 60+ in the United States. *Rev. Panam. Salud Pública* **2020**, *44*, e81.
54. Nguyen-Rodriguez, S.T.; Unger, J.B.; Spruijt-Metz, D. Psychological determinants of emotional eating in adolescence. *Eat. Disord.* **2009**, *17*, 211–224.
55. Cameron, L.; Shah, M. Risk-taking behavior in the wake of natural disasters. *J. Hum. Resour.* **2015**, *50*, 484–515.
56. Faour-Klingbeil, D.; Osaili, T.M.; Al-Nabulsi, A.A.; Jemni, M.; Todd, E.C.D. The public perception of food and non-food related risks of infection and trust in the risk communication during COVID-19 crisis: A study on selected countries from the Arab region. *Food Control* **2021**, *121*, 107617, doi:10.1016/j.foodcont.2020.107617.
57. Spanish Statistical Office Unemployment rates by CCAA Available online: https://www.ine.es/infografias/tasasepa/desktop/tasas.html?t=0&lang=en (accessed on Feb 22, 2021).
58. Solgaard, H.S.; Yang, Y. Consumers' perception of farmed fish and willingness to pay for fish welfare. *Br. Food J.* **2011**, *113*, 997–1010, doi:10.1108/00070701111153751.
59. Muñoz Vives, J.M.; Jornet-Gibert, M.; Cámara-Cabrera, J.; Esteban, P.L.; Brunet, L.; Delgado-Flores, L.; Camacho-Carrasco, P.; Torner, P.; Marcano-Fernández, F. Mortality Rates of Patients with Proximal Femoral Fracture in a Worldwide Pandemic. *J. Bone Jt. Surg.* **2020**, doi:10.2106/jbjs.20.00686.
60. Jeżewska-Zychowicz, M.; Plichta, M.; Królak, M. Consumers' Fears Regarding Food Availability and Purchasing Behaviors during the COVID-19 Pandemic: The Importance of Trust and Perceived Stress. *Nutrients* **2020**, *12*, 2852.
61. Long, N.N.; Khoi, B.H. An empirical study about the intention to hoard food during COVID-19 pandemic. *Eurasia J. Math. Sci. Technol. Educ.* **2020**, *16*, em1857.
62. Borsellino, V.; Kaliji, S.A.; Schimmenti, E. COVID-19 drives consumer behaviour and agro-food markets towards healthier and more sustainable patterns. *Sustain.* **2020**, *12*, 1–26, doi:10.3390/su12208366.
63. Wai, K.; Dastane, O.; Johari, Z.; Ismail, N.B. Perceived risk factors affecting consumers' online shopping behaviour. *J. Asian Financ. Econ. Bus.* **2019**, *6*, 246–260.
64. Smith, S.; Paladino, A. Eating clean and green? Investigating consumer motivations

towards the purchase of organic food. *Australas. Mark. J.* **2010**, *18*, 93–104, doi:10.1016/j.ausmj.2010.01.001.
65. Köster, E.P.; Mojet, J. From mood to food and from food to mood: A psychological perspective on the measurement of food-related emotions in consumer research. *Food Res. Int.* **2015**, *76*, 180–191.
66. Gil Roig, J.M.; Gracia Royoz, A.; Sánchez García, M. Market segmentation and willingness to pay for organic products in Spain. *Int. Food Agribus. Manag. Rev.* **2000**, *3*, 207–226.
67. Bhaskaran, S.; Polonsky, M.; Cary, J.; Fernandez, S. Environmentally sustainable food production and marketing: opportunity or hype? *Br. food J.* **2006**, *108*, 677–690, doi:10.1108/00070700610682355.