Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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Short Communication

The impact of COVID-19 lockdown on food priorities. Results from a preliminary study using social media and an online survey with Spanish consumers

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ABSTRACT

This preliminary study describes the impact of the COVID-19 health crisis on people's interests, opinions, and behaviour towards food. Here, the evolution of people's internet searches, the characteristics of the most watched YouTube videos, and Tweeted messages in relation to COVID-19 and food was studied. Additionally, an online questionnaire (Spanish population, n = 362) studied changes in food shopping habits during the lockdown, motivations behind the changes, and perceived reliability of the information received from media. Results showed initial trending searches and most watched YouTube videos were about understanding what COVID-19 is and how the illness can progress and spread. When the official statement of a pandemic was released, trending searches in relation to food and shopping increased. Data retrieved from Twitter also showed an evolution from shopping concerns to the feeling of uncertainty for the oncoming crisis. The answers to the online questionnaire showed reduction of shopping frequency but no changes in shopping location. Products purchased with higher frequency were *pasta* and *vegetables* (health motivations), others were purchased to improve their mood (*nuts, cheese, and chocolates*). Reduced purchasing was attributed to products with a short shelf-life (*fish, seafood*) or because they were unhealthy and contributed to gained body weight (sugary bakery goods) or mood (*desserts*). Statements made by experts or scientists were considered by consumers to be the most reliable.

1. Introduction

In December 2019 a series of pneumonia cases emerged in China, later identified as the novel coronavirus named severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (also known as the disease name COVID-19) (Tan et al., 2020). Since December 2019, the virus has spread worldwide and on March 11th 2020 the World Health Organisation declared a state of a pandemic.

As the pandemic spread, the research world was set in motion producing a substantial number of studies. According to the Web of Knowledge, at the beginning of April 2020 there were 7496 publications when searching for "COVID/coronavirus" in 2020, with all of them related to health (infectious diseases, respiratory system, public health, internal medicine, research medicine, health care, microbiology, virology, and molecular biology). When adding the term "food" to the search, 4382 studies appeared related to the possible sources of the virus, its genotype, and molecular characterisation. To date, only two studies were not concerning virology, one proposed supplementation of Vitamin D for COVID-19 prevention (Grant et al., 2020) and the other dealt with the loss of smell as a biomarker for COVID-19 infection (Moein et al., 2020).

The main research response for COVID-19 has been related to the understanding of the virus, its spread, and health consequences; however, not only health is being affected. Consumers' concerns regarding governmental mandated lockdowns, social distancing, displacement restrictions, and their uncertainty about this pandemic's extent are changing along with their lifestyle's.

Previous studies (outside pandemic times) have postulated that searches on Google reflect the interest and concerns of populations towards different diets (Kamiński, Skonieczna-Żydecka, Nowak, & Stachowska, 2020). Likewise, YouTube videos are widely used for seeking advice and tips regarding different diets and health issues (Aydin & Aydin, 2020; Basch, Hillyer, Garcia, & Basch, 2019). Besides internet searches, people use social media (i.e. Facebook, Instagram,

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Table 1
List of motivations that participants received when selecting each food, perceived as buying more or less of.

Category	Motivations for "buying more"	Motivations for "buying less"
Limitations	1. I fear that it will be no left	1. I could not buy it
	2. I do not have anything else	2. I need to ration it
	3. I cannot buy it daily	3. I cannot go where I usually buy it
Acceptability	4. I feel for eating it more	4. I do not feel for it
	5. I like it more	5. I do not like it anymore
	6. I am eating it more	6. I am tired of eating it
Mood	7. It cheers me up if I am sad	7. It does not cheer me up if sad
	8. It makes feel better if I am frustrated	8. It does not make me feel good if I am frustrated
	9. It helps me to fight stress	9. It does not help me to fight stress
Price	10. It is cheap	10. It is expensive
Health and weight control	11. It is going to protect me against coronavirus	11. I do not think that it will help against coronavirus
	12. It is what I have when I am sick	12. I do not have it if I am sick
	13. It is healthy	13. It is not healthy
	14. It is going to help to keep shape	14. It is going to make me put on weight
Received information	15. It is said to be good in this moment	15. The experts said that is good in this moment
	16. Everyone is buying it	16. No one is buying it
Shelf-life	17. It is long-lasting	17. It has short shelf-life

and Twitter) to freely express and share the content of their lives (Appel, Grewal, Hadi, & Stephen, 2020). Further, when aiming to answer specific questions about consumer's motivation and perception in exceptional circumstances, specific surveys are needed.

This exploratory study focuses on the first impact of a health crisis on consumers' behaviour regarding food and shopping. Worldwide information was gathered from different sources such as internet searches, most watched videos, and social media during the virus outbreak affecting European countries, Turkey, Russia, and North-America from mid-March to mid-April 2020.

Additionally, an online questionnaire was made (Spanish population) to study consumers' motivations for changing (or not) their shopping habits and their perceived reliability of the information sources in relation to COVID-19 under a strict lockdown period (30th March-14th April). This part of the study was conducted only in Spain, where on March 14th the state of emergency was declared. From March 30th to April 14th, the Spanish government increased the severity of the state of alarm. During this period the circulation of people was limited, and citizens could only leave the house if they were working in essential services (health, security, social, and economic wellbeing of citizens) or if they needed to buy necessary products (groceries and medicines) within their town.

2. Material and methods

2.1. Changes in internet searching trends related to food

The relative popularity data of searches on the internet from January 1st to April 15th were obtained through the Google trends tool. This tool provides (for a term and day) the number of searches (expressed as percentage) in relation to the maximum number of searches of the term in each period. It allows a comparison of searches and, in this case, the values of the number of searches of each term (expressed as percentage) in relation to the maximum number of searches of any terms in the selected period.

Two sets of 25 terms (one set in Spanish, other in English) related to food, virus, or lifestyle (food: *food, shopping, shopping covid, food covid, on-line shop, recipes, cereals, flour, meals covid, stock up shopping, hoarding shopping, yeast, vegetables, toilet paper, fruit;* virus: *flu virus covid, flu symptoms, coronavirus symptoms, coronavirus transmissio*n; lifestyle: *sport videos, sport videos covid, fitness covid, yoga and covid, leaving home covid*) were preliminary proposed to study the change in food habits, but also the concerns and activities that population was worldwide searching during this special period of time. From these initial searches, the most searched terms were further analysed.

A first comparative analysis of searches for the term *Food* and searches of terms (related to the coronavirus) *Symptoms*, *Spread*, and *Lockdown* was obtained. A second comparative analysis of searches for the term *Food* and other specific terms related to food (*Restaurant, recipe,* and *Delivery*) was also completed.

Finally, the popularity of searches of different individual food products was obtained, and those with relevant changes over the analysed period were retained. Searches were conducted in English and Spanish.

2.2. Most watched YouTube videos for food and shopping searches

Using the YouTube platform, the 100 most watched videos when searching for "*coronavirus + food*" and "*coronavirus + shopping*" in English and Spanish (n = 400) were obtained between the 30th March and 13th April 2020. Title, number of views, the upload date, and number of likes and dislikes were recorded for the 400 videos.

The videos were watched independently by three researchers who decided, by consensus, to classify the information into three content categories: *Health advice* (recommendations for prevention or treatment of COVID-19), *News* (novel or actual information), and *Documentary* (non-fiction film that captured in images or interviews of different facts of COVID-19).

Following the same protocol, the informants were also classified into three categories: *Journalist* (people working for newspapers, news websites, or information news), *YouTubers* (people who provided videos but not under news or TV channels), *Health science experts* (main or invited speakers who claimed to have health studies backgrounds such as physicians, virologists, and nutritionists). There were few mixed spontaneous videos not classified under any category. Additionally, the frequency of the most mentioned words, in the 400 video titles, was obtained.

2.3. Data retrieved from Twitter regarding food and shopping

Tweets (the individual message posted on the Twitter platform), containing the terms *Food* and *Coronavirus*, sent between March 19th and April 13th 2020 were retrieved in English (37,200 Tweets) and Spanish (14,537 Tweets) with the rtweet package (Kearney, 2018) from R software (R Core Team, 2016) via Twitter's application programming interface (API). Re-tweets and repeated tweets were not considered. The text was cleaned and the document-term matrix was obtained using the package tm in R (Feinerer, 2013). The frequency of terms was calculated for the total time and dividing the total time in three periods (T1: 19/03/2020 to 26/03/2020, T2: 27/03/2020 to 03/04/2020 and T3: 04/04/2020 to 13/04/2020 which encompassed 8, 8 and 10 days, respectively) to analyse the evolution of the frequency of mention with time.

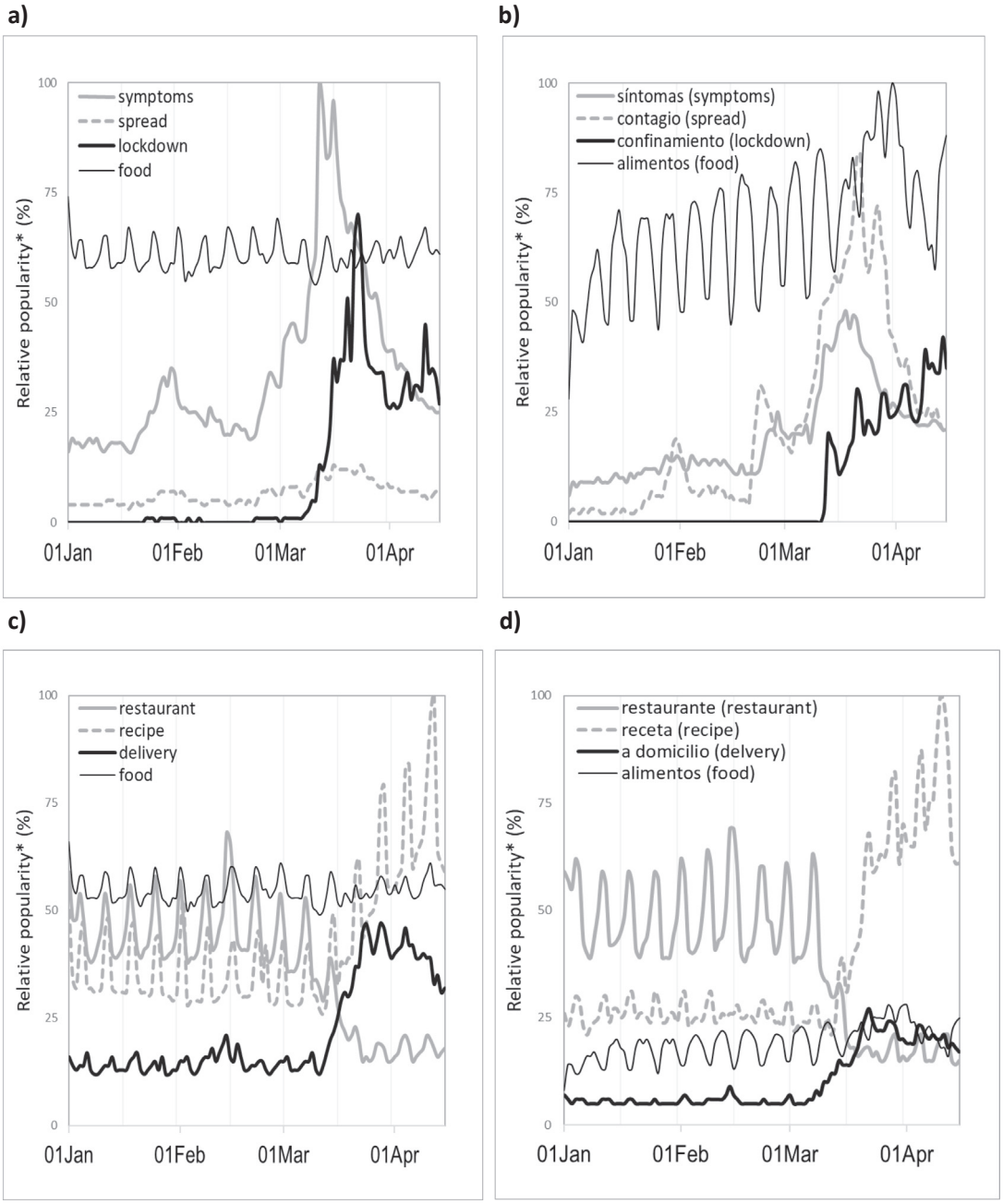

Fig. 1. Relative popularity of worldwide Google searches including the term *food* compared to searches of terms related to the coronavirus situation: *symptoms*, *spread*, and *lockdown* in English (a) and in Spanish (b); compared to searches of specific terms related to food: *restaurant*, *home delivery*, and *recipe* in English (c) and Spanish (d). Values are the number of searches of each term in a day in relation to the maximum number of searches in a day found in the period for any of the included terms.

2.4. Questionnaire on consumers' behaviour regarding food choice

An online questionnaire was sent to 800 consumers from a database that included Spain main areas (Madrid, Catalonia and Valencia). At the end of the strict Spanish lockdown (April 7th-13th), it was completed by 362 consumers (30% men, 70% women from 20 to 76 years old, average age 38.8). This questionnaire was approved by CSIC Ethics committee (046/2020).

Consumers were asked to indicate the food items, from a list, they perceived to buy more during the lockdown than in normal times; the product list was based on a Spanish food frequency questionnaire (Martin-moreno et al., 1993). Consumers were asked to do the same with the food they perceived to be purchasing less than in normal times. When a participant indicated purchasing a product more or less amount, he/she was asked to choose their reasons from a list of 17 motivations (Table 1). The two lists (motivations for purchasing more and less) were based on the Eating Motivation Survey by Phan & Chambers, 2016, adapted to the Spanish language (Laguna, Fiszman, & Tarrega, 2020); few motivations from a previous study on food insecurity (Puddephatt et al., 2020) were also included. The motivations encompass several dimensions: limitations, acceptability, mood, price, health/weight control, information received, and shelf-life. Consumers also had the opportunity to provide other motivations not listed.

Consumers were asked where their usual place of purchase was (*Small/local shop, Supermarket, Online,* or *Other*) and shopping frequency before and during the lockdown (*every day, two/three times per*

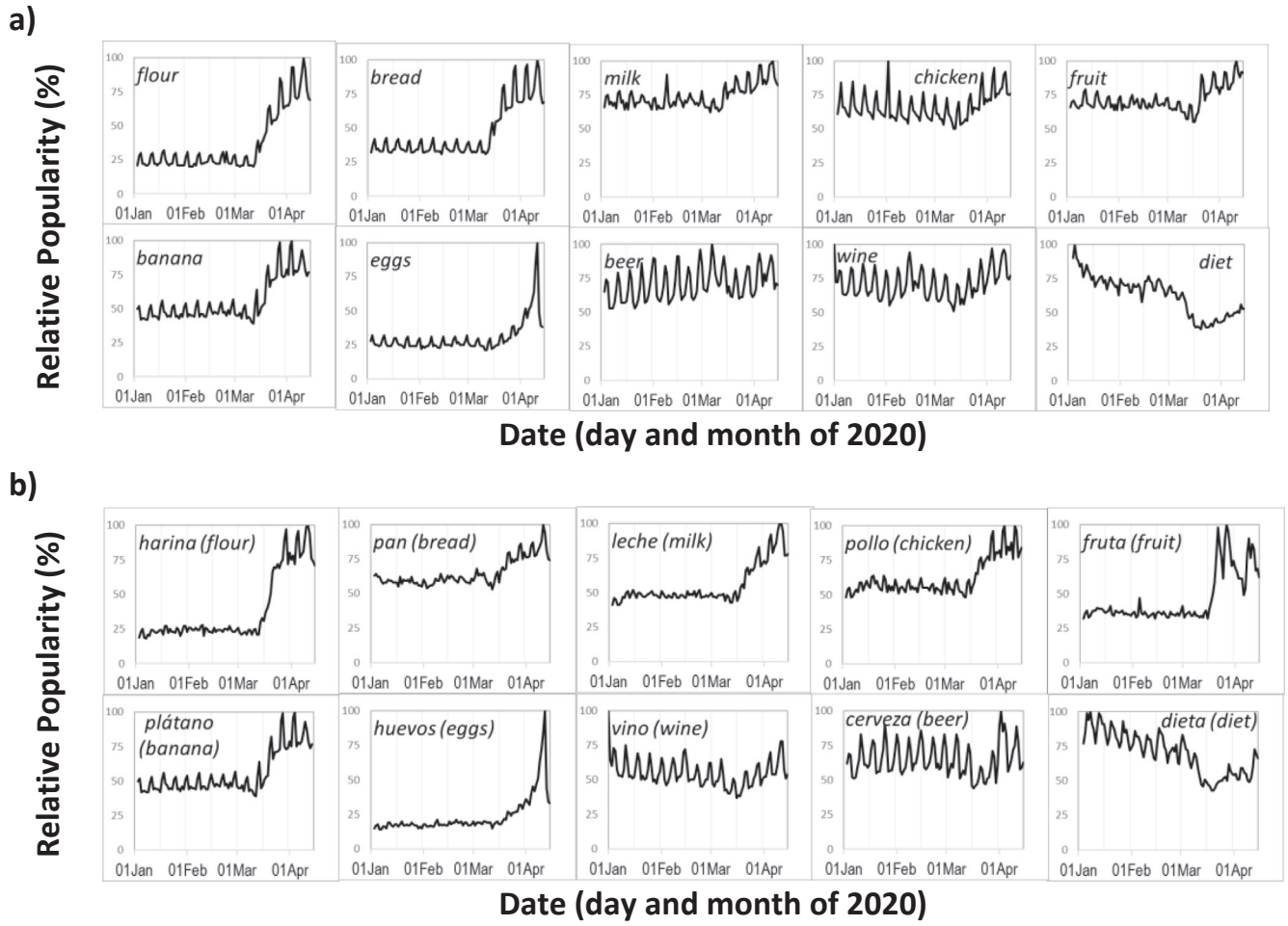

Fig. 2. Individual timeline of the relative popularity of worldwide Google searches for different specific food products and diet. Searches of terms in English (a) and in Spanish (b). For each term, values are the searches in a day in relation to the maximum number of searches found for this same term within the period.

week, once a week, and *once a month*).

Consumers indicated how reliable they considered 10 statements about measures against COVID-19 (provided by the WHO (2020) and non-scientific sources obtained from YouTube videos analysis) on a five-point reliability scale from not reliable to very reliable. Statements provided by WHO were: *Wash your hands with soap and water, Do not go out except exceptions, Avoid touching your eyes, nose, and mouth, To use a face mask,* and *Disinfect all products from outside.* The statements obtained from YouTube videos were: *Take Vitamin D supplements, Eat more citric fruit, Drink plenty of hot drinks, Consume more garlic and ginger, Gargling with warm water and lemon,* and *Eat more bananas*. Consumers also indicated the reliability of different individuals/professionals giving messages of protective measures: *Health staff, Researchers, Family, Politicians, Friends, Work Colleague*, and *Journalists*.

Consumers were also asked for their source of information, using a multiple-choice question including terms: *TV, WhatsApp, Radio, Journals, Social media, Telephone lines for COVID-19*, and *Employees/ Unions*.

2.5. Data analysis

Two Correspondence Analyses (CA), one for purchasing more food products and another for purchasing less, were performed using the food product purchasing data and its corresponding motivations.

Chi-squared test was used to analyse the influence of COVID-19 lockdown in the shopping place and frequency before and after the lockdown, at the alpha level of $p < 0.05$. All the statistical analyses were performed with XLSTAT version 2019.1.3.

3. Results

3.1. Worldwide popularity of Google searches containing terms related to COVID-19 and terms related to food during the first months of 2020

The searches of health-related terms like *Symptoms* and *Spread* (Fig. 1a and b) showed a similar timeline trend to the searches of *Coronavirus* (data not shown). A first small peak of popularity in the last week of January appeared and on February 20th the popularity values started increasing to reach the maximum values on March 12th and 21st for English and Spanish searches, respectively. *Lockdown* was not a trending search until March 13th; it increased in popularity, showing oscillations with peaks of interest approximately every two weeks. The popularity trend for *lockdown* reached its maximum, in English, on March 25th, while for Spanish searches was still growing on April 15th (Fig. 1). Searches on *Food* were popular (perhaps as they always are) over all the period studied; values remained almost constant in the English searches. For searches in Spanish, the values were fluctuant more and showed an increase in popularity from March 24th to April 5th.

Searches on specific terms related to food showed relevant variations in this period (Fig. 1c and d). Terms *Restaurant* and *Recipe* were relatively popular in January and February. After March 13th the popularity of searches for *Restaurant* decreased and after March 24th remained three times lower than at the beginning of the year. In contrast,

Table 2
Characteristics of the 100 most watched YouTube videos up to the end of March 2020 when including in the search term *coronavirus + food/shopping* and its equivalent in Spanish (food: alimentos; shopping: compra).

Search terms	Number of views		Type of information		Informant			Frequent video title words*
	Max-min	Adverts	News	Documentary	Journalist	You-Tubers	Health/Science experts	
Coronavirus + food	4,304,633–26,683	28	49	48	30	58	4	Virus (15); outbreak (14); China (13); buying, market, Wuhan (9); panic (8); news (6); fight, people, prepare, quarantine, street (5); Costco, empty, fears, home lockdown, monkey, shelves, trade (4)
Coronavirus + food (in Spanish)	982,809–26,683	50	41	9	26	24	36	Panic (29); China (8); Peru (6); foods, disinfect, emergency, supermarket; pandemic, toilet paper, fear (4)
Coronavirus + shopping	24,748,780–45,921	22	31	47	51	36	8	Buying, panic, (35); grocery (13); outbreak, stores (10), Costco, news, pandemic (9), emergency, fears, shoppers (8); paper, quarantine, toilet (7); empty shelves (6); shops (5), buy, people (4)
Coronavirus + shopping (in Spanish)	1,302,128–5,041	35	30	33	42	47	2	Defence mechanism, fight (8); quarantine, immunity (6); China, disinfection, supermarket, virus (4)

*Not included the search term.

the popularity of searches for *Recipe* continuously increased with fluctuations coinciding with weekends. The last weekend of the period, April 11-12th, was three-four times higher than at the beginning of the year. The searches for *Delivery* also increased starting on March 13th, and from March 24th to April 10th the popularity was three-four times higher than at the beginning of the year.

Temporal-changes of popularity were investigated independently for several food items; Fig. 2 shows those more representative. Searches for foods like *bread*, *chicken, milk, flour, fruit*, and *banana* increased starting around March 13th. In English and Spanish, the popularity of searches of *recipe* was four times greater and twice for *banana*. Popularity of searches for *bread* increased three times in English and one third in Spanish. Searches of *fruit, milk*, and *chicken* in English showed only a slight increase but doubled their popularity in Spanish. *Eggs* showed an important increase in popularity occurred slightly later than March 13th, with a narrower well-defined peak between April 7-14th that would be probably related to regional, traditional Easter egg.

Wine and *beer* showed fluctuations in popularity since the beginning of year (depending on weekdays and weekends) and the trend did not change. However, for *wine* (both languages) and *beer* (Spanish) between March 13-25th, popularity remained with minimum values recorded slightly lower than the peak values. The searches for *Diet* decreased continuously since the beginning of the year, with a minimum seen on March 20th but slightly increase after.

3.2. Analysis of the most watched worldwide YouTube videos

The 400 videos analysed in English and Spanish showed that the most watched videos were *News* (38.14%), followed by *Advice* (33.83%), and *Documentary* (28.03%) (Table 2). All videos had been uploaded between January 20-26th 2020.

For the search *coronavirus + food* (in English) most of the videos were of terms *News* or *Documentary* and the informants were *YouTubers*. The most frequent words in the video titles were related with terms for the virus acknowledgement (virus, outbreak, China, panic, and news), quarantine (fight, people, prepare, quarantine, and street), and supermarket/stocking-up food (Costco, empty, fear, foods, home lockdown, shelves, and trade).

For the search *coronarivus + food* (in Spanish), the videos were mainly *Advice* (50% of videos) with a higher number of (claimed) *health science expert* informants than with videos in English (36 *vs.* 4). The most mentioned words in the video titles was panic, followed by China and Peru, and then the words supermarket, pandemic, toilet paper, and fear.

When searching *coronavirus + shopping* in English, the most viewed video was *Documentary* with a *Journalist* informant. The most watched video titles contained the words purchasing, panic (for the outbreak), fear (of running out of primary goods in the shops), and toilet paper (rise in demand), which was one of the most watched videos.

In the search of *coronavirus + shopping* in Spanish, *Advice* videos were the most widely viewed having a *Journalist* and *YouTubers* as informants. The contents were related to the defence mechanism, fight, quarantine, immunity, China, disinfection, supermarket, and virus.

3.3. Most frequent worldwide words on Twitter

The most frequent words ($\geq 3.5\%$) used when tweeting about coronavirus and food are shown in Table 3. All words appeared along the whole analysis period with the maximum appearing at different periods.

In English, the frequency of terms indicate three main aspects concerned people: getting and stocking-up food (*Delivery, Get,* and *shop*), health aspects (*Medical*), and recommendation for staying at home (*Home, Stay, Social distance*, and *Work*). The impact of COVID-19 on the economy (*Donation* and *Bank*) showed maximum relevance in T2, and continued in T3 (T2: *Crisis, Govern,* and *Distribution*) with a

Table 3
Frequency of mention of words in Twitter when talking about *Coronavirus* and *Food* in English and in Spanish. Period at which the term showed maximum frequency is indicated as T1 (19/03/2020 to 27/03/2020), T2 (28/03/2020 to 03/03/2020), and T3 (04/04/2020 to 13/04/2020) or as constant when it did not change.

Tweets in English			Tweets in Spanish		
Term	Frequency of mention (%)	Period with maximum % of mentions	Term	Frequency of mention (%)	Period with maximum % of mentions
People	14.5	T3	People	15.2	T1
Help	12.7	T2	Buy	13.6	T1
Need	12.0	T2,T3	Quarantine	9.6	T1
Delivery	10.0	T1	Hunger	6.2	T2
Get	9.2	T1	Going out	5.7	T1
Pandemic	8.7	T2	Crisis	5.4	T3
Supply	8.2	Constant	Water	5.4	T3
Work	7.2	T1	Alone	5.2	T1
Lockdown	7.1	T3	Pandemic	5.2	T2
Home	6.6	T1	Medicines	4.8	T1
Crisis	6.6	T3	Delivery	4.0	T1
Shop	6.5	T1	Government	4.0	T2
Family	6.2	T3	Money	3.9	T2, T3
Donation	5.7	T12			
Distribution	5.7	T3			
Bank	5.6	T2			
Worker	5.5	T2, T3			
Support	5.5	T2, T3			
Provide	5.3	T3			
Medical	5.0	T1			
Essential	4.5	Constant			
Grocery	4.4	T1			
Stay	4.4	T1			
Eat	4.2	T3			
Health	4.2	T2			
Community	4.0	T2			
Thank	3.9	T2, T3			
Social distance	3.7	T1			
Govern	3.6	T3			
Store	3.6	T1			
Spread	3.6	Constant			

feeling of insecurity (T2: *Need, Support,* and *Secure*) and the incoming consequences (T3: *Lockdown* and *Crisis*).

Likewise, when tweeting about *coronavirus + food* in Spanish (Table 3) concern about health (*People*, *Quarantine*, *Pandemic,* and *Die*) and a way to get food (*Buy, Delivery*, and *Going out*) were mentioned more at the beginning (T1). Social issues and polices followed (*Hunger* and *Government*) showing maximum number of mentions in T2, and finally in T3 the economic consequences (*Money* and *Crisis*).

3.4. Spanish consumer's response to the questionnaire: Purchase place, frequency, and changes in the amount of food items

Before the lockdown, consumers mainly purchased their food in *Supermarkets* (≈96.6%), *Small shop* (≈39.21%), and *Online* (7.56%). After the lockdown, no significant changes ($p = 0.095$) of location were seen.

The consumer's frequency of shopping was *Twice per week* (50%) or *Weekly* (35%) before the lockdown. After the lockdown was announced, a significant change in the frequency of shopping ($p = 0.001$) took place; *Weekly* (76.5%) was the main frequency, whereas *Twice per week* (13.65%) reduced, and *Daily* (1.12%) almost disappeared.

The analysis of the amount of food people purchased showed over 20% of participants perceived to change their shopping amount (Fig. 3). Of the 36 products presented, 27 were perceived to be purchased more (Fig. 3a): *Eggs, Milk, Fresh vegetable, Meat, Pulses, Pasta, Fruit, House-cleaning products, Yogurts, Citric fruit, Cheese, Water, Preserves, Flour, Nuts, Wine* and *beer, Coffee* and *tea, Oil, Snacks, Biscuits, Cold meat, Toilet paper, Frozen vegetables, Chocolate,* and *personal care products*. Fourteen products were perceived to be purchased less by (20%) the participants (Fig. 3b): *Alcoholic drinks, Ready meals, Desserts, Bakery goods, Instant soups, Fish and seafood, Soft drinks, Snacks, Beer, Wine, Chocolate, Cold meat, Pickles,* and *Cereals*. Few products appeared on both lists (*Chocolate, Wine,* and *Beer*) which meant that some participants increased their purchase and others decreased it. This particular point is interesting because the amount of these food items were reduced to improve "physical" health (weight control/body shape) during lockdown by some consumers whereas were increased to improve "mental" health/ mood (cheers me up) by others.

The motivations linked to the products purchased more and less than in normal times were studied using correspondence analysis (Fig. 4a and b, respectively).

On the Left part of the map, food products like *Pulses, Pasta, Vegetables*, and *Citric fruit* were associated with motivations of *Health/ Weight control* (*It is healthy; It helps me to keep in shape*). Moreover, *Pulses, Pasta,* and *Oil* were related to *Shelf-life* (*long-lasting*) and *Price* (*It is cheap*). On the right side of the map, food products like *Chocolate, Nuts,* and *Cheese* were related to emotional motivations and mood (*It helps me to combat stress, It cheers me up, It helps me to feel better if I am frustrated*). Close to these food products also appeared the term *feel for eating*, where the participants associated *Snacks,* and *Coffee* and *tea*. Few food items like *Flour*, *Bread,* and *Cold meat* were related to changes in habit (*to be eating it more*). Although it was not considered in the questionnaire, 35 participants spontaneously claimed they were purchasing more flour because they were cooking more to pass free time or keep their children entertained.

The main motivations for purchasing less food products (Fig. 4b) like *Bakery goods* was *health/weight control*, and reasons related to mood for products like *Desserts, Alcoho*l, or *Snacks* was *not improving the mood.* On the extreme right side of the map *Fish* and *seafood* were purchased less, as they had a short shelf-life and high price (*perishable, expensive,* and *not available*).

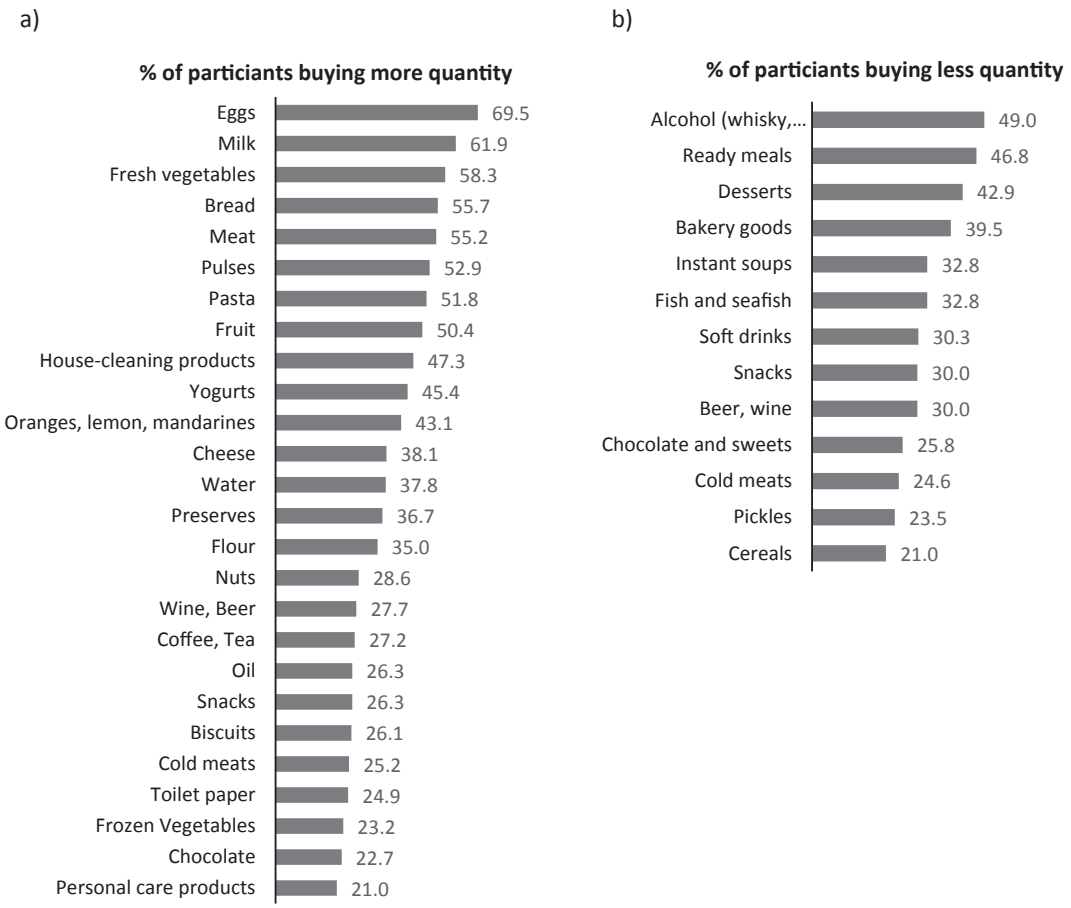

Fig. 3. Perceived changes in quantity of purchased food from the online questionnaire to Spanish consumers. Percentage of consumers buying more (a) and less (b). Only food products with a change in at least 20% of participants were included.

3.5. Spanish consumer's response to the questionnaire: Perceived reliability of the information sources

Over 80% of the participants found advice from the WHO more reliable, however, non-scientific proven statements also reached quiet high reliability levels for some statements. The WHO's more reliable statements were *Wash hands, Do not go out, Avoid touching face,* and *Disinfect all products from outside* like parcels or shopping. Whereas non-scientific advice like *To have more vitamin D, Drink plenty of water, Consume water with ginger, Gargling hot water,* or *Eat more bananas*, were shown variably reliable (25.4–53.3%).

The reliable sources for most participants (95%) were *Researchers* and *Scientists*. Sources of information showed *TV* was the most frequently used (72%) followed by *Journals* (48%) and *Social media* (37%). Other sources like *Employers/Unions* and *WhatsApp* were used around 27% and the least used source for gaining information was the information telephone lines for COVID-19.

4. Discussion

This paper gave the first (preliminary) insight into the effect of the COVID-19 pandemic alert on consumers in relation to food priorities. Changes in popularity of searches related to food were observed during the lockdown period. People's interest in *Restaurants* decreased and interest increased on *Recipes* and *Delivery* reaching huge popularity, comparable or higher than searches related to health (*Symptoms* and *Spread*). People's concerns about diet decreased, but the interest in food products like *Flour, Bread, Fruits, Milk,* and *Chicken* (related to cooking, baking, and storage conditions) increased.

YouTube's most watched videos showed the concern of the population was to understand the origin of the pandemic and how it could be fought with "home" or food remedies. This result would indicate that people watched videos with motivations that were a little different from those of Google searches; while videos pretended to satisfy the need for tutorial, didactic information, Google searches offered more spontaneous and immediate information**.** Unfortunately, most videos were shared and the beginning of the pandemic without update information and not made by experts and could put viewers at risk if they followed the inefficient advice. As the pandemic evolves quickly over time more updated educational materials shall be promoted on YouTube. In a review made (Madathil & Rivera-Rodriguez, 2014) on healthcare information in You Tube, the authors found that some videos contained misleading information, primarily anecdotal, that contradicts the reference standards, but also it was found videos from government organizations and professional associations containing trustworthy and high-quality information.

The data retrieved from Twitter confirmed the concerns that people had regarding food shopping, health care, and economics. Specifically, the temporal analysis of these results captured the evolution of population concerns, from shopping and carefulness (for most vulnerable people), to the uncertainty of what will happen at the end, and how the derived health and economic crisis will be solved. This constant evolution of the situation might be reflected in further changes in the consumers' behaviour and rationality, as there is a constant change in what governs their context and practices (De Krom, 2009).

From the Spanish consumers' responses at the time of the online questionnaire, a change in shopping habits during the lockdown was observed. Notably, these participants were already two weeks into a strict lockdown, and the initial stock-up and fear period had already passed. Although Spanish consumers have confronted food-related

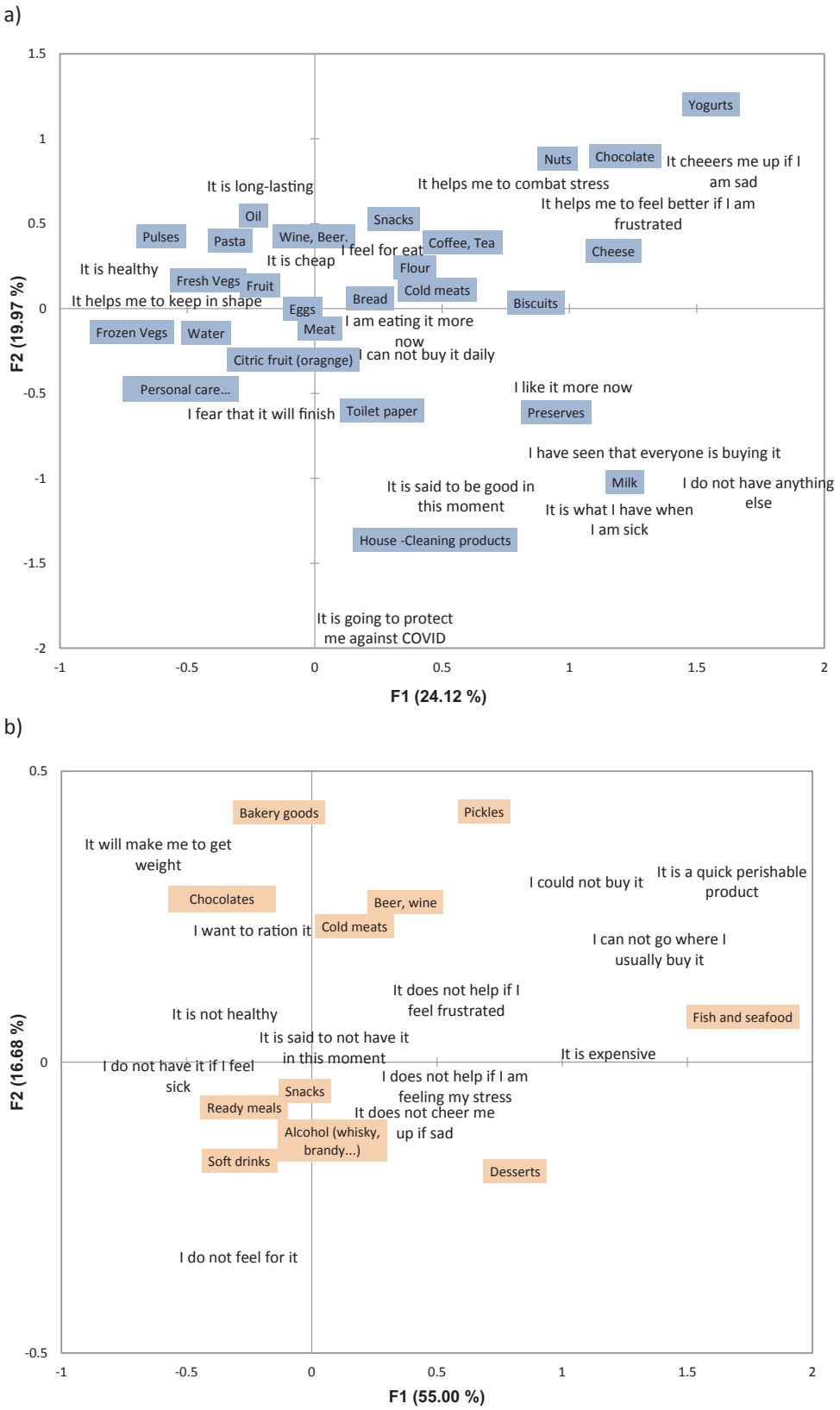

Fig. 4. Correspondence analysis of motivations cited by Spanish consumers (from the online questionnaire) for changing their shopping; (a) for products that they were buying more; (b) for products they were buying less.

crises as with the H5N1 (avian) influenza (De Krom & Mol, 2010), rapeseed oil in Spain (Díaz-Méndez & Gómez-Benito, 2010), and more recently the shredded meat listeriosis, Spanish consumers of the 21st century have never confronted a pandemic crisis and lockdown as presented by the coronavirus. The food-related changes observed, in relation to the mandatory change of their lifestyles, (staying at home or not allowed to exercise outside) have arisen concerns regarding their mood and body weight. In addition, lowering the frequency of shopping has decreased consumption of the most perishable food products like fish and seafood (heavily consumed in normal times). However, shopping for non-perishable ready meals decreased, likely because of unhealthy related opinions and more time for cooking and preparing. In fact, fresh vegetables were purchased more, for that reason and probably they have the perception of being healthier. These results are in line with the increase in popularity of Google searches related to recipes and the decrease of those related to wine and beer. No relation was found between some hoaxes (certainly with relatively low reliability) related to food consumption (such as “Eat more citric fruit”, “Eat more bananas”, and “Take vitamin D”) and the perceived changes in quantity of shopping of some food items. Regarding the perceived reliability of the sources, the statements made by experts or scientists were considered by consumers to be the most reliable. However, this is in contrast with the most watched YouTube videos that were mostly from non-scientific sources.

5. Conclusions

Contribution of the present preliminary study provides initial insights into the behavioural changes in a pandemic situation, an event that has not occurred before in social media times. For the scientific community, it is beneficial to know that although people declare scientists and experts as one of the most reliable sources of information. However, when searching and watching videos, scientists are not the most popular source, and efforts should be made to design more effective information communication channels, avoiding that the population follow non-scientific (hoax/fake-news) advice.

Because of the mandatory change of lifestyle, consumers have changed their habits and the motivations behind them. Further studies are needed to investigate the long-lasting effects and adaptation of food consumption behaviour to the “new normality”.

CRediT authorship contribution statement

L. Laguna: Conceptualization, Formal analysis, Funding acquisition, Methodology, Investigation, Writing - original draft. **S. Fiszman:** Funding acquisition, Methodology, Investigation, Writing - review & editing. **P. Puerta:** Data curation. **C. Chaya:** Supervision, Writing - review & editing. **A. Tárrega:** Conceptualization, Data curation, Formal analysis, Funding acquisition, Supervision.

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