

## Original Research

**Cite this article:** Charilaou L and Vijaykumar S. Influences of news and social media on food insecurity and hoarding behavior during the COVID-19 pandemic. *Disaster Med Public Health Prep.* 17(e58), 1–7. doi: <https://doi.org/10.1017/dmp.2021.315>.

**Keywords:**

Communication; Health Communication; Public Health; Covid-19

**Corresponding author:**

Santosh Vijaykumar,  
Email: [Santosh.vijaykumar@northumbria.ac.uk](mailto:Santosh.vijaykumar@northumbria.ac.uk)

# Influences of News and Social Media on Food Insecurity and Hoarding Behavior During the COVID-19 Pandemic

Lucy Charilaou MSc and Santosh Vijaykumar PhD

Northumbria University, Psychology Department, Newcastle upon Tyne, United Kingdom

### Abstract

**Objectives:** The aim of this study was to examine how sociodemographic variables and frequency of media consumption affect hoarding behavior and food insecurity concerns during the coronavirus disease 2019 (COVID-19) pandemic.

**Methods:** A quantitative, nonexperimental, correlational online survey was administered using a convenience sample of 203 participants from the United Kingdom with no medical issues that affected buying behavior during the pandemic to examine perceptions related to food insecurity, and self-reported food hoarding behavior.

**Results:** Younger adults and lower income groups reported higher food insecurity perceptions and hoarding behaviors. Consuming COVID-19 information from websites was significantly associated with food insecurity perceptions, while information from social media was significantly associated with more food hoarding behaviors.

**Conclusions:** Younger adults and lower income groups are vulnerable populations from the perspective of food insecurity and hoarding behavior in times of health disasters like pandemics. While social media can play a positively catalytic role during crises, excessive online information and misinformation can contribute negatively to public panic and feelings of insecurity. Implications for disaster preparedness and future research are discussed. The findings suggest that age is the main predictor of food insecurity and hoarding behavior, with younger adults more likely to be affected. They also suggest that people are turning to National Health Service (NHS) websites, which were deemed more trustworthy than social media, to avoid “news fatigue” and avoiding speculation. Suggestions for future research were made, specifically to examine people’s social support during the pandemic to understand its potential link to stockpiling behavior or food insecurity concerns.

The coronavirus disease 2019 (COVID-19) outbreak was declared in China on December 31, 2019,<sup>1</sup> and spread rapidly across the world before being declared a global pandemic on March 11, 2020.<sup>2</sup> The pandemic attracted widespread media coverage and its announcement coincided with a wave of stockpiling behavior in supermarkets across the globe.<sup>3</sup> In the United Kingdom, estimates suggest that consumers spent an extra £1.9bn in the period February 24 to March 21, compared with the same period last year and made over 80m extra shopping trips.<sup>4</sup> This surge in supermarket sales provoked extended media coverage of the empty shelves and stockpiling behavior seen in shoppers,<sup>5</sup> which arguably in itself could be a catalyst for the increase in stockpiling behavior.

One explanation for stockpiling behavior and food insecurity is the emotional contagion theory, specifically fear contagion. It argues that emotional contagion takes places in 3 stages: mimicry, feedback, and contagion,<sup>6</sup> whereby people mimic behavior which affects how they process their emotions and leads them to internalize this behavior. This “contagion of fear” can be exacerbated by media coverage as seen in the United States throughout the Ebola outbreak in 2014. Previous researchers concluded that mass media can be responsible for inducing panic in the population even in cases where the actual risk to the public is low. This demonstrates that face-to-face proximity is not needed for emotional contagion, and images and videos are also effective ways for emotions to spread. This perspective is especially relevant in the context of the COVID-19 pandemic when face-to-face contact has been drastically reduced because of repeated lockdowns, with people relying heavily on social media and online interaction.<sup>8</sup>

Previous studies have shown how emotion, many times fueled by mass media, can spread easily on social networks, specifically on Twitter<sup>9</sup> and Facebook<sup>10</sup> through people replicating the emotions of others as seen on social media. During the Ebola pandemic, for instance, a news video triggered tens of thousands of tweets and Internet searches related to Ebola, a pattern attributed to the panic-inducing characteristics of the original video.<sup>7</sup> Other studies attest to a linear relationship between the emotional valence of the stimuli that Internet users are exposed to and their emotional responses.<sup>11</sup> Public health emergencies like COVID-19 might motivate people to post emotional online content, thereby creating an emotion-induced climate of values

in the society that prioritizes securing oneself and avoiding threats.<sup>12</sup> These studies attest to the power of social media to fuel emotion contagion during COVID-19 even though the extent to which it is associated with self-preservation behaviors and threat-related beliefs like hoarding and food insecurity, respectively, remains to be understood.

News media play a crucial part in reducing public concern during an outbreak, especially as a tool to avoid the health system being overwhelmed.<sup>13</sup> When used correctly, the media can minimize the public's perception of risk; however, the growing access to a 24/7 news cycle leaves people prone to media-related anxiety, which is incongruent with actual public risk.<sup>14</sup> Media richness theory argues that the effectiveness of the message will depend on the media form, with images and video considered the most effective.<sup>15</sup> Research has shown that exposure to graphic images still triggers anxiety after a traumatic event,<sup>16</sup> and priming theory suggests that higher exposure to images and videos can evoke related thoughts in the minds of consumers.<sup>17</sup> This is of particular importance during this pandemic, as recent research suggests people are spending more time on social media<sup>18</sup> meaning they have had the opportunity to be exposed to more media forms that may have had an impact on their buying behavior. Placing these perspectives in the context of fear contagion theory leads us to postulate that posting and sharing images and videos of panic buying at supermarkets on social media might spread fears around the lack of availability of food, thereby fueling insecurities and hoarding tendencies aimed as self-preservation.

Previous research indicates that people have a set of societal norms that they look to for guidance on how to behave, particularly during times of uncertainty when it is easier to be influenced by these norms.<sup>19,20</sup> Studies have examined the relationship between conformity and social influence when there is a threat to mortality<sup>21</sup> and highlight the idea that following social norms generally increases the likelihood of avoiding death. This is not to say that the media coverage of the stockpiling in United Kingdom supermarkets may have increased people's mortality salience; however, general news coverage of the virus may have increased people's awareness of their mortality and increased their desire for survival. In this way, it could be argued that people see stockpiling as a rational behavior during times when survival is threatened and people want to prepare for the worst-case scenario, as seen in previous studies.<sup>22,23</sup>

These problems are also affected by sociodemographic variables such as age and gender, and social determinants of health like income and education. For instance, previous research has suggested that females and younger adults from lower income groups and older adults, one of the main vulnerable groups for COVID-19, are more likely to be affected by food insecurity.<sup>24–28</sup> Furthermore, those from lower income groups are less likely to resort to hoarding behaviors given their access to lesser disposable income; in contrast higher income and education might be associated with a greater propensity to hoard possibly given greater threat perceptions among this group which too has shown to influence.<sup>29–32</sup>

Throughout the pandemic, there has been a growing need to be aware of future problems caused by the pandemic, and research suggests that the changes to the food chain may limit people's access to healthy food.<sup>33,34</sup> Therefore, it is important to understand what drives hoarding and panic buying during a pandemic to be able to predict how people may behave so that everyone has equal access to food and other resources. In addition, a pandemic places enormous strain on the healthcare system, and some researchers have made nutrition recommendations for the pandemic to ensure

people maintain a healthy diet and avoid placing stress on the food supply chain and health-care system.<sup>35</sup> In this context, the extent of the twin problems of food insecurity and hoarding behavior and the influences of news and social media on these behaviors have thus far been understudied in the United Kingdom, a country with the highest COVID-19 mortality in Europe. In the context of this study, media consumption serves as an information source and takes into account various forms of media such as social media, traditional media, and websites. This is the gap in research our study seeks to address. Evidence from the above literature review allows us to formulate the following research questions:

RQ1: To what extent do media consumption, food insecurity perceptions, and food hoarding behaviors vary among different age groups in the United Kingdom?

RQ2: How do COVID-19 related food insecurity perceptions and food hoarding behaviors vary among different income groups in the United Kingdom?

RQ3: To what extent does exposure to online information on COVID-19 affect food insecurity perceptions and food hoarding behaviors?

## Methods

We used a quantitative, nonexperimental, cross-sectional design to age and income-based differences in food insecurity perceptions and hoarding behaviors, and identify factors related to media consumption that might affect these outcomes.

## Participants

Using a convenience sampling approach, we recruited 203 participants between May 22 and July 16, 2020, through advertisements on Facebook, Twitter, Reddit, online food forums, and Survey Circle. By way of inclusion criteria, participants were required to be at least 18 y of age, residing in the United Kingdom since the start of the pandemic, and to have no medical issues that affected their buying behavior during the pandemic (eg, needing to be shielded which may have impacted how participants shopped during the pandemic and may have needed to stock up on certain items). Participants were informed that their participation was voluntary and anonymous and gave their informed consent before participating.

## Measures

The survey was composed of 3 different adapted scales to measure food insecurity, hoarding behavior, and media consumption. The Food Insecurity Experience Scale Survey Module (FIES-SM)<sup>36</sup> was used to measure food insecurity as it is designed to measure access to food, and any changes in diet. This scale was originally designed as part of a Food and Agriculture Organization of United Nations project to measure food insecurity across the world and is designed to measure food insecurity at the individual and the household level. It has widely been used as a measure of countries' food insecurity<sup>37,38</sup> as it is the "first experience-based food insecurity measurement system" which allows for comparison across countries.<sup>36</sup> It was deemed a suitable measure for this study because it enables the measurement of people's access to food during the coronavirus pandemic, and how worried they have been about accessing food during the pandemic. Selected items from this scale were chosen to

build our food insecurity scale. Building on the questions consisted of a 3-item (Since the global COVID-19 pandemic was announced [March 11, 2020], has there been a time when, due to a lack of money or other resources: you have been unable to access healthy and nutritious food, your household ran out of food, you had to skip a meal), 5-point scale (Never, Rarely, Sometimes, Frequently, Very Often) (Cronbach's  $\alpha = 0.76$ ; mean = 5.21).

The hoarding behavior scale was adapted from the Saving Inventory-Revised (SI-R)<sup>39,40</sup> which was designed to measure symptoms of compulsive hoarding and the levels of distress sometimes seen in hoarders. The items in the scale aim to measure general symptoms seen in those with hoarding tendencies, such as feeling the need to acquire items and any distress associated with hoarding behaviors. The hoarding scale was included in this survey to be able to examine stockpiling behavior during the pandemic and the SI-R has again been widely used to measure hoarding behavior.<sup>41,42</sup> Building our hoarding scale consisted of selecting appropriate items from the SI-R, which again used a 5-point scale to measure hoarding behavior (During the Covid-19 pandemic, how often have you acquired things you may not need immediately? Never, Rarely, Sometimes, Frequently, Almost Always). (Cronbach's  $\alpha = 0.69$ ; mean = 8.39)

The final scale was adapted from the Ofcom News Consumption Survey<sup>43</sup> which aims to discover people's news consumption preferences in the United Kingdom. This survey is flexible and allows for many different types of news platforms to be examined. Including this survey in the study allows for a detailed examination of which types of media people are using the most for coronavirus related news and how often they are consuming it to determine how much news they are being exposed to, and whether this affects their buying behavior. This Ofcom survey is conducted every year, and the data from it is widely used in other studies to examine people's news consumption preferences.<sup>44,45</sup>

Media consumption (used to measure people's source of information) was measured using the following media types: word of mouth, radio (analogue/online), newspapers (print/online), television (on TV and online), governmental health websites (eg, NHS), medical websites (eg, WebMD), social media, and other. These media channels were then condensed into 3 broad categories: traditional media (radio, television, newspapers), websites (governmental health websites, medical websites), and social media. It is important to distinguish between different sources of media, as not all forms of media will have the same effect on people's food insecurity and hoarding behaviors.

Two word association questions were included at the end of the survey to determine the priming effects of the media on people's perceptions of the words "food shopping" and "supermarket." Participants were shown a list of words such as "rationing" and "empty shelves" and asked to select which words (if any) they associated with "food shopping" and "supermarket." The aim of these questions was to create a word index based on how many words participants selected, with a higher score indicating that they had more negative perceptions of "supermarket" and "food shopping." To determine the priming effects of the word association, a "supermarket" ( $M = 2.52$ ;  $SD = 1.25$ ) and "food shopping" ( $M = 1.5$ ;  $SD = 0.80$ ) index was calculated by adding together the number of words each participant selected, with higher scores indicating more negative associations with these words. The online survey platform Qualtrics was used to implement the survey. Ethical approval for the study was granted by the faculty ethics committee at a university in the United Kingdom.

**Table 1.** Sociodemographic profile of survey participants

Demographics	n	%
Gender		
Male	25	12.3
Female	175	86.2
Other/prefer not to say	1	0.5
Age (y)		
18-39	105	51.7
40 and over	91	44.8
Education		
Undergraduate degree or below	103	50.7
Postgraduate degree or above	97	47.8
Household income		
£0-20,000	52	25.6
£20-50,000	85	41.9
£50,000 and over	63	31.0

## Analysis

We performed simple descriptive statistics to generate a profile of the participants. Age- and income-based comparisons were performed using independent t-test and 1-way analysis of variance (ANOVA). Factors associated with food insecurity perceptions and hoarding behaviors were identified through linear regression modeling using the stepwise method to generate the most parsimonious model while controlling for age, gender, income, and education. Statistical significance was set at  $P < 0.05$  level for all tests. All data were then analyzed using SPSS v.26.

## Results

Frequency statistics for the participants are shown in Table 1. Frequency statistics were also carried out for news sources for COVID-19 with television, government health websites, and social media among the most popular. A food insecurity score was calculated by aggregating scores on all items related to the FIES-SM scale ( $M = 1.70$ ;  $SD = 0.75$ ), and a hoarding score was also calculated by aggregating scores on all items from the questions related to the SI-R scale ( $M = 2.08$ ;  $SD = 0.61$ ).

In response to RQ1, we found no age-based differences in use of traditional media and medical and health websites (Table 2). However, social media use among 18- to 39-y-old participants was significantly higher than 40+-y-old participants. We also found that food insecurity perceptions and hoarding behaviors among the younger age group were significantly higher than the older age group.

In response to RQ2, we found no significant income-based differences in the use of traditional media, websites, and social media, or food hoarding behaviors (Table 3). Food insecurity was the only variable that demonstrated a significant difference between income groups at the  $P < 0.05$  level. Tukey's post-hoc analyses revealed that the lowest income group of £0-20,000 significantly differed from the £20-50,000 group ( $P = 0.03$ ) and the >£50,000 group ( $P = 0.01$ ). No significant differences were found between the £20-50,000 and >£50,000 groups.

In response to RQ3, we ran a hierarchical stepwise linear regression to identify the most parsimonious model (Table 4). None of the variables entered into the regression were highly correlated (Supplementary Table 1). Exploring factors explaining food

**Table 2.** Age-based comparison of media consumption, food insecurity, and hoarding behaviors

Variable	18-30 years		31-40 years		<i>p</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Traditional Media	8.13	3.18	8.74	3.05	0.18
Websites	3.77	1.99	3.84	1.77	0.80
Social Media	3.67	1.59	2.96	1.65	0.004
Food Insecurity Perceptions	1.47	0.62	1.13	0.28	<0.001
Hoarding Behaviors	2.30	0.63	1.91	0.60	<0.001

insecurity perceptions, we found that younger participants, or those who earned less were associated with higher food insecurity perceptions. Also, use of medical and health websites and priming related to food shopping was positively associated with higher food insecurity perceptions.

Exploring factors explaining food hoarding behaviors, we found that younger participants were more likely to display hoarding behavior and those with higher education were associated with higher food hoarding behaviors. Additionally, we also found that social media use and priming related to supermarkets were associated with higher food hoarding behaviors.

## Discussion

Market research agencies have documented stockpiling behaviors among United Kingdom consumers in 2020 by pointing to 79 million extra shopping trips and an additional spending of £1.9 billion on groceries over the past year.<sup>4</sup> The aim of the present study was to investigate the influences of sociodemographic factors, with a particular emphasis on age and income, and media consumption on food insecurity perceptions and such hoarding behaviors using priming theory and emotional contagion theory. Our analyses revealed 3 important findings of relevance to the community of public health nutrition communication practitioners and researchers. Specifically, we found that younger adults reported not only significantly higher social media use, but also food insecurity perceptions and food hoarding behaviors. Furthermore, lower income groups reported significantly higher food insecurity perceptions and substantially higher food hoarding behaviors. However, age became the main observed demographic variable due to its significant findings. Last, we found that online media, both by way of websites and social media, were associated with food insecurity perceptions and food hoarding behaviors, respectively. These findings should be considered in the context of the sample which had an unequal gender balance toward females; however, other demographic variables were more equally proportioned. Below, we seek to unpack these key findings individually in the context of prior research and implications to the nutrition education community.

Our finding about greater food insecurity perceptions among younger adults is consistent with research in other high-income countries like Australia where the 18-25 age group accounted for nearly 36% of those were found to be food insecure.<sup>46</sup> In the United Kingdom, where food insecurity quadrupled due to COVID-19, adults who were unemployed were found to be at risk of food insecurity,<sup>47</sup> similar to income-based disparities observed in Australia as well as in our study where younger adults reported lower household incomes. Lower income increases susceptibility to food insecurity,<sup>48</sup> an undesirable relationship that might have been

strengthened with the impact of COVID-19 on increased unemployment in the United Kingdom.<sup>49</sup>

The results of the parsimonious regression suggest that higher education is associated with hoarding behavior and food insecurity. This finding supports previous research suggesting that consumers with a higher level of education are more likely to stockpile because they are more likely to show a greater risk perception of infection.<sup>31</sup> Further research would be useful to examine how education can lead to increased hoarding behavior, and whether education would actually be a useful tool in combatting hoarding behaviors during a pandemic.

We found hoarding behaviors decreasing with increasing income; however, this association was not significant. While it would be reasonable to think that lower income impedes an individual's financial capacity to stockpile, previous research supports this seemingly counterintuitive finding by suggesting that those who earn less are in fact more likely to hoard,<sup>50,51</sup> with the studies suggesting further research is needed to determine whether hoarding is a consequence of financial insecurity, or if hoarding behavior leads to financial insecurity. While our study does not possess the data to draw causal linkages about the effect of income, the consistent patterns from our study and other related research clearly paints a picture of the extent of the economic burden that COVID-19 has placed on young adults and the socio-structural inequities that might have exacerbated food insecurity perceptions among lower income groups. Taken in the context of fear contagion theory, this finding suggests that those on lower incomes feel more vulnerable and have a higher tendency to display self-preservation behaviors, such as food hoarding.

The significant effect of age, however, continued to persist as younger adults reported higher hoarding behaviors. One possible explanation from correlated research reporting similar findings is that hoarding behaviors are influenced by impulsivity which is pronounced among younger age groups<sup>52</sup> and can be triggered by panic.<sup>53</sup> Relatedly, findings about higher food insecurity hoarding behaviors among younger adults should not only be seen in the context of food shortages in supermarkets in the United Kingdom during the initial months of COVID-19, but also situated against the greater extent of social media use among this group as a possible explanation for panic. This perspective gains strength with 1 study finding 20 million mentions of "coronavirus" across social media and news sites in a single day,<sup>54</sup> and other large-scale analyses of Twitter data that describe how a combination of human and automated agents were responsible for spreading manipulated content or misinformation during the initial months of the pandemic.<sup>55</sup>

The "infodemic" that the World Health Organization refers to constitutes not only a large-scale spread of misinformation but also an over-abundance of information in general which was diffusing at scale through social media, reaching people in various combinations of textual, visual, and audible content. Among these strands of multimedia content were pictures of empty store shelves<sup>56-58</sup> which, using emotional contagion theory, it could be argued to have caused panic and anxiety among consumers in the midst of an emergency characterized by high levels of uncertainty, leading them to stockpile food supplies. Recent research has argued that the media's framing of the situation helped to drive stockpiling behavior which then became "self-perpetuating,"<sup>59</sup> for example, supermarkets introducing product restrictions could encourage people to buy extra quantities of other items and increase their perception of uncertainty. However, hoarding behavior can be seen as



**Table 3.** Differences in media consumption, food insecurity perceptions and hoarding behaviors between different income groups in the United Kingdom

Variables	£0-20,000 M(SD)	£20-50,000 M(SD)	>£50,000 M(SD)	Sum of squares	Df	F	P-Value
Traditional Media	7.78(3.21)	8.63(3.09)	8.70(3.17)	28.80	2	1.45	0.24
Websites	4.11(1.97)	3.55(1.84)	3.89(1.82)	9.76	2	1.40	0.25
Social media	3.60(1.68)	3.44(1.68)	3.12(1.60)	6.29	2	1.15	0.32
Food insecurity perceptions	1.52(0.66)	1.27(0.45)	1.22(0.49)	2.59	2	4.77	0.01
Food hoarding behaviors	2.24(0.76)	2.14(0.58)	1.98(0.62)	1.83	2	2.20	0.11

Abbreviation: Df, indicates degrees of freedom.

**Table 4.** Sociodemographic, media consumption, and priming factors predicting food insecurity perceptions and hoarding behaviors

Predictors	B	P-Value	F	R <sup>2</sup>
Food insecurity perceptions model				
Age	-0.1	0.001**	11.38	0.28
Education	-0.008	0.13		
Income	-0.008	0.003**		
Gender	0.16	0.09		
Websites	0.08	0.001**		
Priming: food shopping related	0.03	0.05		
Hoarding behavior model				
Age	-0.30	0.001**	9.83	0.001**
Education	0.20	0.13		
Income	-0.01	0.83		
Gender	0.12	0.33		
Priming: supermarket-related	0.14	0.001**		
Frequency social media	0.06	0.01**		

\*\*significant predictors at the 0.01 level.

rational during times of crisis when there is a fear of the unknown and a need to control the situation and feel prepared.<sup>60</sup>

Whereas social media is widely seen as an untrustworthy source of news,<sup>61</sup> it was still one of the most popular news sources for COVID-19 for those aged 18-39 y. Twitter reports of food shortages and queues in supermarkets were shared multiple times,<sup>62</sup> increasing people's exposure to these events, especially if checked several times a day, as was the case in this study. Psychological distress associated with COVID-19 increases as exposure to COVID-19 related news increases,<sup>63</sup> and the findings of the current study suggest that exposure to COVID-19 related news on social media can increase concerns over food insecurity and hoarding behavior, potentially due to media priming and emotional contagion. Those on lower incomes may already be feeling vulnerable during the pandemic, and may, therefore, be more susceptible to emotional contagion by means of social media, prompting them to hoard more and feel more food insecure.

The significant association of website use with food insecurity perceptions which might be explained by the fact that government health websites were among the most commonly used sources of media. This is supported by earlier research showing that visits to NHS sites hit a peak of 22.5 million visits in March 2020.<sup>18</sup> Our findings suggest that people might be seeking factual information about various aspects of COVID-19 such as symptoms, and guidelines related to social distancing and self-isolation, all of which can be sourced from the NHS website. The lack of opinionated or user-generated content on government websites makes it less likely for

these informational sources to trigger and diffuse emotional responses. As such, the role of governmental websites such as the NHS is to provide information on a "need-to-know" basis with the aim being to supply authentic information as opposed to eliciting emotional reactions or inducing panic. Therefore, use of these fact-based websites may prove an effective way to stop emotional and fear contagion through media consumption. This approach has been suggested as the best way to manage psychological distress from repeated media exposure to COVID-19 related news, as it allows people to access appropriate and critical information about the virus without overloading themselves.<sup>64</sup> Television was the main news source used, and research suggests that many people rely on television as they perceive it to be more trustworthy than other news sources, such as social media.<sup>61</sup>

Our arguments about websites and social media may be considered in view of the hyper-linked media systems where all forms of media seamlessly blend into each other. Such a complex informational ecosystem is cohabited by individual and institutional sources of amplification of risk,<sup>65</sup> with each actor and channel contributing to emotional contagion of outbreak news in different ways as was seen during the Ebola crisis.<sup>7</sup> Given that social media use was highest among 18-39 y olds, and this group had higher levels of food insecurity, this contributes to the idea that emotional contagion through social media was at play here, leading to these higher levels of food insecurity and hoarding behavior among this age group. It is important to note that not all forms of social media may lead to information overload, and some forms of social media have been used to provide support to others during the pandemic, such as Facebook. Hundreds of Facebook community support groups were set up in March<sup>66</sup> helping to build solidarity in local communities and provide support for vulnerable people. This sense of community provides an important indicator of people's desire to stockpile, and those who score higher in Honesty-Humility on the HEXACO scale are less likely to stockpile because they care about the welfare of others and the negative impact of stockpiling on the wider community.<sup>67</sup> Therefore, if people have engaged extensively in social media during the pandemic and participated in these community groups, they may be less likely to display hoarding behaviors.

## Conclusion

The aim of this study was to contribute to a growing understanding of food insecurity and hoarding behaviors during pandemics by considering the role of sociodemographic differences and different forms of media. We found that both these tendencies were higher in younger and poorer income groups and identified the role of online and social media in catalyzing these behaviors. The implications of these findings are especially relevant to the nutrition

education community who may target community interventions toward these vulnerable groups. Also, these findings, in concert with extant research, call for the nutrition education community to have a more concerted presence on online and social media platforms, so that communication campaigns can be geared toward alleviating panic and anxiety and providing accurate information. These efforts might be especially relevant in contexts such as the United Kingdom and the United States which are characterized by high levels of diet-related chronic conditions such as diabetes and socioeconomic disparities acting as barriers to food and nutritional diets.

**Supplementary material.** To view supplementary material for this article, please visit <https://doi.org/10.1017/dmp.2021.315>.

**Acknowledgments.** The data were taken from an MSc thesis submitted for an MSc Psychology degree at Northumbria University.

## References

- World Health Organization.** Listings of WHO's response to COVID-19. <https://www.who.int/news-room/detail/29-06-2020-covid-timeline>. Published 2020. Accessed September 1, 2020.
- BBC News.** Coronavirus: what is a pandemic and why use the term now? <https://www.bbc.com/news/health-51358459>. Published 2020. Accessed September 1, 2020.
- Statista.** Coronavirus: consumers stockpiling food, by country worldwide 2020. <https://www.statista.com/statistics/1105759/consumers-stockpiling-food-by-country-worldwide/>. Published 2020. Accessed September 1, 2020.
- Nielsen.com.** COVID-19: U.K. Quarantine Living Preparations Lead to A Massive Spike in FMCG Sales. <https://www.nielsen.com/uk/en/insights/article/2020/covid-19-uk-quarantine-living-preparations-lead-massive-spike-fm-cg-sales/>. Published 2020. Accessed September 1, 2020.
- BBC News.** Supermarkets urge shoppers to stop stockpiling. <https://www.bbc.co.uk/news/business-51883440>. Published 2020. Accessed September 1, 2020.
- Decety J, Ickes W.** *The Social Neuroscience of Empathy*. Cambridge, MA: MIT Press; 2011.
- Towers S, Afzal S, Bernal G, et al.** Mass media and the contagion of fear: the case of Ebola in America. *PLoS One*. 2015;10(6):e0129179. doi: [10.1371/journal.pone.0129179](https://doi.org/10.1371/journal.pone.0129179)
- De R, Pandey N, Pal A.** Impact of digital surge during Covid-19 pandemic: a viewpoint on research and practice. *Int J Inf Manage*. 2020;55:102171.
- Bae Y, Lee H.** Sentiment analysis of twitter audiences: Measuring the positive or negative influence of popular twitterers. *J Am Soc Inf Sci Technol*. 2012;63(12):2521-2535. doi: [10.1002/asi.22768](https://doi.org/10.1002/asi.22768)
- Kramer A, Guillory J, Hancock J.** Experimental evidence of massive-scale emotional contagion through social networks. *Proc Natl Acad Sci U S A*. 2014;111(24):8788-8790. doi: [10.1073/pnas.1320040111](https://doi.org/10.1073/pnas.1320040111)
- Ferrara E, Yang Z.** Measuring emotional contagion in social media. *PLoS One*. 2015;10(11):e0142390.
- Steinert S.** Corona and value change. the role of social media and emotional contagion. *Ethics Inf Technol*. 2020:1-10.
- Anwar A, Malik M, Raees V, et al.** 2020. Role of mass media and public health communications in the COVID-19 pandemic. *Cureus*, 2020;12(9):e10453. doi: [10.7759/cureus.10453](https://doi.org/10.7759/cureus.10453)
- McDonnell WM, Nelson DS, Schunk JE.** Should we fear "flu fear" itself? Effects of H1N1 influenza fear on ED use. *Am J Emerg Med*. 2012;30(2):275-282. doi: [10.1016/j.ajem.2010.11.027](https://doi.org/10.1016/j.ajem.2010.11.027)
- Daft RL, Lengel RH.** Organizational information requirements, media richness and structural design. *Manage Sci*. 1986;32(5):513-644. doi: [10.1287/mnsc.32.5.554](https://doi.org/10.1287/mnsc.32.5.554)
- Holman EA, Garfin DR, Lubens P, et al.** Media exposure to collective trauma, mental health, and functioning: does it matter what you see?. *Clin Psychol Sci*. 2019;8(1):111-124. doi: [10.1177/2167702619858300](https://doi.org/10.1177/2167702619858300)
- Straubhaar J, LaRose R, Davenport L.** *Media Now: Understanding Media, Culture, and Technology*. 8th ed. Wadsworth: Cengage Learning; 2014.
- Ofcom.org.uk.** Effects of Covid-19 on online consumption. [https://www.ofcom.org.uk/\\_data/assets/pdf\\_file/0027/196533/covid-19-news-consumption-week-ten-comscore.pdf](https://www.ofcom.org.uk/_data/assets/pdf_file/0027/196533/covid-19-news-consumption-week-ten-comscore.pdf). Published 2020. Accessed September 2, 2020.
- Sherif M.** *The Psychology of Social Norms*. New York: Octagon Books; 1973.
- FeldmanHall O, Shenhav A.** Resolving uncertainty in a social world. *Nat Hum Behav*. 2019;3(5):426-435. doi: [10.1038/s41562-019-0590-x](https://doi.org/10.1038/s41562-019-0590-x)
- Gailliot MT, Stillman TF, Schmeichel BJ, et al.** Mortality salience increases adherence to salient norms and values. *Pers Soc Psychol Bull*. 2008;34(7):993-1003. doi: [10.1177/0146167208316791](https://doi.org/10.1177/0146167208316791)
- Savage D, Torgler B.** Stocking up to prepare for a crisis isn't 'panic buying'. It's actually a pretty rational choice. *The Conversation*. <https://theconversation.com/stocking-up-to-prepare-for-a-crisis-isnt-panic-buying-its-actually-a-pretty-rational-choice-13243>. Published 2020. Accessed September 2, 2020.
- Sterman JD, Dogan G.** "I'm not hoarding, I'm just stocking up before the hoarders get here." Behavioral causes of phantom ordering in supply chains. *J Oper Manage*. 2015;39-40(1):6-22. doi: [10.1016/j.jom.2015.07.002](https://doi.org/10.1016/j.jom.2015.07.002)
- Power M, Uphoff EP, Stewart-Knox B, et al.** Food insecurity and socio-demographic characteristics in two UK ethnic groups: an analysis of women in the Born in Bradford cohort. *J Public Health*. 2017;40(1):32-40. doi: [10.1093/pubmed/idx029](https://doi.org/10.1093/pubmed/idx029)
- Loopstra R.** *Vulnerability to Food Insecurity Since the COVID-19 Lockdown*. London: The Food Foundation; 2020.
- Fernandes SG, Rodrigues AM, Nunes C, et al.** Food insecurity in older adults: results from the Epidemiology of Chronic Diseases Cohort Study 3. *Front Med (Lausanne)*. 2018;5:203. doi: [10.3389/fmed.2018.00203](https://doi.org/10.3389/fmed.2018.00203)
- Purdam K, Esmail A, Garratt E.** Food insecurity amongst older people in the UK. *Br Food J*. 2019;121(3):658-674. doi: [10.1108/bfj-05-2018-0301](https://doi.org/10.1108/bfj-05-2018-0301)
- Connors C, Malan L, Canavan S, et al.** The Lived Experience of Food Insecurity Under Covid-19. A Bright Harbour Collective Report for the Food Standards Agency; 2020. [https://www.food.gov.uk/sites/default/files/media/document/fsa-food-insecurity-2020\\_-report-v5.pdf](https://www.food.gov.uk/sites/default/files/media/document/fsa-food-insecurity-2020_-report-v5.pdf). Accessed October 22, 2020.
- Meadows S.** Panic buyers are 'selfish and divisive' as 'only the better-off can afford it'. *The Telegraph*. <https://www.telegraph.co.uk/news/2020/09/23/panic-buyers-selfish-divisive-better-off-can-afford/>. Published 2020. Accessed October 22, 2020.
- Ons.gov.uk.** Graduates in the UK labour market - Office for National Statistics. <https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/articles/graduatesintheuklabourmarket/2017#graduate-and-non-graduate-earnings>. Published 2017. Accessed October 22, 2020.
- Wang E, An N, Gao Z, et al.** Consumer food stockpiling behavior and willingness to pay for food reserves in COVID-19. *Food Secur*. 2020;12(4):739-747. doi: [10.1007/s12571-020-01092-1](https://doi.org/10.1007/s12571-020-01092-1)
- Micalizzi L, Zambrotta NS, Bernstein MH.** Stockpiling in the time of COVID-19. *Br J Health Psychol*. 2020. doi: [10.1111/bjhp.12480](https://doi.org/10.1111/bjhp.12480)
- BBC News.** Food supply 'needs a rethink' after coronavirus. <https://www.bbc.co.uk/news/uk-wales-52500906>. Published 2020. Accessed September 2, 2020.
- Timmer CP.** Reflections on food crises past. *Food Policy*. 2010;35(1):1-11. doi: [10.1016/j.foodpol.2009.09.002](https://doi.org/10.1016/j.foodpol.2009.09.002)
- Naja F, Hamadeh R.** Nutrition amid the COVID-19 pandemic: a multi-level framework for action. *Eur J Clin Nutr*. 2020;74(8):1117-1121. doi: [10.1038/s41430-020-0634-3](https://doi.org/10.1038/s41430-020-0634-3)
- Food and Agriculture Organization of the United Nations.** Methods for estimating comparable prevalence rates of food insecurity experienced by adults throughout the world. <http://www.fao.org/3/a-i4830e.pdf>. Published 2020. Accessed September 2, 2020.
- Jones AD.** Food insecurity and mental health status: a global analysis of 149 countries. *Am J Prev Med*. 2017;53(2):264-273. doi: [10.1016/j.amepre.2017.04.008](https://doi.org/10.1016/j.amepre.2017.04.008)
- Nord M, Cafiero C, Viviani S.** Methods for estimating comparable prevalence rates of food insecurity experienced by adults in 147 countries and areas. *J Phys Conf Ser*. 2016;772:012060. doi: [10.1088/1742-6596/772/1/012060](https://doi.org/10.1088/1742-6596/772/1/012060)

39. Frost RO, Steketee G, Grisham J. Measurement of compulsive hoarding: saving inventory-revised. *Behav Res Ther.* 2004;42(10):1163-1182. doi: [10.1016/j.brat.2003.07.006](https://doi.org/10.1016/j.brat.2003.07.006)
40. Frost RO, Gross RC. The hoarding of possessions. *Behav Res Ther.* 1993;31(4):367-381. doi: [10.1016/0005-7967\(93\)90094-b](https://doi.org/10.1016/0005-7967(93)90094-b)
41. Mueller A, Mitchell JE, Crosby RD, et al. The prevalence of compulsive hoarding and its association with compulsive buying in a German population-based sample. *Behav Res Ther.* 2009;47(8):705-709. doi: [10.1016/j.brat.2009.04.005](https://doi.org/10.1016/j.brat.2009.04.005)
42. Landau D, Iervolino AC, Pertusa A, et al. Stressful life events and material deprivation in hoarding disorder. *J Anxiety Disord.* 2011;25(2):192-202. doi: [10.1016/j.janxdis.2010.09.002](https://doi.org/10.1016/j.janxdis.2010.09.002)
43. Ofcom.org.uk. News Consumption Survey - CAPI Questionnaire. [https://www.ofcom.org.uk/\\_data/assets/pdf\\_file/0024/147516/news-consumption-survey-2019-questionnaire.pdf](https://www.ofcom.org.uk/_data/assets/pdf_file/0024/147516/news-consumption-survey-2019-questionnaire.pdf). Published 2020. Accessed September 2, 2020.
44. Gulyas A, O'Hara S, Eilenberg J. Experiencing local news online: audience practices and perceptions. *Journal Stud.* 2018;20(13):1846-1863. doi: [10.1080/1461670x.2018.1539345](https://doi.org/10.1080/1461670x.2018.1539345)
45. Constantinides M, Dowell J, Johnson D, et al. Exploring mobile news reading interactions for news app personalisation. Proceedings of the 17th International Conference on Human-Computer Interaction with Mobile Devices and Services - MobileHCI '15. 2015. doi: [10.1145/2785830.2785860](https://doi.org/10.1145/2785830.2785860)
46. Kent K, Murray S, Penrose B, et al. Prevalence and socio-demographic predictors of food insecurity in Australia during the COVID-19 pandemic. *Nutrients.* 2020;12(9):2682. doi: [10.3390/nu12092682](https://doi.org/10.3390/nu12092682)
47. The Food Foundation. Vulnerability to food insecurity since the COVID-19 lockdown. [https://www.foodfoundation.org.uk/wp-content/uploads/2020/04/Report\\_COVID19FoodInsecurity-final.pdf](https://www.foodfoundation.org.uk/wp-content/uploads/2020/04/Report_COVID19FoodInsecurity-final.pdf). Published 2020. Accessed December 21, 2020.
48. Power M, Doherty B, Pybus K, et al. How COVID-19 has exposed inequalities in the UK food system: the case of UK food and poverty. *Emerald Open Research.* 2020;2:11. doi: [10.35241/emeraldopenres.13539.1](https://doi.org/10.35241/emeraldopenres.13539.1)
49. Office for National Statistics. Labour market overview, UK: December 2020. <https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/bulletins/uklabourmarket/december2020>. Published 2020. Accessed December 21, 2020.
50. Wang E, An N, Gao Z, et al. Consumer food stockpiling behavior and willingness to pay for food reserves in COVID-19. *Food Secur.* 2020;12(4):739-747. doi: [10.1007/s12571-020-01092-1](https://doi.org/10.1007/s12571-020-01092-1)
51. Spittlehouse JK, Vierck E, Pearson JF, et al. Personality, mental health and demographic correlates of hoarding behaviours in a midlife sample. *PeerJ.* 2016;4:e2826. doi: [10.7717/peerj.2826](https://doi.org/10.7717/peerj.2826)
52. Timpano KR, Rasmussen J, Exner C, et al. Hoarding and the multi-faceted construct of impulsivity: a cross-cultural investigation. *J Psychiatr Res.* 2013;47(3):363-370.
53. Dammeyer J. An explorative study of the individual differences associated with consumer stockpiling during the early stages of the 2020 Coronavirus outbreak in Europe. *Pers Individ Dif.* 2020;167:110263.
54. Molla R. How coronavirus took over social media. Vox. <https://www.vox.com/recode/2020/3/12/21175570/coronavirus-covid-19-social-media-twitter-facebook-google>. Published 2020. Accessed September 4, 2020.
55. Gallotti R, Valle F, Castaldo N, et al. Assessing the risks of 'infodemics' in response to COVID-19 epidemics. *Nat Hum Behav.* 2020;4(12):1285-1293. doi: [10.1038/s41562-020-00994-6](https://doi.org/10.1038/s41562-020-00994-6)
56. Leung J, Chung JYC, Tisdale C, et al. Anxiety and panic buying behaviour during COVID-19 pandemic—a qualitative analysis of toilet paper hoarding contents on Twitter. *Int J Environ Res Public Health.* 2021;18(3):1127.
57. Oosterhoff B, Palmer CA. Attitudes and psychological factors associated with news monitoring, social distancing, disinfecting, and hoarding behaviors among US adolescents during the coronavirus disease 2019 pandemic. *JAMA Pediatr.* 2020;174(12):1184-1191.
58. Wheaton MG, Prikhidko A, Messner GR. 2021. Is fear of COVID-19 contagious? The effects of emotion contagion and social media use on anxiety in response to the coronavirus pandemic. *Front Psychol.* 2021;11:567379.
59. Loxton M, Trussett R, Scarf B, et al. Consumer behaviour during crises: preliminary research on how coronavirus has manifested consumer panic buying, herd mentality, changing discretionary spending and the role of the media in influencing behaviour. *J Risk Financial Manage.* 2020;13(8):166. doi: [10.3390/jrfm13080166](https://doi.org/10.3390/jrfm13080166)
60. Yuen KF, Wang X, Ma F, et al. The psychological causes of panic buying following a health crisis. *Int J Environ Res Public Health.* 2020;17(10):3513. doi: [10.3390/ijerph17103513](https://doi.org/10.3390/ijerph17103513)
61. EBU Media Intelligence Service. Market insights: trust in media 2020. [https://www.ebu.ch/files/live/sites/ebu/files/Publications/MIS/open/Trust\\_in\\_Media\\_2020/EBU-MIS-Trust\\_in\\_Media\\_2020.pdf](https://www.ebu.ch/files/live/sites/ebu/files/Publications/MIS/open/Trust_in_Media_2020/EBU-MIS-Trust_in_Media_2020.pdf). Published 2020. Accessed September 9, 2020.
62. Twitter.com. Panic-buying' leaves empty shelves and frustration in supermarkets (Twitter moment). <https://twitter.com/i/events/1239151447339495424?lang=en>. Published 2020. Accessed September 9, 2020.
63. Yao H. The more exposure to media information about COVID-19, the more distressed you will feel. *Brain Behav Immun.* 2020;87:167-169. doi: [10.1016/j.bbi.2020.05.031](https://doi.org/10.1016/j.bbi.2020.05.031)
64. Garfin DR, Silver RC, Holman EA. The novel coronavirus (COVID-2019) outbreak: amplification of public health consequences by media exposure. *Health Psychol.* 2020;39(5):355-357. doi: [10.1037/hea0000875](https://doi.org/10.1037/hea0000875)
65. Vijaykumar S, Jin Y, Nowak G. Social media and the virality of risk: the Risk Amplification through Media Spread (RAMS) model. *J Homel Secur Emerg Manage.* 2015;12(3):653-677.
66. Booth R. Community aid groups set up across UK amid coronavirus crisis. the Guardian. <https://www.theguardian.com/society/2020/mar/16/community-aid-groups-set-up-across-uk-amid-coronavirus-crisis>. Published 2020. Accessed September 9, 2020.
67. Columbus S. Honesty-humility, beliefs, and prosocial behaviour: a test on stockpiling during the COVID-19 pandemic. 2020. doi: [10.31234/osf.io/8e62v](https://doi.org/10.31234/osf.io/8e62v)