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Restaurants and COVID-19: What are consumers’ risk perceptions about restaurant food and its packaging during the pandemic?

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ABSTRACT

The COVID-19 pandemic and subsequent U.S. in-restaurant dining restrictions deleteriously affected the restaurant industry. While dining restrictions were adopted to prevent human contact, evidence suggests that consumers may mistakenly perceive that restaurant ‘food’ and its ‘packaging’ are risky sources of COVID-19. To explore consumers’ COVID-19 risk perceptions about food itself, restaurant food specifically, and restaurant food packaging, this study collected nationwide U.S. consumer survey data (n = 958) using an online consumer panel. Findings showed that: (1) consumers were less concerned about contracting COVID-19 from food in general than restaurant food and its packaging, with consumer restaurant concern highest for food served in restaurants, and lowest for hot/cooked restaurant food followed by restaurant food from carry-out; and (2) the risk perceptions of consumers varied with financial concern for food, gender, and being in a high-risk category of COVID-19. Implications for researchers, restauranteurs, government, and food safety professionals are discussed.

1. Introduction

The COVID-19 pandemic created significant changes to the consumer food landscape. State and local stay-at-home orders in the United States that started mid-March 2020 resulted in consumers clearing supermarket shelves to prepare to be at home for several weeks (Schuchat, 2020). Simultaneously, restaurants either voluntarily or were mandated by state or local governments to discontinue in-restaurant dining to meet social distancing guidelines as part of the U.S. COVID-19 mitigation plan (Luna, 2020; National Restaurant Association Restaurant Law Center, 2020). Additionally, some consumers began to question the safety of the food supply. Anecdotal reports from consumers, news reports, and consumer marketing research suggested that consumer misconceptions existed about food, including that COVID-19 could be contracted from food, especially if prepared by someone who was infected (e.g., Dataessential, 2020a; International Food Information Council (IFIC), 2020; Wadyka, 2020; Whithworth, 2020). This belief occurred despite the U.S. Centers for Disease Control and Prevention (CDC) stating that COVID-19 was a respiratory virus (CDC, 2020a) and news reports that food was not a source of transmission (e.g., Simon, 2020).

For restaurants, consumers could have interpreted the closure of in-restaurant dining as a sign that restaurant foods were less safe than food in general (i.e., food from any source). In fact, consumer marketing research in mid-March 2020 indicated that 89% of consumers believed that food from grocery stores and home was safer than food from restaurants (Dataessential, 2020b). Food packaging for off-premise dining (i.e., carry-out/curbside pick-up/drive-through) could also have been a source of angst for some consumers due to CDC’s indication of contaminated surfaces as a possible transmission mode (CDC, 2020a).

With restaurant losses reported to be $120 billion between March and May 2020 (Klein, 2020), understanding consumer perceptions about restaurants is necessary—including perceptions about contracting COVID-19 from restaurant foods—so that restauranteurs can produce appropriate consumer messages and eliminate unfair barriers to future food sales. Thus, this study assessed consumers’ perceptions (or misperceptions) about the risks of contracting COVID-19 from various types of restaurant food (e.g., cold/raw/uncooked or hot/cooked foods and restaurant service types including dine-in, carry-out, and in-house or third-party delivery) and its packaging. Additionally, COVID-19 risk perceptions about restaurants may vary with consumer socio-demographics and COVID-19 related characteristics. Therefore, this study also evaluated their influence on perceptions about restaurant food and packaging. These results have far-reaching implications for restauranteurs, public health officials, and food safety professionals.

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2. Literature review & research questions

2.1. Perceptions of consumer food safety risk

CDC data indicate approximately 48 million people become sick with foodborne illness (FBI) annually (CDC, 2018). Yet, the U.S. is considered to have one of the safest food supplies in the world. This viewpoint is supported by marketing surveys revealing that 68% of consumers report confidence in the U.S. food supply (IFIC, 2018). While this viewpoint may hold true in aggregate, consumers’ food safety risk perceptions are multi-dimensional (Hassauer and Roosen, 2019), driven by food safety being an abstract food attribute that cannot be evaluated before eating (Barrena and Sánchez, 2010). Because questions have arisen about a connection between COVID-19 and food and food packaging, understanding consumer risk perceptions about food safety related to this novel virus is important.

Risk perceptions have been characterized as intuitive judgments (Slovic, 2016). Human intuition, however, is far from perfect and has many influences (Kahneman, 2011). While the basis of intuitions and consequent risk perceptions are multi-factorial, three factors described in the food safety literature are particularly relevant to consumer’s potential concerns of contracting COVID-19 from food and food packaging: (1) knowledge (Knight and Warland, 2005), (2) availability heuristics (Hassauer and Roosen, 2019), and (3) trust (Kennedy et al., 2008).

Knowledge has a strong impact on people’s food safety risk perceptions (Knight and Warland, 2005). Greater relevant knowledge has been associated with more accurate food safety risk perceptions (Nardi et al., 2020). In the early stages of the pandemic, knowledge about COVID-19 virus was limited and quickly evolving, which may have challenged consumer confidence in their knowledge and risk perceptions related to the virus and food. The CDC did take steps to boost consumer knowledge and clarify misperceptions by stating on their website, “There is currently no evidence to support transmission of COVID-19 is associated with food” (CDC, 2020c). However, the word “currently” may have caused ambiguous interpretation and misperceptions about COVID-19. While definitive knowledge can help consumers evaluate their risk, ambiguous information can cause consumers to become alarmist based on the available information (Renn, 2018). Furthermore, Kivi and Shogren (2010) found that food safety ambiguity could impact consumer purchasing decisions.

In terms of virus transmission via packaging, van Doremalen et al. (2020) reported that COVID-19 could survive on surfaces such as cardboard for up to 24 h and plastic up to 72 h, both of which are materials used in restaurant food packaging. However, CDC indicated that despite its survival on surfaces, virus transmission via this mode was believed not to be the “main way the virus spreads” (CDC, 2020a). Again, CDC’s phrasing had a certain degree of ambiguity and may have yielded various consumer interpretations.

Faced with incomplete or ambiguous knowledge, consumers often rely on ‘availability heuristics’ to discern risk probabilities (Renn, 2018). ‘Availability heuristics’ refers to making situational judgments based on similar examples, events, or information that are readily retrieved from memory (Tversky and Kahneman, 1974, 1983). Consumers commonly and frequently use these heuristics in decision-making; however, such mental shortcuts may often cause inaccurate assumptions (e.g., Broniarczyk and Alba, 1994; Gruber et al., 2014). An example of an inaccurate inference related to food safety happened in similar contexts, the 2009 H1N1 pandemic. Dhand et al. (2011) and Lau et al. (2009) evaluated public perceptions of food safety during the H1N1 pandemic, where virus genetics were associated with pigs, and the virus was commonly called the ‘swine flu’ in the popular press. Despite leading health organizations’ reporting that handling or eating pork was not a source of transmission, some consumers formed judgment biases and heuristically linked the swine flu to pork products (Dhand et al., 2011; Lau et al., 2009).

Similarly, consumers could have formed (mis)perceptions about contracting COVID-19 from food based on at least three availability heuristics. First, the initial COVID-19 viral spread was associated with a food marketplace (Chen et al., 2020). Second, stay-at-home orders across the U.S. resulted in closures of almost all in-person restaurant dining (Luna, 2020; National Restaurant Association Restaurant Law Center, 2020). Restaurant dining closures could have led consumers to erroneously connect the virus to both food in general, as well as restaurant foods. Lastly, hallmark gastrointestinal (GI) symptoms of COVID-19 (Gu et al., 2020) mirror common GI symptoms of norovirus, a leading cause of FBI in the U.S. (Painter et al., 2013). Collectively, these availability heuristics may have biased consumer judgments about the risk of contracting COVID-19 from food.

CDC messaging about food packaging and COVID-19 was also phrased cautiously because of the available scientific evidence, but again left consumers with ambiguity. CDC advised consumers to disinfect high-touch surfaces frequently (CDC, 2020d). However, without clear instructions about food packaging, some consumers may have taken steps to decrease their perceived risk by disinfecting delivery bags or containers before opening (Datassential, 2020). Trust is another influencer on consumer food safety risk perceptions. During the pandemic, food safety trust would have included (1) trust in the information from government regulatory institutions (e.g., the CDC and FDA; de Jonge et al., 2004; Chen, 2013) and (2) trust in the source of food. Generally, the more people trust their governments, the less concerned they are about food safety risks (Nardi et al., 2020). Reliance on regulatory institutions for food safety information is necessary as consumers don’t have the means or time to evaluate the scientific literature to ascertain safe food criteria for themselves (de Jonge et al., 2004). Thus, under crisis situations like the COVID-19 pandemic, government actions serve as important signs to the public. Although the CDC was providing guidance based on available evidence, the ambiguous nature of statements about food “currently” not being a source of COVID-19 transmission and a lack of direct information about food packaging (CDC, 2020c, 2020d) may have diminished the government-consumer trust relationship.

Food safety trust has also been linked to where food is prepared. For example, CDC data has indicated that restaurants are the most common setting of reported FBI outbreaks (representing 43% of outbreak-associated illnesses) compared to private homes (source of only 10%) (Dewey-Mattia et al., 2018). Congruently, researchers have noted that consumers have concerns about restaurant food safety (Knight et al., 2009; Sharma and Radhakrishna, 2015) and believe that food prepared at home is safer than food prepared elsewhere (e.g., restaurants; Young and Waddell, 2016). Therefore, consumers may have greater concerns about contracting COVID-19 from food prepared at restaurants compared to food prepared at home related to trust.

In sum, the dynamic knowledge of the virus, consumer’s use of availability heuristics, and varying degrees of trust in regulatory agencies and food preparation location likely influenced consumer (mis)perceptions of contracting COVID-19 from food and food packaging. While presumptions can be made based on prior studies and market research, consumer perceptions about transmission of COVID-19 from food in general, restaurant food, and food packaging are unknown. Therefore, the first research question was proposed as:

Research Question 1 (RQ1): During the initial height of the COVID-19 pandemic in the U.S., were consumers concerned about the risk of contracting COVID-19 from food in general, from restaurant food, or from restaurant food packaging?

Because food safety concerns have been shown to alter purchase decisions (Barrena and Sánchez, 2010), the answer to this question has important implications for various stakeholders, especially restaurateurs, governments, and public health professionals.

2.2. Consumer differences in food safety risk perceptions

Research suggests that sociodemographic factors may affect people’s

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food safety perceptions. Such sociodemographic factors include gender, age, education, income, household size, and presence of children (Knight et al., 2009; Nardi et al., 2020). For example, women were found to be more concerned about food safety risks than men (Dosman et al., 2001). A meta-analysis study conducted by Nardi et al. (2020) showed that people’s education level was negatively related to their food safety risk perceptions, while age, household size, and the presence of children in the household positively influenced their risk perceptions. Income level, which was originally expected to be negatively connected to risk perceptions, showed no significant impact in this particular study (Nardi et al., 2020). Rimal et al. (2001) studied health condition and ethnicity/race related to food safety risk perceptions and found that people in good health were more concerned about food safety issues. Researchers reported no differences between Caucasians and non-Caucasians in their food safety concern levels.

Research connecting demographics and social factors to how consumers perceive restaurant food safety risk in a pandemic is missing from peer-reviewed literature. To fill the research gap, a second research question was:

**Research Question 2 (RQ2):** Did various consumer groups have different perceptions of restaurant food safety during the initial height of the COVID-19 pandemic in the U.S.?

The knowledge ascertained from answering this question is critical from the perspective of restaurant industry and other stakeholders crafting informational messaging for consumer groups.

3. Methodology

3.1. Research design & data collection

A retrospective consumer survey was developed to explore the research questions. Participants were instructed to answer questions based on their feelings during the initial height of the COVID-19 pandemic in the U.S. (i.e., approximately mid-March to mid-April of 2020, depending on the state in which they lived). Participants were recruited through Amazon Mechanical Turk (MTurk.com) due to its demographic diversity and data reliability compared to the data collected from traditional convenience samples (Buhrmester et al., 2011; Goodman and Paolacci, 2017; Paolacci and Chandler, 2014). More than one thousand U.S. adult residents participated in the survey from May 5–7, 2020. After removing unqualified responses (e.g., incomplete responses from key questions, reported unawareness of COVID-19, and failure to answer attention check questions correctly), the final dataset for analysis included 958 qualified responses (Table 1).

Relative to COVID-19, 15.1% of the sample were unemployed, laid-off, or furloughed due to COVID-19; 45.6% were living in states where new pandemic in the U.S. (i.e., approximately mid-March to mid-April of 2020, depending on the state in which they lived). Participants were recruited through Amazon Mechanical Turk (MTurk.com) due to its demographic diversity and data reliability compared to the data collected from traditional convenience samples (Buhrmester et al., 2011; Goodman and Paolacci, 2017; Paolacci and Chandler, 2014). More than one thousand U.S. adult residents participated in the survey from May 5–7, 2020. After removing unqualified responses (e.g., incomplete responses from key questions, reported unawareness of COVID-19, and failure to answer attention check questions correctly), the final dataset for analysis included 958 qualified responses (Table 1).

Relative to COVID-19, 15.1% of the sample were unemployed, laid-off, or furloughed due to COVID-19; 45.6% were living in states where new COVID-19 cases were holding steady at the time of data collection; 91.1% had shelter-in-place/stay-at-home orders; 94.1% had federal/state/local guidelines prohibiting in-restaurant dining during the initial height of the COVID-19 pandemic, and 27.7% were either in a high-risk category or living with such a person. Table 1 shows that the sample profile is generally compatible with the U.S. Census data (https://www.census.gov; accessed June 2020), except for education and household income levels, lending credence to the recruiting method.

3.2. Measures

3.2.1. Dependent variables

To fully assess consumers’ perception of foods and packaging, nine food-related dependent variables were examined. Participants rated their levels of concern about the risk of contracting COVID-19 from (1) food in general (i.e., “food”); (2) restaurant food in general (i.e., “restaurant food”); (3) hot/cooked food from restaurants; (4) cold/raw/uncooked food from restaurants (i.e., salads, sandwiches); (5) food served in restaurants (i.e., in-restaurant dining); (6) food from carry-out/curbside pick-up/drive-thru; (7) food delivered by restaurants; (8)

| Table 1 Independent Variables & Participant Profile in Comparison to the U.S. Census Data. | Study sample (N = 958) | U.S. Census data |
|-----------------------------------------------|------------------------|------------------|
| **Demographic variables (continuous)** | | |
| • Age | 21 83 | 44.1 12.7 |
| • Household size | 1 8 | 2.7 1.3 |
| • Financial concern about the purchase of food in the next two months (1 = not worried at all to 7 = extremely worried) | 1 7 | 2.8 1.9 |
| **COVID-19 related variable** | | |
| • Male | 427 44.6 | 49.2 (sex) |
| • Female | 525 54.8 | 50.8 (sex) |
| • Other/Prefer not to say | 6 0.6 | n/a |
| **Race/Ethnicity** | | |
| • Caucasian | 739 77.1 | 72.2 |
| • African American | 63 6.6 | 12.7 |
| • Hispanic or Latino | 42 4.4 | 18.3 (of any race) |
| • Asian | 80 8.4 | 5.6 |
| • Other/Prefer not to say | 34 3.5 | 9.5 (other races) |
| **Education level** | | |
| • Some high school but no diploma, or less | 8 0.8 | 10.6 |
| • High school diploma, or equivalent | 76 7.9 | 26.3 |
| • Bachelor’s degree | 256 26.7 | 27.8 |
| • Graduate degree or higher | 176 18.4 | 12.0 |
| **Household annual income level** | | |
| • < $25,000 | 106 11.1 | 19.1 |
| • $25,000-$49,999 | 211 22.0 | 20.8 |
| • $50,000-$99,999 | 400 41.8 | 29.7 |
| • $100,000-$149,999 | 172 18.0 | 14.9 |
| • $150,000-$199,999 | 39 4.1 | 7.0 |
| • $200,000 | 30 3.1 | 8.5 |
| **Live with a spouse or domestic partner** | | |
| • Have children (< age 18) in the household | 348 36.4 | 40.7 |
| • Have elderly (< age 65) in the household | 182 19.0 | n/a |
| **Health status** | | |
| • Poor | 20 2.1 | n/a |
| • Fair | 84 8.8 | |
| • Average | 174 18.2 | |
| • Good | 474 49.5 | |
| • Very good | 206 21.5 | |
| **COVID-19 related variables (categorical)** | | |
| • Employed full-time | 617 64.4 |
| • Employed part-time | 113 11.8 |
| • Unemployed/laid-off/ | 71 7.4 |
| • Furloughed related to COVID-19 | 20 2.1 |
| • Unemployed/laid-off/ | |
| • Furloughed related to COVID-19 but have returned to my pre-COVID-19 job | 54 5.6 |
| • Unemployed/laid-off/ | 32 3.3 |
| • Furloughed related to COVID-19 but now working on a new job | (continued on next page)


Table 1 (continued)

| Study sample (N = 958) | U.S. Census data |
|-----------------------|------------------|
| Min | Max | Mean | SD |

- Unemployed/laid-off/ furloughed not related to COVID-19
- Retired
- Not employed, not looking for work
- Disabled/Prefer not to say COVID-19 state-level status – living in a state where:
  - New cases were decreasing
  - New cases in the state were neither increasing nor decreasing
  - New cases were increasing
- Shelter-in-place/Stay-at-home order in effect in state of residency during the initial height of the COVID-19 pandemic (mid-March to mid-April, 2020)
- Federal/State/Local guidelines prohibiting in-restaurant dining in state of residency during the initial height of the COVID-19 pandemic (mid-March to mid-April, 2020)
- Federal/State/Local guidelines prohibiting in-restaurant dining in state of residency during May 5 – 7, 2020 (i.e., at the time of data collection)

3.2.2. Independent variables

The independent variables included relevant socio-cultural and demographic factors based on the food safety literature, along with COVID-19 related characteristics. Measurements were either categorical or continuous, depending on the nature of each variable. Table 1 provides the full list of independent variables investigated in this research. Participants were also asked for their residency (i.e., the 50 U.S. states, Washington D.C., and Puerto Rico). Residency was recoded into three categories of COVID-19 risk as 1 = the states where new cases were decreasing, 2 = the states where new cases were mostly the same, and 3 = the states where new cases were increasing. State risk level information followed The New York Times’ (2020) case count data posted on May 5, 2020, which tracked case count trends in every state starting February 26, 2020. For example, during this time, New York State’s new cases were decreasing, California and Florida were mostly the same in terms of new cases, and Texas saw an increase in new cases.

4. Results

Repeated-measures (within-subjects) one-way analysis of variance (ANOVA) and multiple pairwise comparison tests with Bonferroni adjustment were conducted to determine the differences in consumers’ concern of contracting COVID-19 from different types of food, restaurant food, and restaurant food packaging (i.e., RQ1). Furthermore, a series of one-way (between-subjects) analyses of covariance (ANCOVAs) were conducted to explore consumer group differences regarding their concern of contracting COVID-19 from food, restaurant food, and restaurant packaging (i.e., RQ2).

4.1. Research question 1 results

Table 2 demonstrates the descriptive statistics and pairwise comparison results of consumers’ levels of concern about contracting COVID-19 from food, the various categories of restaurant food, and restaurant food packaging. Consumers had a moderate level of concern about contracting COVID-19 from food and packaging (i.e., grand mean across all kinds of food, restaurant food, and its packaging = 3.81; less than the midpoint value of 4). The repeated-measures ANOVA with a Greenhouse-Geisser correction confirmed that consumers perceived varying levels of COVID-19 risk concern among different types of food, restaurant food, and restaurant food packaging (F(6, 5565) = 168.9, p < .001, η² = .15).

Specifically, nearly half of consumers (46.7%) were not at all concerned (i.e., responses 1 & 2 out of a 7-point scale) about contracting COVID-19 from food. However, pairwise comparison results confirmed that, while consumers were least concerned about food (M = 3.15, SD = 1.83), they were more concerned about restaurant food and restaurant food packaging (p’s < .001 with Bonferroni adjustment). In fact, among all categories of restaurant food and its packaging, the highest mean concern level (M = 4.76, SD = 2.06) was found for food served in restaurants (p’s < .001), with nearly half of participants (45.0%) reporting they were very concerned (i.e., responses 6 & 7 on a 7-point scale) about the dine-in restaurant “food.” The second highest concern levels were shown for cold/raw/uncooked food from restaurants (M = 3.99, SD = 2.01; 26.7% very concerned) and restaurant food packaging (M = 3.94, SD = 1.88; 23.1% very concerned). Comparatively, consumers were less concerned about hot/cooked food from restaurants (M = 3.48, SD = 1.89; 38.5% not concerned) and the restaurant food that they themselves picked up through carryout, curbside pickup, or drive-thru (M = 3.62, SD = 1.84; 33.6% not concerned). Consumers’ levels of COVID-19 risk concern about restaurant food, as well as food delivered either by the restaurant or by a third-party delivery service were mid-range on the scale (M’s = [3.74, 3.83]); however, food from third-party delivery services was perceived to be significantly riskier source of COVID-19.
than restaurant delivered food ($p < .05$).

### 4.2. Research question 2 results

Due to the exploratory nature of the current research, two rounds of between-subjects one-way ANCOVA tests were conducted to explore answers to RQ2. For the first round, a series of ANCOVA tests were conducted using level of COVID-19 risk concerns about different types of food and food packaging as dependent variables (DV’s) and each of the demographic and COVID-19-related variables as independent variables (IV’s). The three continuous demographic variables of age, household size, and financial concern were included as covariates. Results revealed that demographic factors of household annual income level, living with a spouse or domestic partner, children or elderly in the household, and self-reported health status and consumers’ COVID-19 related characteristics of COVID-19 state-level status, shelter-in-place/stay-at-home orders both at the initial height of the COVID-19 pandemic and at the time of data collection, federal/state/local guidelines prohibiting in-restaurant dining at the time of data collection, and self-reported COVID-19 health status (i.e., diagnosis, symptoms, and exposure) were not significantly related to the DV’s ($p > .1$). Therefore, the second round of ANCOVA tests was conducted, excluding the aforementioned non-significant variables to increase the statistical power for a clearer outlook and analyses.

The second round ANCOVA test results (Table 3) showed that among the included IV’s, consumers’ financial concern about the purchase of food in the next two months had the strongest effect on risk concern among all nine DV’s about food types, restaurant food, and restaurant food packaging ($F(1, 930) = 39.5, p < .001, \eta^2 = .041$). Specifically, the more worried consumers were about having enough money to buy food in the next two months, the more concerned they were about contracting COVID-19 from all types of food, restaurant food, and restaurant food packaging.

The second most impactful factors were gender and being in a high-risk category of contracting COVID-19. Both factors significantly

### Table 2

**Descriptive Statistics & Pairwise Comparisons of COVID-19 Risk Concerns about Food for RQ1.**

| Variables                                      | M     | SD   | Freq. | %    | Freq. | %    | Very concerned (6 & 7) | Range |
|------------------------------------------------|-------|------|-------|------|-------|------|------------------------|-------|
| Food served in restaurants                     | 4.76a | 2.06 | 189   | 19.7 | 338   | 35.3 | 431                    | 45.0  |
| Cold/raw/uncooked food from restaurants        | 3.99b | 2.01 | 290   | 30.3 | 412   | 43.0 | 256                    | 26.7  |
| Restaurant food packaging                      | 3.94bc| 1.88 | 262   | 27.3 | 475   | 49.6 | 221                    | 23.1  |
| Food delivered by delivery services            | 3.83d | 1.94 | 303   | 31.6 | 435   | 45.4 | 220                    | 23.0  |
| Restaurant food in general (‘restaurant food’) | 3.78e | 1.95 | 314   | 32.8 | 427   | 44.6 | 217                    | 22.7  |
| Food delivered by restaurants                  | 3.74f | 1.90 | 305   | 31.8 | 463   | 48.3 | 190                    | 19.8  |
| Food from carryout/curbside pick-up/drive-thru | 3.67g | 1.84 | 322   | 33.6 | 457   | 47.8 | 178                    | 18.6  |
| Hot/cooked food from restaurants               | 3.48h | 1.89 | 369   | 38.5 | 426   | 44.5 | 163                    | 17.0  |
| Food in general (‘food’)                       | 3.15i | 1.83 | 447   | 46.7 | 390   | 40.7 | 121                    | 12.6  |

**Note.** Freq. = Frequency; Scale: 1 = Not at all concerned to 7 = Very concerned; Variables are displayed following the descending order of the means; means with different superscripts (a to g) are significantly different from each other ($p < .05$) based on pairwise comparison tests with Bonferroni adjustment; $n = 958$.

### Table 3

**Between-subjects ANCOVA Results for RQ2.**

| Independent Variables | Food in general (‘food’) | Food served in restaurants | Cold/raw/uncooked food from restaurants | Food from carryout/curbside pick-up/drive-thru | Food delivered by restaurants | Food delivered by delivery services | Restaurant food packaging |
|-----------------------|--------------------------|----------------------------|----------------------------------------|-----------------------------------------------|-------------------------------|------------------------------------|--------------------------|
| Gender                | 4.0**                    | 10.2**                     | 5.7*                                   | 3.8                                            | 7.0**                         | 7.1**                             | 6.3*                     |
| Race/Ethnicity        | 7.3***                   | 4.0**                      | 4.8***                                 | ns                                            | 2.4*                          | ns                                 | 3.0*                     |
| Education level       | ns.                      | 3.2*                       | 2.4*                                   | 2.5*                                          | ns                            | 2.8*                              | 2.4*                      |
| Age                   | ns.                      | ns.                        | ns.                                    | 8.0**                                         | ns                            | ns                                 | 3.0*                     |
| Household size        | 6.3*                     | ns.                        | ns.                                    | 4.6*                                          | 3.9*                          | 5.7*                              | 6.2*                     |
| COVID-19 related variables | 3.1**                   | ns.                        | ns.                                    | ns.                                           | ns                            | ns                                 | ns.                      |
| Employment status     | 6.0*                     | ns.                        | ns.                                    | ns.                                           | ns                            | ns                                 | ns.                      |
| Financial concern     | 7.0**                    | 6.2*                       | 6.1*                                   | 3.1†                                          | 9.5**                         | 11.5**                             | 6.2*                     |
| Financial concern about the purchase of food    | 217.0***                 | 175.6***                   | 164.9***                               | 112.8***                                      | 39.5***                       | 183.5***                           | 156.2***                |

**Note.** The ANCOVA F-statistics are shown in the table; ns. = not statistically significant at the $\alpha = .1$ level; $n = 952$ after excluding listwise missing data; Independent variables of the current study that showed no significant effects across any of the nine types of food, restaurant food, and restaurant food packaging were excluded from the analysis models and thus not reported in this table.

* As continuous variables, these three variables were included as covariates.

† $p < .1$, ‡ $p < .05$, § $p < .01$, ¶ $p < .001$. 
affected COVID-19 risk concern about all types of food, restaurant food, and restaurant food packaging at least at the marginal level (i.e., \( p > .1 \)). Women (M’s = [3.6, 4.6]) were more concerned about contracting COVID-19 from all types of food, restaurant food, and restaurant food packaging than men were (M’s = [3.4, 4.4]). Also, those who reported being in a high-risk category of contracting COVID-19 (M’s = [3.7, 4.8]) compared to not (M’s = [3.3, 4.2]) were more concerned about COVID-19 risks from all types of food, restaurant food, and restaurant food packaging.

Consumers’ race/ethnicity and household size were also important factors for their COVID-19 risk concerns (most \( p < .05 \); a few \( p < .1 \)). Except for restaurant dine-in food and food delivered by the restaurant, African Americans (M’s = [4.2, 5.1]) were the most concerned about COVID-19 risks from all types of food, restaurant food, and restaurant food packaging. In comparison, Caucasians (M’s = [3.1, 4.0]) were the least concerned among all the race/ethnicity groups. Regarding household size, the larger the household, the more concerned the participant was about contracting COVID-19 from food, certain types of restaurant food, and restaurant food packaging.

The other variables (i.e., age, education levels, employment status, and federal/state/local dine-in restrictions) showed mixed or unclear patterns. Generally, elderly consumers showed more concern about contracting COVID-19 from some types of restaurant food and packaging (e.g., dine-in restaurant food and cold/raw/uncooked restaurant food) than younger consumers (\( p < .05 \)). Consumers with higher educational levels tended to have more COVID-19 risk concerns about different types of restaurant foods and their packaging than consumers with lower education levels (\( p < .05 \)). In terms of employment status, trends suggested that employed consumers were generally more concerned about food and restaurant food than unemployed consumers due to the COVID-19 pandemic (\( p < .05 \)). Lastly, the federal/state/local restaurant dine-in restrictions at the pandemic’s initial height mainly affected consumers’ COVID-19 risk concerns about food and food delivered by restaurants (\( p < .05 \)): that is, consumers were more concerned about contracting COVID-19 from food delivered by the restaurant (M = 4.2) and food (i.e., from any source) (M = 3.8) if the government did not prohibit in-restaurant dining in their state during the height of the COVID-19 pandemic compared to those living in areas where in-restaurant dining was prohibited (M’s = 3.7 & 3.2, respectively).

5. General discussion

This study addressed two important questions about consumer food risk perceptions during the height of the COVID-19 pandemic. First, findings for Research Question 1 (RQ1) showed an affirmation of a moderate concern among consumers of contracting the virus from food and restaurant food of various types. This food safety perception existed despite CDC messaging that COVID-19 is a respiratory virus (CDC, 2020a) with no “current” evidence that food is a transmission mode and news outlets reinforcing CDC messaging (e.g., Simon, 2020). Because of the evolving knowledge about the virus, the CDC likely did not want to make a definitive statement and used the ambiguous term “currently.” However, the ambiguous information has seemingly resulted in consumers utilizing heuristic clues (e.g., Broniarczyk and Alba, 1994; Gruber et al., 2014) (i.e., initial viral spread linked to a food marketplace, closure of in-person restaurant dining, and GI symptom similarity between COVID-19 and norovirus) to form heightened concerns about contracting COVID-19 from food.

When comparing each analyzed factor, consumers were most concerned about contracting COVID-19 from food served in restaurants and least concerned about virus contraction from food (i.e., from any source). This finding aligns with consumers trusting the safety of at-home prepared foods more than restaurant-prepared food (Young and Waddell, 2016). Interestingly, almost twice as many people or more indicated they were “very concerned” about contracting COVID-19 from food served in restaurants compared to restaurant food (in general), as well as delivered and take-out food (i.e., carry-out/curb-side pick-up/drive-thru), although risk of COVID-19 contraction from restaurant food itself (i.e., no risk) would be the same no matter how it is acquired. Mandated closures of in-restaurant dining may have been a heuristic “clue” leading consumers to this misperception and attribution of a higher risk of viral food contamination of food served in the restaurant. Furthermore, consumers may have assumed food from in-person dining to be riskier due to the food’s exposure to more employees and customers and surfaces touched by them compared to delivered or take-out restaurant food. Importantly, consumers had less concern about contracting COVID-19 from food delivered by the restaurant compared to a third-party delivery service. Further research is recommended to determine why consumers appeared to have less trust in third-party delivery services.

Consumers also had greater concern about cold, raw, or uncooked restaurant foods compared to hot, cooked restaurant foods. This finding was congruent with consumer marketing research from mid-March 2020, in which 62% of consumers agreed with the statement that “Coronavirus cannot be contracted through food that has been thoroughly cooked” (Datassential, 2020a). Consumer concern about cold, raw, or uncooked food is not surprising since raw leafy greens have been associated with more FBI outbreaks than any other foods (Painter et al., 2013). Additionally, seven of the top 10 multistate foodborne illness outbreaks in 2019 were for foods typically served cold, raw, or uncooked (Flynn, 2019). Other studies have investigated consumer perceptions for cold foods such as raw fish/sushi which require a menu warning about the safety of consuming them (e.g., Kim et al., 2019), however, the current study used cold, raw, or uncooked food such as salads, sandwiches, which do not require a warning about consumption.

Food packaging was of moderate to high concern for the majority of participants. This concern may have occurred because CDC guidance indicated the virus could be spread by touching contaminated surfaces and then touching one’s mouth, nose, or eyes (CDC, 2020a) and experimental data revealed the virus could survive on cardboard for 24 h and plastic for 72 h (van Doremalen et al., 2020); however, an evaluation of COVID-19 survival on Styrofoam, a popular take-out food container, has not been reported. Consumer marketing data from the end of March 2020 revealed 34% of consumers disinfected or wiped down restaurant food delivery bags and containers before opening (Datassential, 2020c). However, since CDC guidance stated that surface transmission is not the “main way the virus spreads” (CDC, 2020a) and there have been no reports of a person contracting COVID-19 from food packaging, the necessity of these disinfecting steps was unclear. In fact, after this study’s data collection, the CDC published warnings to not use bleach or disinfectants on food or food packaging (CDC, 2020c).

The findings of Research Question 2 (RQ2) revealed sociodemographic variation among consumer perceptions about contracting COVID-19 from food, restaurant food, and restaurant food packaging. Financial concern was most strongly related to all nine measured food and restaurant food/packaging factors and had, comparatively, the largest effect sizes. The more worried a participant was about having enough money to purchase food in the next two months, the greater their concern about contracting COVID-19 from food (all measured types) and restaurant food packaging. A meta-analysis pre-COVID-19 showed no significant relationship between income and food safety risk perception (Nardi et al., 2020); however, food safety perception studies evaluating food insecurity specifically are lacking. Self-enhancement theory (i.e., motivation to view oneself in a positive manner) (Luo et al., 2020) suggests that consumers concerned about their finances for food might “prefer” to think that restaurant food, which is more expensive than food prepared at home, would be riskier than other food sources to preserve their self-image. Further studies would be needed to evaluate this hypothesis. Interestingly, restaurant workers have experienced food insecurity at a higher rate than the general population (Restaurants Opportunities Centers United, 2013; Chen, 2014). A more
granular study of restaurant workers, as a subset of food-insecure people, and COVID-19 risk perception from food, especially restaurant food, is suggested.

Women compared to men and participants reporting a high-risk for contracting COVID-19 were more concerned about contracting COVID-19 from food, restaurant food, and its packaging. Women are generally more concerned about food safety than men (Dosman et al., 2001), and our finding corroborated this in a pandemic context. This concern is believed to be rooted in the social theory of gender, which posits that, because of their social/familial role of women as nurturer and caregiver, women have a greater concern for health and safety risks (Davidson and Freudenburg, 1996). Similarly, high-risk participants increased concern may have occurred because they were fearful of risks from any possible transmission route. This supposition is supported by COVID-19 studies in the United Kingdom showing that individuals with higher fear of COVID-19 were more likely to engage in recommended public health behaviors to prevent transmission (Harper et al., 2020). Additionally, as suggested by Ahorsu et al. (2020, pg. 2), “[w]ith high levels of fear, individuals may not think clearly and rationally when reacting to COVID-19.”

Two groups in particular, African Americans and older adults, showed increased concern with some but not all nine measured food and packaging variables. For example, African Americans were more concerned than other racial/ethnic groups about COVID-19 contraction from food, restaurant food, and restaurant food packaging, except for food served in or delivered by restaurants. Caucasians showed the lowest concern levels. This finding differs from general food safety studies showing no significant differences in food safety risk concerns between Caucasians and non-Caucasians (Rimal et al., 2001). Racial disparities of contracting COVID-19 with disproportionate numbers of Blacks being hospitalized and dying from the virus (Dyer, 2020) could have contributed to the present study’s findings.

Similar to general food safety studies (Nardi et al., 2020), age factored into concerns about restaurant foods. Greater concern for food served cold/raw/uncooked from restaurants, delivered restaurant foods, and restaurant food packaging was associated with increasing age. Surveillance sampling data from the CDC showed that during March 2020, 74.5% of the hospitalized patients included in the analytical sample were aged 50 years or more (Garg et al., 2020). Additionally, the CDC identified the 65 and older age group as being at higher risk of developing severe COVID-19 illness (CDC, 2020b). Therefore, fear of COVID-19 contraction with older adults could have resulted in greater concern about restaurant foods’ safety and its packaging concerns than younger adults.

Participants reporting federal, state, or local restrictions for in-restaurant dining at the pandemic’s initial height compared to those living in areas without restrictions were less concerned about contracting COVID-19 from food and food delivered by restaurants. The reason for this is unclear. It is possible that restrictions gave consumers a sense of security because the government was regulating the measures needed to protect consumers, rather than relying on consumers to make their own and perhaps confusing decisions. More studies are needed to test this postulate. Additionally, the state where participants resided relative to whether the number of new cases was decreasing, mostly the same, or increasing had no bearing on perceptions of contracting COVID-19 from the analyzed food sources or food packaging.

5.1. Practical implications

Studies have shown that consumers’ food safety risk perceptions impact their purchase decisions (Barrena and Sánchez, 2010). Therefore, restaurateurs need a clear understanding of how consumers perceive restaurant food safety during the COVID-19 pandemic to develop appropriate consumer-directed communication, make operational changes if needed, and prepare for future pandemics or related crises. From a communication perspective, the misperception of restaurant food as a source of the COVID-19 virus may need to be counteracted with a stronger voice from the restaurant community directly to consumers. CDC and news outlets did provide messaging that COVID-19 is not transmissible via food based on current evidence (CDC, 2020a; Simon, 2020); however, based on the present studies’ results, not all consumers understood this message.

When designing food safety risk messaging during a pandemic, restaurateurs may need to focus more on emotional appeals rather than rational appeals. Rational appeals focus on objective, factual information, whereas emotional appeals utilize subjective factors to provoke affective responses (Yoo and MacInnis, 2005; McKay-Nesbitt et al., 2011). Emotional appeals have been shown to enhance consumers’ behavioral intentions toward an organization in a time of crisis (Kim and Cameron, 2011) and are superior to rational appeals in a health communication context (Flora and Maibach, 1990). Hang et al. (2020), during the COVID-19 pandemic, revealed that emotional appeals (i.e., messaging focused on hotel employees and families being susceptible to the virus just like consumers) provided a greater hotel “attachment” compared to rational appeals (i.e., messaging focused on cancellation policy and cleanliness). Therefore, restaurant industry’s food safety risk messaging should capitalize on emotional appeals based on “we are all in this together.” Furthermore, messaging may need to be designed to invoke an emotional connection, especially for persons with financial concerns about food, women, individuals at high risk for COVID-19 (i.e., older adults), and African Americans as their misperceptions or concerns were greater than their counterparts.

From an operations perspective, restaurants may need to evaluate their menu and food delivery options during a pandemic. For example, restaurateurs may need to re-engineer the menu to decrease the number of foods served raw, cold, or uncooked as consumers reported less confidence in these foods’ safety than hot, cooked foods. Close monitoring of sales may be necessary to make adjustments accordingly. For delivery, restaurants using third-party deliverers may want to examine the potential of making delivery in-house. At the beginning of the pandemic, restaurants that did not already provide delivery service looked to third-party deliverers as their only possible sales channel and means of survival (Snyder, 2020). However, greater food safety concerns for third-party delivery compared to restaurant delivery suggests restaurateurs should revisit their food delivery model.

Restaurateurs should also edit crisis management communication plans to address consumer misperceptions about food safety, and potential operational changes that may be needed should another non-food transmitted viral pandemic occur. The World Health Organization predicts future pandemics are likely (World Health Organization, 2019). Making plans now will help restaurateurs better manage the next pandemic or other crisis situations.

This study also has implications for government and non-governmental public health and food safety professionals in their messaging to consumers. These stakeholder groups need to monitor misperceptions among the population and adjust messaging accordingly. In the case of COVID-19, messaging may need to be updated to more clearly outline how the virus is not spread to alloy consumer misperceptions and negative impact on businesses such as the restaurant industry.

5.2. Academic implications, limitations and future research

The present study adds to the food safety perception literature and offers new understandings in a pandemic context. Specifically, the results shed light on consumer perceptions of food safety related to a virus that is not transmitted via food or the packaging sourced from restaurants. To date, only a few studies have examined this topic and that was during another non-food transmissible viral pandemic, H1N1 (Dhand et al., 2011; Lau et al., 2009). Additionally, the present study provided a more granular comparison of food safety risk perception of food in general compared to restaurant food, types of restaurant food,
restaurant food acquisition mode, and food packaging than previous research. While the results suggest knowledge, availability heuristics, and trust played a role in forming consumers’ food safety (mis)perceptions, the current study’s exploratory nature does not confirm these constructs as influencers of food safety viewpoints during the COVID-19 pandemic. Future investigations are needed to confirm that these factors are underling mechanisms in perception development in a crisis such as a pandemic. Furthermore, consumers’ perceptions and concerns will likely evolve across the different stages of the pandemic, as well vary in other parts of the world. Hence, longitudinal and global data are needed to provide a full picture of how the pandemic impacts consumers’, restaurant food-, and food packaging-related perceptions and, in turn, affects the restaurant industry.

The present study also adds to the body of literature evaluating demographic differences in food safety risk perceptions and contributes new information about these differences in restaurants during a pandemic. For example, the results corroborated prior studies showing food safety concern is generally greater among women than men (Dosman et al., 2001) and older adults compared to younger (Nardi et al., 2020). Yet, prior findings that showed no differences in food safety risk concerns among racial/ethnic groups were contradicted by the present study, with Blacks showing a greater level of concern than other groups. Furthermore, finances related to food significantly influenced consumer perceptions and was a newly investigated construct in the food safety literature and worthy of inclusion in future food safety studies.

A strength of this study was that it was conducted within a few weeks of the initial height of the COVID-19 pandemic in the U.S., thereby providing baseline consumer perceptions. Our findings provide a means of comparison for other studies during the COVID-19 pandemic and future pandemics. Additionally, this study considered COVID-19 related consumer characteristics that should be considered in other pandemic research. These strengths must be balanced with caution when interpreting the results as the study sample, despite a large sample size of nearly a thousand, was not perfectly representative of the U.S. population (especially, education and household income levels). Future studies may wish to verify the findings using national probability samples.

5.3 Conclusion

The COVID-19 pandemic has brought tremendous financial hardship to the restaurant industry. Consumer (mis)perceptions revealed in this study exacerbate the problem. Therefore, the restaurant industry needs to partner with public health officials to provide unambiguous information to the public about food safety, and restaurant food safety specifically, during pandemic situations.

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Declaration of Competing Interest

None.

References

Ahorsu, D.K., et al., 2020. The fear of COVID-19 scale: development and initial validation. Int. J. Ment. Health Addict. https://doi.org/10.1007/s11469-020-00270-9.
Barrena, R., Sanchez, M., 2010. Differences in consumer abstraction levels as a function of risk perception. J. Agric. Econ. 61 (1), 34–59. https://doi.org/10.1111/j.1477-9552.2009.00224.x.
Bromartczyk, S.M., Alba, J.W., 1994. ‘The role of consumers’ intuitions in inference making’. J. Consum. Res. 21, 393-407.
Buhmester, M., Kwang, T., Gosling, S.D., 2011. Amazon’s Mechanical Turk: a new source of inexpensive, yet high-quality, data? Perspect. Psychol. Sci. 6 (1), 3–5. https://doi.org/10.1177/1745691610359380.
CDC, 2018. Estimates of Foodborne Illness in the United States. Available at: https://www.cdc.gov/foodborneburden/index.html (Accessed: 23 June 2020).
CDC, 2020a. Coronavirus Disease 2019 (COVID-19): How COVID-19 Spreads (April 13, 2020). Available at: https://www.cdc.gov/coronavirus/2019-ncov/daily-life-coping/how-covid-spreads.html (Accessed: 25 May 2020).
CDC, 2020b. Coronavirus Disease 2019 (COVID-19) Situation Summary, Updated April 10, 2020. Available at: https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/situation-summary.html (Accessed: 6 May 2020).
CDC, 2020c. Food and Coronavirus Disease 2019 (COVID-19) Food Safety.. Available at: https://www.cdc.gov/coronavirus/2019-ncov/daily-life-coping/food-and-COVID-19.html. (Accessed: 12 November 2020).
CDC, 2020d. Guidance for Cleaning and Disinfecting. Available at: https://www.cdc.gov/coronavirus/2019-ncov/community/pdf/Reopening_America_Guidance.pdf, (Accessed: 13 November 2020).
Chen, W., 2013. The effects of different types of trust on consumer perceptions of food safety. China Agric. Econ. Rev. 5 (1), 43-65. https://doi.org/10.11108/0760317131294757.
Chen, M., 2014. ‘Nearly 1 in 3 Restaurant Workers Suffers From Food Insecurity’, the Nation, 06 June. Available at: https://www.thenation.com/article/nearly-one-third-of-restaurant-workers-suffers-food-insecurity/ (Accessed: 23 June 2020).
Chen, N., et al., 2020. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. Lancet 395 (10223), 507–513. https://doi.org/10.1016/S0140-6736(20)30217-7. Elsevier Ltd.
Datassential, 2020a. COVID-19: Coronavirus and the Impact on Eating. Chicago, IL. Available at: https://datassential.com/wp-content/uploads/2020/03/Datassential-Coronavirus-1-3-12-20.pdf (Accessed: 23 June 2020).
Datassential, 2020b. COVID-19 Report 2: Fear and Response (3/17/20). Chicago, IL. Available at: https://datassential.com/wp-content/uploads/2020/03/Datassential-Coronavirus-2-3-17-20.pdf (Accessed: 23 June 2020).
Datassential, 2020c. COVID-19 Report 4: Hands Off. Chicago, IL. Available at: https://datassential.com/wp-content/uploads/2020/03/Datassential-Coronavirus-4-3-24-20.pdf (Accessed: 23 June 2020).
Davidson, D.J., Freudenberg, W.R., 1996. Gender and environmental risk concerns: a review and analysis of available research. Environ. Behav. 28 (3), 302-339.
de Jonge, J., et al., 2004. Monitoring consumer confidence in food safety: an exploratory study. Br. Food J. 106 (10), 837-849.
Dewey-Mattia, D., et al., 2018. Surveillance for foodborne disease outbreaks - United States, 2009-2015. Morb. Mortal. Wkly. Summ. 67 (10), 2009-2015. https://doi.org/10.15585/mmwr.S67101A1.
Dhand, N.K., et al., 2011. Public perceptions of the transmission of pandemic influenza A/HINI 2009 from pigs and pork products in Australia. Prev. Vet. Med. 98 (2-3), 165-175. https://doi.org/10.1016/j.prevetmed.2010.11.006.
Dosman, D.M., Adamowicz, W.L., Hrudey, S.E., 2001. Socioeconomic determinants of food safety concern is generally greater among women than men (Dosman et al., 2001) and older adults compared to younger (Nardi et al., 2020). Yet, prior findings that showed no differences in food safety risk concerns among racial/ethnic groups were contradicted by the present study, with Blacks showing a greater level of concern than other groups. Furthermore, finances related to food significantly influenced consumer perceptions and was a newly investigated construct in the food safety literature and worthy of inclusion in future food safety studies.

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References

Alhorus, D.K., et al., 2020. The fear of COVID-19 scale: development and initial validation. Int. J. Ment. Health Addict. https://doi.org/10.1007/s11469-020-00270-9.
Barrena, R., Sanchez, M., 2010. Differences in consumer abstraction levels as a function of risk perception. J. Agric. Econ. 61 (1), 34–59. https://doi.org/10.1111/j.1477-9552.2009.00224.x.
Bronarczyk, S.M., Alba, J.W., 1994. ‘The role of consumers’ intuitions in inference making’. J. Consum. Res. 21, 393-407.
Kim, J., et al., 2019. Factors affecting consumption of raw or undercooked foods in restaurants. Int. J. Hosp. Tour. Adm. 20 (3), 281–300. https://doi.org/10.1080/19392117.2019.1529182.

Kivi, P.A., Shogren, J.F., 2010. Second-order ambiguity in very low probability risks: food safety valuation. J. Agric. Resource Econ. 35 (3), 443–456.

Klein, D., 2020. Restaurant Industry Has Already Lost $120 Billion. QSR Magazine. June. Available at: https://www.qsrmagazine.com/fast-food/restaurant-industry-has-a-120-bilion-120-billion (Accessed: 25 June 2020).

Knight, A.J., Worland, R., 2005. Determinants of food safety risks: a multi-disciplinary approach. Rural Social. 70 (2), 253–275. https://doi.org/10.1526/0036011057763895.

Knight, A.J., Worosz, M.R., Todd, E.C.D., 2009. Dining for safety: consumer perceptions of food safety and eating out. J. Hosp. Tour. Res. 33 (4), 471–486. https://doi.org/10.1177/1948550609344211.

Lau, J.T.F., et al., 2009. Widespread public misconception in the early phase of the H1N1 influenza epidemic. J. Infect. 122–127. https://doi.org/10.1016/j.jinf.2009.06.004.

Lau, N., 2020. To Slow Coronavirus Spread, Taco Bell, Chick-Fil-A, Chipotle, Panda Express, Shake Shack, Starbucks Move to Off-premise Only Operations. Nation’s Restaurant News, 16 March. Available at: https://www.nrn.com/quick-service/fast-food/2020-03-16/to-slow-coronavirus-spread-taco-bell-chick-fil-a-chipotle-panda-express-shake-shack (Accessed: 25 June 2020).

Luo, Y.L.L., Sedikides, C., Cai, H., 2020. On the etiology of self-enhancement and its association with psychological well-being. Soc. Psychol. Personal. Sci. 11 (4), 435–445. https://doi.org/10.1177/1948550619877410.

McKay-Nesbitt, J., et al., 2011. Effects of age, need for cognition, and affective intensity on advertising effectiveness. J. Bus. Res. 64 (1), 12–17. https://doi.org/10.1016/j.jbusres.2009.09.013.

Nardi, V.A.M., et al., 2020. A meta-analytic review of food safety and eating out. J. Hum. Sci. Extension 3 (3), 57–64.

Nardi, V.A.M., et al., 2020. Attribution of foodborne illnesses, hospitalizations, and deaths to food commodities by using outbreak data, United States, 1998-2008. Emerging Infect. Dis. 19 (3), 407–415. https://doi.org/10.3201/eid1903.111866.

Paolacci, G., Chandler, J., 2014. Inside the Turk: understanding mechanical turk as a participant pool. Curr. Dir. Psychol. Sci. 23 (3), 184–188. https://doi.org/10.1177/0963721414531598.

Renn, O., 2018. Implications for risk governance. Psychological Perspectives on Risk and Safety Practices. J. Hum. Sci. Extension 3 (3), 57–64.

Simon, M., 2020. Are Food Deliveries and Groceries Safe During Coronavirus Pandemic? Yes, Experts Say. CNN Wire, 20 March. Available at: https://www.cnn.com/2020/03/20/health/food-safety-groceries-coronavirus-wellness/index.html (Accessed: 25 June 2020).

Slovic, P., 2016. Perception of risk. In: Slovic, P. (Ed.), The Perception of Risk. Taylor & Francis.

Snyder, G., 2020. Food Delivery Apps are More Popular Than Ever. But Can They Help Restaurants Survive?’. Los Angeles Times, 19 September. Available at: https://www.latimes.com/food/story/2020-09-19/the-state-of-food-delivery, (Accessed: 5 May 2020).

The New York Times, 2020. Coronavirus in the U.S.: Latest Map and Case Count. The New York Times, 5 May, pp. 1–23. Available at: https://www.nytimes.com/interactive/2020/us/coronavirus-us-cases.html (Accessed: 5 May 2020).

Tversky, A., Kahneman, D., 1974. ‘Judgement under uncertainty: heuristics and biases’. Science 185 (4157), 1124–1131.

Tversky, A., Kahneman, D., 1983. ‘Extensional versus intuitive reasoning: the conjunction fallacy of probability judgment’. Psychol. Rev. 90 (4), 293–315.

van Doremalen, N., et al., 2020. Aerosol and surface stability of SARS-CoV-2 as compared with SARS-CoV-1. N. Engl. J. Med. 382 (16) https://doi.org/10.1056/NEJMcm2004973.

Wadyka, B.S., 2020. Answers to common questions about coronavirus and the food you eat. Consum. Rep. Health, 1 April, pp. 1–11. Available at: https://www.consumerreports.org/food-safety/coronavirus-common-questions-about-the-food-you-eat-food-safety/ (Accessed: 24 June 2020).

Whitworth, J., 2020. Study Finds People Believe False Info About COVID-19 and Food Safety. Food Safety News, 6 June, pp. 24–26. Available at: https://www.foodsafetynews.com/2020/06/study-finds-people-believe-false-info-about-covid-19-food-safety/ (Accessed: 24 June 2020).

World Health Organization, 2019. ‘Global Influenza Strategy 2019-2030’. Geneva. Available at: https://apps.who.int/iris/handle/10665/311184 (Accessed: 30 April 2020).

Yoo, C., MacInnis, D., 2005. ‘The brand attitude formation process of emotional and informational ads’. J. Bus. Res. 58 (10), 1397–1406. https://doi.org/10.1016/j.jbusres.2005.03.011.

Young, I., Waddell, L., 2016. Barriers and facilitators to safe food handling among consumers: a systematic review and thematic synthesis of qualitative research studies. PLoS One 11 (12), 1–21. https://doi.org/10.1371/journal.pone.0167695.