Disgusted and Afraid: Consumer Choices under the Threat of Contagious Disease

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Consumers regularly encounter cues of contagious disease in daily life—a commuter sneezes on the train, a colleague blows their nose in a meeting, or they read recent headlines about the dangerous spread of a disease. Research has overwhelmingly argued that the dominant response to these cues is disgust—an emotion that leads to a desire to reject and avoid potential contamination. We argue, however, that contagious disease cues can also elicit fear. Across four experiments and two large empirical data analyses of the presence of contagious disease on actual consumption behavior, we find that cues of contagious disease increase both fear and disgust, and these emotions together form a unique behavioral tendency with respect to consumer behavior. Relative to either emotion alone, disgust and fear increase preference for more-familiar products asymmetrically over less-familiar ones. These results contribute theoretically to research on complex emotional states and the behavioral tendencies of emotions, document a systematic and consequential impact of contagious disease cues on real consumption behavior, and have significant practical implications for marketers.

Keywords: contagion, emotion, disgust, familiarity, fear, disease

On March 11, 2020, the World Health Organization declared COVID-19—or Coronavirus Disease 2019—a pandemic. Even before this announcement, the disease caused mass hysteria around the world. Schools, restaurants, and places of work closed, and governments mandated that people shelter in place, sometimes requiring that people carry documentation when leaving home (Hauck, Reyes, and Ortiz 2020; Ivanova and Craver 2020). Hand sanitizer, disinfectants, shelf-stable foods, and even toilet paper were out of stock on major store shelves, and the supply of respirator masks and other necessary medical equipment was so low due to public demand that hospitals had a hard time getting enough personal protective equipment for healthcare workers on the front lines (Campbell and Murphy 2020; Jacobs, Richtel, and Baker 2020; Togoh 2020). The pandemic vividly illustrates that a contagious disease can provoke a powerful emotional response that influences consumers' choices. While COVID-19 is a particularly salient example of this effect, consumers often incidentally find themselves in the presence of contagious disease. For instance, a commuter sneezes on a train, a friend complains of a sore throat, or a partner comes home with a chesty cough. Unlike COVID-19, these instances are unlikely to lead to hysteria, but they may nevertheless have a systematic and consequential impact on consumption patterns.

But what might this impact look like? Cues of contagious disease can influence consumption behavior systematically by eliciting emotions. The existing literature

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Editor: J. Jeffrey Inman

Associate Editor: JoAndrea Hoegg

Advance Access publication May 28, 2020

 • Vol. 47 • 2020
DOI: 10.1093/jcr/ucaa025

overwhelmingly suggests that, when an individual is confronted with the threat of contagious disease, the dominant emotional response is disgust (Han, Lerner, and Zeckhauser 2012; Rozin and Haidt 2013; Rozin, Haidt, and McCauley 2008; Tybur et al. 2013). When a consumer senses the presence of contaminants in the environment and feels the emotion of disgust, the dominant behavioral tendency is to reject the contaminant and to isolate the self from potential infection by reducing consumption (Han et al. 2012; Lerner and Keltner 2000; Lerner, Small, and Loewenstein 2004).

However, we propose that cues of a contagious disease can evoke fear as well. Fear is an emotional response to uncertainty and lack of personal control over an outcome (Ellsworth and Smith 1988; Lerner and Keltner 2000). When a consumer encounters a contagious disease cue, in addition to providing a salient cue signaling the presence of contaminants, there is also often a level of uncertainty and lack of personal control. In other words, when a fellow commuter sneezes on the train, a nearby commuter may feel disgusted and also fears the possibility of becoming sick.

In this article, we explore how this joint emotional response to contagious disease cues can alter the systematic impact these cues have on consumption behavior. We draw on research on appraisal tendencies and mixed emotions to argue that the behavioral response to a contagious disease cue will asymmetrically *increase* preference for familiar and comforting products, and therefore sometimes increase consumption overall, contrary to the prediction of prior research on disgust. We assess this proposal across six studies, including two large-scale empirical analyses of influenza incidence and panel or retail sales data as well as four experiments. Across these studies, we find that cues of contagious disease can elicit both disgust *and* fear in consumers. Rather than avoid purchasing, consumers demonstrate an asymmetric preference for familiar products. Our findings highlight the importance of understanding when, why, and how the joint experience of emotions can impact behavioral tendencies. We demonstrate a significant influence of contagious cues on real consumption decisions, add theoretical insight into the role of joint emotions in influencing consumption behavior, and conclude with discussing practical implications for marketers.

CONCEPTUAL DEVELOPMENT

The Appraisal Tendency Framework and Discrete versus Mixed Emotional States

The appraisal tendency framework argues that emotions arise from complex judgments consumers make about their relationship to their environment (Lazarus 1991; Lerner and Keltner 2000; Smith and Ellsworth 1985). Each discrete emotion can be defined and differentiated from others on the basis of how the situation is judged. For instance, Smith and Ellsworth (1985) identified six dimensions on which emotions can be classified and differentiated: attention (whether people are driven to pay attention to, ignore, or avoid the situation), certainty (whether the situation is predictable or not), control (whether the situation is controlled by the person, someone else, or something else), pleasantness (whether the situation is pleasant or unpleasant), responsibility (whether the situation was brought about by the self or others), and anticipated effort (how much the person has to work in the situation).

While discrete emotions can share appraisals on some of the underlying dimensions (i.e., both fear and disgust are unpleasant emotions), one key tenant of the appraisal tendency framework is that each discrete emotion differs from others on the basis of its unique profile on each of the appraisal dimensions. For example, fear and anger are distinct from each other because fear is defined by uncertainty and a lack of personal control whereas anger is defined by a high sense of certainty and other responsibility (Lerner and Keltner 2001; Lerner et al. 2003; Tsai and Young 2010).

Each discrete emotion has a unique pattern of cognitive appraisals, and research has shown that each emotion also has a unique influence on how people tend to think and behave in subsequent tasks. For example, fear and anger have opposite appraisals on the dimension of certainty, so they have opposing influences on assessments of risk. Because fear results from an appraisal of low certainty, this leads people feeling afraid to believe that outcomes are generally uncertain and to therefore make more risk averse choices in subsequent tasks (Lerner and Keltner 2001; Raghunathan and Pham 1999). In contrast, because anger results from an appraisal of high certainty, people become more risk seeking in subsequent tasks (Lerner and Keltner 2001; Lerner and Tiedens 2006). Disgust results from an assessment of being too close to an offensive object, so people feeling disgusted exhibit a general tendency to avoid and expel (Di Muro and Noseworthy 2013; Galoni and Noseworthy 2015; Han et al. 2012; Lerner et al. 2004).

However, the situations people face in daily life can often afford multiple judgments on appraisal dimensions, and research as well as common wisdom has shown that people can and do experience multiple, and sometimes conflicting, emotions simultaneously. Most research has focused on the simultaneous experience of multiple emotions that differ on valence. For instance, feeling "bittersweet" (sadness and contentment) or "guilty pleasures" (guilt and happiness) is the example of the simultaneous experience of emotions that share appraisals on some dimensions but conflict on the appraisal of pleasantness. However, people can and do feel emotions of the same valence simultaneously, even when the emotions conflict on other appraisal dimensions (Lee and Ellsworth 2013; Morales, Wu, and Fitzsimons 2012). Notably, research shows that people

can simultaneously experience fear and disgust, even though the two emotions conflict on appraisals of certainty and attention (Morales et al. 2012).

Despite some research documenting the phenomenon of mixed emotions with conflicting appraisals, the appraisal tendency framework provides little insight and guidance on how or whether conflicting appraisals of mixed emotional states resolve within the individual, or how the experience of multiple emotions might influence behavioral tendencies. This has led to a call for an increased focus on the psychology of these mixed emotional states and how the interaction of multiple appraisals can predict behavior (So et al. 2015). Here, we use the appraisal tendency framework and integrate research on the psychology of emotional responses to understand how the simultaneous experience of fear and disgust might influence subsequent behavioral tendencies.

Contagious Disease Cues: A Joint Fear and Disgust Response

When people encounter a contagious disease cue, it is widely assumed that the immediate emotional response is disgust. In fact, the emotion of disgust itself is thought to have evolved as an adaptive mechanism of avoiding disease, poison, and food-borne illness (Haidt, McCauley, and Rozin 1994; Nemeroff and Rozin 1994; Rozin et al. 2008; Rozin, Millman, and Nemeroff 1986; Tybur et al. 2013). The appraisals that define the experience of disgust include certainty that there are contaminants in the environment (high certainty) and a desire to avoid becoming contaminated (low attentional activity; Lerner et al. 2004; Smith and Ellsworth 1985).

However, contagious disease cues can also evoke fear. Like disgust, fear is an adaptive response that helps consumers detect and defend against threats in their environment (Marks and Nesse 1994; Neuberg, Kenrick, and Schaller 2011). Consumers feel fear when they appraise situational uncertainty and a lack of personal control over outcomes (Ellsworth and Smith 1988; Lerner and Keltner 2000, 2001; Smith and Ellsworth 1985). Beyond making the presence of contaminants salient and evoking disgust, contagious disease cues usually afford appraisals of uncertainty and lack of control with respect to whether the consumer is likely to get sick. It is therefore plausible that encountering cues about contagious illness can elicit fear in consumers. In fact, the response to COVID-19 was characterized as "panic" by the media (Gross 2020) and some researchers have called the response to pathogen cues "contamination anxiety" (Dutta and Rao 2015).

We thus propose that contagious disease cues elicit a joint disgust and fear response in consumers. First, a contagious disease cue usually makes contaminants salient (e.g., the presence of pathogens via coughing, sneezing, vomiting, or news reports about the spread of disease). Regardless of whether this cue signals a real risk of harm to the observer (e.g., if they are immune), the salience of the cue nevertheless allows for an appraisal that there are contaminants present. This appraisal elicits a disgust response. In addition, the contagious disease cue often affords an appraisal that there is a real threat imminent in the environment that is out of their control (e.g., the lack of control over getting sick). This appraisal elicits a fear response.

Conflicting Appraisals in a Joint Fear and Disgust Response

While the disgust and fear responses to contagious cues share appraisals of unpleasantness (both are unpleasant), control (both lack personal control), responsibility (both are other responsibility), and anticipated effort (both are high), they do not share appraisals of certainty and attentional activity. Disgust arises from a certainty appraisal whereas fear arises from an uncertainty appraisal (Smith and Ellsworth 1985; Tiedens and Linton 2001). Disgust is characterized by low attentional activity whereas fear is ambivalent with respect to attentional activity (Blanchard et al. 2011; Coleman et al. 2017; Krusemark and Li 2011). On first glance, it might seem that these conflicting appraisals might mean disgust and fear ought not to be experienced together, or, at the very least, these conflicting appraisals might cancel each other out and thus have no influence on subsequent consumption behavior. However, we propose and show that fear and disgust can be experienced together and that these seemingly conflicting appraisals hold the key to the unique behavioral tendencies in response to contagious disease.

Resolving Certainty: Certain Source, Uncertain Outcome

First, we propose that people do not experience a certainty conflict when simultaneously experiencing fear and disgust because, in the case of the response to contagious disease cues, fear and disgust are driven by certainty appraisals directed toward different aspects of the situation. In particular, appraisals of certainty with respect to the emotion of disgust are directed toward the *source* of the threat, whereas appraisals of uncertainty with respect to the emotion of fear are directed toward the *outcome* of the threat. When faced with a contagious disease cue, the certainty consumers' experience arises from a feeling of knowing that there are in fact pathogens present in the environment. In contrast, the appraisal of uncertainty arises from not knowing whether those pathogens will contaminate the consumer (Dutta and Rao 2015; Marzillier and Davey 2005). Imagined in a different context, people can still feel certain that a tiger is chasing them whilst simultaneously being afraid of what might happen if it catches them. Thus, in

situations where appraisals of certainty or uncertainty can be directed toward both the source and outcome, the conflicting certainty appraisals of disgust and fear may not cancel each other out, and people could thus feel both disgusted and afraid simultaneously. More formally:

H1a: When confronted with a contagious disease cue, consumers feel disgust from appraising a certain source of threat and fear from an uncertain outcome of that threat.

But how might these diverging certainty appraisals affect subsequent behavior? We propose that the appraisal of a certain source inherent in the disgust response to contagious disease cues spurs action that might not occur under conditions of fear alone. Research has shown that there are two possible behavioral tendencies of fear: freezing or action (Blanchard et al. 2011; Gray 1987; Izard 1977; Tiedens and Linton 2001). The key decision criteria between these two behavioral outcomes is whether people believe the source of threat is looming or imminent. When people first feel that a threat is looming, fear leads to freezing behavior in service of detecting the threat, assessing the real risk, and deciding on an appropriate course of action (Blanchard et al. 2011). We propose that when confronted with a contagious disease cue, the certainty appraisal about the source of the threat (i.e., that the consumer believes pathogens are present) satisfies the purpose of freezing behavior, making the threat appear more imminent, and therefore encouraging consumers to take action.

One additional feature of pathogens as a source of threat is that, once exposed, consumers have little control over whether they get sick. Thus, when pathogen presence is isolated as the source of threat, it might further highlight and amplify the perceived lack of control over outcomes. Feeling like one lacks control motivates action toward regaining control (Brehm 1966; Rothbaum, Weisz, and Snyder 1982; Whitson and Galinsky 2008). For example, people who feel like they lack control show a preference for making a choice over deferring (Coleman et al. 2017), have a greater desire for power (Lammers et al. 2016), and are more likely to find illusory patterns in random data (Whitson and Galinsky 2008). Thus, when pathogens are isolated as the source of threat, they might highlight and amplify the perceived lack of control over outcomes, further motivating action toward regaining a sense of control. Thus, the differences in disgust and fear on the appraisal dimension of certainty are not in conflict and might even enhance the behavioral tendency to act against the threat. More formally:

H1b: Relative to fear alone, experiencing disgust and fear together in response to contagious disease cues increases perceived lack of control over outcomes.

H1c: Relative to fear alone, experiencing disgust and fear together in response to contagious disease cues motivates taking action toward eliminating the threat.

Resolving Attention: Avoiding Pathogens and Approaching Control

Another appraisal dimension on which fear and disgust do not align is that of attentional activity. The experience of disgust is accompanied by an intense desire to avoid and expel the source of contamination (i.e., a strong appraisal of attentional avoidance). Indeed, research on the neurophysiological response to disgust has shown that people engage in significant and immediate repulsion behaviors when confronted with disgusting stimuli (Marks and Nesse 1994; Neuberg et al. 2011). Attention narrows to the disgust-causing stimuli, and bodily systems associated with restricting access to internal functions are engaged (e.g., reduced activity in brain centers associated with attention to the external environment, closing of eyes, and slowing of breath; Anderson et al. 2013; Ekman, Levenson, and Friesen 1983; Marks and Nesse 1994; Neuberg et al. 2011). In contrast, fear is ambivalent with respect to attentional activity and whether people are motivated to avoid or approach is contingent upon which behavior is believed to help resolve the threat in that context (Anderson et al. 2013; Coleman et al. 2017; Neuberg et al. 2011; Smith and Ellsworth 1985). For instance, people avoid making risky choices when they feel afraid because that behavior leads to even greater uncertainty in outcomes (Raghunathan and Pham 1999). Yet people feeling afraid are also more likely to make (rather than defer) a choice when doing so resolves uncertainty and helps the consumer regain a feeling of control (Coleman et al. 2017).

We propose that experiencing fear and disgust when confronted with a contagious disease cue will thus narrow avoidance behaviors to the source of the threat, specifically, but will spark approach behaviors toward objects that help restore a sense of control. This pattern of behavior seems to be present—albeit untested—in other research on disgust. In research paradigms where researchers manipulate disgust but not fear, the experience of disgust alone seems to lead to avoidance behaviors in general, irrespective of the actual benefit of approach behaviors in subsequent tasks. For example, when normatively disgusting products that offer no real threat to the self (i.e., new and unopened feminine hygiene products) come into contact with cookies, people feel disgusted and are less willing to try the cookies (Morales and Fitzsimons 2007). In contrast, in research paradigms where manipulations of disgust might also induce fear, participants seem to avoid the pathogen, specifically, but also approach objects that might help regain a sense of control over the outcome. One such paradigm is studies on physically dirty money (Di Muro and Noseworthy 2013; Galoni and Noseworthy 2015). When people encounter physically dirty money, research has shown that participants feel disgusted, but participants may have also felt fear from the uncertainty about what those pathogens may have transferred to them. In turn,

empirical results show that participants do indeed avoid the source of pathogens (e.g., by spending more of the dirty currency and de-valuing products that the currency may have come into contact with; Di Muro and Noseworthy 2013; Galoni and Noseworthy 2015), and also actively approach and increase the value they place on products that help restore a sense of control over the outcome—in this case, cleansing products (Galoni and Noseworthy 2015). Thus, the joint fear and disgust response to contagious disease cues might narrow avoidance behaviors to objects associated with the source of threat, specifically, but increase approach behaviors toward objects associated with regaining a sense of control over the threat.

Unique Behavioral Tendencies of the Joint Emotion of Fear and Disgust

We have thus far proposed that the joint fear and disgust response to contagious disease cues will spark action more than fear alone and will draw attention to and spark approach behaviors toward objects that help restore a sense of control over outcomes more than disgust alone (hypothesis 1b-c). But what might this mean with respect to the systematic effect of such cues on consumption behavior, specifically? We propose that contagious disease cues will asymmetrically increase preference for familiar products. By familiar, we mean brands or products that are well-known and commonly used by the consumer. When consumers feel they lack control, one way in which they can restore a sense of control is to reestablish a feeling of structure and predictability (Whitson and Galinsky 2008). Familiar products can thus help restore a sense of control because they are seen as more predictable (Bornstein, Kale, and Cornell 1990), certain (Park and Lessig 1981), and comforting (Titchener 1910) to the consumer than less-familiar or novel products. Indeed, research has shown that unfamiliar products can reduce a consumer's sense of control, further compounding the feelings of a lack of control rather than resolving them (Faraji-Rad, Melumad, and Johar 2017). Thus, if the joint experience of disgust and fear leads to a greater tendency to approach objects that can help restore a sense of control, then when faced with a choice between a familiar product and a less-familiar product, we expect that consumers will choose the familiar.

H2: Cues of contagious disease asymmetrically increase preference for familiar products.

Taken together, our hypotheses suggest that cues of contagious disease evoke a joint fear and disgust response in consumers through a unique mix of appraisals. The salience of contaminants in the environment elicits disgust by making the source of the threat appear evident and evokes behavioral tendencies toward avoiding the offending contaminant. Likewise, the lack of control in the likelihood of getting sick evokes fear and elicits behavioral tendencies toward regaining control over the outcome. The joint experience of disgust and fear thus leads to greater action tendencies than fear alone and greater approach behaviors than disgust alone (hypothesis 1c), thus asymmetrically increasing preference for the familiar (hypothesis 2). We test these hypotheses across six studies.

STUDY 1: CONSUMER PANEL DATA ANALYSIS

Our initial analysis examines whether cues of contagious disease consumers confront in daily life might systematically influence consumption choices. To provide an initial test of our hypothesis that disease should asymmetrically increase preference for the familiar (hypothesis 2), we turn to consumer panel data from Nielsen alongside archival data from the Center for Disease Control (CDC) and Google Flu Trends over a period of 6 years. We use this data to assess whether the presence of contagious disease in a particular place at a particular time systematically affects what and how much people buy.

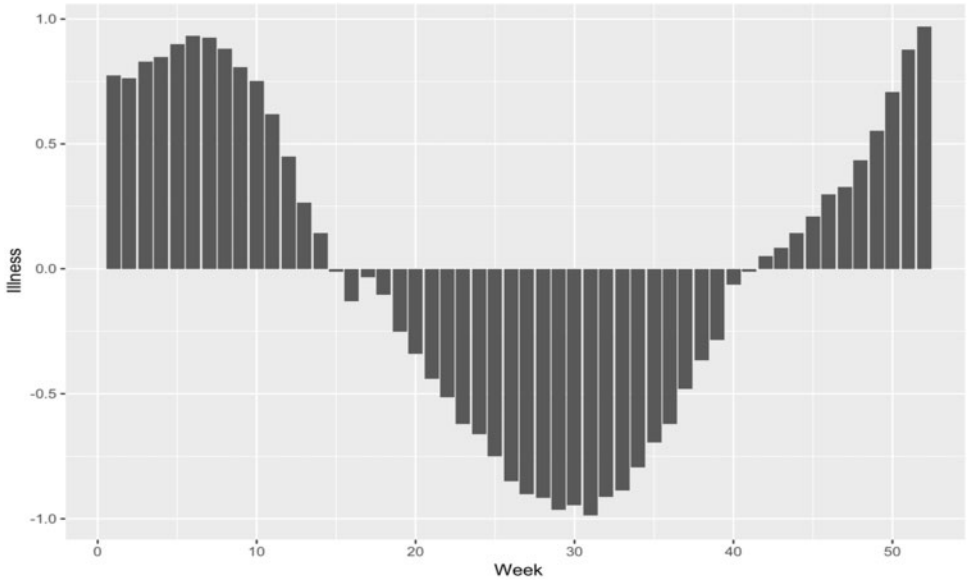
Data Treatment Methods

Our time frame is the period starting the first week of January 2009 and ending the last week of December 2014. Our unit of analysis is a weekly estimate of flu levels and household sales within each state in the contiguous 48 states of the United States, plus the District of Columbia. We chose this unit of analysis and time frame because they provide a level of granularity that was consistently available across the Google, CDC, and Nielsen datasets, and therefore did not require that we make additional assumptions trying to estimate a more general or granular level of analysis. This time frame and unit of analysis yield a dataset representing 312 weeks across 49 states. We log transform our disease index and household purchasing data because the data have strong positive skew. In addition, a log–log analysis allows us to interpret coefficients as elasticities so that a 1% change in disease results in a corresponding percent change in sales.

An Index of Disease Presence. We chose to study the impact of the influenza virus on consumption behavior because it is a well-known, highly contagious, and well-publicized disease with publicly available data. We conceptualized disease presence as the aggregate presence of flu-like illnesses in a particular state in a particular week. We created a weekly state-level disease index by taking the average of five standardized variables available from Google Flu Trends and the CDC. The variables from the CDC included a variable rating the overall presence of the flu in the state, a variable indicating the total number of flu-like illness cases presented in hospitals, the number of flu-like specimens sent to the laboratory, and the percent of

FIGURE 1

AVERAGE ILLNESS INDEX BY WEEK OF THE YEAR ACROSS THE UNITED STATES.



laboratory specimens returned positive. The Google Flu Trends data included a single state-level weekly count variable that represents the estimated number of cases of the flu in a particular state based on flu-related queries on the search engine. As a check to ensure that our disease index was tracking the seasonal pattern of the flu, we plotted the average weekly level of illness across the United States. As is evident in figure 1, our illness index indeed captures the regular seasonality of the flu (increased illness in the first and last weeks of the year, decreased illness over the summer).

Household Spending. To assess the systematic influence of illness on consumption within household, we used the Nielsen consumer panel data. The panel data provides household demographic information along with date, store, product, and price information for every shopping trip the household makes during their time on the panel. Over 60,000 households participate in the consumer panel program each year. Households spend an average of 3.7 years in the panel during our time frame and make an average of 161.5 shopping trips per year. A total of 112,764 unique households engaging in over 12 million purchases are represented in our time frame (January 2009–December 2014).

Choosing Product Categories. To have rich enough data to assess our proposal, we chose product categories that most households consume relatively frequently and consistently throughout the year. Products that are bought infrequently (e.g., furniture, appliances, electronics) or only by a subset of consumers (e.g., baby products, automotive supplies) are not conducive to assessing a systematic shift in preference. It was also important to choose relatively homogenous categories where different products are likely to be considered substitutes. For example, the category "household paper products" is too broad because buying more toilet paper than paper towels does not necessarily mean that toilet paper is more familiar. To provide a conservative estimate of our effect, we excluded personal cleansing products and household cleaners because of their close association with disgust (Galoni and Noseworthy 2015). Finally, we included a variety of food and nonfood products to assess the generalizability of the effect.

With these constraints, we chose four product categories for analysis: canned soup, cookies, paper towels, and batteries. Each row in our data represents a purchase occasion of a product in one of these four categories and includes a unique product identifier (upc), a variable indicating which category the product belongs to, the number of equivalent units purchased (in ounces for soup and cookies, and in units for batteries and paper towel), the price paid (per equivalent unit), the time and location where the purchase was made, the disease index at the time the purchase was made, and household demographics. Each unique product purchased in a given shopping trip has its own line in the dataset. If a household bought two different products in the same product category (e.g., Brawny and Scott paper towels) or two products in different product categories (e.g.,

batteries and paper towels) during the same shopping trip, each of these products would have its own line in the data, and we control for any dependency by including a trip control in our model. However, all units purchased of the same product in the same shopping trip (e.g., a purchase of five cans of private label chicken noodle soup in the same shopping trip) would be included in the same row.

Assessing Familiarity. The panel data provides the household's entire purchase history in each category in our time frame. We operationalize familiarity based on the share a given product takes up within the household's purchase history for the category. For example, if a household buys Scott paper towels 90 times and Brawny paper towels 10 times, Scott has a 90% share, and is therefore the more-familiar product in the category, whereas Brawny has 10% share and is less familiar. We compute familiarity using the entire time frame rather than a training or calibration year to account for the fact that new products are introduced throughout the time frame and that households might sometimes grow to be more familiar with different brands over time. By conceptualizing familiarity as share of category, we are also able to account for the fact that some households are more familiar with private label products than national brand products.

Operationalizing familiarity this way raises one potential issue. When a household only buys one product in a category across the entire 6-year time period, the single purchase is considered as familiar ($1/1 = 100\%$) as a household that loyally purchases the same product 100 times in the data set ($100/100 = 100\%$). To address this situation, we removed observations where a household bought only a single product in the category during our time frame ($n = 46{,}794$). The final dataset consists of 12,196,440 purchase instances across our categories of interest from January 2009 to December 2014.

Model and Controls. To determine if the disease index predicted asymmetries in the consumer choices between more-familiar and less-familiar products, we used a multilevel-modeling framework with restricted maximum likelihood estimation (Bates et al. 2015). This framework allows us to control for a series of variables that could influence our results. In particular, we wanted to control for the fact that some states might have higher baseline illness and sales than others as well as border effects—the fact that the level of illness and preference for particular products in New York at any particular time is likely more correlated with illness and preference in New Jersey than in California. We used regional assignments given by the CDC called Health and Human Service regions to create an effect of state within region, allowing us to control for these two issues. The flu is a seasonal illness but sales are seasonal as well. For example, people are sicker in December than they are in April and also might unrelatedly buy more cookies in December than in April because families enjoy eating them over the holidays, or more soup because it is just generally colder in December than in April. To control for this potentially shared seasonality, we included a measure of how sick people were, on average, in any given week of the year (an effect of illness within week of the year). Also, the datasets we use were newer to states, retailers, and hospitals in 2009 than they were in 2014, and companies often introduce more products over time. We therefore included a variable that controls for increased compliance in reporting over time as well as increases in sales volume over time (an effect of time). We included a variable that controls for price (an effect of price, in equivalent units) and variables that control for product category and household-level effects.

To see whether the presence of disease increased purchases of products familiar to the household (hypothesis 2), we predict purchase quantity by our disease index, the household's familiarity with the product, and their interaction. We log-transformed these variables to account for strong positive skew. We report the core effects of interest in the model results section below, but additional details, including separate analyses for each product category, are found in the web appendix.

Results

We found a significant effect of the disease index. Households bought more overall when disease was more present in the state ($\beta = .003$, SE $= 0.0002$, $t = 16.97$, $p < .001$). Supporting our predictions, this effect was qualified by a significant disease × familiarity interaction ($\beta = .005$, SE $= 0.0009$, $t = 5.99$, $p < .001$). The positive sign of the coefficient means that the positive effect of disease *increased* for products that were more familiar to the household, supporting hypothesis 2.

Discussion

Across four product categories, the present analysis indicates that the presence of disease can systematically alter consumer behavior in a real way that is practically relevant to marketers. Within households in the United States, the presence of disease increases purchase quantity overall and leads to an asymmetric preference for familiar products. We cannot, however, assess whether the changes in consumption patterns are driven by consumers who fear becoming sick, as we propose, or by consumers who are actually sick. We also cannot account for differences in the availability of products that might be influencing purchase behavior. Likewise, the empirical analysis lacks a direct measure of consumer appraisals and emotion. Our experiments help address these limitations.

STUDY 2: CONTAGIOUS DISEASE, DISGUST, AND FEAR

We designed study 2 to test whether cues of contagious disease elicit a joint disgust and fear response in consumers (hypothesis 1a) and to assess whether this joint emotional response causes the asymmetric increase in preference for familiar products (hypothesis 2). In addition, we use a noncontagious disease as a secondary control condition to rule out the alternative possibility that the pattern of results found in the empirical analyses represents consumer response to illness in general rather than contagious diseases specifically. While both contagious and noncontagious diseases might increase appraisals of uncertainty and feelings of fear over the control, we propose that only contagious diseases should increase both appraisals that pathogens are present and that participants have little control over outcomes, therefore evoking both fear and disgust. By making the threat seem more imminent, experiencing both emotions together should lead to an asymmetric preference for familiar products in service of regaining control over outcomes. Thus, we predict that the asymmetric preference for familiar products should be present when reading about contagious disease but not noncontagious disease.

Method

Design. Two hundred twenty-six participants from Amazon's Mechanical Turk were randomly assigned in a three-cell between-subjects design with cue (contagious disease, noncontagious disease, control) as the manipulated factor.

Manipulating Emotions. After consenting to participate, all participants read a short news report. In the control condition, participants read about a new pressure cooker called the "Instant Pot." In the noncontagious disease cue condition, participants read a report about the dangers of heart disease: "the Lead Killer" of people in the United States. In the contagious disease cue condition, participants read about the spread of the flu in the United States this season. Thus, participants in both the noncontagious and contagious disease conditions read about a serious disease, but because heart disease does not make impurities salient, only the flu condition should elicit both disgust and fear. All news stories were sourced from real information on the product or respective disease and were equal in length. Complete language of the news stories is available in the web appendix.

Measuring Emotions. After reading the news report, all participants responded to an emotions index adapted from prior research where they indicated on a scale from 1 = "not at all" to 7 = "very much" the extent to which they felt each of 20 emotion words during the news report task (Galoni and Noseworthy 2015). Embedded in the 20 emotion words were four items that measured disgust ("Unclean," "Disgusted," "Dirty," "Revolted;" $\alpha = .89$). Likewise, five items measured fear ("Scared," "Anxious," "Afraid," "Nervous," "Vulnerable;" $\alpha = .95$).

Measuring Preference. We measured preference for the familiar under the guise of a second study interested in grocery shopping and food habits. First, all participants were shown a list of 14 common grocery store items and were asked to choose (by dragging and dropping) the five items they would be most likely to buy on their next shopping trip. The 14 items were presented all together in a random order to participants but actually consisted of seven pairs of items from the same product category that differed in their degree of familiarity to a Western audience. For example, one pair represented common starches and included "Potatoes"—an ingredient very common in a Western household—and "Rice"—an ingredient less common in a traditionally Western household and more familiar to an Asian or Hispanic household. Other examples of pairs in the choice set included spices: "Oregano" versus "Curry Powder" and sauces: "Ketchup" versus "Soy Sauce." A pretest ($N = 53$, $M_{age} = 34.32$, 44% females) confirmed that the items coded as familiar to a Western household were indeed considered more familiar to a Western household ($M = 5.45$, SD = 0.63) than the non-familiar items ($M = 2.64$, SD = 1.00; $F(1, 52) = 253.52$, $p < .001$, $\eta^2 = .83$). Finally, participants completed survey demographics (including their own cultural heritage and a multicultural ideology scale; Berry and Kalin 1995) and were debriefed.

Results

Exclusion. Of the 226 participants, 24 did not follow instructions in the basket composition task (either put no items in their basket ($n = 2$) or put more than five items in their basket ($n = 22$)) and were excluded from all analyses. The remaining participants ($N = 202$, $M_{age} = 36.05$, 59.9% females) are included in analyses below.

Emotions. A one-way analysis of variance revealed a significant effect of experimental condition on participants' experienced fear ($F(2, 199) = 29.44$, $p < .001$) and experienced disgust ($F(2, 197) = 17.86$, $p < .001$). Planned contrasts revealed that both participants who read about the flu ($M = 3.36$, SD = 1.74; $t(199) = 7.35$, $p < .001$, $d = 1.29$) and who read about heart attacks ($M = 2.91$, SD = 1.58, $t(199) = 5.50$, $p < .001$, $d = 1.05$) felt more fear than participants who read about the instant pot ($M = 1.50$, SD = 1.07). The flu and heart attack conditions were marginally different from each other ($t(199) = 1.72$, $p = .086$, $d = .27$). As expected, participants who read about the flu also felt more disgust ($M = 2.47$, SD = 1.50) than participants in the control condition ($M = 1.32$, SD = 0.76; $t(199) = 5.92$, $p < .001$, $d = .97$). The heart attack condition also elicited greater disgust over the control

condition ($M = 1.74$, SD = 1.03; $t(199) = 2.14$, $p = .034$, $d = .46$). Importantly, however, participants reading about the flu experienced significantly more disgust than participants reading about heart attacks ($t(199) = 3.66$, $p < .001$, $d = .57$), which supports hypothesis 1a.

Basket Composition. To assess whether asymmetric preference for the familiar changes as a function of which news story participants read, we first formed an index wherein we computed the proportion of culturally familiar items participants put in their baskets during the shopping task. From the demographics collected, we had 180 self-identifying North American or European participants and 22 self-identifying Asian or Hispanic participants in the sample. We coded the traditionally Western basket items as familiar for participants who identified as North American or European and the non-Western items as culturally familiar for participants who identified as Asian or Hispanic. In this way, a higher number on the index indicates that the participant's basket contained a higher proportion of their own culture's familiar ingredients.

We expect that participants who read about the flu would be more likely to choose culturally familiar ingredients than participants in the heart attack or control conditions (hypothesis 2). A one-way analysis of variance supported this prediction with a significant effect of experimental condition on the basket composition index ($F(2, 199) = 3.26$, $p = .040$). Planned contrasts revealed that participants who read about the flu chose a significantly greater proportion of culturally traditional ingredients ($M = 0.62$, SD = 0.17) over participants in the control ($M = 0.56$, SD = 0.19; $t(199) = 2.04$, $p = .043$, $d = .33$) and heart attack conditions ($M = 0.55$, SD = 0.20; $t(199) = 2.35$, $p = .02$, $d = .38$), as we predicted. The control and heart attack conditions did not differ from each other ($t(199) = .35$, $p = .724$, $d = .05$). Participants who read about contagious disease chose significantly more culturally traditional ingredients than participants in the other conditions, supporting hypothesis 2. These results hold both when we run the analysis on all participants, as reported, and when controlling for any differences between Western and non-Western participants (details are in web appendix).

Discussion

Study 2 provides evidence that cues of contagious disease can increase both fear and disgust. Study 2 also provides support for the hypothesis that the behavioral response to cues of contagious disease is to asymmetrically increase preference for familiar products. Indeed, participants reading about the flu chose significantly more culturally familiar ingredients than participants reading about noncontagious heart disease or the instant pot. We used heart disease as a secondary control to make sure that it was not the behavioral response to illness in general, but rather the fear and disgust arising from contagious disease cues driving the effect. However, heart disease is an illness that can be managed through diet and it is possible that participants in this condition are choosing more non-familiar products because they are perceived as healthier.

STUDY 3: USING A DIFFERENT CONTROL

We designed study 3 to replicate and extend study 2 using a different secondary control and a modified version of the basket composition task. By removing constraints on the number of items participants could place in their baskets, we can assess the hypothesis that the threat response to cues of contagious disease should asymmetrically increase preference for familiar products (hypothesis 2) when consumers are free to choose what and how much they buy. This change to the basket composition task also allows us to test whether experiencing disgust and fear together increases action toward eliminating the threat (hypothesis 1c). To the extent that consuming products is a form of taking action, we might expect that participants feeling both disgusted and afraid would put more products in their basket, overall. This experiment also included a second measure of preference for familiarity in which we asked participants to choose a restaurant that varied on how familiar it was to the average American. We expected that participants encountering contagious disease cues would show a greater preference for more-familiar restaurants.

Method

Design. Three hundred fifty-four participants from Amazon's Mechanical Turk were randomly assigned in a three-condition between-subjects design with reminder (contagious illness, unemployment risk, control) as the manipulated factor. We also had a second exploratory factor in this experiment manipulating geographic location of the reminder; there were no significant differences across locations within reminder condition; however, so for simplicity in reporting we have collapsed this factor into a single factor design.

Manipulating and Measuring Emotion. Like study 2, participants in the contagious disease condition read a short news story about the spread of the flu and participants in the control condition read about the "Instant Pot." To avoid the effects that heart disease might have had on food choice, we manipulated a similarly negative but noncontagious reminder in this experiment using a news report about the current state of unemployment. Following the manipulation, all participants responded to the same emotions index included in study 2 (fear $\alpha = .93$; disgust $\alpha =$

.90). We included an additional five emotion words ("Relieved," "Lucky," "Grateful," "Fortunate," "Secure") designed to measure how relieved participants might have felt after reading the news reports. We included this measure, as well as questions in the demographics assessing whether participants had received a flu shot and whether they were currently employed, to control for any variation in actual circumstances that could have been influencing the results. The measure of relief had no effect on results and is thus not included in the analysis.

Measuring Preference. We measured preference for the familiar in the same way as in study 2 with minor modifications. Participants saw a list of 20 food items (three new pairs of fresh ingredients) and were asked to simply indicate what they would be most likely to buy and least likely to buy on their next shopping trip. We also asked participants to explain why they made the choices they did. As a second measure of preference for familiarity, participants also saw a set of four restaurant choices ("American," "Mexican," "Malaysian," and "Korean-Mexican") and were asked to choose their likely dining choice among the options. Participants then completed a set of demographics and were debriefed to the true nature of the study.

Results

Exclusion. Of the 354 participants, 34 gave straight-line responses to all emotions, did not choose a restaurant, or did not give any explanation for the choices they made in the basket composition task. The remaining participants ($N = 320$, $M_{age} = 36.35$, 46.3% females) are included in all analyses below. The analyses including employment security and flu vaccination as covariates had the same pattern of results. We report the results not including covariates below.

Emotions. To assess whether the flu news report elicited both fear and disgust and whether the unemployment news report elicited fear alone against the control, we ran a one-way analysis of variance with reminder condition as the predictor and fear and disgust as dependent variables. This analysis revealed a significant effect of condition on experienced fear ($F(2, 317) = 20.45$, $p < .001$). In line with study 2, the planned contrasts revealed that both the flu news report ($M = 2.95$, SD = 1.66; $t(317) = 5.40$, $p < .001$, $d = 1.07$) and the unemployment news report ($M = 3.19$, SD = 1.53; $t(317) = 6.32$, $p < .001$, $d = 1.34$) made people feel more afraid than participants in the control condition ($M = 1.54$, SD = 0.84). Likewise, the analysis revealed a significant effect of condition on experienced disgust ($F(2, 317) = 4.07$, $p = .018$). Unlike experienced fear, the planned contrasts revealed that only the flu news report ($M = 2.01$, SD = 1.35) made people feel significantly more disgusted than the control condition ($M = 1.44$, SD = 0.81; $t(317) = 2.73$, $p = .007$, $d = .51$). There were no significant differences in disgust between participants in the control and unemployment fear condition ($M = 1.74$, SD = 1.15; $t(317) = 1.51$, $p = .132$, $d = .32$). Thus, the unemployment reminder elicited more fear, but not disgust, over the control, whereas the flu reminder elicited significantly more disgust and fear over the control (hypothesis 1a).

Preference. We tested whether the flu news report led to taking greater action toward the threat (hypothesis 1c) and an asymmetric preference for familiar products (hypothesis 2). We had 294 self-identifying North American or European participants and 26 self-identifying Hispanic or Asian participants. Like in study 2, we reverse-coded the pairs of grocery items for participants who self-identified as Asian or Hispanic as the alternative item in the pair would be more familiar to these cultures. To assess whether reading the flu news report changed the number of familiar items in the basket (hypothesis 1c), we used the number of familiar items participants indicated they would be likely to buy on their next shopping trip as our dependent variable of interest. As in study 2, we took the proportion of the basket that was traditional to the participant to assess whether reading the flu news report led to an asymmetric preference for familiar products (hypothesis 2).

To test our predictions, we ran a one-way analysis of variance on these two variables with reminder condition as the predictor, this time contrasting the flu reminder condition against both the control and the unemployment reminder conditions. This analysis revealed an effect on the number of items in the basket ($F(2, 317) = 5.29$, $p = .005$). Participants in the flu reminder condition put significantly *more* items in their baskets ($M = 3.72$, SD = 1.48) than both participants in the control ($M = 3.07$, SD = 1.32; $t(317) = 2.69$, $p = .008$, $d = .46$) and unemployment ($M = 3.27$, SD = 1.39; $t(317) = 2.65$, $p = .008$, $d = .31$) conditions. Thus, participants reading about the flu indicated that they would be likely to choose more of the items on the list than participants reading about unemployment or participants in the control condition.

To explore whether our results replicated study 2, we examined the difference between participant choices in the flu reminder, unemployment, and control conditions. The predicted effect on asymmetric preference for the familiar was significant ($F(2, 316) = 3.49$, $p = .032$). Participants in the flu reminder condition chose a significantly greater proportion of familiar items ($M = 0.67$, SD = 0.21) than both participants in the control ($M = 0.58$, SD = 0.29, $t(316) = 2.28$, $p = .023$, $d = .36$) and unemployment reminder ($M = 0.61$, SD = 0.21; $t(316) = 2.04$, $p = .042$, $d = .29$) conditions, as predicted.

Finally, we assess whether reminder condition influenced restaurant choice. A pretest ($N = 50$, $M_{age} = 34.08$, 46% females) confirmed that the restaurant choices

linearly decreased in familiarity to a North American audience (see web appendix), so we treated restaurant choice as a continuous variable where lower values represent a preference for familiarity. A one-way analysis of variance on restaurant choice with reminder condition as the predictor revealed a marginally significant effect of condition ($F(2, 317) = 2.58$, $p = .077$). The planned contrasts revealed that participants reading about the flu did indeed choose more-familiar restaurants ($M = 2.09$, SD = 1.01) over participants in the control condition ($M = 2.49$, SD = 1.14; $t(317) = 2.27$, $p = .024$). However, participants reading about the flu did not prefer the more-familiar restaurant over participants reading about unemployment ($M = 2.19$, SD = 0.98; $t(317) = 0.81$, $p = .418$). Given that unemployment is often a contentious issue with respect to immigration policy (despite evidence to the contrary; American Immigration Council 2013; Okkerse 2008), it is possible that participants in the unemployment reminder condition were responding to this contention by choosing what they thought was a more local restaurant. While understanding this shift is outside of scope of this work, this explanation is an interesting possibility worthy of future research.

Discussion

The results of study 3 replicated study 2's findings and provided additional evidence for the unique effect of contagious disease cues on consumption behavior using a different negative control condition (unemployment) and a modified basket composition task. In particular, study 3 provides support for the hypothesis that contagious disease cues can increase action toward eliminating the threat (hypothesis 1c) and can asymmetrically increase preference for the familiar (hypothesis 2).

Studies 2 and 3 together provide convergent evidence that cues of contagious disease asymmetrically increase preference for the more familiar over the less familiar, compared to cues that induce fear alone. One remaining issue is that the effect might be driven by disgust alone. We propose that the behavioral response to cues of contagious illness is a joint disgust and fear response that amplifies the behavioral tendency of disgust to avoid and the behavioral tendency of fear to approach comforting familiar products. To assess that both emotional components are necessary to explain the pattern of results, subsequent experiments manipulate whether participants are feeling fear, disgust, neither, or both.

STUDY 4: SALIENCE OF CONTAMINANTS AND OUTCOME UNCERTAINTY

The purpose of study 4 is twofold. First, we assess whether it is indeed the appraisals of salient contaminants and outcome uncertainty causing the joint disgust and fear response—and not other features of the flu specifically—that are driving the behavioral response to contagious disease cues. To do so, we use a different disease (shingles), hold disease constant, and orthogonally manipulate whether news about the disease affords appraisals of salient contaminants and uncertainty over outcomes. Second, we assess the generalizability of our effect to nonfood categories. To do so, we examine preference for a pair of headphones that are either framed as a familiar and trusted brand or as a novel and innovative brand. We expect that when reading about the shingles causes appraisals of outcome uncertainty and makes impurities salient (hypothesis 1a), consumers will show an asymmetric preference for the headphones framed as familiar (hypothesis 2).

Method

Design. Six hundred participants recruited from Amazon's Mechanical Turk were randomly assigned in a 2 (impurities: salient vs. not) × 2 (outcome: certain vs. uncertain) × 2 (product framing: familiar vs. novel) between-subjects design where they read a short scenario about the shingles and then rated a pair of headphones that were framed as familiar or novel.

Manipulating Appraisals. All participants first read a short vignette that asked them to imagine there had been an outbreak of shingles spreading in their city. To manipulate whether the vignette made contaminants salient, half of participants read about the visible symptom that the shingles can cause (blisters, scabs, sweating, nausea) whereas the other half of participants read about the more internal, non-visible symptoms that the shingles can cause (headaches, body chills, muscle aches, fever). A pretest ($N = 51$, $M_{age} = 32.94$, 47.1% females) established that participants considered both sets of symptoms to be equally severe ($M_{visible} = 4.14$ vs. $M_{invisible} = 4.18$; $F(1, 50) = 0.07$, $p = .793$), but thought the visible symptoms made the presence of disease more apparent ($M = 5.66$, SD = 0.95) than the non-visible symptoms ($M = 3.10$, SD = 1.11; $F(1, 50) = 204.68$, $p < .001$, $\eta^2 = .80$).

To manipulate appraisals of uncertainty over outcomes, we capitalized on the common (but false) belief that the shingles is potentially contagious. As established in study 2, if a disease is not contagious, it is certain that the consumer will not catch the illness and should thus not evoke fear. In contrast, if a disease is contagious, there is a level of uncertainty in whether the consumer will become sick. Half of participants read that the shingles were contagious and that a close coworker arrived at work complaining of symptoms. For these participants, the potential risk of catching the shingles provides a source of uncertainty over the outcome that might produce fear. The other half of participants read the truth about shingles: that they are a noncontagious disease caused by harboring a dormant virus.

These participants also read that a close coworker arrived at work complaining of symptoms, but that their doctor had recently told them they did not have the dormant disease.

We ran a pretest ($N = 160$, $M_{age} = 36.98$, 55% females) to establish that the manipulation of uncertainty in these scenarios elicited fear whereas the manipulation of symptom visibility in these scenarios elicited disgust. A two-way ANOVA revealed a significant main effect of symptom visibility on perceived disgust ($F(1, 155) = 123.18$, $p < .001$, $\eta^2 = .44$) such that visible symptoms produced more disgust ($M = 5.83$, SD = 1.23) than non-visible symptoms ($M = 3.18$, SD = 1.75). Importantly, there was no main effect of visibility of symptoms on experienced fear ($M_{visible} = 4.80$ vs. $M_{invisible} = 4.25$, ns). Likewise, the analysis revealed a main effect of outcome control on experienced fear ($F(1, 155) = 38.32$, $p < .001$, $\eta^2 = .20$) such that the potential risk of catching the disease led to more fear ($M = 5.43$, SD = 1.63) than when there was no potential risk ($M = 3.63$, SD = 2.04). Importantly, there was no main effect of outcome control on disgust ($M_{certain} = 4.38$ vs. $M_{uncertain} = 4.68$, ns). Thus, holding disease constant, the salience of impurities made the disease cue more disgusting whereas outcome uncertainty made the disease cue scarier.

Measuring Preference. All participants read about and rated the newest release of Beats headphones. For half of participants, we framed the headphones as familiar and trusted whereas for the other half we framed the headphones as novel and innovative. Participants read:

> These new Beats by Dr. Dre headphones are from one of the [most familiar and trusted/ newest and most innovative] brands of headphones in the world. These Beats use a [long-standing and trusted high-fidelity sound/ innovative and untested bone conductance] technology to provide crisp sound quality and deep, clean bass notes to listeners. [Traditional/Novel], high quality sound – brought to you by Beats.

After reading the information, participants rated the headphones on how much they liked, were interested in learning more about, and their likelihood of buying the headphones on 7-point scales (where 1 = *not at all* to 7 = *very much*). As an attention check, we had participants indicating which brand of headphones they had rated at the end of the study.

Results

Exclusion. Of the 600 participants, 40 cases came from the same geo-locations and were removed due to the suspicion of being fraudulent entries (Kennedy et al. 2018). An additional 46 participants were excluded for indicating suspicion or knowledge about the shingles or for failing to identify the brand of headphones, therefore failing the attention check. The remaining participants ($N = 516$, $M_{age} = 37.69$, 49.6% females) are included in the analysis below.

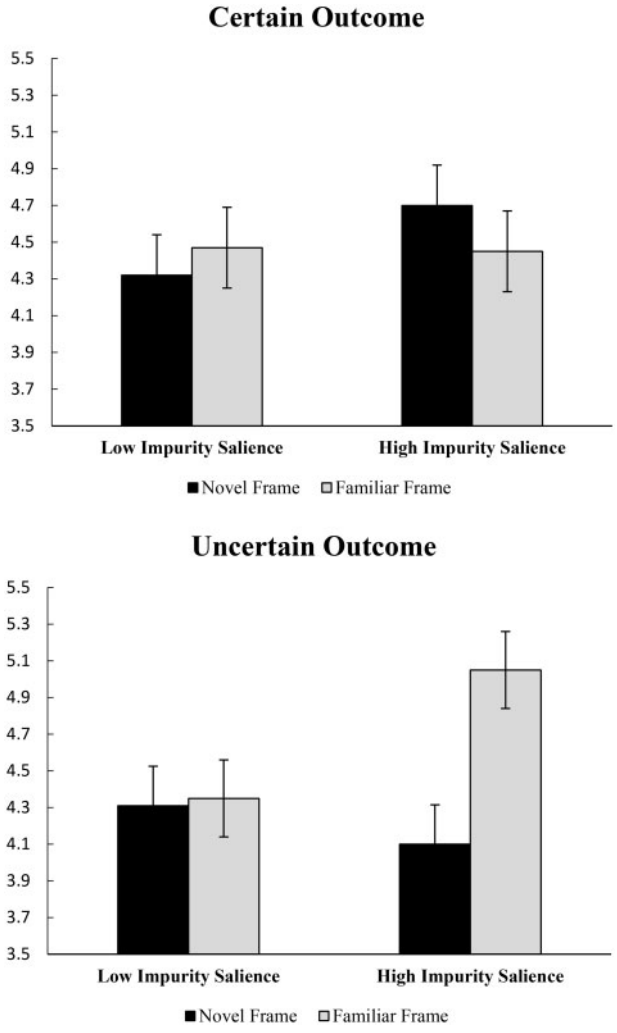
Preference. We expected participants appraising both outcome uncertainty and salient contaminants to show an asymmetric preference for the Beats headphone framed as traditional. To assess this hypothesis, we ran a three-way analysis of variance on the average rating of the three liking items ($\alpha = .91$). None of the lower-order interactions or main effects were significant except for a marginal outcome uncertainty × familiarity interaction ($F(1, 506) = 3.03$, $p = .082$, $\eta^2 = .006$). However, this analysis revealed the predicted three-way outcome uncertainty × contaminant salience × familiarity interaction ($F(1, 506) = 4.28$, $p = .039$, $\eta^2 = .008$). This interaction was such that when the outcome was known and certain (no possibility of catching shingles), there were no main effects of impurity salience or familiarity on preferences (*p*s > .387). However, when there was a risk of catching the shingles, we found a significant main effect of familiarity ($F(1, 506) = 5.28$, $p = .022$, $\eta^2 = .010$) such that participants experiencing outcome uncertainty preferred the familiar headphones ($M = 4.70$, SD = 1.77) to the novel headphones overall ($M = 4.20$, SD = 1.80). This main effect was qualified by the predicted contaminant salience × familiarity interaction ($F(1, 506) = 4.36$, $p = .038$, $\eta^2 = .016$). As is evident in figure 2, planned contrasts revealed that when the outcome was uncertain but contaminants were not salient, participants liked the headphones equally regardless of whether they were framed as familiar ($M = 4.35$, SD = 1.81) or novel ($M = 4.31$, SD = 1.80; $F(1, 506) = 0.22$, $p = .882$). It was only when the outcome was uncertain *and* when contaminants were salient that participants demonstrated a significant asymmetric preference for the headphones framed as familiar ($M = 5.05$, SD = 1.65) over the headphones framed as novel ($M = 4.10$, SD = 1.81; $F(1, 506) = 9.64$, $p = .002$, $\eta^2 = .019$).

Discussion

Study 4 provides convergent evidence that cues of contagious disease asymmetrically increase preference for the familiar through the appraisals these cues afford. We replicate our core effect while holding disease constant and orthogonally manipulating the appraisals that cues about the disease allow. When the contagious disease cue made contaminants salient, it elicited disgust, and when the cue made the outcome appear uncertain, it elicited fear. These two appraisals together caused the joint fear and disgust response in consumers, which lead to the unique behavioral tendency to asymmetrically value the familiar. Study 4, consistent with the empirical analysis of the household data, provides evidence that this effect extends beyond culturally bound or food-related items. Thus, the joint fear

FIGURE 2

BOTH APPRAISALS OF OUTCOME UNCERTAINTY AND CONTAMINANT SALIENCE LEAD TO ASYMMETRIC PREFERENCES FOR FAMILIAR HEADPHONES.



and disgust response to contagious disease cues increases preference for the familiar irrespective of the xenophobia or cultural preference that past research on disgust has shown.

STUDY 5: THE MEDIATING ROLE OF PERCEIVED CONTROLLABILITY

We propose that, when consumers feel that a threat is imminent and that the outcome is uncertain and beyond their control, consumers take actions to restore control (hypotheses 1b and 1c). To assess this possibility, in study 5, we use the same manipulation of contaminant salience and outcome uncertainty as study 4, measure participants' perceptions of controllability over outcomes, and have participants engage in the basket composition task used in study 3. We expect that perceived control over outcomes will be lowest when people are feeling both disgusted and afraid (hypothesis 1b) and that this perceived lack of control will mediate the relationship between emotion and subsequent preference for the familiar (hypothesis 2).

Method

Design. We recruited 240 participants from Amazon's Mechanical Turk and assigned them randomly in a 2 (contaminants: salient vs. not) × 2 (outcome: certain vs. uncertain) between-subjects design where they read a short scenario about the shingles and then completed a basket composition task.

Manipulating Appraisals. We manipulated appraisals using the same set of vignettes as study 4 where participants read about the shingles. To manipulate disgust, we altered whether the disease was described as producing very visible contamination symptoms (e.g., vomiting) or invisible symptoms (e.g., fever) and therefore whether contaminants were salient. To manipulate fear, we altered whether the disease was contagious (and therefore getting sick was uncertain) or not contagious (thus participants were certain they would not get sick).

Measuring Perceived Controllability. We measured perceived control over outcomes using a three-item scale adapted from Kushner et al. (1993). These items included "I always control whether or not bad things happen to me," "When bad things happen, I can always make things come out the way I want them to," and "No matter what happens, I am always in control of my situation" (all measured on 7-point scales where 1 = "strongly disagree" to 7 = "strongly agree;" $\alpha = .90$). The presentation of the perceived control measure was counterbalanced with the presentation of the basket composition-dependent variable to account for any order effects.

Measuring Preference for Familiarity. To measure preference for familiarity, we used the same unconstrained basket composition task used in study 3 wherein participants were asked to choose which items they would be most likely to buy from a list of 20 grocery items. The items were actually 10 pairs of products where one product was more familiar to a Western audience than the other (e.g., Frank's Red Hot vs. Sriracha). We expected that participants feeling both disgusted and afraid would put more-familiar items in their baskets than participants feeling either emotion alone (hypothesis 2). The survey concluded with demographics and an attention check asking participants to select which disease they had just read about.

Results

Exclusion. Of the 240 participants, the data from 21 were removed for indicating knowledge about the shingles, failing the attention check, or were from duplicate geolocations tagged as potentially fraudulent. The remaining participants ($N = 219$, $M_{age} = 34.69$, 32% females) are represented in all analyses below.

Basket Composition. In line with prior studies, six participants indicated that they were from East Asian or Hispanic cultures and we reverse-coded familiarity for these participants. We ran a two-way ANOVA predicting the number of familiar items in the basket. This analysis revealed a significant main effect of contaminant salience ($F(1, 215) = 4.45$, $p = .036$, $\eta^2 = .020$) such that people feeling disgusted put significantly more-familiar items in their baskets ($M = 6.16$, SD = 2.19) than people not feeling disgusted ($M = 5.49$, SD = 2.45). However, replicating study 3, this main effect was qualified by a marginal contaminant salience × outcome uncertainty interaction ($F(1, 215) = 3.21$, $p = .075$, $\eta^2 = .015$). Given that our contrasts were planned, it is appropriate to conduct them despite the fact that the omnibus test did not achieve conventional levels of statistical significance (Hsu 1996; see also Hancock 1997 for discussion). These planned contrasts revealed that when the outcome was certain, people chose the same number of familiar items whether the symptoms were disgusting ($M = 5.82$, SD = 2.21) or not ($M = 5.72$, SD = 2.30; $F(1, 215) = 0.05$, $p = .823$, $\eta^2 = .000$). In contrast, when the outcome was uncertain, people put significantly more-familiar items in their basket when the symptoms were also disgusting ($M = 6.44$, SD = 2.14) than when the symptoms were not ($M = 5.22$, SD = 2.60; $F(1, 215) = 7.66$, $p = .006$, $\eta^2 = .034$). We ran this same analysis on the proportion of familiar items in the basket and found the same pattern of results (details are available in web appendix).

Perceived Controllability. We expected that participants would feel like they most lacked control when they were feeling both disgusted and afraid. To assess this possibility, we ran a two-way ANOVA predicting perceived controllability. This analysis revealed a marginal main effect of outcome uncertainty on perceived controllability such that when the outcome was uncertain, people felt like it was also less controllable ($M = 3.69$, SD = 1.37) than when the outcome was certain ($M = 4.03$, SD = 1.61; $F(1, 215) = 3.07$, $p = .081$, $\eta^2 = .014$). Important to our core hypothesis, this main effect was qualified by an outcome uncertainty × contaminant salience interaction ($F(1, 215) = 3.22$, $p = .074$, $\eta^2 = .015$). This interaction was such that when the symptoms were not disgusting, there were no significant differences in perceived controllability whether the outcome was certain ($M = 3.81$, SD = 1.72) or uncertain ($M = 3.82$, SD = 1.31; $F(1, 215) = 0.001$, $p = .976$, $\eta^2 = .000$). In contrast, when the symptoms were disgusting, people felt like they had significantly less control over outcomes when the outcome was uncertain ($M = 3.58$, SD = 1.42) than when it was certain ($M = 4.30$, SD = 1.44; $F(1, 215) = 6.20$, $p = .014$, $\eta^2 = .028$). Thus, participants felt like they had the least control over outcomes when they were feeling both disgusted and afraid.

Mediation. To check whether perceived controllability mediated the relationship between emotion and basket composition choices, we ran a moderated mediation model where we predicted share of familiar items in the basket by outcome uncertainty and contamination salience, mediated by perceived controllability (Hayes 2012; model 7; 5,000 draws). This analysis revealed a significant index of moderated mediation, 95% CI [0.001; 0.018]. Supporting hypotheses 1b and 2, feeling both disgusted and afraid reduced perceived control over outcomes (hypothesis 1b), which subsequently increased the share of familiar products participants indicated they would purchase (hypothesis 2; full mediation results are available in the web appendix).

Discussion

Study 5 examines the mechanism underlying the joint disgust and fear response on subsequent behavior. We argued that experiencing disgust and fear together in response to contagious cues makes the threat seem imminent, increasing perceived lack of control over outcomes, which increases preference for the familiar. Our results support our prediction.

STUDY 6: ASSESSING BEHAVIOR ACROSS THE UNITED STATES

So far, we have demonstrated that contagious disease cues elicit fear and disgust, highlighting a lack of control over outcomes, so consumers asymmetrically prefer the familiar over the unfamiliar. We have shown this effect across four product categories in the Nielsen consumer panel data. In study 6, we use the same disease index as study 1 alongside the Nielsen retail scanner data to examine how preferences shift across the country.

Data Treatment

An Index of Disease Presence. We use the same time period (6 years: January 2009–December 2014) and disease index used in study 1.

Measuring Sales of Familiar and Non-Familiar Products. The Nielsen retail scanner data is a very large data set. To maintain a feasible amount of computing power required for the analysis, we limit our analysis to one within-brand comparison and one within-category comparison. For consistency with study 1, we analyzed

unit sales from one national cookie brand (OREOs) and one entire product category (canned soup) across more than 35,000 retail outlets in the United States.[1]

We do not have individuals' shopping histories on which to build an individualized familiarity variable in this data set, so we operationalize familiarity in this analysis by using the market leader in the category as the familiar brand. In the soup category, we used sales of the market-leading national brand (Campbell's) as familiar and sales of any private label product as less familiar. We coded sales of the traditional OREO as familiar and sales of any product with additional attributes beyond the standard OREO (e.g., different flavors, coatings, or stuffing) as less familiar.

For both the within-category and within-brand comparison, we calculated the total unit sales in a week across all retailers in a particular state. This aggregation provided us with four sales values for each week in each state: two for the within-category comparison [the total units of Campbell's sold (familiar category) vs. the total units of private label soup sold (non-familiar category)] and two for the within-brand comparison [the total units of standard OREOs sold (familiar brand) vs. the total units of nonstandard OREOs sold (non-familiar brand)]. The resulting data set had 30,576 observations: 312 weeks of data $\times$ 49 states $\times$ 2 types of familiarity.

Model and Controls. To test whether our disease index revealed asymmetries in consumer choices, we used a multilevel-modeling framework with restricted maximum likelihood estimation (Bates et al. 2015). We ran our analysis of the within-brand and within-category comparisons separately because we predicted that soup would generally increase in sales as people became sicker and did not want to generalize this effect to the within-brand comparison. The model of interest for each comparison included the effect of the illness index, the effect of familiarity, and their interaction controlling for state, border, seasonality, and time effects (see study 1). We report the core effects of interest in the model results section below, but methodological details including data access instructions are found in the web appendix.

Results

Canned Soup. The model revealed an effect of illness such that as illness increased, people bought more soup on average ($\beta = .08$, SE $= 0.009$, $t = 9.41$, $p < .001$). Likewise, given that Campbell's is the national brand and therefore more popular, there was an effect of familiarity such that people bought fewer non-familiar products than familiar products on average ($\beta = -.32$, SE $= 0.008$, $t = -39.31$, $p < .001$). However, both of these effects were qualified by a significant familiarity $\times$ illness interaction ($\beta = -.08$, SE $= 0.002$, $t = -45.20$, $p < .001$). This interaction is pictured in figure 3 and indicates that in line with the hypothesis, people asymmetrically preferred Campbell's national brand and asymmetrically punished private label brands when they feared getting sick. While soup sales generally increased as people became sicker, a 10% increase in illness was associated with a 1.6% increase in soup sales for familiar brands but only a 0.1% increase in soup sales for non-familiar brands. The average price for a can of private label soup is \$1.39 and the average weekly volume is 77,898 units per state. A back of the envelope calculation would indicate that, for every 10% increase in illness, private labels are selling 28,712 fewer units, losing \$39,910 in revenue per week across the United States than they would have in a world where an asymmetric preference for the familiar did not exist. Similarly, the average price for a can of Campbell's soup is \$1.89 and the average weekly volume in this time period is 229,131 units per state. By these same calculations, for every 10% increase in illness, Campbell's is benefitting from 84,453 more units sold and \$159,616 in revenue per week across the United States than they would have if people did not demonstrate this asymmetric preference.

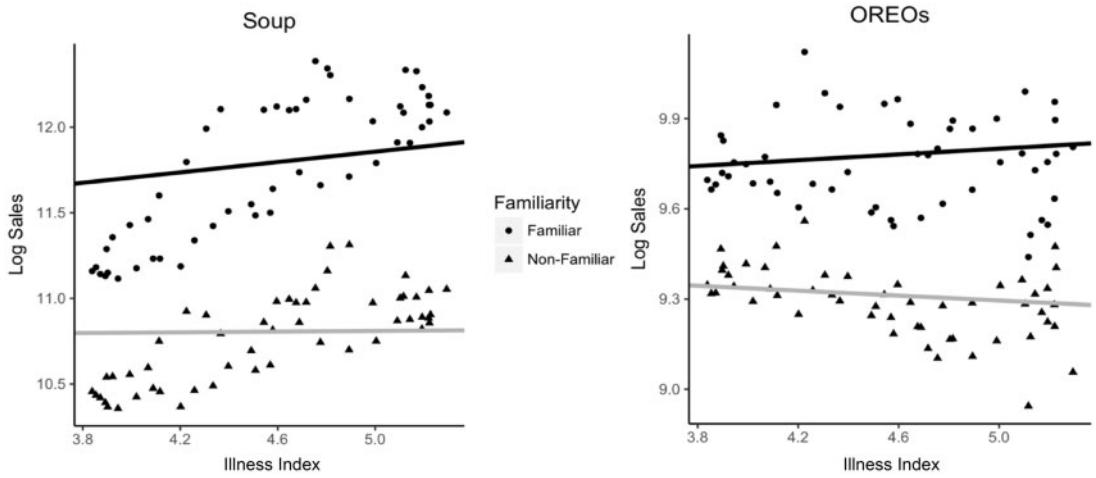
OREOs. The pattern of results for OREOs was largely the same as that for canned soup except the analysis did not reveal the same effect of illness on sales on average ($\beta = .01$, SE $= 0.007$, $t = 1.31$, ns). However, there was a significant familiarity $\times$ illness interaction ($\beta = -.05$, SE $= 0.001$, $t = -35.71$, $p < .001$). As with canned soup, people showed an asymmetric preference toward the familiar OREOs compared to the non-familiar OREOs when they feared getting sick. A 10% increase in illness was associated with a 0.61% *increase* in unit sales of familiar OREOs but a 0.44% *decrease* in unit sales for non-familiar OREOs. Given that a package of non-familiar OREOs retails for \$3.05 and they sell on average 17,879 units per week per state, for every 10% increase in illness, OREO loses \$11,807 in revenue per week across the United States than they would have in a world where this asymmetric preference did not exist. However, OREO has a net benefit from this asymmetric preference for the familiar because they sell more-familiar than non-familiar units in general. This asymmetric increase in preference means that for every 10% increase in illness, OREO earns an additional \$27,394 per week on sales of traditional OREOs.

Replicating the pattern of results within the OREO brand is important because OREOs are not a product commonly associated with the flu. It is possible that the asymmetric preference for Campbell's was not due to people switching

1 All results calculated (or derived) based on data from The Nielsen Company (US), LLC, and marketing databases provided by the Kilts Center for Marketing Data Center at The University of Chicago Booth School of Business. Copyright © 2018 The Nielsen Company (US), LLC. All Rights Reserved. The conclusions drawn from the Nielsen data are those of the researchers and do not reflect the views of Nielsen. Nielsen is not responsible for, had no role in, and was not involved in analyzing and preparing the results reported herein.

FIGURE 3

THE EFFECT OF PATHOGEN PRESENCE ON SALES VOLUME OF FAMILIAR AND LESS-FAMILIAR SKUS ACROSS CANNED SOUP AND OREO CATEGORIES.



Note: Data points represent average weekly unit sales of familiar and non-familiar products. Full analysis was run on raw data, and lines are fit lines from the multilevel model after accounting for the influence of the controls, and therefore capture the unique effect of illness presence on sales. For this reason, we did not expect the fit lines to capture the individual data points. Soup sales share greater seasonality with the flu than OREO sales, so it makes sense that the actual model fit is more conservative than the raw correlation not including controls.

preference, but rather due to new, less frequent consumers of soup entering the market when they are sick (e.g., customers who only buy soup when they are sick and buy Campbell's simply because they have less expertise in the category and therefore default to the national brand). It is less likely (both conceptually and empirically given the lack of a main effect of illness on OREO sales in this analysis) that there exists a parallel segment of consumers who only buy OREOs when they have the flu and prefer traditional OREOs over nontraditional OREOs because they are less familiar with the category. Instead, we can infer from the increase in unit sales of familiar and decrease in unit sales of non-familiar OREOs that there is indeed some amount of consumer switching away from the non-familiar and toward the familiar when people are afraid of becoming sick.

Discussion

Across two product categories, one within-category comparison and one within-brand comparison, the present analysis indicates that the presence of illness can systematically alter consumer behavior in a very real way that is practically relevant to marketers. While an empirical analysis lacks a direct measure of consumer emotion, taken together with the results of the laboratory experiments, the present analysis clearly highlights that cues of contagious disease can have real consequences on shopping habits and product choice.

GENERAL DISCUSSION

Across two large empirical data analyses and four experiments, we find that cues of contagious disease have a meaningful and systematic impact on consumption behavior. Our results suggest that cues of contagious disease evoke appraisals of outcome uncertainty and appraisals of salient contaminants, leading to a joint fear and disgust response in consumers. The joint disgust and fear response amplifies the unique behavioral tendencies of each emotion, producing an asymmetric preference for familiar products and sometimes increasing purchase quantity overall. Unlike disgust alone, which motivates rejection of the contaminant, feeling fear and disgust motivates consumers to seek familiar and helpful products to reestablish a sense of control. Unlike fear alone, which can lead to inaction, feeling disgust and fear together motivates taking action, amplifying the tendency to regain control, and resulting in an asymmetric preference for more-familiar alternatives.

Our findings contribute meaningfully to understanding how emotions and mixed emotional states can influence consumption behavior. Most prior research on contagious cues examines the role of disgust specifically on consumption behavior (Han et al. 2012; Lerner et al. 2004). Likewise, most prior research on emotions has studied

situations where discrete emotions diverge and how they individually impact behavioral tendencies (Lerner and Keltner 2001; Lerner et al. 2004). Little research, however, examines the behavioral consequences of situations in which people feel both disgust and sadness or both anger and fear. While the common notion might be that these emotions contribute discretely to behavior, here we contribute to the literature showing that there can be unique and emergent behavioral tendencies when multiple emotions converge. Cues of contagious disease—by eliciting both fear and disgust—amplify the behavioral tendencies of each emotion and result in an emergent asymmetric preference for the familiar. These behavioral tendencies cannot be explained by an understanding of fear or disgust, alone. Instead, our results suggest that understanding how consumers feel emotions simultaneously and how different emotions interact can reveal the behavioral tendencies that emerge from feeling these emotions.

We explore how fear—as an additional response to the well-known disgust response—can alter the impact of contagious cues on consumption behavior. Many other moderators, however, may influence the relative strength of each emotion. For example, an extremely salient impurity (e.g., if a consumer can feel the commuter's sneeze on their skin) might increase the strength of the disgust response relative to the fear response. Likewise, if a consumer is high in trait anxiety or has a really important interview in the following day and cannot afford to get sick, then perhaps the uncertainty a contagious cue provokes might outweigh the disgust response. In cases such as these, whether the disgust response might sometimes dominate the fear response and potentially reduce consumption remains an interesting question. A related question for future research is whether there is an order-of-entry effect of different emotions. For example, some research has suggested that disgust is an immediate and focalized response to a specific threat, whereas fear—because of the inherent uncertainty in its experience—is a more generalized response to a potential threat (Krusemark and Li 2011; Neuberg et al. 2011; Susskind et al. 2008). These differences might mean that certain emotions happen faster and last for shorter durations than others, and these differences might influence the time window in which we observe the unique behavioral tendencies of joint emotional states. Finally, it is noteworthy that our results found few main effects of fear on preference. This finding highlights past research showing that the initial behavioral response to fear is inaction in service of isolating and identifying the threat (Blanchard et al. 2011). Here, we show that disgust can play a role in providing certainty about the source of the threat, spurring action. However, it would be interesting to explore what factors in other studies led fear to result in action. Exploring these questions is outside of the scope of this article but provides a fruitful avenue for future research.

Beyond suggesting that mixed emotions can have unique behavioral tendencies and calling for an increased effort in understanding joint emotional states, our findings suggest that the specific appraisal dimensions that differentiate between discrete emotions in the laboratory might be thought of differently when consumers name and assess their own emotional experience in daily life. For example, past research has shown that consumers can isolate disgust from fear on the basis of the appraisal dimension of uncertainty: people call how they are feeling "fear" when the situation is uncertain, whereas they call how they are feeling "disgust" when the situation is certain (Ellsworth and Smith 1988). Situations often have multiple and conflicting sources of information that can influence these appraisals (e.g., certainty that there are impurities present and uncertainty in whether the disease is infectious), and instead of making tradeoffs to name a specific discrete emotion, the present research demonstrates that people can and do integrate the information into a joint emotional state. In other words, people can feel disgust while feeling uncertain and can feel fear despite some situational certainty. While it is useful to understand what differentiates the discrete emotions when studying them in isolation, our findings provide evidence that the real experience of emotion is often much more complex and nuanced and discrete appraisal dimensions might not be as diagnostic of emotional experience. Understanding the dynamics of joint emotional states is critical to understanding how the holistic assessment of emotion might influence behavioral tendencies and consumption behavior.

One lingering issue of interest concerns how consumers perceive comfort foods and products in response to contagious disease cues. In studies 1 and 6, we found that the increase in sales held both for products that help combat the threat like soup, and also for comforting products like cookies. Likewise, during the COVID-19 pandemic, in addition to items that help control outcomes directly such as hand sanitizer, hand soap, and respirator masks, comfort foods seemed to also be in high demand. For instance, one reporter noted that beer and Doritos seemed to be finding more and more of an "essential" place in the grocery carts of consumers (Bubacz 2020). One potential explanation could be that comfort foods help consumers restore a sense of control in a different way: by providing solace that everything will be okay. However, this preference for comfort foods could be driven by an entirely different coping mechanism. A supplemental experiment (available in the web appendix) manipulated whether products were framed as helping to control outcomes and found that our effect only held when the product was designed to help consumers regain a sense of control. While this provides support for the mechanism of perceived control, it remains to be seen whether or how other methods of restoring control (perhaps comfort foods) might influence the effect. Future research might wish to explore the mechanisms behind

why comforting products seem to be in high demand when consumers are confronted with contagious disease cues.

Our results have important implications for marketing practitioners. Many contagious diseases share the same seasonal patterns as the flu, wherein people are usually sicker in the winter than they are in the summer months. The present research suggests that understanding this seasonality might be important for promotion decisions and message framing. In particular, if a product is novel, marketers might be better served promoting the product in the summer months when people are less likely to encounter contagious cues and are more receptive to novelty. If a product is familiar, marketers might be better served promoting in the winter months when people are likely to consume more, overall, and asymmetrically favor these familiar products. In addition, the present research suggests that marketers frame messaging in a way that highlights the familiar and trusted aspects of a new product in the winter months and save highlighting the novel features of the product for the summer months when consumers are less likely to encounter a contagious disease cue.

The present research also provides a foundation for future research on the influence of contagious cues on social behavior in general. For instance, studies 2, 3, and 5 demonstrate that people prefer culturally familiar products after reading about contagious illness. Might it also be true that consumers show an asymmetric preference toward culturally familiar people when making hiring decisions, or show stricter immigration policy preferences when asked about their political views after encountering a contagious disease cue? This is one potential way in which consumer prejudice in general, beyond country and origin issues, may be influenced or amplified by the presence of contagious cues. Research supports this notion. Regions with historically higher pathogen prevalence promote societies with increased collectivist behaviors such as ethnocentrism and conformity in service of reducing the spread of disease (Fincher et al. 2008). Likewise, during the recent COVID-19 pandemic, some French grocers switched to selling exclusively French produce (Bertrand 2020). Perhaps cues of contagious disease—because of the emotions they elicit beyond the historic presence of disease—might also systematically amplify collectivist motives and increase ethnocentrism and conformity behaviors. Indeed, cues of contagious disease might have a systematic influence in many domains of social, political, and economic life. Understanding these influences is a fruitful avenue for future research.

DATA COLLECTION INFORMATION

The first author received authorization for access to Google Flu Trends in May 2016 under the supervision and permissions of the second author. The first author scraped the data from the CDC FluView Interactive service in July 2016. The first author aggregated and analyzed these data along with the Nielsen retail scanner data under the guidance of the second and third authors between September 2016 and September 2017. The first author received authorization for access to the Nielsen consumer panel data along with the retail scanner data in July 2016. The consumer panel data were analyzed by the first author under the guidance of the second and third authors between September and December 2018. The first author designed, collected, and analyzed studies 2 and 3 under the guidance and feedback of the second and third authors between May and December 2017. Study 4 was collected and analyzed between August and November 2018. Study 5 was collected and analyzed between November and December 2019. These experimental data were shared and discussed on multiple occasions by all authors.

REFERENCES

American Immigration Council (2013), "The Economic Blame Game: Immigration and Unemployment," *Immigration and Unemployment Fact Sheet*. https://www.americanimmigrationcouncil.org/research/economic-blame-game-immigration-and-unemployment. Accessed June 2, 2020.

Anderson, Adam K., Kalina Christoff, David Panitz, Eve De Rosa, and John D. E. Gabrieli (2013), "Neural Correlates of the Automatic Processing of Threat Facial Signals," *Social Neuroscience: Key Readings*, 23 (13), 185–98.

Bates, Douglas, Martin Mächler, Ben Bolker, and Steve Walker (2015), "Fitting Linear Mixed-Effects Models Using Lme4," *Journal of Statistical Software*, 67 (1), 1–48.

Berry, J. W. and Rudolf Kalin (1995), "Multicultural and Ethnic Attitudes in Canada: An Overview of the 1991 National Survey," *Canadian Journal of Behavioural Science/Revue Canadienne Des Sciences du Comportement*, 27 (3), 301–20.

Bertrand, Philippe (2020), "Les Supermarchés Basculent Vers 100 % de Fruits et Légumes Français," *Les Echos*, March 24, https://www.lesechos.fr/industrie-services/conso-distribution/les-supermarches-basculent-vers-100-de-fruits-et-legumes-francais-1188359. Accessed June 2, 2020.

Blanchard, D. Caroline, Guy Griebel, Roger Pobbe, and Robert J. Blanchard (2011), "Risk Assessment as an Evolved Threat Detection and Analysis Process," *Neuroscience & Biobehavioral Reviews*, 35 (4), 991–8.

Bornstein, Robert F., Amy R. Kale, and Karen R. Cornell (1990), "Boredom as a Limiting Condition on the Mere Exposure Effect," *Journal of Personality and Social Psychology*, 58 (5), 791–800.

Brehm, J. W. (1966), *A Theory of Psychological Reactance*, New York, NY: Academic Press.

Bubacz, Kate. (2020), "Take a Look at What People Have Bought to Prepare for the Coronavirus Outbreak," *BuzzFeed News*, March 16. https://www.buzzfeednews.com/article/katebubacz/beer-doritos-coronavirus-essentials-groceries. Accessed June 2, 2020.

Campbell, Courtney and Shayna Murphy. (2020), "These 10 Household Essentials Are Selling Out—Here's Where You Can Still Get Them," *USA Today*. https://www.usatoday.com/story/tech/reviewedcom/2020/03/30/where-buy-sold-

out-household-essentials-toilet-paper-hand-sanitizer-disinfectant-wipes-and-more/5087376002/. Accessed June 2, 2020.

Coleman, Nicole Verrochi, Patti Williams, Andrea C. Morales, and Andrew Edward White (2017), "Attention, Attitudes, and Action: When and Why Incidental Fear Increases Consumer Choice," *Journal of Consumer Research*, 44 (2), 283–312.

Di Muro, Fabrizio, and Theodore J. Noseworthy (2013), "Money Isn't Everything, but it Helps if it Doesn't Look Used: How the Physical Appearance of Money Influences Spending," *Journal of Consumer Research*, 39 (6), 1330–42.

Dutta, Sunasir, and Hayagreeva Rao (2015), "Infectious Diseases, Contamination Rumors and Ethnic Violence: Regimental Mutinies in the Bengal Native Army in 1857 India," *Organizational Behavior and Human Decision Processes*, 129, 36–47.

Ekman, P, R. Levenson, and W. Friesen (1983), "Autonomic Nervous System Activity Distinguishes among Emotions," *Science*, 221 (4616), 1208–10.

Ellsworth, Phoebe C. and Craig A. Smith (1988), "From Appraisal to Emotion: Differences among Unpleasant Feelings," *Motivation and Emotion*, 12 (3), 271–302.

Faraji-Rad, Ali, Shiri Melumad, and Gita Venkataramani Johar (2017), "Consumer Desire for Control as a Barrier to New Product Adoption," *Journal of Consumer Psychology*, 27 (3), 347–54.

Fincher, Corey L., Randy Thornhill, Damian R. Murray, and Mark Schaller (2008), "Pathogen Prevalence Predicts Human Cross-Cultural Variability in Individualism/Collectivism," *Proceedings of the Royal Society B: Biological Sciences*, 275 (1640), 1279–85.

Galoni, Chelsea and Theodore J. Noseworthy (2015), "Does Dirty Money Influence Product Valuations?," *Journal of Consumer Psychology*, 25 (2), 304–10.

Gray, Jeffrey A. (1987), *The Psychology of Fear and Stress*, 5th ed., New York, NY: CUP Archive.

Gross, Terry. (2020), "'All of this Panic Could Have Been Prevented': Author Max Brooks On COVID-19," *National Public Radio*, March 24. https://www.npr.org/2020/03/24/820601571/all-of-this-panic-could-have-been-prevented-author-max-brooks-on-covid-19. Accessed June 2, 2020.

Haidt, Jonathan, Clark McCauley, and Paul Rozin (1994), "Individual Differences in Sensitivity to Disgust: A Scale Sampling Seven Domains of Disgust Elicitors," *Personality and Individual Differences*, 16 (5), 701–13.

Han, Seunghee, Jennifer S. Lerner, and Richard Zeckhauser (2012), "The Disgust-Promotes-Disposal Effect," *Journal of Risk and Uncertainty*, 44 (2), 101–13.

Hancock, Greg. (1997), "Re: Omnibus F Test," http://www.math.yorku.ca/Who/Faculty/Monette/Ed-stat/0525.html. Accessed June 2, 2020.

Hauck, Grace, Lorenzo Reyes, and Jorge L. Ortiz. (2020), "'Stay Home, Stay Healthy': These States Have Ordered Residents to Avoid Nonessential Travel amid Coronavirus," *USA Today*, March 29, https://www.usatoday.com/story/news/nation/2020/03/21/coronavirus-lockdown-orders-shelter-place-stay-home-state-list/2891193001/. Accessed June 2, 2020.

Hayes, Andrew F. (2012), "PROCESS: A Versatile Computational Tool for Observed Variable Mediation, Moderation, and Conditional Process Modeling [White Paper]," 1–39. http://claudiaflowers.net/rsch8140/Hayesprocess.pdf.

Hsu, Jason C. (1996), *Multiple Comparisons: Theory and Methods*, Boca Raton, FL: Chapman & Hall/CRC.

Ivanova, Irina and Thom Craver. (2020), "Closed Due to Coronavirus: List of Activities and State Shutdowns over COVID-19 Outbreak Concerns," *CBS News*, March 18, https://www.cbsnews.com/news/closed-due-to-coronavirus-list-of-activities-and-state-shutdowns-over-covid-19-outbreak-concerns/. Accessed June 2, 2020.

Izard, C. E. (1977), *Human Emotions*, New York, NY: Plenum.

Jacobs, Andrew, Matt Richtel, and Mike Baker. (2020), "'At War With No Ammo': Doctors Say Shortage of Protective Gear Is Dire," *New York Times*, March 19. https://www.nytimes.com/2020/03/19/health/coronavirus-masks-shortage.html. Accessed June 2, 2020.

Kennedy, Ryan, Scott Clifford, Tyler Burleigh, Philip D. Waggoner, Ryan Jewell, and Nicholas Winter. (2018), "The Shape of and Solutions to the MTurk Quality Crisis," Available at SSRN 3272468.

Krusemark, Elizabeth A. and Wen Li (2011), "Do All Threats Work the Same Way? Divergent Effects of Fear and Disgust on Sensory Perception and Attention," *Journal of Neuroscience*, 31 (9), 3429–34.

Kushner, Matt G., David S. Riggs, Edna B. Foa, and Suzanne M. Miller (1993), "Perceived Controllability and the Development of Posttraumatic Stress Disorder (PTSD) in Crime Victims," Behaviour Research and Therapy, 31 (1), 105–10.

Lammers, Joris, Janka I. Stoker, Floor Rink, and Adam D. Galinsky (2016), "To Have Control over or to Be Free from Others? The Desire for Power Reflects a Need for Autonomy," *Personality and Social Psychology Bulletin*, 42 (4), 498–512.

Lazarus, Richard S (1991), "Cognition and Motivation in Emotion," *American Psychologist*, 46 (4), 352–67.

Lee, Spike and Phoebe C. Ellsworth (2013), "Maggots and Morals: Physical Disgust Is to Fear as Moral Disgust is to Anger," in *Components of Emotional Meaning: A Sourcebook*, ed. Johnny J. R. Fontaine, Klaus R. Scherer, and Cristina Soriano, Oxford, UK: Oxford University Press, 271–80.

Lerner, Jennifer S. and Dacher Keltner (2000), "Beyond Valence: Toward a Model of Emotion-Specific Influences on Judgement and Choice," *Cognition & Emotion*, 14 (4), 473–93.

—— (2001), "Fear, Anger, and Risk," *Journal of Personality and Social Psychology*, 81 (1), 146–59.

Lerner, Jennifer S., Deborah A. Small, and George Loewenstein (2004), "Heart Strings and Purse Strings: Carryover Effects of Emotions and Economic Decisions," *Psychological Science*, 15 (5), 337–41.

Lerner, Jennifer S. and Larissa Z. Tiedens (2006), "Portrait of the Angry Decision Maker: How Appraisal Tendencies Shape Anger's Influence on Cognition," *Journal of Behavioral Decision Making*, 19 (2), 115–37.

Lerner, Jennifer S, Roxana M. Gonzalez, Deborah A. Small, and Baruch Fischhoff (2003), "Effects of Fear and Anger on Perceived Risks of Terrorism: A National Field Experiment," *Psychological Science*, 14 (2), 144–50.

Marks, Isaac M. and Randolph M. Nesse (1994), "Fear and Fitness: An Evolutionary Analysis of Anxiety Disorders," *Ethology and Sociobiology*, 15 (5–6), 247–61.

Marzillier, Sarah L. and Graham C. L. Davey (2005), "Anxiety and Disgust: Evidence for a Unidirectional Relationship," *Cognition & Emotion*, 19 (5), 729–50.

Morales, Andrea C., Eugenia C. Wu, and Gavan J. Fitzsimons (2012), "How Disgust Enhances the Effectiveness of Fear Appeals," *Journal of Marketing Research*, 49 (3), 383–93.

Morales, Andrea C. and Gavan J. Fitzsimons (2007), "Product Contagion: Changing Consumer Evaluations through Physical Contact with 'Disgusting' Products," *Journal of Marketing Research*, 44 (2), 272–83.

Nemeroff, Carol, and Paul Rozin (1994), "The Contagion Concept Adult Thinking in the United States: Transmission of Germs and of Interpersonal Influence," *Ethos*, 22 (2), 158–86.

Neuberg, Steven L., Douglas T. Kenrick, and Mark Schaller (2011), "Human Threat Management Systems: Self-Protection and Disease Avoidance," *Neuroscience & Biobehavioral Reviews*, 35 (4), 1042–51.

Okkerse, Liesbet (2008), "How to Measure Labour Market Effects of Immigration: A Review," *Journal of Economic Surveys*, 22 (1), 1–30.

Park, C. Whan and V. Parker Lessig (1981), "Familiarity and Its Impact on Consumer Decision Biases and Heuristics," *Journal of Consumer Research*, 8 (2), 223.

Raghunathan, Rajagopal and Michel Tuan Pham (1999), "All Negative Moods Are Not Equal: Motivational Influences of Anxiety and Sadness on Decision Making," *Organizational Behavior and Human Decision Processes*, 79 (1), 56–77.

Rothbaum, Fred, John R. Weisz, and Samuel S. Snyder (1982), "Changing the World and Changing the Self: A Two-Process Model of Perceived Control," *Journal of Personality and Social Psychology*, 42 (1), 5–37.

Rozin, Paul and Jonathan Haidt (2013), "The Domains of Disgust and Their Origins: Contrasting Biological and Cultural Evolutionary Accounts," *Trends in Cognitive Sciences*, 17 (8), 367–8.

Rozin, Paul, Jonathan Haidt, and Clark McCauley. (2008), "Disgust," in *Handbook of Emotions*, ed. M. Lewis, J. M. Haviland-Jones, and Lisa Feldman Barrett, New York, NY: Guilford Press, 757–76.

Rozin, Paul, Linda Millman, and Carol Nemeroff (1986), "Operation of the Laws of Sympathetic Magic in Disgust and Other Domains," *Journal of Personality and Social Psychology*, 50 (4), 703–12.

Smith, Craig A. and Phoebe C. Ellsworth (1985), "Patterns of Cognitive Appraisal in Emotion," *Journal of Personality and Social Psychology*, 48 (4), 813–38.

So, Jane, Chethana Achar, Da Hee Han, Nidhi Agrawal, Adam Duhachek, and Durairaj Maheswaran (2015), "The Psychology of Appraisal: Specific Emotions and Decision-Making," *Journal of Consumer Psychology*, 25 (3), 359–71.

Susskind, Joshua M., Daniel H. Lee, Andrée Cusi, Roman Feiman, Wojtek Grabski, and Adam K. Anderson (2008), "Expressing Fear Enhances Sensory Acquisition," *Nature Neuroscience*, 11 (7), 843–50.

Tiedens, Larissa Z. and Susan Linton (2001), "Judgment under Emotional Certainty and Uncertainty: The Effects of Specific Emotions on Information Processing," *Journal of Personality and Social Psychology*, 81 (6), 973–88.

Titchener, Edward B. (1910), *A Text-Book of Psychology*, New York, NY: Macmillan.

Togoh, Isabel. (2020), "Here's How Some of the Countries Worst Hit by Coronavirus Are Dealing with Shortages of Protective Equipment for Healthcare Workers," *Forbes*, March 31. https://www.forbes.com/sites/isabeltogoh/2020/03/31/heres-how-some-of-the-countries-worst-hit-by-coronavirus-are-dealing-with-shortages-of-protective-equipment-for-health-care-workers/#376015e2c13b. Accessed June 2, 2020.

Tsai, Ming-Hong and Maia J. Young (2010), "Anger, Fear, and Escalation of Commitment," *Cognition & Emotion*, 24 (6), 962–73.

Tybur, Joshua M., Debra Lieberman, Robert Kurzban, and Peter DeScioli (2013), "Disgust: Evolved Function and Structure," *Psychological Review*, 120 (1), 65–84.

Whitson, Jennifer A. and Adam D. Galinsky (2008), "Lacking Control Increases Illusory Pattern Perception," *Science*, 322 (5898), 115–7.