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

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RESEARCH ARTICLE

Threat of infectious disease during an outbreak: Influence on tourists' emotional responses to disadvantaged price inequality☆

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ABSTRACT

The ongoing COVID-19 pandemic has negatively influenced the global tourism industry. Despite the documented negative impacts of diseases on tourism demand and people's perceived health risk, researchers have seldom examined the psychological responses of tourists travelling during an infectious disease outbreak. We therefore conducted three studies to examine this key aspect, and our findings indicate that tourists have a strong negative emotional reaction towards disadvantaged tourism-related prices in response to a high (vs low) infectious disease threat. Furthermore, risk aversion acts as an underlying mechanism driving this effect: tourists are more risk aversive under the threat of an infectious disease, which consequently magnifies their negative emotional reaction. At last, theoretical and practical implications of these findings for tourism are discussed.

Introduction

The outbreak of infectious diseases imposes a major effect on tourism demand and the economies of destinations (Page, Song, & Wu, 2012). Infectious diseases documented in the tourism literature include avian flu, swine flu (H1N1), severe acute respiratory syndrome (SARS), Lyme disease, and foot-and-mouth disease (Donohoe, Pennington-Gray, & Omodior, 2015; Lee & Chen, 2011; Lee, Song, Bendle, Kim, & Han, 2012; Miller & Ritchie, 2003). A new and ongoing infectious disease outbreak, COVID-19, was declared a pandemic by the World Health Organization on March 11, 2020 (WHO, 2020). As a result, many countries and regions have introduced travel restrictions, which are exerting a severe negative economic influence on the tourism sector worldwide (Yang, Zang, & Chen, 2020). Based on the estimations of the United Nations World Tourism Organization (UNWTO) in April 2020, global tourism could experience a 20–30% decline in global international tourist arrivals this year, leading to a US$30–50 billion decrease in tourist spending. This underscores the fact that tourism is unfortunately one of the industry sectors hardest hit by the COVID-19 pandemic (UNWTO, 2020).

The negative effects on the tourism sector and its destinations are due not only to travel restrictions but also to potential tourists' reduced willingness to travel during epidemics or pandemics. Understandably, the danger of catching an infectious disease has become a major health concern, which influences tourists' willingness to travel and ultimately decreases their intention to visit places that may be hazardous to their health (Jonas, Mansfeld, Paz, & Potasman, 2011; Page, 2009). Thus, tourists tend to avoid visiting destinations that may be regarded as dangerous and risky (Carter, 1998). For example, Wen, Huimin, and Kavanaugh (2005) revealed

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SARS, an infectious viral disease similar to COVID-19, had a negative impact on people's intrinsic motivation to travel. Thus, the perceived threat of infectious diseases plays a key role in tourists' travel planning. However, little is known on the impact of infectious diseases on tourists' perceptions and experiences if they are travelling during an outbreak.

Infectious diseases such as COVID-19 break out suddenly and spread rapidly, and many tourists who are travelling at an affected destination may need to immediately take physical preventative actions (e.g., regularly washing their hands, wearing facial masks and avoiding large crowds). However, travellers may not be fully aware that their emotions and psychological responses are also affected by such infectious diseases. In addition, given that the timing of the outbreak has varied in different countries, such that different countries are experiencing different phases of the COVID-19 trajectory, people's perceptions of the disease threat and their own vulnerability vary with their geographical locations. For example, when China had passed the peak of COVID-19, countries such as Italy, Spain and the US were still approaching their peak (The Guardian, 2020). In light of this reality, it is important for tourism managers to learn how tourists' emotional and psychological responses change when their vulnerability to a disease threat varies.

Previous investigations of infectious diseases in tourism have mostly been centred on examining setbacks to tourism demand and obstruction of tourist travel-planning decisions (e.g., Kuo, Chang, Huang, Chen, & McAleer, 2009; Lepp & Gibson, 2003). However, the role of infectious diseases on tourists' experiences during a trip has been rarely studied. The lack of such research may simply be due to the fact that infectious diseases such as COVID-19 result in the imposition of travel restrictions in many countries and the cessation of most tourism activities (UNWTO, 2020). However, the extent of restriction of tourism-related activities can vary according to the threat level of the infectious disease. Another key point is that the impact of an infectious disease can persist even after the disease peaks, when many tourism businesses re-open. Therefore, we investigate whether and why infectious diseases, such as COVID-19, influence tourists' psychological responses in different service contexts, which may have significant theoretical and practical implications.

A variety of pricing challenges are created in a pandemic crisis such as COVID-19 (McKinsey & Company, 2020). In response to the threat of infectious diseases, businesses may apply new pricing strategies to maintain market demand, bolster their business or cover the losses inflicted by the infectious disease (Rittichainuwat & Chakraborty, 2009). Many examples are witnessed during the COVID-19 pandemic, including the rising food prices in the US (The Washington Post, 2020), the price increase of iconic handbags of luxury brands such as Louis Vuitton, Chanel and Tiffany (Reuters, 2020), and the subsidisation of tourists' post-COVID-19 trip expenses by some destinations such as the Italian island of Sicily and Japan (Forbes, 2020). However, without a good understanding of the customers' responses to such pricing strategies during a disease outbreak, businesses may not be fully aware of impact of such pricing strategies on their business performance in both the short run and the long run (KPMG, 2020; McKinsey & Company, 2020). For example, after China passed the COVID-19 peak, China's biggest hotpot restaurant, Haidilao, reopened and quietly raised its prices. This price increase attracted much criticism from consumers and soon became a trending topic on Weibo, one of China's biggest social media platforms (Koetse, 2020). In an online poll of 257,000 respondents on Weibo, 64% (i.e., 165,000) expressed anger and believed that Haidilao's price increase was unacceptable (Sina, 2020). Haidilao quickly realised its mistake, issued an apology letter and reinstated its original prices (Haidilao, 2020). This case raises an intriguing question: do people become more easily irritated by disadvantaged price inequality under the threat of infectious diseases such as COVID-19?

In addition to price increases, tourism managers may adopt other pricing strategies, such as dynamic pricing (Ropero, 2011), price promotions (Campo & Yagüe, 2008), and discriminatory pricing (Raab, Mayer, Kim, & Shoemaker, 2009) that give rise to price differences. According to equity theory and distributive justice, people will perceive inequality and develop negative emotional responses when they realise that they are paying more than a comparable reference party (Gelbrich, 2011; Xia, Monroe, & Cox, 2004). In this study, we hypothesise that an infectious disease outbreak can activate tourists' propensity for risk aversion, such as detection and avoidance of possible risks and losses in both cognitive and emotional ways (Neuberg, Kenrick, & Schaller, 2011), which then carries over to influence tourists' decision making in non-health domains. Since disadvantaged price inequality signals a financial loss, it would arouse tourists' stronger emotional reactions when they are facing salient disease threats.

The current research contributes to the literature in several important aspects. First, prior research has focused on the effect of infectious diseases on tourism demand and tourist trip planning, whereas this research provides a fresh perspective to explore the relationship between infectious disease outbreaks and tourism, by investigating how and why disease threats affect tourists' psychological states. Second, the present research investigates a new and important consequence: the emotional responses of tourists to price inequality. In particular, we aim to provide the first evidence in the tourism literature of the impact of infectious diseases on tourist perceptions of price variations, given the reality that pricing strategies are common business tactics during an infectious disease outbreak. Third, by testing risk aversion as the mediator, we shed light on the mechanism by which infectious diseases can generate stronger negative emotional reactions to disadvantaged price inequality. Finally, to the best of our knowledge, we are the first tourism researchers to implement an experimental design to investigate the impact of infectious diseases on individual tourists, and reveal some useful implications for the tourism industry.

Disease threat and tourism

The role of disease is not a traditional focus of tourism research (Chien, Sharifpour, Ritchie, & Watson, 2017; Donohoe et al., 2015), yet there is growing interest in the relationship between disease and tourism (Page, 2009). As the development of tourism industry depends on a peaceful travel environment, it can be highly vulnerable to a disease outbreak (Jonas et al., 2011). The disease threat thus creates a tourism crisis by increasing people's perceived health risk and threatening the prosperity of destination development (Haque & Haque, 2018; Page, Yeoman, Munro, Connell, & Walker, 2006). Hence, the possible threat of disease on tourism represents an important research topic in tourism that warrants closer attention.

Prior research has tested how disease threats can influence macro-level variables in the tourism industry. For example, Page et al. (2012) showed that the swine flu pandemic significantly decreased inbound tourism demand in the UK. Blake, Sinclair, and Sugiyarto (2003) revealed that the foot-and-mouth disease outbreak significantly reduced tourism expenditure in the UK, which greatly affected its GDP. Yang et al. (2020) recently provided the first empirical evidence of COVID-19's impact on the tourism economy and provided some policy implications for welfare.

Another growing stream of research is the examination of tourist perceptions of health risks, which are a major determinant of tourists' intentions to visit a destination (Chien et al., 2017). Rittichainuwat and Chakraborty (2009) demonstrated the negative impact of infectious diseases (i.e., SARS and bird flu) on Thailand's destination image and tourists' travel intentions, which was driven by the health risk concerns of potential tourists. Some destinations that are greatly affected by infectious diseases (e.g., Africa affected by HIV) become perceived as high-risk destinations by tourists (Carter, 1998), who then show protective behaviour prior to departure (Jonas et al., 2011).

Page (2009) divided travel behaviour associated with health and disease into three phases: pre-travel, travel and post-travel. Most investigations into the impact of disease on tourist perspectives at the individual level have focused on the pre-travel phase. However, it is important to determine how the threat of disease impacts tourists during the travel phase, as tourists are exposed to unfamiliar environments while travelling, which may involve health challenges, thereby increasing their susceptibility and vulnerability to disease compared to when they remain at home (Chien et al., 2017). The sudden outbreak and rapid spread of infectious diseases (e.g., COVID-19) further contributes to the psychological challenges to under-prepared tourists in disease-affected areas and even in neighbouring unaffected areas.

Psychology researchers have begun to investigate the influence of disease on individuals' feelings and behaviours. It has been shown that a disease threat can lead people to dehumanise out-group members (Navarrete & Fessler, 2006), conform to majority views (Wu & Chang, 2012), become less extroverted and make avoidant movements (Mortensen, Becker, Ackerman, Neuberg, & Kenrick, 2010). However, other consequences of a disease threat in the tourism context require exploration. In the current research, we extend the literature by focusing on how disease impacts tourists' price perceptions, specifically their emotional reactions to disadvantaged price inequality.

Price inequality and tourism

Price inequality is defined as a situation in which consumers find they have paid more or less than comparable others for specific products or services (Gelbrich, 2011; Xia et al., 2004). Price inequality may occur in many consumption scenarios. For example, as some firms adopt discriminative or dynamic pricing strategies as a revenue management practice, customers may be charged different prices for the same product at various occasions (Kopalle et al., 2009). Also, competing firms rely on price promotions to attract consumers, which enables consumers to pay different prices at different stores (Bolton, Warlop, & Alba, 2003).

There are two reasons for the focus of current research on tourists' emotional responses to disadvantaged price inequality (i.e., consumers paying more than a reference group pays). First, literature findings suggest that disadvantaged price inequality, relative to advantageous price inequality, can do greater harm to firms (Jin, He, & Zhang, 2014; Xia et al., 2004). Therefore, investigating this type of price inequality has direct managerial implications for service providers in the travel destinations. Second, it has been posited in prior work that the emotional responses of customers are direct and key psychological consequences when they face disadvantaged price inequality (Finkel, 2001; Jin et al., 2014; Xia et al., 2004). Specifically, researchers have recently revealed that individuals' reactions to disadvantaged inequality are primarily based on an emotional process, whereas their reactions towards advantaged inequality involve more complex cognitive functions (Gao et al., 2018). In addition, tourists' emotional reactions drive many downstream consequences such as their perceptions of the destination, overall enjoyment, and whether they recommend the destination to others (Prayag, Hosany, Muskat, & Del Chiappa, 2017). Combining all these points, it is theoretically and practically meaningful to directly examine tourists' emotional responses to disadvantaged price inequality.

It has been found that a series of antecedents may influence consumer responses to price inequality, such as the characteristics of transactions (Xia et al., 2004), customer attribution of inequality (Gelbrich, 2011), the social status of customers (Jin et al., 2014), and so forth. However, scarce literature has paid attention to the impact of the ambient environment on customer responses to price inequality. Marketing researchers have investigated the environmental influence (e.g., type of store) on consumer responses to price information (Büyükkurt, 1986; Dodds, Monroe, & Grewal, 1991), while few studies have been performed to examine the role of environmental factors associated with public health. In this study we fill this research gap by examining how the threat of an infectious disease can shape tourist reactions to disadvantaged price inequality.

The mediating role of risk aversion

Neuberg et al. (2011) documented that humans have threat-management systems to avoid risks when facing disease threats, which we refer to as risk aversion. Prior studies showed that the risk aversion induced by health threats can manifest in humans' feelings and emotions (e.g., anxiety, fear, and disgust), which enable people to detect and avoid potential health threats. For example, individuals tend to feel disgusted by contaminated food, which acts as a risk-avoidance response (Rozin, Millman, & Nemeroff, 1986). Also, the risk-aversion tendency can lead individuals to be aversive to others with cues of disease threats, including physical disability and obesity (Crandall & Moriarty, 1995; Park, Schaller, & Crandall, 2007).

More importantly, these emotional responses associated with risk aversion are found to be able to spill over to influence people's mental states and behaviours in non-health domains (Schaller & Park, 2011). For example, Schaller and Park (2011) suggested that a

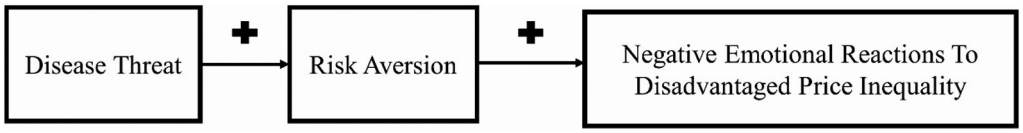

Fig. 1. Conceptual framework.

disease threat may induce aversion towards social interaction with others, because more frequent interaction signals a higher risk of being infected. In addition, researchers have posited that a disease threat can induce more aversive attitudes towards foreign outgroup members because of the inference that they are associated with a higher infection risk (Faulkner, Schaller, Park, & Duncan, 2004). Disease threats can even facilitate individuals' endorsement of conservative political attitudes, which are linked with risk-aversion and uncertainty avoidance (Helzer & Pizarro, 2011; Jost, Glaser, Kruglanski, & Sulloway, 2003; Murray & Schaller, 2016). All of these findings resonate with the proposition of Lopes (1987) that people facing a threat to their own security generally become more risk averse.

It has been demonstrated that individuals with a higher risk-aversion tendency are more sensitive to possible threats and losses, and thus more motivated to minimise the possibility of these occurring (Consiglio & Van Osselaer, 2019; Molden, Lee, & Higgins, 2008; Neuberg et al., 2011). Specifically, risk-averse (vs risk-seeking) individuals have been shown to care more about whether they fall below a certain reference point (Higgins, 2009; Scholer, Zou, Fujita, Stroessner, & Higgins, 2010). In the context of disadvantaged price inequality, tourists engage in upward comparisons with peer tourists and consider the prices paid by peers as a reference point (Jin et al., 2014; Lee & Fay, 2017). Therefore, disadvantaged price inequality can be perceived as a type of financial loss for tourists who have paid a higher price (Oh, 2003; Rondan-Cataluña & Martin-Ruiz, 2011). As tourists with higher risk aversion are more sensitive to losses, we propose that these tourists would show a stronger negative emotional response when facing such price inequality. In sum, previous findings suggest possible links between disease threat, risk aversion, and negative emotional reactions to disadvantaged price inequality. In summary, we present the following two hypotheses.

Hypothesis 1. A high (vs low) disease threat strengthens tourists' negative emotional reactions to disadvantaged price inequality.

Hypothesis 2. The effect proposed is driven by tourists' heightened risk aversion.

Fig. 1 illustrates the conceptual framework of our research.

Overview of the studies

Three studies were conducted to investigate whether the threat of an infectious disease magnified the negative emotional reaction to a disadvantaged price inequality. Similar to previous literature on disease threat and human behaviour (Murray & Schaller, 2012; Wu & Chang, 2012), we combine survey (Study 1) and experimentation (Studies 2A and 2B) methods. All of the studies were completed during February 2020 on Amazon Mechanical Turk using American samples, before the WHO declared the COVID-19 outbreak to be a pandemic. During this period, there were only 24 confirmed COVID-19 cases in the United States and no related deaths had been reported. Therefore, these studies did not suffer from a possible confounding effect due to the actual pandemic (i.e., all participants might perceive a high disease threat, which would possibly lead to ceiling effect). In Study 1, we found that tourists' perceived threat of infection were positively associated with their negative emotional reaction to a disadvantaged price inequality. In Study 2A, we manipulated the disease threat, and conducted a content analysis that revealed that a higher threat increased tourist risk aversion. In Study 2B, we manipulated the disease threat and showed that a higher disease threat led tourists to be more risk averse, which in turn magnified their negative emotional reaction to a disadvantaged price inequality. The participant profiles for three studies are presented in Table 1.

Study 1

Study 1 served as an initial test of the relationship between perceived disease threat and negative emotional reaction to disadvantaged price inequality. Specifically, we proposed that the higher the disease threat perceived by tourists, the more negative would be their emotional reaction when they faced a disadvantaged price inequality.

Method

Participants and design

We recruited U.S. participants during the second week of February 2020, on Amazon Mechanical Turk (Mturk). Mturk is an online crowdsourcing platform with participants from various backgrounds, which has been commonly used in social science research (Hwang & Mattila, 2018; Paolacci & Chandler, 2014; Zhang, Hou, Li, & Huang, 2020). We used a correlational study design and excluded seven people due to their extreme response timing in completing the survey. One hundred and forty-six participants (51.4% female, M_{age} = 40.6 years, SD = 14.06) remained. The sample size was regarded as appropriate, as a power analysis using G*Power software (Faul, Erdfelder, Buchner, & Lang, 2009; Kim, Zhang, & Park, 2018; Lu, Lee, Gino, & Galinsky, 2018) showed that approximately 82 participants would provide 80% power to detect a medium-sized effect in a correlation analysis (i.e., 0.3) with a false

Table 1
Participant profiles for three studies.

	Study 1 $N = 146$	Study 2A $N = 172$	Study 2B $N = 166$
Gender			
Male	48.6%	59.3%	59.6%
Female	51.4%	40.7%	40.4%
Age			
18–29	24.7%	26.2%	27.7%
30–39	32.9%	39.5%	44.0%
40–49	15.8%	18.6%	16.9%
50–59	14.4%	8.7%	4.8%
≥60	12.3%	7.0%	6.6%
Education			
Less than high school	0%	0%	0%
High school graduate	11.6%	15.1%	6.6%
College	29.5%	26.2%	30.1%
Bachelor's degree	44.5%	45.9%	48.8%
Master	9.6%	11.0%	12.0%
Professional degree	2.7%	1.2%	1.8%
Doctorate	2.1%	0.6%	0.6%
Annual household income			
Less than $20,000	10.3%	11.6%	13.3%
$20,000 to $39,999	21.2%	20.9%	13.3%
$40,000 to $59,999	24.0%	32.6%	34.3%
$60,000 to $79,999	18.5%	15.1%	19.9%
$80,000 to $99,999	13.7%	8.7%	9.6%
$100,000 or more	12.3%	11.0%	9.6%

positive rate of 5%.

Procedures

All of the participants completed two surveys. The first was the perceived vulnerability to disease (PVD) scale (Duncan, Schaller, & Park, 2009), which consists of 15 items to assess individual differences in perceived threat from an infectious disease (Wu & Chang, 2012). The scale consisted of two subscales, a 7-item perceived infectability subscale to assess participants' perceived susceptibility to infectious diseases (e.g., 'I am more likely than the people around me to catch an infectious disease.'), and an 8-item germ-aversion subscale measuring participants' discomfort when faced with the threat of pathogen transmission (e.g., 'It really bothers me when people sneeze without covering their mouths.'). Participants responded to all items on a 7-point Likert scale (1 = strongly disagree, 7 = strongly agree). In the second task, participants indicated their opinions regarding a hypothetical travel scenario. Thus, participants imagined that they were on a flight to another city, and that they found by talking with a nearby passenger that the passenger had paid US$544 for their flight ticket, while the participants themselves had paid US$610 for his/her ticket almost on the same day. The participants' negative emotional reaction to this disadvantaged price inequality was measured on a 2-item scale (i.e., How sad/angry would you feel in this situation, 1 = not sad/angry at all, 7 = very sad/angry; adapted from Jin et al., 2014). Finally, the participants provided their demographic information, such as their sex (1 = male, 0 = female), age, and a 6-point scale measuring annual household income (1 = less than $20,000, 6 = $100,000 or more).

Results

We averaged the scale items measuring negative emotional reactions ($r = 0.67$) as the dependent variable. As previous researchers using the PVD scale have either treated all 15 items as a single scale or examined the two subscales independently (Duncan et al., 2009; Faulkner et al., 2004; Wu & Chang, 2012), we performed both of these analyses.

First, we examined the association between the total PVD score and tourists' negative emotional reactions. We averaged the 15 items in the PVD scale ($\alpha = 0.77$) as the independent variable and regressed the negative emotional reaction on the PVD score. The results revealed that there was a positive association between PVD score and negative emotional reaction: $\beta = 0.47$, $t[144] = 6.42$, $p < .001$. Second, we separately averaged the items in the perceived infectability subscale ($\alpha = 0.87$) and in the germ-aversion subscale ($\alpha = 0.71$). The results of these two regression analyses showed that tourists' negative emotional reactions were positively associated with both perceived infectability ($\beta = 0.33$, $t[144] = 4.26$, $p < .001$) and germ aversion ($\beta = 0.37$, $t[144] = 4.73$, $p < .001$). All of these effects (i.e., the effects of scores in the PVD scale, the perceived infectability subscale and the germ aversion subscale on emotional reactions) remained robust (all $ps < .001$) after including sex, age and income as covariates. Therefore, the results supported our hypothesis.

The findings from Study 1 provided preliminary support of the association between a disease threat and tourists' emotional reactions to disadvantaged price inequality. In the next studies, we manipulated disease threats so as to examine their causal impacts on tourists' emotional reactions, and then shed light on the underlying mechanism.

Study 2A

Study 2A had two objectives. First, it served as a pilot test to check the effectiveness of our manipulation of the disease threat. Second, it was used to investigate the effect of a disease threat on tourists' risk aversion, which may act as the potential mechanism underlying tourists' emotional reaction towards disadvantaged price unfairness. We predicted that a high disease threat would lead tourists to be more risk averse.

Method

Participants and design

We recruited U.S. participants on Mturk during the third week of February 2020. We used a one-factor (disease threat: high vs. low) between-subjects design. Seven people were excluded due to their extreme response timing in completing the survey and a total of 172 participants (40.7% female, M_{age} = 37.9 years, SD = 11.52) remained. This sample size was regarded as appropriate because a power analysis using G*Power software (Faul et al., 2009; Kim et al., 2018; Lu et al., 2018) showed that approximately 64 participants in each condition would provide 80% power to detect a medium-sized effect (i.e., 0.5) at a false positive rate of 5%.

Manipulation of disease threat

Participants were randomly assigned to a high-threat or low-threat condition. They first engaged in a mental visualisation task and imagined themselves were in a one-week trip to a new city. They then read a piece of local news describing a fictitious influenza-like infectious disease, through which we manipulated disease threat. The manipulation was based on previous literature (Agrawal & Wan, 2009; Menon, Block, & Ramanathan, 2002). Specifically, the content of this piece of news varied depending on conditions. In the high-threat (vs low-threat) condition, participants learned that the new influenza-like disease, X-11, occurred in the city they were visiting (vs. some cities 300 km away), that its transmission rate was 1.3 (vs. 0.5), similar to (vs. much lower than) the normal influenza, and that it was often contracted through droplets when infected people coughed, sneezed or talked (vs. through very close, prolonged personal contact with infected people), making it easy (vs. difficult) to contract. To ensure that the participants fully understood the news, they had to provide correct answers to three multiple choice questions before they could proceed to the next page.

Manipulation check and measurement of tourist risk aversion

Participants first responded to the manipulation check question (i.e., 'How likely will you catch X-11 when travelling in this city?' 1 = not at all likely, 7 = very likely). A higher score indicated a higher disease threat (Menon et al., 2002). Next, they were asked to write down their feelings when travelling in this travel destination after reading the news, through which we coded the risk aversion level of each participant. Finally, the participants provided their demographic information, such as their sex (1 = male, 0 = female), age, and a 6-point scale measuring annual household income (1 = less than $20,000, 6 = $100,000 or more).

Results

Manipulation check

The perceived disease threat was higher in the high-threat condition (M = 4.03, SD = 1.42) than in the low-threat condition (M = 2.46, SD = 1.25): $t[170] = 7.67$, $p < .001$, $d = 1.17$. Thus, the manipulation of the disease threat was successful.

The effect of disease threat on risk aversion

Following the content analysis method suggested by Lu et al. (2018), we invited two coders who were blind to the study hypotheses and manipulations to read each participant's writing, and then responded to a 7-point scale (i.e., "Risk aversion means individuals are inclined to protect themselves against the risks around. Please read the writing of this respondent, and then rate the level of risk aversion expressed in this respondent's writing". 1 = very low, 7 = very high, ICC(2) = 0.85). We then averaged the two ratings as the risk aversion score. An independent t-test showed that risk aversion was significantly higher in the high-threat condition (M = 4.43, SD = 1.61) than in the low-threat condition (M = 3.29, SD = 1.59): $t(170) = 4.67$, $p < .001$, $d = 0.71$, supporting our hypotheses. The regression analyses including sex, age, and income as covariates showed that the effect of disease threats (1 = high, 0 = low) on risk aversion was robust, $\beta = 0.33$, $t[167] = 4.63$, $p < .001$.

The results of Study 2A confirmed that the manipulation of the disease threat was effective. More importantly, the content analysis showed that higher disease threat led tourists to become more risk averse. Next, in Study 2B, we investigated the causal effect of the disease threat on the participants' emotional reactions to disadvantaged price inequality while directly measuring risk aversion as the underlying mechanism.

Study 2B

Study 2B had two objectives: first, we replicated the proposed effect of the disease threat on tourists' emotional reactions to a disadvantaged price inequality by manipulating rather than measuring the disease threat; second, we directly examined tourist risk aversion as the mechanism underlying the proposed effect. Specifically, we predicted a mediation model in which a higher disease threat leads participants to be more risk averse at the travel destination, which in turn magnifies their negative emotional reaction to a disadvantaged price inequality (i.e., disease threat → risk aversion → negative emotional reaction).

Method

Participants and design

The study employed a one-factor (disease threat: high vs low) between-subjects design. We recruited 173 U.S. participants on Mturk during the fourth week of February 2020. We excluded 7 people due to their extreme response timing in completing the study. A total of 166 participants (40.4% female, M_{age} = 36.4 years, SD = 10.36) remained.

Measurement of negative emotional reaction to a disadvantaged price inequality

Participants were first engaged in the same mental visualisation task (i.e., imagining they were in a one-week trip to a new city, and reading a piece of local news) as in Study 2A, in which we manipulated the disease threat. Next, participants were presented with a scenario regarding their travel experience in the city. Specifically, they imagined that they were taking a 5-day package tour at the destination, during which a conversation with another tourist on the tour bus alerted them to the fact that they had paid a higher price (i.e., $642) than the tourist paid (i.e., $602) for the tour package. Next, all of the participants responded to the same items as in Study 1 to indicate their negative emotional responses (i.e., How sad/angry would you feel in this situation? 1 = not sad/angry at all, 7 = very sad/angry).

Measurement of risk aversion

Participants then completed a scale measuring their risk aversion after reading the news about X-11. The scale measuring risk-aversion was adapted from the literature (Consiglio & van Osselaer, 2019; Sharma, 2010) to suit our research context. Specifically, the scale has three items (i.e., 'At that moment, I was inclined to be cautious of the risks around me', 'At that moment, I thought a lot about how to stay safe from the risks around me', and 'At that moment, I was motivated to protect myself against the risks of being exposed to the disease'; 1 = strongly disagree, 7 = strongly agree). At last, the participants provided their demographic information, such as their sex (1 = male, 0 = female), age, and a 6-point scale measuring annual household income (1 = less than $20,000, 6 = $100,000 or more).

Results

Manipulation check

The perceived disease threat was higher in the high-threat condition (M = 4.68, SD = 1.51) than in the low-threat condition (M = 2.55, SD = 1.57): $t[164] = 8.91$, $p < .001$, $d = 1.38$, confirming that our manipulation of disease threat was effective.

The effect of disease threat on emotional reaction

We averaged the two items measuring participants' negative emotional reaction ($r = 0.71$). An independent *t*-test revealed that the negative emotional reaction to the disadvantaged price inequality was higher in the high-threat condition (M = 3.79, SD = 1.63) than in the low-threat condition (M = 3.29, SD = 1.51): $t[164] = 2.08$, $p = .039$, $d = 0.32$. The regression analyses including sex, age, and income as covariates showed that the effect of disease threats (1 = high, 0 = low) on negative emotional reaction was robust, $\beta = 0.16$, $t[161] = 2.08$, $p = .040$. Therefore, these results support our hypothesis.

Mediation test

To test the underlying mechanism, we examined the mediating role of risk aversion. First, we coded the disease threat condition (1 = high, 0 = low) and averaged the items of risk aversion ($\alpha = 0.95$). Then, we examined the mediation model through both path analysis and a bootstrap analysis (Kim, Chen, & Zhang, 2016; Preacher & Hayes, 2008). The path analysis results revealed that the disease threat was positively associated with both the negative emotional reaction ($\beta = 0.16$, $t[164] = 2.08$, $p = .039$) and the risk aversion ($\beta = 0.44$, $t[164] = 6.30$, $p < .001$). After including disease threat and risk aversion as predictors and negative emotional reaction as the outcome, the effect of risk aversion was significant ($\beta = 0.18$, $t[163] = 2.08$, $p = .039$), while the effect of disease threat became non-significant ($\beta = 0.08$, $t[163] = 0.97$, $p > .30$; see Fig. 2). This showed that risk aversion mediated the effect of the disease threat on the tourists' negative emotional reactions to the disadvantaged price inequality. In addition, the results of a bootstrap analysis with 5000 bootstrapping samples (PROCESS macro Model 4; Preacher & Hayes, 2008) further confirmed that the influence of the disease threat on the negative emotional reaction to the disadvantaged price inequality was significantly mediated by risk aversion (indirect effect = 0.25, SE = 0.13, 95% CI [0.01, 0.54], excluding zero). The mediation model was robust after incorporating sex, age, and income as covariates (indirect effect = 0.34, SE = 0.13, 95% CI [0.11, 0.61], excluding zero). These findings thus supported our initial hypothesis.

The results of Study 2B supported both Hypotheses 1 and 2. First, Study 2B replicated the finding of Study 1 by showing that a

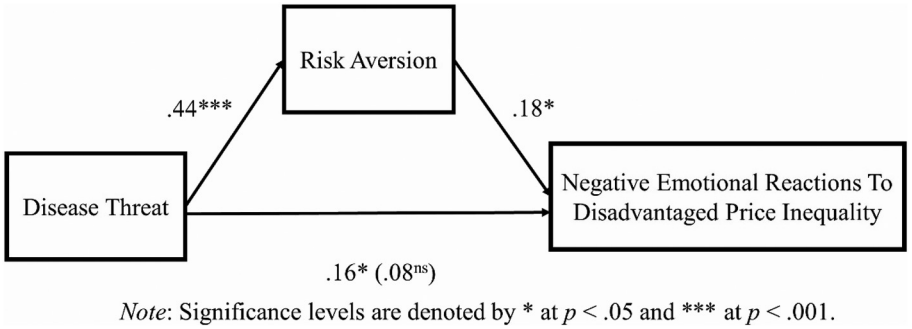

Fig. 2. The mediating role of risk aversion.

higher disease threat led to a stronger negative emotional reaction to a disadvantaged price inequality. More importantly, Study 2B offered evidence of the mediating role of risk aversion. Specifically, a high disease threat made the tourists more risk averse. In this case, they tended to show stronger negative emotions when facing a disadvantaged price inequality. In other words, the tourists were more sensitive to inequality when facing a higher disease threat. These findings discovered the underlying mechanism of the proposed effect and also have important practical implications for tourism management under an epidemic or pandemic threat.

Discussion and conclusion

It is particularly important that tourism-service providers have knowledge about tourists' psychological needs and experiences, as this enables providers to select effective business strategies to ensure that their services meet customer expectations and offer satisfactory experiences. This becomes particularly crucial in crisis situations such as the threat of infectious diseases, as tourists' emotional responses to service encounters are likely to be magnified by this threat. Given the increasingly frequent outbreaks of infectious diseases such as COVID-19, and their dramatic impact on the tourism industry, research in this area is urgently needed. We responded to this need by conducting the present study, which makes theoretical, methodological, and practical contributions.

To the best of our knowledge, this research represents the first attempt in the tourism literature to investigate the impact of infectious diseases on tourists' psychological states. The findings of this study provide initial evidence for the significant influence of infectious diseases on tourists' emotional responses to price information. Our carefully designed studies revealed that the perceived threat of an infectious disease tended to magnify tourists' negative emotional reactions to disadvantaged price inequality.

Notably, the impact of diseases on consumer psychology is an emerging field of research. Thus, by focusing our study on a new consequence of this impact, from a tourism perspective, we have made a novel addition to this emerging line of research. Our determination of the mechanism of the above impact represents another useful theoretical contribution. That is, we have found that risk aversion is the underlying process by which infectious diseases can lead to more negative emotional responses to disadvantaged price inequality. This means that when faced with an infectious disease threat, tourists are more likely to demonstrate risk aversion. In this context, tourists perceive disadvantaged price inequality as financial loss, and more risk-averse tourists tend to develop more negative emotional reactions. Our findings therefore shed light on the mediating role of risk aversion in the effect of the threat of infectious diseases on negative emotional responses to disadvantaged price inequality.

From a methodological perspective, we used a two-stage, between-subjects experimental design, and conducted both content analysis and statistical hypothesis testing to ensure the robustness of the findings. To the best of our knowledge, our research described herein was among the first wave of researchers applying an experimental design to analyse the effect of infectious diseases on tourism.

The findings offer useful practical implications. Because this study is set in the general context of infectious diseases, its implications are not restricted to the present COVID-19 outbreak, but are general to a broader context. When there is a destination-specific or global outbreak of an infectious disease, such as COVID-19, there is threat to tourists and the tourism industry, the magnitude of which depends on the scale and severity of the epidemic. If tourism businesses continue to operate during such an outbreak, including before and after travel restrictions and destination lockdown, tourists will encounter various tourism services during their trip, and may potentially experience disadvantaged price inequality and perceived price unfairness, as described in the experiments of this study. From the service provider's perspective, there can be multiple reasons for price inequality, including the service provider's own revenue management practices (e.g., price increases due to cost variations, discounts due to competition pressure and declining demand, or price discrimination in different market segments), as well as multiple channels of distribution that allow travel intermediaries to exercise their own pricing strategies. Pricing strategies are commonly exercised in a competitive market, especially when there is over-supply against insufficient or reduced demand, such as during a pandemic.

Thus, the findings of this study have important implications for the pricing decisions of tourism businesses during an infectious disease outbreak. Specifically, when a destination faces the threat of an infectious disease such as COVID-19, tourism businesses operating at the destination need to be cautious in offering discounts or promotions, implementing dynamic pricing or price discrimination strategies, and must carefully manage their multi-channel distribution strategies. Tourism businesses must also consider the balance between short-term profitability and long-term business sustainability, and taking a cautious decision on increasing

prices during an infectious disease outbreak, even though the operating cost may increase due to the infectious disease outbreak (McKinsey & Company, 2020). A lesson can be learned from the Haidilao case, as introduced earlier in this article.

Price inequality may be inevitable in tourism markets during an outbreak of an infectious disease, as many tourism businesses need to react to the decline in demand or increased production costs. Where a new pricing strategy has to be implemented, these tourism businesses must pay particular attention to communicating these price variations to customers clearly and effectively. Full information on different pricing options should be made available to customers, such as making clear any restrictions that apply to lower-priced services (e.g., advance booking or inflexible cancellation), and all of the benefits that accompany higher-priced services.

In sum, the key to avoiding negative emotional reactions from customers is to make them feel that the price inequality between services is acceptable. Therefore, in addition to effective communication, tourism businesses need to understand what pricing strategies their customers perceive as acceptable and fair. Where multi-channel distribution is used, the principal service provider needs to work closely with travel intermediaries to understand each other's latest pricing strategies and ensure that full information of their respective offers, such as restrictions of price discounts, is made available to potential customers. These aspects are relevant to the present COVID-19 pandemic, because tourists are still likely to feel threatened by the pandemic during the recovery period after travel restrictions are lifted, and will continue to do until the pandemic has completely finished. Therefore, tourism businesses need to bear in mind that tourists during this period may exhibit heightened emotional reactions to new revenue management practices and pricing strategies.

In light of the propensity of risk aversion as the underlining mechanism of the effect revealed in this study, tourism businesses need to work closely with destination marketing organisations to manage tourist risk perceptions, such as releasing timely updates about heath and safely issues at the destination through multiple channels, including the businesses' own social media. In particular, in the recovery phase of COVID-19 and similar pandemics, marketing should be focused on domestic markets and nearby regions where there is better knowledge of the destination and less-biased risk perception.

The empirical findings of this study contribute to the initial wave of tourism research on the impact of disease threat. However, there are several limitations of this study which suggest avenues for further research. First, the current research provides empirical support of tourists' increased propensity for risk aversion and stronger negative emotional reactions to disadvantaged price inequality when under the threat of an infectious disease. Subsequent research could investigate other psychological states and perceptions of tourists under the threat of infectious diseases, together with the mechanisms underlying these. For example, in response to infectious disease threat, might tourists prefer tourism products of national (vs. international) brand because of in-group favouritism. Second, while our study focused on tourists' emotional reactions to a disadvantaged price inequality, scholars should also consider the effects of infectious diseases on other price perceptions in the tourism context, such as a price-quality inference, and further study the impact on tourists' behaviours. For instance, would infectious disease threat influence tourists' price-quality inference of tourism products and could such an effect further lead to refusal to repurchasing the tourism service? Finally, while we used controlled experiments with high internal validity, future work could use other methods (e.g., big data or field studies) that are based on larger samples and could offer more external validity.

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