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WHO,
carcinogenic food category,
feelings of guilt,
purchase behavior

ABSTRACT

In October 2015, the World Health Organization (WHO) reported that the International Agency for Research on Cancer (IARC) had classified the consumption of both red and processed meats as carcinogenic to humans (Bouvard et al., 2015; IARC, 2015). The primary purpose of this study was to investigate the effect of the awareness of this announcement on Korean married female consumers' moral attitudes, with a particular focus on feelings of guilt and purchase behavior. Through a survey and analysis of real purchase data, we discovered the effect of consumers' recognition of IARC's carcinogenicity assessment on consumer guilt and purchase of red and processed meats.

1. Introduction

In October 2015, the World Health Organization (WHO) reported that the International Agency for Research on Cancer (IARC) had classified the consumption of both red and processed meats as carcinogenic to humans (Bouvard et al., 2015; Chung, 2015a; Nam, 2015). After the release of this report, domestic sales of processed meats in some large Korean supermarkets dropped (Sah, 2015). Amid the confusion over the WHO announcement, the South Korean government is about to launch an expert task force and consult with the relevant government agencies to closely investigate the cancer risks relating to processed and red meat and Koreans' consumption habits (Chung, 2015b).

As this situation exemplifies, food can be a source of worry and anxiety (Steenhuis, 2009). As the starting point of this study, we analyzed the buzz on social media by searching related keywords through the social media monitoring software, SOCIAL Metrics, created by Daum Communications, to keep track of positive or negative audience sentiments or opinions regarding the carcinogenic food categories classified by WHO. After the announcement of the food categories on October 26, 2015, the buzz surrounding meat products (keywords: pork, processed meat, sausage, ham) increased rapidly and dramatically; in particular, the negative buzz about processed meats (keywords: processed meat, sausage, ham) increased 19 or more times. It was assumed that this increased buzz about red meat or processed meat products on social media would influence consumers' attitudes.

Therefore, the primary purpose of this study was to investigate the effect of the awareness of the WHO report on carcinogenicity on Korean married female consumers' moral attitudes, with a particular focus on feelings of guilt and purchase behavior.

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2. Literature Review and Research Question

2.1. WHO's Report on Carcinogenicity

In October 2015, IARC, the cancer agency of WHO in Lyon, France, evaluated the carcinogenicity of the consumption of red and processed meats. A working group comprising 22 experts from 10 countries classified the consumption of red meat as “probably carcinogenic to humans” (Group 2A). This association was observed mainly with colorectal cancer, but associations were also seen with pancreatic cancer and prostate cancer (IARC, 2015). In addition, processed meat was classified as “carcinogenic to humans” (Group 1) on the basis of sufficient evidence in humans that the consumption of processed meat causes colorectal cancer (IARC, 2015). These evaluations were published in volume 114 of the IARC Monographs (Bouvard et al., 2015). The Monographs are widely used and referenced around the world by governments, organizations, researchers, and the public; therefore, it is critical that the working group's conclusions be clear and transparent (Pearce et al., 2015).

According to IARC's definition, red meat refers to all types of mammalian meat, including beef, veal, pork, lamb, mutton, horse, and goat meat (IARC, 2015); it is usually consumed after being cooked (Bouvard et al., 2015). Processed meat refers to meat that has been transformed through salting, curing, fermentation, smoking, or other processes to enhance flavor or improve preservation. Most processed meats contain pork or beef, but might also contain other red meats, poultry, offal, or meat by-products, such as blood (Bouvard et al., 2015; IARC, 2015). Examples of processed meat include hot dogs (frankfurters), ham, sausage, corned beef, biltong or beef jerky, as well as canned meat and meat-based preparations and sauces (IARC, 2015). Complementing these assessments, Bouvard et al. (2015) reported the presence of N-nitroso-compounds (NOCs), polycyclic aromatic hydrocarbons (PAHs), and heterocyclic aromatic amines (HAAs)—well-known carcinogenic chemicals that cause colorectal cancer—in the processing and cooking of meats, such as curing and smoking (NOCs, PAHs), or when heating meat at high temperatures (HAAs) (Alaejos, González, & Afonso, 2008; De Mey, De Maere, Paelinck, & Fraeye, 2015; Herrmann, Duedahl-Olesen, Christensen, Olesen, & Granby, 2015; Kim, Coelho, & Blachier, 2013; Larsson, 1986; Trafialek & Kolanowski, 2014).

Recently, IARC's Program for the Evaluation of Carcinogenic Risks to Humans has been criticized for several of its evaluations and the approach used to perform these evaluations (Boffetta, 2006; Boffetta et al., 2008; Kabat, 2012; McLaughlin et al., 2011; Pearce et al., 2015). Some critics have claimed that the IARC working group's failure to acknowledge the study's weaknesses and the biases of the working group members led to inappropriate assessments of a number of agents as carcinogenic to humans (Pearce et al., 2015). However, Pearce et al. (2015) asserted that the criticisms of IARC's classification procedures are unconvincing because the scientists from various disciplines who composed the working group and the techniques that they followed to review the literature and perform hazard evaluations of various agents produced a balanced evaluation and an appropriate indication of the weight of the evidence.

The goal of the present study was to examine the effect of consumers' recognition of IARC's carcinogenicity assessment on the consumption of red meat and processed meat products.

2.2. Perceived Moral Obligation and Feelings of Guilt

Perceived moral obligation (or moral norm) has been shown to be a useful extension in a number of applications of the theory of planned behavior (Sparks & Shepherd, 2002). Models such as the expectancy-value-based theory of reasoned action (TRA) and the theory of planned behavior (TPB) have been applied extensively in social psychology to predict consumer behavior and health behaviors (Ajzen & Timko, 1986; Beck & Ajzen, 1991; Sparks & Shepherd, 2002). The TRA links volitional behaviors to behavioral intentions, attitudes, subjective norms, behavioral beliefs, outcome evaluations, normative beliefs, and motivation to comply, while the TPB adds a measure of perceived behavioral control to the structure of the TRA (Sparks & Shepherd, 2002). TPB is applicable to behaviors that are not entirely under the person's control (Ajzen, 1991; Ajzen & Fishbein, 1980). Furthermore, there is increasing evidence that the role of perceived moral obligation within (or in addition to) the TPB indicates the importance of a moral or normative influence on social and personal behaviors (Etzioni,

1988; Harsanyi, 1977; March, 1978; Raats, Shepherd, & Sparks, 1995; Sen, 1987; Sparks & Shepherd, 2002).

Consumer guilt is a subjective feeling that results from one's recognition of having failed to achieve or violated (or even imagining having done so) internalized personal or social moral norms (Bonsu & Main, 2006; Boujbel, 2008; Lisa & Mark, 2007). Consumer guilt is a type of guilt that is related specifically to consumption decision situations (Dedeoğlu & Kazançoğlu, 2010). According to previous studies, feelings of guilt for violating a perceived moral obligation can have both maladaptive and adaptive consequences (Baumeister, Stillwell, & Heatherton, 1995; Breugelmans, 2004; Dahl, Honea, & Manchanda, 2003, 2005; Luyten, Fontaine, & Corveleyn, 2002; Steenhuis, 2009; Yi & Baumgartner, 2004). The adaptive consequences of guilt inform individuals that they have violated intra and interpersonal or social standards and motivate them to perform reparative actions, such as modifying subsequent behavior (Baumeister et al., 1995; Dahl et al., 2003, 2005; Yi & Baumgartner, 2004). In this sense, feelings of guilt are associated with attempts to correct mistakes (Steenhuis, 2009). However, Breugelmans (2004) found that feelings of guilt are positively associated with receiving disapproval from others, loss of control, poor self-esteem, and regret. Luyten et al. (2002) summarized a number of other maladaptive consequences, including negative self-evaluation, self-aggression, and self-criticism. Maladaptive consequences are particularly likely to occur when there is no possibility of repairing what was done wrong (Luyten et al., 2002).

In the context of food consumption, previous studies have shown that consumers' moral attitudes influence their purchase behavior (Arvola et al., 2008). The research has also shown that feelings of guilt and anxiety regarding food are very common among people who suffer from anorexia, bulimia, or other eating disorders (Sassaroli et al., 2005). In general, women tend to express more feelings guilt about food consumption than men do (Dewberry & Ussher, 1994; Nowak & Speare, 1996; Rozin, Fischler, Imada, Sarubin, & Wrzesniewski, 1999; Wansink, Cheney, & Chan, 2003).

Raats et al. (1995) and Sparks and Shepherd (2002) analyzed the effect of consumers' perceived moral obligation to the family's health on their purchase behaviors. Specifically, Raats et al. (1995) examined how a mother's sense of a moral obligation to ensuring her family's health relate to the intention to consume skim milk. Likewise, Sparks and Shepherd (2002) focused on the intention to consume genetically modified foods.

In our study, we focused on the maladaptive or adaptive consequences (mainly food consumption behaviors) of feelings of guilt on purchasing red meats or processed meat products, which are known to belong to carcinogenic food categories according to WHO's evaluations.

Previous studies on consumer guilt have investigated the behavior of consumers who take responsibility for the family's dietary life—mostly wives and mothers—in Korea, because it is assumed that they experience more guilt.

H₁₋₁: The release of the WHO report on carcinogenic food categories elevates the consumer's guilt about purchasing red meat.

H₁₋₂: The release of the WHO report on carcinogenic food categories elevates the consumer's guilt about purchasing processed meat.

Moreover, we assumed that sociodemographic characteristics, including parental status (having or not having a child), and consideration for food safety would moderate the relationship between the impact of the report and the consumer's guilt.

H₂₋₁: The relationship between the release of the WHO report on carcinogenic food categories and the consumer's guilt about purchasing processed meat will be moderated by the consumer's parental status.

H₂₋₂: The relationship between the release of the WHO report on carcinogenic food categories and the consumer's guilt about purchasing processed meat will be moderated by the consumer's consideration of food safety.

Our study differed from previous research because it experimentally investigated the moral attitudes of Korean married female consumers toward the purchase of red and processed meats. We expected that

the results of this study would provide substantial evidence that these attitudes do not affect the actual amount of red and processed meats that these consumers purchase.

H₃₋₁: The consumer's guilt about purchasing red meat will minimize her purchase of red meat.

H₃₋₂: The consumer's guilt about purchasing processed meat will minimize her purchase of processed meat.

On the basis of this assumption, we constructed the research model shown in Figure 1. In Study 1, we examined the effect of the release of the WHO report on consumers' feelings of guilt associated with the purchase of food products known to be carcinogenic. In Study 2, we analyzed whether the actual purchase patterns before and after the release of the report differed.

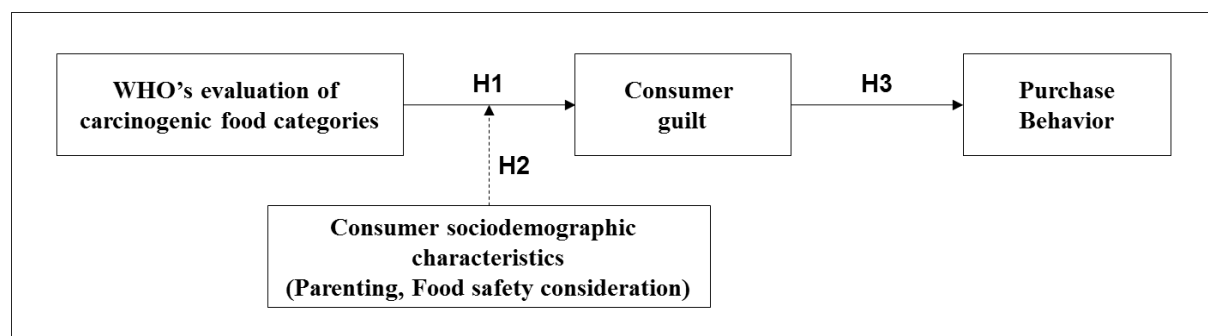


Figure 1. Research model

3. Study 1: The Effect on Consumers' Feelings of Guilt

3.1. Method Description and Measurement Development

The survey consisted of two parts (Table 2). The first part included questions about the amount of meat consumed weekly (beef, pork, and processed meat products) and the factors affecting food choice (price, taste, safety, nutrition, etc.). The second part comprised questions about the participants' awareness of the WHO report, purchase behavior changes after the release of the report, and their feelings of guilt about purchasing red meats and processed meat products. The questions relating to consumer guilt were developed according to Dedeoğlu and Kazançoğlu (2010) categorization. A 5-point Likert scale was used in the survey in relation to purchase behavior changes after the WHO evaluation and associated consumer guilt (1 = "strongly disagree" to 5 = "strongly agree").

Table 1. Measure Descriptions: Study 1

Questions	# of Items	Items	Scale
Weekly intake of meat products	3	In your home, how many times a week do you eat beef/pork/processed meat?	Number of times consumed
Important factors in grocery shopping	1	Which is the most important factor to consider when you are buying groceries?	1. Price, 2. Taste, 3. Safety, 4. Nutrition
Recognition of WHO's evaluation	1	Are you aware of WHO's classification of the consumption of red meat as "probably carcinogenic to humans" (Group 2A) and processed meat as "carcinogenic to humans" (Group 1)?	Yes/No
Purchase behavior changes after WHO's evaluation	4	Since the WHO evaluation, I have thought that I need to reduce the consumption of red meat.	Likert 5-point scale

Consumer guilt	10	Since the WHO evaluation, I have thought that I need to reduce the consumption of processed meat.	Likert 5-point scale
		Since the WHO evaluation, I have actually reduced the consumption of red meat.	Likert 5-point scale
		Since the WHO evaluation, I have actually reduced the consumption of processed meat.	Likert 5-point scale
		I hesitate to buy red meat/processed meat.	Likert 5-point scale
		I often feel sad when I buy red meat/processed meat.	Likert 5-point scale
Consumer guilt	10	I'm unwilling to pay to buy red meat/processed meat.	Likert 5-point scale
		I usually regret buying red meat/processed meat.	Likert 5-point scale
		I usually blame myself when I buy red meat/processed meat.	Likert 5-point scale

3.2. Data collection

To achieve the goal of this study, a total of 435 married females aged in their 30s, 40s, and 50s were recruited to assess their dietary concerns and feelings of guilt about purchasing these carcinogenic food products. The data were collected via an online survey. Table 1 displays the demographic profile of the respondents.

Table 2. Demographic Profile of Respondents: Study 1

		N	%
Age	30–39 (30s)	142	32.6%
	40–49 (40s)	149	34.3%
	50–59 (50s)	144	33.1%
Education	High school graduate or less	105	24.1%
	College graduate	285	65.5%
	Postgraduate degree	45	10.3%
Employment	Employed	226	50.8%
	Unemployed	209	49.2%
Parental status	At least one child	387	89.0%
	No children	48	11.0%

3.3. Results and Discussion

Of all the survey respondents ($n = 435$), 354 (81%) were aware of the WHO report (the aware group) and 81 (19%) had not heard about it (the unaware group). To compare the feelings of guilt between the two groups (the aware and unaware groups) after the release of the WHO report, we used an independent samples t-test and analysis of variance (ANOVA). According to the results measuring the consumers' feelings of guilt about purchasing food products, the aware group ($n = 354$) felt more guilty about buying processed meats than the unaware group ($M_{recognizing} = 2.8102$ vs. $M_{not-recognizing} = 2.4494$; $t = -3.396$, $p < .001$); however, guilt about buying red meats was not significant ($M_{recognizing} = 2.0881$ vs.

$M_{not-recognizing} = 2.1160$; $t = .300$, $p = .764$). Thus, Hypothesis 1 is partially supported (H_{1-2} is supported); WHO's carcinogenic food categories have a statistically significant influence on consumer guilt regarding purchasing red meat.

Furthermore, to test whether the degree of guilt about buying processed meats differed depending on (1) level of food safety consideration and (2) the participant's parental status as moderators of guilt, a two-way ANOVA was performed. There was a marginally significant main effect of the consideration of food safety on consumer guilt; the results of the statistical analysis suggest that those who consciously think about food safety felt guiltier about purchasing processed meats after the release of the WHO classification than those who do not consider food safety ($M_{food\ safety\ considered} = 2.8079$ vs. $M_{food\ safety\ not-considered} = 2.5939$; $F(1, 431) = 2.889$, $p = .090$). As expected (see Table 3), people who were aware of the WHO announcement felt more guilt than those who were unaware. Further, although the two main effects (of food safety and WHO awareness) were significant, the interaction effect of food safety consideration and recognition of the WHO classification was not significant ($p = .880$) (Left side of Figure 1).

We also found a significant main effect of parenting on consumer guilt; this means that people who have a child felt guiltier about purchasing processed meats after the release of the WHO classification than those who do not ($M_{with\ child} = 2.7798$ vs. $M_{without\ child} = 2.4458$; $F(1, 431) = 8.059$, $p = .005$). Likewise, people who were aware of WHO's announcement felt more guilt than those who were unaware (see Table 3). However, there was no interaction effect of parenting, and awareness of the WHO classification was significant ($p = .173$) (Right side of Figure 1).

In the next step, we conducted a t-test to determine if the actual weekly intake of meat products differed between the two awareness groups (recognizing vs. not-recognizing). According to our results, the consumption of both red meat (beef and pork) and processed meats did not differ significantly between the two groups (Beef: $M_{recognizing} = 1.4322$ vs. $M_{not-recognizing} = 1.2099$; $p = 0.119$ / Pork: $M_{recognizing} = 2.0960$ vs. $M_{not-recognizing} = 2.0000$; $p = 0.525$ / Processed meats: $M_{recognizing} = 1.8051$ vs. $M_{not-recognizing} = 1.8051$; $p = 0.143$) (Table 4).

To sum up, the results of the present study provide evidence that the consumers' feelings of guilt about purchasing foods classified as carcinogenic, including processed meats, increased after the release of the WHO report, and consumers who have children and who consider food safety felt guiltier about purchasing processed meat. However, the purchase behavior of the consumers did not change. Thus, H_1 and H_2 are partially supported, but H_3 is not supported.

In our further study aiming to reinforce the results of Study 1, we analyzed consumer panel data and the actual amounts of red and processed meats purchased before and after the release date of the WHO report.

Table 3. Means and standard deviations for consumer guilt across groups

		WHO awareness	Mean	SD
Food safety consideration	Considered	Unaware	2.5094	.86520
		Aware	2.8712	.88643
	Not considered	Unaware	2.3357	.63258
		Aware	2.6635	.84176
With/Without child	With child	Unaware	2.5278	.77300
		Aware	2.8375	.89414
	Without child	Unaware	1.8222	.69602
		Aware	2.5897	.70030

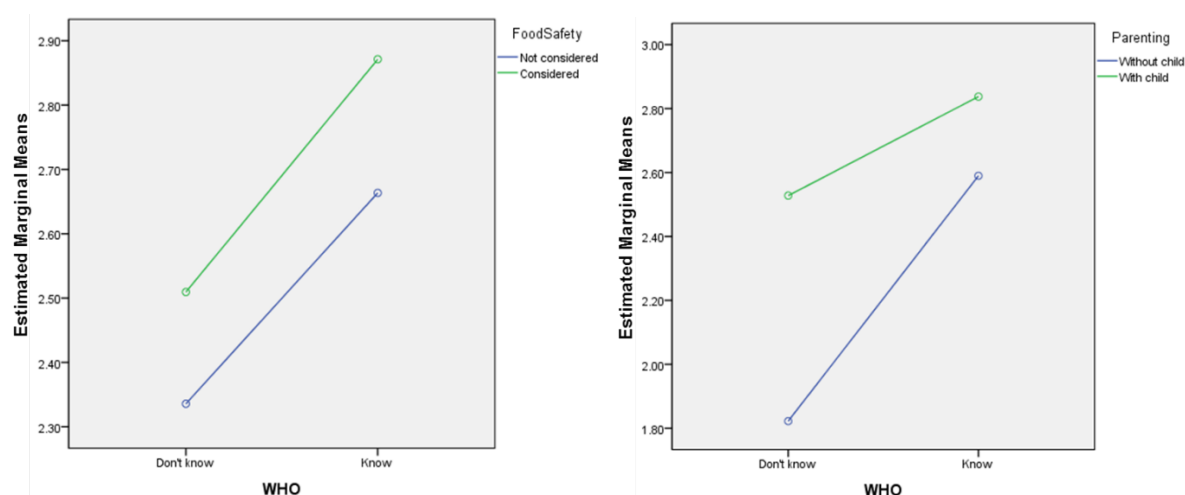


Figure 2. Interaction effect on consumer guilt across groups

Table 4. Difference of mean amount of weekly intake

Weekly intake of meat products	WHO awareness		T	p
	Unaware (n = 81)	Aware (n = 354)		
Beef	1.2099	1.4322	-1.562	.119
Pork	2.0000	2.0960	-.636	.525
Processed meats	1.5062	1.8051	-1.469	.143

4. Study 2: Effect on Consumers' Actual Purchase Behavior

4.1. Data Collection

In Study 2, we compared the difference between the actual amounts of red meat and processed meats purchased before and after the report release date (October 26, 2015) using purchase receipt data from the Korea Rural Development Administration. The purchase receipt data of 491 consumers (red meat consumers = 357, processed meat consumers = 481) were used in the analysis, and the total amounts purchased were calculated by the two products (red meat and processed meat) separately. The data from September 20 to November 30, 2015 were divided by the report release date. Thus, the amounts purchased before and after the report release date reflected 36 days for each condition.

4.2. Results and Discussion

To determine the impact of the WHO classification of carcinogenic food categories on the amounts of red and processed meats purchased, we divided the purchase receipt data into two groups, according to whether they were aware of the classifications or not. Moreover, we conducted t-tests for four conditions (2 products: red meat vs. processed meat \times 2 awareness groups: aware vs. unaware) to compare the means of the amounts purchased before and after the publication date of the classification.

First, regarding the purchase of red meat, the mean amount purchased for the group that was aware of the announcement significantly decreased after the date when the classification was published ($M_{\text{before the date}} = 86078.09$ vs. $M_{\text{after the date}} = 74796.86$; $p < .1$); for the group that was unaware, the amount purchased did not significantly change ($p = .183$). Second, regarding the purchase of processed meat, the consumers who were aware of the announcement reduced their purchase of the processed meat after the report release date ($M_{\text{before the date}} = 12405.292$ vs. $M_{\text{after the date}} = 9982.03$; $p < .1$), whereas the consumers who were unaware of the announcement did not reduce their purchase significantly after this date ($p = .184$).

Conclusively, the test verified that the consumers who were aware of the WHO classification of carcinogenic food categories reduced their purchase of red meat and processed meat products. Despite the results regarding the consumers' intake in Study 1, the impact of the classification of carcinogenic food categories had a marginal effect on the amounts purchased.

Table 5. Independent sample t-test results

Product	Awareness Group	Announcement Date	Purchased Amount Mean	SD	df	T	p
Red meat (Beef, Pork)	Aware	Before the date (n = 333)	86078.09	81523.244	633.385	1.950	.052
		After the date (n = 322)	74796.86	65946.919			
	Unaware	Before the date (n = 120)	84671.41	69191.623	239	1.335	.183
		After the date (n = 121)	73090.15	65457.282			
Processed meat	Aware	Before the date (n = 221)	11869.88	12405.292	395	1.687	.092
		After the date (n = 176)	9982.03	9131.619			
	Unaware	Before the date (n = 76)	12240.66	10637.523	142	1.334	.184
		After the date (n = 68)	10095.15	8367.013			

· $p < .1$, * $p < .05$, ** $p < .01$

5. Conclusion

The objective of this study was to investigate the effect of consumers' awareness of WHO's announcement on Korean married female consumers' moral attitudes, with a particular focus on feelings of guilt and purchase behavior. In order to examine this, samples were collected through a series of surveys and real purchase data. Then an independent samples t-test and ANOVA were conducted to show the effect of consumers' awareness of WHO's announcement on consumer guilt and purchase behavior.

The results of Study 1 revealed that the recognition of the WHO classification of carcinogenic food categories increased the consumer guilt about purchasing the carcinogenic foods; however, the consumption did not differ significantly between the consumers who were aware and unaware of the classification. Furthermore, the results of Study 2 revealed that the consumers who were aware of the WHO classification of carcinogenic food categories reduced their purchase of red meat and processed meat products.

The findings of this research suggest that the awareness of the classification of carcinogenic food categories by WHO, which is a highly trustworthy organization, influenced and increased the consumer guilt associated with purchasing the products. Hence, consumer guilt affected food choice and consumption to some degree. Our findings support the idea that perceived feelings of guilt may exert a predictive effect on consumption and purchase behavior.

On this point, the findings of this research have some implications for the grocery market and its marketers. The decreased purchase or consumption of red and processed meats resulting from negative information that provokes moral obligations or feelings of guilt can be reversed by reducing consumer guilt. To achieve this goal, the food marketers can apply some marketing strategies to subdue the consumer guilt, such as offering discounts or vice-virtue food bundles.

The findings of this study also make a contribution to the literature in the field of marketing. This body of literature contains a number of studies that have successfully illustrated that the impact of

ethical/moral considerations may influence the intentions and attitudes in relation to some food choices. The findings of this study may extend those of prior studies toward the possibility of uncovering that consumer guilt may also influence real purchase or consumption behavior.

While the findings of Study 1 have some positive implications, they also cast further doubt and highlight the need for further research.

In Study 2, we analyzed consumer panel data to examine the changes in the amounts purchased before and after the release of the WHO report. However, we could not match the changes in consumer guilt and amounts purchased because we did not survey the panel for consumer guilt. In a future study, we will administer a survey about the consumer guilt in relation to purchasing carcinogenic foods and investigate the relationship between the consumer guilt and the amounts purchased and consumed.

Another concern relates to the methods used in this study. We used the independent samples t-test to analyze the difference in the amounts purchased before and after the dissemination of the carcinogenic food classifications; however, we could not observe the treatment effect of recognizing the classification of carcinogenic foods in a time series. Furthermore, we did not control the other variables that might moderate the impact of recognizing the classification of carcinogenic foods on purchase behavior, such as the sample's sociodemographic characteristics. Therefore, we will use difference-in-difference models to investigate cross-sectional and time series changes in consumers' purchase behavior in this future study.

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