

## FOOD ALLERGY COMMUNICATION IN FULL-SERVICE RESTAURANTS: PERSPECTIVES OF CUSTOMERS WITH FOOD ALLERGIES

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### ABSTRACT

This study explored food allergy, communication in full-service restaurants from the perspective of customers with food allergies. Results from 291 respondents demonstrated that customers with food allergies felt that they were mostly responsible for preventing food allergy reactions in restaurants and initiating communication with restaurant staff. Food allergy severity, reaction experience, and frequency of dining out predicted customers' frequency of communicating with restaurant staff about food allergies. Food allergy reactions in restaurants occurred occasionally, yet most customers did not notify servers about their condition. The findings highlighted the need for better communication between customers and restaurant staff for the prevention of food allergy reactions.

**Keywords:** Food allergy, communication, message, responsibility, strategies

### INTRODUCTION

A food allergy is a chronic, complicated health condition in which the immune system attacks a food protein that is not supposed to be harmful to the human body (Mayo Clinic, 2019). It is estimated that about 32 million individuals suffer from food allergies in the United States (Food Allergy Research and Education [FARE], 2020; Gupta et al., 2019). This health condition is unequally distributed among populations of different age groups (Rous & Hunt, 2004). Nearly one in 17 children less than three years of age, one in 25 school-aged children, and one in 13 children under 18 years have food allergies, compared to 11% of adults (Crespo, James, Fernandez-Rodriguez, & Rodriguez, 2006; FARE, 2020; Gupta et al., 2018; Young, Munoz-Furlong, & Sicherer, 2009). A more recently published article that surveyed 40,433 American adults further showed that the food allergy prevalence among American adults could be as high as 10.8%. (Gupta et al., 2019).

Although the "Major Eight" allergens (i.e., eggs, fish, milk, peanuts, soy, shellfish, tree nuts, and wheat) account for 90% of food allergy reaction cases in the U.S. (Boyce et al., 2011; FARE, 2020), other less common food allergens, such as corn, beef, seeds, spices, herbs, and citrus also cause food allergy reactions (FARE, 2020a). Symptoms of food allergy reactions range from mild (e.g., skin irritation) to severe. In severe cases, anaphylactic shock can occur and lead to life-threatening symptoms, such as loss of consciousness, difficulty breathing, coma, and even death (Mayo Clinic, 2019). Statistics have shown that 100 to 200 deaths occur yearly due to severe allergic reactions to food (National Institute of Allergy and Infectious Diseases, 2017). Moreover, food allergy reactions are responsible for 200,000 emergency room visits annually (Clark, Espinola, Rudders, Banerji, & Camargo, 2011). Between 2004 and 2006, there was a total of 9,537 hospitalizations due to diagnosed food allergies among children and infants, compared to 4,135 cases between 2001 and

2003 (Centers for Disease Control and Prevention, 2008). Additionally, hospitalizations due to food allergies tripled between the late 1990s and the mid-2000s among children with food allergies (Branum & Lukacs, 2008).

An individual may suffer from a food allergy reaction after consuming food served at various locations, including commercial and non-commercial foodservice establishments, social event venues, and homes (Bock et al., 2007; Wanich, Weiss, Furlong, & Sicherer, 2008). However, customers with food allergies reported that food allergy reactions that occurred in restaurants (Furlong, DeSimone, & Sicherer, 2001; Knoblauch et al., 2007; Kwon & Lee, 2012) were mostly caused by hidden allergens in food items (Anibarro, Seoane, & Mugica, 2007), cross-contact when foods were prepared in close proximity with food allergens, shared cooking utensils or equipment, or when food allergens were transferred via food preparers' hands (Eigenmann & Zamora, 2002; Kwon & Lee, 2012). In specific, cross-contacts with shared cooking equipment or service supplies were responsible for about 22% of reported food allergen exposures by customers with peanut and tree nut allergies (Furlong et al., 2001). Furthermore, the lack of awareness and food allergy training among foodservice employees, resulting in insufficient food allergy knowledge and improper food allergen handling practices, have also contributed to many food allergy incidents (Ajala et al., 2010; Bailey et al., 2014; Dupuis et al., 2016; Lee & Sozen, 2016; Lee & Sozen, 2018; Lefevre et al., 2018; Radke et al., 2016; Soon, 2018; Wham & Sharma, 2014). At the federal level, the U.S. Food Code requires that restaurant managers or operators should be knowledgeable about major food allergens, cross-contact, and symptoms of allergic reactions. Further, employees should be properly trained about food allergies as related to their assigned duties (Food and Drug Administration, 2017).

An ineffective communication chain between customers with food allergies and servers and between servers and chefs may also lead to food allergy reactions in restaurants (Furlong et al., 2001; Kwon & Lee, 2012; Lee & Xu, 2015; Leftwich et al., 2011; Pratten & Towers, 2003; Soon, 2018). Customers with food allergies may experience an allergic reaction even after speaking to servers and chefs about their special needs and referring to the menu descriptions (Knoblauch et al., 2007). While restaurant staff agreed that customers with food allergies should inform them about their food allergies (Lee & Sozen, 2016; Wen & Kwon, 2017; Soon, 2018), many customers with food allergies assumed that the foods were safe and did not notify restaurant employees about their special dietary needs (Mandabach et al., 2005).

Begen et al. (2018) found that written communication (e.g., restaurant websites, menus, and online recipes) was the customers' preferred method for food allergy communication, especially when customers with food allergies dined at an

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unfamiliar location. Verbal communication was used to seek further clarification regarding the food items. Consistent with the previous literature (Leftwich et al., 2011), Begen et al.'s study (2018) found that customers with food allergies were hesitant to communicate about their food allergies due to potential social embarrassment. On the contrary, restaurant employees felt that it is appropriate for customers with food allergies to request information about the ingredients and preparation methods of the food items (McAdams, Deng, & MacLaurin, 2018). This gap in perception and communication need to be further explored, as effective communication may be used as a tool to reduce food allergy reactions in the restaurants. Therefore, the purpose of this study was to explore food allergy communication in restaurants from the perspective of customers with food allergies. The specific objectives were to (1) examine the effectiveness of current food allergy messages on restaurant menus in encouraging customers to communicate with restaurant staff about their food allergies, (2) explore perceived responsibility regarding the prevention of food allergy reactions, the initiation of communication about food allergies, and the handling of food allergy requests from customers' perspectives, (3) identify factors that predict customers' frequency of communicating with restaurant staff about their food allergies, and (4) provide communication-related strategies to restaurateurs to prevent food allergy reactions in their operations.

## METHODOLOGY

The research protocol was approved by the Institutional Review Board of two large universities in the U.S. prior to data collection. The population of this study was restaurant customers with food allergies in the U.S. The sample was recruited via Amazon Mechanical Turk (MTurk;) (<https://www.mturk.com>), where participants receive compensation through completing tasks (e.g., online surveys) for which they are qualified. MTurk is a widely-used data collection platform with the advantage of collecting data in a short period of time. Additionally, MTurk can reach a large pool of the target population and the reliability of results has been well established in previous studies (Paolacci et al., 2010; Rand, 2012; Shank, 2016). To ensure those study participants were customers with food allergies in the U.S., filtering questions were asked at the very beginning of the survey to screen out participants who do not have food allergies or do not currently live in the U.S. For example, participants were asked to "select the following that best describes you (please check all that apply)," and if "an adult with food allergies" was not selected, they would be led to the end of the survey.

### Instrument Development

Questions on the online survey instrument were developed based on a review of the previous literature (Tonsor, Schroeder, & Pennings, 2009; Kwon & Lee, 2012; Lee & Xu, 2015; Wen & Kwon, 2016; 2017; 2019). This survey instrument consisted of four sections. Section one collected information about participants' demographics characteristics (e.g., age, gender, and educational background), the severity of their food allergy, frequency of dining out, previous food allergic reaction experiences after dining out in restaurants, frequency of communicating with restaurant staff about their food allergies, and their risk perceptions toward dining out with food allergies. The risk perception scale was adapted from the food safety risk perception scale developed by Tonsor, Schroeder, and Pennings (2009).

In section two, participants were asked to rate the effectiveness of current food allergy messages on restaurant menus and indicate their intention to communicate with restaurant staff about their food allergies after reading each message. The four most common food allergy messages identified by Wen and Kwon (2019) were used in

this section. These four messages included, "Please notify your server if anyone in your party has any food allergies," "Items on the menu may contain or come in contact with peanuts, shellfish, or other ingredients that may cause allergic reactions," "We try our best to accommodate food allergies but cannot guarantee that the food will be entirely free of allergens," and, "The restaurant has separate menus for customers with food allergies."

Section three asked participants to rate the effectiveness of food allergy-related communication strategies in preventing food allergy reactions in restaurants. The list of communication strategies was adopted from previous research about food allergy risk communication in restaurants (Wen & Kwon, 2016; 2019).

In the last section, participants were asked to indicate who they perceived to be responsible for preventing food allergy reactions, initiating communication about food allergies, and handling allergen-free requests in restaurants. All the items in sections two, three, and four were measured using seven-point Likert scales. The survey instrument was reviewed and revised by two researchers with vast experience in conducting food allergy-related research prior to uploading it onto the Qualtrics survey platform.

### Data Collection

The survey instrument was pilot tested (N=30) on MTurk to ensure the inter-item reliability of the survey questions. The results of the pilot test indicated that the Cronbach's alpha values for all constructs were above 0.7. For example, the Cronbach's alpha value for intention to communicate was above 0.9 for all messages, and the alpha value for communication strategies was 0.843. Therefore, no further revisions were made prior to the final data collection.

The Qualtrics survey link was distributed to the potential participants. Participants read the survey instructions and indicated their willingness to participate at the very beginning of the survey. Those who passed the filtering questions (i.e., participants who are 18 years old and older, have a food allergy, and have dined out at a restaurant in the past month) were eligible to participate in this study. Two attention-check questions were included in the survey to screen out those failing to pay attention or read the questions carefully while completing the survey. For instance, among the communication strategy questions, participants were instructed to select "Very Ineffective" as their response to one of the items. Those who did not read the questions and selected other options were automatically led to the end of the survey and were excluded from the final data collection. A total of 26 participants were screened out in the first attention check question, and five participants were screened out on the second attention check question. The survey was available on MTurk in summer 2018 for five days, and it was closed when the desired amount of responses was collected. Of 322 participants who were qualified and agreed to participate in this study, 291 responses were valid and used for data analyses.

### Data Analyses

The data collected in this study was analyzed by using The Statistical Package for the Social Sciences (SPSS), Version 25.0. Descriptive statistics, such as means, frequencies, and standard deviations were calculated to summarize the data. Multiple linear regression analyses were conducted to identify the predictors of the dependent variables (e.g., customers' frequency of communicating with restaurant staff about food allergies). For the ranking questions, 3 points were given to those ranked as most responsible person, 2 points were given to those ranked as second most responsible person, while one point was given to those ranked as the third most responsible person.

Afterward, weighted averages were calculated, as presented in Table 3. Statistical significance was determined at  $p < 0.05$ .

## RESULTS AND DISCUSSION

### Participants' Demographic Characteristics

A total of 291 valid and complete responses was collected via MTurk. The demographic characteristics of the participants were summarized in Table 1. The majority of respondents were male ( $n = 184$ ; 63.23%), Caucasian ( $n = 181$ ; 62.19%), and have Bachelor's degrees ( $n = 157$ ; 53.95%). The ethnicity breakdown of participants is very close to the U.S. census estimation of 2019 (U.S. Census Bureau, 2019). Most participants self-reported that they were allergic to more than one food allergen. In terms of the severity of food allergies, most participants indicated that their food allergies range from mild ( $n = 127$ ; 43.64%) to moderate ( $n = 138$ ; 47.42%). The majority of the participants ( $n = 192$ ; 66.0%) in this study reported dining out at least once a month. This finding was consistent with previous research that found that rather than avoid dining out altogether, customers with food allergies preferred to take preventive measures when they decide to dine out (Kwon, Sauer, Wen, Bisges, & Myers, 2013), partially because dining out with friends and family is one of the most important social needs of Americans (National Restaurant Association, 2019).

The results of this study further revealed that 69.26% ( $n = 203$ ) of participants had experienced food allergy reactions after dining out in restaurants, which is quite concerning. The percentage of food allergy reactions reported here is much higher than the findings from previous studies that nearly 15% (Furlong et al., 2001), 33% (Wanich et al., 2008), and 50% (Kwon & Lee, 2012) of respondents had experienced food allergy reactions after eating in restaurants.

### The Effectiveness of Food Allergy Messages on Menus

As reported by a survey of restaurant service staff (Wen & Kwon, 2019), four different types of food allergy messages were frequently included in restaurant menus. In this study, participants were asked to rate the effectiveness of these messages in encouraging customers to communicate with restaurant staff about their food allergies (Table 2). The results showed that the participants were most likely to communicate with restaurant staff about their food allergies when the restaurant indicated that they have a separate menu for customers with food allergies ( $5.27 \pm 1.48$ ). When a one-way analysis of variance (ANOVA) analysis with repeated measures with a Greenhouse-Geisser correction was conducted, no significant differences were identified among the mean scores of the communication intentions of the four different types of messages ( $F(2.636, 764.315) = 0.833, p = 0.463$ ). This finding implied that all messages could have the same level of effectiveness in encouraging customers to communicate about their food allergies with restaurant staff.

### Perceived Responsibility

Participants were asked to rank the responsibility of different people in preventing food allergy reactions in restaurants based on their perception. The results of this study showed that customers with food allergies ranked themselves as the person most responsible in preventing food allergy reactions in restaurants, followed by the front-of-the-house service staff, managerial staff, and back-of-the-house staff (Table 3). This finding was consistent with previous studies that demonstrated customers with food allergies perceived themselves as the most responsible person in preventing food allergy reactions (Lee & Sozen, 2016; Mandabach et al., 2005; Wen & Kwon, 2017). However, front-of-the-house restaurant service staff perceived that the back-of-the-house kitchen staff were mostly responsible for preventing food allergic reactions (Wen & Kwon, 2017).

**Table 1. Characteristics and Dining Behaviors of the Participants (N= 291)**

Characteristics	N	%
<b>Gender</b>		
Male	184	63.23
Female	106	36.43
Prefer not to answer	1	0.34
<b>Age</b>		
19 - 30	217	74.57
31 - 40	64	21.99
41 - 69	10	3.44
Prefer not to answer	1	0.34
<b>Race/Ethnicity</b>		
White or Caucasian	181	62.19
Black or African	53	18.21
Asian/Asian	27	9.28
Hispanic/Latino	18	6.19
American Indian or Alaskan Native	8	2.75
Others	4	1.37
<b>Educational background</b>		
Less than high school	1	0.34
High school graduate or GED	26	8.93
Some college	47	16.15
Associate degree	18	6.19
Bachelor's degree	157	53.95
Graduate degree (Masters or Doctorate)	41	14.09
Professional degree	1	0.34
<b>Participants' food allergies<sup>a</sup></b>		
Peanuts	85	29.21
Shellfish	83	28.52
Milk	77	26.46
Egg	72	24.74
Fish	70	24.05
Soy	50	17.18
Wheat	44	15.12
Tree nuts	43	14.78
Others	30	10.31
<b>Severity of participants' food allergies</b>		
Mild (i.e., rashes, swollen lips, non-life threatening)	127	43.64
Moderate (i.e., nausea, vomiting, nasal congestion, seldom life threatening)	138	47.42
Severe (i.e., require administration of epinephrine or immediate medical attention)	26	8.93
<b>Frequency of dining out at full-service restaurants</b>		
Never	9	3.09
Rarely (less than once in 6 months)	47	16.15
Infrequently (less than once a month)	43	14.78
Sometimes (1-2 times a month)	123	42.27
Often (3-4 times a month)	47	16.15
Frequently (2-3 times a week)	21	7.22
Very frequently ( $\geq 4$ times a week)	1	0.34

<sup>a</sup>Participants may be allergic to one or more common food allergens.

More specifically, participants in this study believed that customers are most responsible for *initiating communication* with restaurant staff if the customer has food allergies ( $5.56 \pm 1.43$ ). At the same time, chefs are most responsible for *handling requests* for allergen-free foods ( $5.38 \pm 1.36$ ) (Table 4). These findings corroborated the results of

**Table 2. Food Allergy Messages on Restaurant Menus**

Food allergy message	Mean±SD
<i>"Restaurants have separate menus for customers with food allergies."</i>	5.27±1.48
<i>"Please notify your server if anyone in your party has any food allergies."</i>	5.20±1.40
<i>"We try our best to accommodate food allergies but cannot guarantee that the food will be entirely free of allergens."</i>	5.20±1.49
<i>"Items on menu may contain or come in contact with peanuts, shellfish or other ingredients that may cause an allergic reaction."</i>	5.16±1.52

Note. Perceived Effectiveness Scale, 1 = least effective; 7 = most effective.

previous studies that surveyed restaurant service staff in full-service restaurants which found customers are responsible for initiating communication (Lee & Sozen, 2016; Wen & Kwon, 2017). However, restaurant service staff perceived that they themselves should handle allergen-free food requests (Wen & Kwon, 2017), while customers in the current study believed that the chef should bear more responsibility when serving customers with food allergies in full-service restaurants. This result supported the finding of a previous study that analyzed online reviews related to customers' dining experiences with food allergies that the chef's presence in handling allergen-free requests may lead to customer satisfaction (Wen et al., 2019).

#### Communicating with Restaurant Staff about Food Allergies

In terms of communicating with restaurant staff, only 72 participants (24.74%) indicated that they always or frequently communicate about their food allergies when placing orders (Table 5). This is concerning, as 203 participants in this study (69.76%) reported that they had experienced food allergy reactions after dining out in restaurants.

Multiple linear regression analyses were conducted to identify factors that influence customers' frequency of communicating with restaurant staff about food allergies when placing orders in full-service restaurants (Table 6). The results indicated that three predictors (i.e., food allergy severity, food allergy reaction experience, and frequency of dining out) together explained 12.90% of the variance ( $R^2=0.129$ ,  $F(8, 281)=5.199$ ,  $p < 0.001$ ). The more severe customers' food allergies are, the more likely that they will communicate with restaurant staff about their food allergies ( $\beta=0.232$ ,  $p < 0.001$ ). Consumers were more likely to communicate with restaurant staff if they had experienced a food allergy reaction after dining in restaurants ( $\beta=0.155$ ,  $p = 0.008$ ). Besides, the more frequently they dined out, the more likely it became that customers would communicate with restaurant staff about their food allergies ( $\beta=0.1626$ ,  $p = 0.005$ ).

Regarding the reasons why customers chose to not always communicate with restaurant staff about their food allergies, 63.57% ( $n=185$ ) of the participants in this study indicated that they know which food items are safe to consume and 40.89% ( $n=119$ ) said that they could ensure their own safety. Furthermore, 28.18% ( $n=82$ ) of participants identified "restaurant employees do not seem to care or know about food allergies", 27.49% ( $n=80$ ) considered their "food allergies are too mild to communicate", and 19.93% ( $n=58$ ) indicated "it is too embarrassing to discuss their food allergies with the restaurant employees" as reasons that prevented them from communicating about their food allergies. Participants who chose the

'other' option also commented that they "don't want to be perceived as a 'complainer,'" and, "it's too much of a hassle to have to ask what I can eat." The results here reflected the findings from previous studies that customers did not discuss their food allergies because of the potential social embarrassment (Begen et al., 2018), or they thought the foods were safe (Sampson, Mendelson, & Rosen, 1992). The results together highlighted the need to eliminate concerns from customers and encourage them to communicate with restaurant staff about their food allergies to reduce the chance of food allergy reactions in restaurants.

#### Food Allergy Communication Strategies

The participants were asked to indicate their opinions on the effectiveness of various strategies in preventing food allergy reactions at restaurants (Table 7). The results showed that servers who ask customers about their special needs once they have been greeted was the most effective strategy (5.58±1.46), followed by customers being informed about uncommon ingredients in the menu items (5.40±1.47). The results of the ANOVA with repeated measures with a Greenhouse-Geisser correction indicated that there were significant differences among the effectiveness of different strategies ( $F(6.078, 0.045)=13.508$ ,  $p < 0.001$ ).

In addition to the strategies listed in Table 7, participants were also asked to provide other strategies that would enhance food allergy communication in restaurants. A total of 15 participants suggested that the restaurant should include all of the ingredients on the menu so that customers can select foods without allergens. More specifically, the ingredient list should also include the type of oil used. On the menu, several participants ( $n=14$ ) suggested that the major allergens present in each dish should be identified with a symbol or an icon next to the menu item. Restaurateurs may also use pictures of these food allergens to make it visually appealing to customers. In addition to a warning statement on the menus, some participants ( $n=7$ ) suggested that restaurant websites could serve as an important communication tool to inform customers about ingredients included in menu items and to encourage customers to communicate with restaurant staff about their food allergies before visiting the restaurant or before placing orders. A few participants ( $n=3$ ) also emphasized the importance of training about how to serve and prepare foods for customers with food allergies. Other strategies, such as calling the restaurant before visiting, reading online reviews ahead of time, and using a mobile app to filter menu items were also mentioned by the participants. Some of these strategies were consistent with the findings from previous research (Kwon & Lee, 2012).

**Table 3. Perceived Responsibilities in Preventing Food Allergy Reactions in Full-service Restaurants (n=291)**

Parties	Rank 1 (3 points)	Rank 2 (2 points)	Rank 3 (1 point)	Rank 4 (0 points)	Weighted average ranking
Customers with food allergies	184	32	35	35	2.24
Front-of-the-house service staff	37	105	86	60	1.40
Managerial staff	41	79	79	90	1.24
Back-of-the-house kitchen staff	34	73	85	95	1.14

**Table 4. Perceived Responsibilities of Customers with Food Allergies and Full-service Restaurant Employees in Food Allergy Communication (n=291)**

Items	Mean±SD
<b>Initiate communication</b>	
It is the <b>customer's</b> responsibility to <i>initiate communication</i> with restaurant staff if the customer has food allergies.	5.56±1.43
It is the <b>restaurant server's</b> responsibility to <i>initiate communication</i> with customers if the customer has food allergies.	4.53±1.70
<b>Handle requests</b>	
It is the <b>chef's</b> responsibility to <i>handle requests</i> for allergen-free food.	5.38±1.36
It is the <b>restaurant server's</b> responsibility to <i>handle requests</i> for allergen-free food.	5.31±1.45
It is the <b>restaurant manager's</b> responsibility to <i>handle requests</i> for allergen-free food.	4.73±1.59

Note. Scale 1= Strongly Disagree and 7 = Strongly Agree

## CONCLUSION AND IMPLICATIONS

Many Americans, adults and children, are affected by food allergies (FARE, 2020). Adults with food allergies and parents of children with food allergies have expressed their anxiety, worries, and fear when dining out (Begen et al., 2018; Kwon et al., 2013; Leftwich et al., 2011). They often need to negotiate and take positive risks as steps for food allergy management when dining out (Begen et al., 2018). To alleviate these issues, it is important for restaurateurs to understand the needs of customers with food allergies and be better prepared when serving this group of customers. Because miscommunication and lack of communication between customers with food allergies and restaurant staff were identified as two of the most critical triggers of food allergy reactions in restaurants, research is needed to identify communication-related issues in restaurants and identify ways to encourage communication about food allergies between these two parties. Previous studies were conducted among restaurateurs to understand their perceptions of food allergy communication (Wen & Kwon, 2016, 2017, 2019). However, research regarding customers with food allergies on this issue is limited.

To address this gap in the literature, this study was conducted to explore food allergy communication in restaurants from the perspectives of customers with food allergies. This study found no statistical difference in the effectiveness of various kinds of messages in encouraging customers to communicate with restaurant staff about their food allergies. Customers with food allergies perceived that they should be mostly responsible to prevent food allergy reactions in restaurants, as well as to initiate communication about food allergies with restaurant staff. The results of the multiple regression analyses identified that food allergy severity, food allergy reaction experience, and the frequency of dining out were significant predictors of customers' frequency of communicating about food allergies with the restaurant staff. The majority of the participants indicated that they do not always notify the servers about their food allergies because they know which food items are safe to consume. Participants believed that the most effective strategy in food allergy communication is to have the servers ask them about their special needs once they have been greeted. The servers should also inform them about any uncommon ingredients in the menu items when an order is placed.

## Practical Implications

In addition to addressing the gap in the literature by exploring customers' perspectives in food allergy communication in restaurants, the results of this study also provided restaurateurs, customers with food allergies, food allergy advocates, policy makers, and foodservice educators with important insights. Customers with food allergies, front-of-the-house staff, managers, and back-of-the-house staff seemed to have different roles in the prevention of food allergy reactions based on the findings of this study. For instance, customers with food allergies should be the ones that disclose their special dietary requests, while chefs are in charge of making sure the food allergens are handled appropriately in food preparation. These findings are useful in employee food allergy training as they aid the management in developing a guideline that outlines the specific roles played by each position in the restaurant operation, which collectively will better serve customers with food allergies. More specifically, front-of-the-house staff should be trained to inquire about customers' dietary restrictions to prevent potential social embarrassment, while customers need to announce/disclose their food allergies. Second, restaurant servers should inform customers about any changes to the ingredients when orders are taken, since some customers with food allergies rely on the ingredient list on the menu when ordering food, and they do not necessarily discuss their food allergies directly with the servers.

Data collected from the open-ended questions further indicated that the participants would like to see a symbol or an icon next to the food items that contain one of the Big 8 food allergens in the U.S.. Restaurateurs may adopt this strategy to make food items containing major food allergens more prominent and identifiable to customers with food allergies. In addition to printed menus in restaurants, customers with food allergies identified restaurant websites as important communication platforms. If feasible, restaurateurs may consider posting the complete list of ingredients of menu items online to allow customers to make more informed decisions when deciding where to dine.

Food allergy advocates and policy makers may use the results of this study to prepare food allergy service guidelines for the restaurant industry and food allergy community. In addition to educating restaurant staff about food allergies, it is critical to develop related guidelines for customers with food allergies regarding the prevention

**Table 5. Frequency of Communicating with Full-service Restaurant Staff about Food Allergies**

Frequency	N	%
Never	21	7.22
Rarely (in less than 10% of cases)	59	20.28
Occasionally (in about 30% of cases)	77	26.46
Sometimes (in about 50% of cases)	62	21.31
Frequently (in about 70% of cases)	39	13.40
Always (in about 90% of cases)	33	11.34

**Table 6. Multiple Regression Analyses Predicting Customers' Frequency of Communicating Food Allergies (N=291)**

Variables	B	S.E. B	$\beta$	t	Sig.
Gender	-0.222	.0171	-0.075	-1.298	0.195
Education background	-0.059	0.069	-0.049	-0.852	0.395
Number of food allergens	-0.016	0.058	-0.016	-0.271	0.787
Severity of food allergies	0.519	0.129	0.232	4.017	0.000***
Food allergy reaction experience	0.483	0.181	0.155	2.668	0.008**
Frequency of eating out	0.189	0.068	0.162	2.798	0.005**
Risk perception	-0.014	0.104	-0.008	-0.137	0.891
Perceived responsibilities	0.029	0.059	0.029	0.490	0.624
$R^2$	0.129***				
Adjusted $R^2$	0.104				
F for changes in $R^2$	5.199				

Note. \*\*\*p < 0.001; \*\*p < 0.01; \*p < 0.05.

of food allergy reactions when dining out. Special attention should be paid to the communication process. On the other hand, policy makers may enforce the inclusion of food allergy messages on restaurant menus. Meanwhile, customers with food allergies should be encouraged to always notify restaurant staff of their food allergies when placing orders instead of making false assumptions. A study conducted by Redke et al. (2016) indicated that as much as 55% of the restaurants surveyed (n = 278) included a note on the menus, reminding the customers to inform the restaurant if they or other individuals in their party have food allergies. The current study found that less than 25% of participants reported that they always or frequently communicate about their food allergies when placing orders. This is alarming, as nearly one third of the fatalities related to food allergies were caused by foods from foodservice operations (Bock et al., 2007; Wanich et al., 2008). With the potential changes in food ingredients and cross-contact in food preparation areas, policy makers may support consumer education programs to remind customers to be proactive for the prevention of food allergy reactions.

As current students who majored in hospitality management are also current or future employees of the foodservice industry, it is important that topics about food allergy communication is included in education modules or curriculum. Even though food allergies is one of the topics in food safety courses (e.g., ServSafe® certification courses) in different types of hospitality and foodservice education programs, it is noteworthy that most teaching modules focus on knowledge about food allergens and awareness of the severity of food allergies, very few of them discussed the importance of communication. Therefore, foodservice educators should use these results and add content about food allergy communication to the teaching modules

of food allergies in food safety courses. For example, content related to how to establish a consistent line of communication among there staff when taking allergen-free orders will be very useful for hospitality management students.

#### Limitations and Future Research

This study is not without limitations. As the data were collected through online surveys, those individuals who do not use computers or do not have access to the internet were excluded from taking this survey. Also, the participants were recruited through MTurk, a market research company. Because of this, this study only included customers with food allergies whose contact information already existed in the company's database. Future studies should recruit participants from other channels, including members of food allergy organizations and food allergy social media support groups. Furthermore, the participants may have been influenced by social desirability bias. Therefore, the results of this study should be interpreted with caution. Although the food allergy messages and communication strategies evaluated in the current study were adopted from previous research, they may not include all the effective messages. Future studies may use other research methods, such as experimental design, to examine the most effective ways of encouraging customers to communicate with restaurant staff about their food allergies. On the other hand, this study only explored the messages in full-service restaurants; future studies may expand the context to different types of foodservice operations. Finally, this study was conducted in the U.S., so the results may not be generalizable to restaurant operations in other countries. Future studies may explore food allergy communication in other countries and compare the results with those of the current study.

**Table 7. Perceived Effectiveness of Food Allergy Communication Strategies in Full-service Restaurants**

Strategies	(Mean±SD)
The servers ask customers about special dietary needs as soon as they are greeted.	5.58±1.46
Customers are informed if there are uncommon ingredients included in menu items.	5.40±1.47
Customers are informed when the restaurant is unable to provide allergen-free meals.	5.33±1.56
A statement is included on the menu to advise customers to notify the server if anyone has a food allergy.	5.31±1.42
Restaurant staff informs customers about how allergen-free orders were prepared in the kitchen.	5.21±1.44
A written protocol is in place specifying the standard procedures for serving customers with food allergies.	5.05±1.47
A sign or poster is displayed in the dining area asking customers to notify the server if anyone has a food allergy.	5.00±1.46
The chef visits the table to provide assurance that the meal is allergen-free.	4.86±1.68

Note. Scale 1= Strongly Disagree and 7 = Strongly Agree

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