

## Original Research



# Korean consumers' use and concerns about food delivery service

Jong-Youn Rha <sup>1,2</sup>, Youngwon Nam <sup>1,2§</sup>, Jihyun Yoon <sup>2,3</sup>, and Bohan Lee <sup>4§</sup>

<sup>1</sup>Department of Consumer Science, Seoul National University, Seoul 08826, Korea

<sup>2</sup>Research Institute of Human Ecology, Seoul National University, Seoul 08826, Korea

<sup>3</sup>Department of Food and Nutrition, Seoul National University, Seoul 08826, Korea

<sup>4</sup>Department of Consumer Policy Research, Korea Consumer Agency, Eumseong 27738, Korea

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### Corresponding Authors:

#### Youngwon Nam

Department of Consumer Science, Seoul National University, 1 Gwanak-ro, Gwanak-gu, Seoul 08826, Korea.

Tel. +82-2-880-8762

Fax. +82-2-871-2506

Email. ywnam@snu.ac.kr

#### Bohan Lee

Department of Consumer Policy Research, Korea Consumer Agency, 54 Yongdu-ro, Maengdong-myeon, Eumseong 27738, Korea.

Tel. +82-43-880-5674

Fax. +82-43-880-0811

Email. bohan@kca.go.kr

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### ORCID iDs

Jong-Youn Rha 


<https://orcid.org/0000-0002-4865-9707>

Youngwon Nam 

<https://orcid.org/0000-0001-7630-5896>

Jihyun Yoon 

<https://orcid.org/0000-0002-9479-9305>

Bohan Lee 

<https://orcid.org/0000-0002-6805-7770>

<https://e-nrp.org>

## ABSTRACT

**BACKGROUND/OBJECTIVES:** Despite the rapid growth of the online food delivery service market since the outbreak of coronavirus disease 2019, little research has focused on how consumers are using food delivery service and what they are concerned about when using food delivery service. Moreover, previous studies have not paid adequate attention to how these concerns are related to consumers' intention to use food delivery service. Therefore, our study examines behaviors and concerns regarding food delivery service and identifies the key factors in consumers' intention to use food delivery service.

**SUBJECTS/METHODS:** Using data collected from 549 Korean consumers, we conducted descriptive analysis, exploratory factor analysis, and multiple regressions.

**RESULTS:** We found that using food delivery service is not only for main meals at home or the office but also to meet a variety of dietary needs and occasions. The findings indicated that Korean consumers are most concerned about the sustainability of food delivery service, followed by health, hygiene, hedonic, and usability aspects of the service. Hygiene concerns and a hedonic aspect of the service were negatively associated with consumers' intention to use food delivery service among users, while health concerns decreased the intention of non-users.

**CONCLUSION:** The findings have implications for practitioners and policy makers in food delivery service. To further propel market growth, they should help reduce health concerns of non-users, as well as hygiene and hedonic concerns of existing users.

**Keywords:** Food services; meals; surveys and questionnaires; Korea

## INTRODUCTION

Food delivery service has received considerable recent attention as an emerging trend in the e-commerce market. Unlike traditional food delivery service that has mostly been from fast food or pizza stores with toll-free numbers, food delivery service through mobile applications is more flexible in that consumers can choose from a wider variety of restaurants and menu items regardless of their physical distance to the stores. Consumers directly benefit from the convenience and ability to meet their unique dietary needs and tastes. Food delivery service has also opened up more business opportunities for many restaurants and bars by overcoming the spatial limitations, which has given them access to a broader customer base [1,2].

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**Conflict of Interest**

The authors declare no potential conflicts of interests.

**Author Contributions**

Conceptualization: Rha JY; Formal analysis: Nam Y, Lee B; Investigation: Nam Y, Lee B; Methodology: Nam Y, Lee B; Supervision: Rha JY; Validation: Rha JY, Yoon J; Writing - original draft: Rha JY, Nam Y, Yoon J, Lee B; Writing - review & editing: Rha JY, Nam Y, Yoon J, Lee B.

The growth of food delivery service accelerated and intensified during the pandemic. When many restaurants and bars were forced to shut down or close early during lockdowns, ordering food delivery service became the main alternative for consumers who still wanted to enjoy convenient food in a safe place. In response to the challenge of the global pandemic, the global online food delivery service market grew at an average compound annual growth rate of 10.3% between 2020 and 2021 [3]. In Korea, the online food delivery service market showed an explosive 80% growth rate in 2020 compared to 2019 [4]. As the market growth suggests, using food delivery service has become an integral part of Koreans' dietary lifestyle for consumers. Thus, it is worthwhile to investigate how the use of food delivery service has reshaped dietary choices and behaviors among current consumers.

Given the growing interest in the market, many studies have explored the possible drivers or inhibitors of using food delivery service [1]. However, existing studies on food delivery service have mostly focused on the role of technology or mobile platforms in consumers' intention to use food delivery service [5-8]. These studies have mostly seen the use of food delivery service as an acceptance of technology-driven service and thus have described how consumers' attitudes toward or perceived characteristics of online platforms and IT features influence the adoption of online food delivery service. Despite the considerable explanatory power of existing studies, they are somewhat limited in that they do not explain how the use of food delivery service affects consumers' nutritional needs or dietary lifestyle.

The objective of the current study is to provide a comprehensive snapshot of the use of food delivery service in Korea. We investigated consumers' experiences with food delivery service in detail by describing the usage, choices, and concerns of consumers. We also examined how behavioral concerns and consumers' characteristics influence the intention to use food delivery service. Considering the higher interest and demand driven by the global pandemic, this study provides practitioners and policy makers with a deeper understanding of consumers' dietary behaviors and concerns with respect to the use of food delivery service.

**SUBJECTS AND METHODS**

**Data collection**

To collect data for this study, a survey was conducted targeting Korean adult consumers in their 20s and older. Samples were recruited online by a third-party research company in Korea. The survey was conducted with panels who were willing to respond to the questionnaire by sending them a link to the survey web page. For this study, participants were drawn using quota-sampling, so they were equally distributed by gender and age groups. Our sample may not be representative of the Korean population since we did not consider a larger share of older people. However, the quota-sampling allowed us to secure an adequate sample size for each consumer group categorized by gender and age. Data were collected for 6 days from October 12 to October 18, 2020, about 8 mon after the outbreak of coronavirus disease 2019 (COVID-19) in Korea. This study was approved by the Institutional Review Board (IRB) of Seoul National University (IRB: No. 2010/003-012). The responses of 549 participants were used for analysis.

**Measures**

For this study, a questionnaire with 4 parts was designed to collect information about consumers' characteristics and general dietary behaviors (part 1), the use of home meal

replacement products (part 2), the use of food delivery service (part 3), and changes in dietary attitudes and behaviors during COVID-19 (part 4). A previous study analyzed the responses to consumers' characteristics and general dietary behaviors (part 1) and changes in dietary attitudes and behaviors during the COVID-19 (part 4), specifically examining the changes in dietary attitudes and behaviors [9]. The current study focuses on the usage of food delivery service (part 3) and consumers' characteristics (part 1).

Respondents were asked to answer the following questions to describe their usage and experience of food delivery service: "Do you usually use food delivery service?" "For what purpose do you usually use food delivery service?" "When do you usually use food delivery service?" "Where do you usually use food delivery service?" and "With whom do you usually eat food from food delivery service?"

In addition, to measure consumer satisfaction with each attribute of food delivery service, the respondents were asked to assess 14 attributes with respect to food delivery service: convenience (no need to prepare the meal), variety of choices, taste, quantity, brand awareness, expiration date, freshness, safety, nutrition, origin of the material, healthiness, use of eco-friendly ingredients, use of domestic food ingredients, and price. Respondents rated the extent to which they were satisfied with each attribute on a 5-point Likert scale from 1 (not satisfied at all) to 5 (very satisfied).

Next, 14 items were included to measure consumers' concerns about food delivery service to reflect their perceptions of various aspects related to food delivery service, such as concerns about health, hygiene, and sustainability. The items were derived from previous studies [10-13]. The respondents were asked to what extent they agreed with each statement on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). A sample item is, "I'm worried about eating a lot of delivered food from food delivery service."

Lastly, to measure the intention to use food delivery service, 3 items were developed referring to previous studies [14]. Respondents were asked to indicate the degree of agreement with 3 statements on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). The 3 statements were "I will use food delivery service in the near future," "I am willing to spend my time and money on using food delivery service," and "I will use food delivery service as much as I currently do even after the COVID-19 ends." The 3 responses were averaged to form one variable. To capture socio-demographic information, participants were asked to identify their gender, age, education level, annual household income, employment, and household composition as a composite measure based on marital status and children in the home.

### Statistical analysis

We conducted descriptive analyses to understand (1) respondents' usage of food delivery service, (2) when they mostly used food delivery service, (3) places where they usually used food delivery service, and (4) with whom they usually used food delivery service. In addition, to understand the level of satisfaction by attribute of food delivery service and concerns related to food delivery service, we conducted basic analyses including means and SDs.

With respect to the attributes of food delivery service and the concerns about food delivery service, the next step was conducting exploratory factor analysis (EFA) to determine the rotation method of factors and the number of factors to be derived. In this study, EFA was used to investigate the structure of the variables indicating the attributes of food

delivery service and the concerns about food delivery service. EFA is mainly used when the relationship between variables and factors is not theoretically established or logically systematized [15-17]. First, for factor rotation, the varimax method was chosen because the relationship between the extracted factors and variables could be made clearer, and problems caused by multicollinearity would be solved in the regression analysis performed later. As for the number of factors, factors with eigenvalues greater than or equal to 1 were automatically extracted so the factors could explain the variance of one variable at the most.

For a detailed comparison of concerns about food delivery service based on demographic variables, the statistical significance of the difference in average values was verified through *t*-tests and an analysis of variance for each factor. The demographic variables included gender, age, education level, household income, household composition, and the use of food delivery service.

Finally, multiple regression analysis was performed to identify concerns that affect consumers' intention to use delivered food. To compare the difference between food delivery service for users and non-users, the respondents were divided into 2 groups and multiple regression analysis was performed for each group. We coded a respondent as a user if the respondent answered "yes" to the question "Do you usually use food delivery service?" and coded the respondent as a non-user otherwise. As independent variables, demographic factors including gender, age, marital status, and household income were included as well as 5 factors (health concerns, hygiene concerns, usability concerns, hedonic concerns, sustainability concerns) derived through the EFA.

## RESULTS

### Descriptive analysis

Our sample consisted of 549 Korean consumers including 375 users of food delivery service and 147 non-users (Table 1). Overall, most respondents (71.9%) had a college degree. In addition, almost half of the respondents (46.3%) answered that their household income was between 3 million KRW and 6 million KRW. Slightly less than half of the respondents (44.3%) were married, divorced, or widowed with children. Finally, 68.3% of the total respondents had used food delivery service.

Table 1 shows the differences in demographic characteristics between food delivery service users and non-users. There were significant differences between these 2 groups in all variables except gender. First, the proportions were high for food delivery service users in their 20s, 30s, and 40s, while the proportion was high for non-users in their 60s. In addition, many non-users of food delivery service had a high school education level or less. The proportion of respondents who did not use delivery food was high among the group with a household income of 3 million KRW or less. There was also a high proportion of users who were non-married living with their parents or grandparents. In contrast, there was a high proportion of non-users who were married without children.

### Use of food delivery service

Among the 375 users of food delivery service, 330 (88.0%) used food delivery service to replace their main meals and only 20 (5.3%) responded that they ordered food for eating between meals (Table 2). Two-thirds of the users ordered food for their dinner (66.9%),

**Table 1.** Descriptive analysis

Characteristics	Total (n = 549)	Users (n = 375)	Non-users (n = 174)	$\chi^2$ (P-value)
Gender				0.660 (0.417)
Male	279 (50.8)	195 (52.0)	84 (48.3)	
Female	270 (49.2)	180 (48.0)	90 (51.7)	
Age (yrs)				50.754 (< 0.001)
20–29	105 (19.1)	86 (22.9)	19 (10.9)	
30–39	110 (20.0)	91 (24.3)	19 (10.9)	
40–49	111 (20.2)	79 (21.1)	32 (18.4)	
50–59	113 (20.6)	70 (18.7)	43 (24.7)	
60–69	110 (20.0)	49 (13.1)	61 (35.1)	
Education level				8.214 (0.016)
High school graduation or less	96 (17.5)	54 (14.4)	42 (24.1)	
College degree	395 (71.9)	282 (75.2)	113 (64.9)	
Graduate degree	58 (10.6)	39 (10.4)	19 (10.9)	
Household income				9.608 (0.008)
Low ( $\leq$ 3 million KRW)	145 (26.4)	85 (22.7)	60 (34.5)	
Middle ( $>$ 3 million KRW, $\leq$ 6 million KRW)	254 (46.3)	187 (49.9)	67 (38.5)	
High ( $>$ 6 million KRW)	150 (27.3)	103 (27.5)	47 (27.0)	
Household composition				11.964 (0.007)
Unmarried and living alone or with siblings	99 (18.0)	61 (16.3)	38 (21.8)	
Unmarried and living with parents or grandparents	122 (22.2)	95 (25.3)	27 (15.5)	
Married without children	85 (15.5)	49 (13.1)	36 (20.7)	
Married, divorced, widowed with children	243 (44.3)	170 (45.3)	73 (42.0)	

Values are presented as number (%). Results of the  $\chi^2$  test of users and non-users for demographic variables are indicated by P-values.

**Table 2.** Use of food delivery service

Use of food delivery service	Users (n = 375)
Purpose of food delivery service	
For meal replacement	330 (88.0)
Eating between meals	20 (5.3)
Snacks with alcoholic beverage	12 (3.2)
For hospitality	6 (1.6)
As lunch/dinner box	5 (0.3)
As side dish for meals	1 (0.3)
For gifts	1 (0.3)
When usually to use food delivery service	
For dinner	251 (66.9)
For lunch	64 (17.1)
For a late-night snack	38 (10.1)
For brunch	10 (2.7)
For a snack between lunch and dinner	8 (2.1)
Before the meal	3 (0.8)
For breakfast	1 (0.3)
Places where users usually use food delivery service	
At home	350 (93.3)
At the office	17 (4.5)
The place where I order food	4 (1.1)
At school	2 (0.5)
Outside (e.g., park, street)	2 (0.5)
With whom users usually to use food delivery service	
Family	275 (73.3)
Alone	51 (13.6)
Friends	34 (9.1)
Colleagues	15 (4.0)

Values are presented as number (%).

17.1% for lunch, and 10.1% for a late-night snack. Most of the users used food delivery service at home (93.3%). About 73% of users answered they ate delivered food with their family, and 13.6% said they ate alone.

**Table 3** shows the results of users' satisfaction with various attributes of food delivery service. The 375 users answered each item on a 5-point Likert scale (1 = not satisfied at all, 5 = very satisfied). The EFA revealed 3 underlying factors of service attributes after excluding 4 items: taste, quantity, brand awareness, and price. Meal-related attributes consisted of "convenience to prepare the meal" and "variety of choices." Health-related attributes consisted of "freshness," "safety," "nutrition," and "healthiness." Ingredient-related attributes consisted of "expiration date," "origin of the material," "use of domestic food ingredients," and "use of eco-friendly ingredients." All 3 factors showed Cronbach's alpha values of 0.7 or higher, which indicated that the internal consistency of each factor was maintained.

The respondents were most satisfied with meal-related attributes ( $3.77 \pm 0.63$ ). This finding implies that they seemed to prefer ordering food that required little preparation so they could save time and effort to cook or to pick up a take-out. In addition, consumers seemed to be highly aware of the satisfaction that came from various options and were satisfied with the taste of food that was difficult to find or cook at home. They were less satisfied with health-related attributes ( $3.00 \pm 0.58$ ) and ingredient-related attributes ( $2.94 \pm 0.56$ ) indicating that consumers had a relatively low level of satisfaction with the ingredients included in the delivered food itself or the effect of the ingredients on their health. Detailed results of each item are presented in **Table 3**.

### Consumers' concerns about food delivery service

The EFA based on the data of this study, revealed 5 factors, as shown in **Table 4**. First, 5 questions, including concerns about excessive consumption of delivered food, concerns that it may harm their health, and concerns about food additives, related to overall health concerns. We named this factor "Health concerns." Next, one factor was derived from 3 questions including concerns that the delivered food packaging would not be clean, concerns that the storage method would not be clean, and uncertainty about the origin of the ingredients in the food. We named this factor "hygiene concerns." The third category was "usability concerns." This factor was related to consumers finding it difficult to order food delivery service or make a payment. In other words, this factor refers to the degree to which it is difficult to order and pay for delivered food. The fourth factor we named "hedonic concerns." This factor consisted of 2 items, with questions about whether respondents thought that food delivery service reduced their need to cook or the variety of the foods they ate. In other words, this factor describes the extent to which respondents believed that

**Table 3.** Level of satisfaction by attribute of food delivery service

Attribute of food delivery (users, n = 375)	Level of satisfaction <sup>1)</sup>	Ingredient-related attributes	Health-related attributes	Meal-related attributes
Use of domestic food ingredients	2.82 ± 0.71	0.861		
Use of eco-friendly ingredients	2.82 ± 0.71	0.859		
Origin of the material	2.97 ± 0.65	0.694		
Expiration date	3.17 ± 0.61	0.670		
Healthiness	2.82 ± 0.73		0.801	
Nutrition	2.99 ± 0.64		0.788	
Safety	3.03 ± 0.70		0.720	
Freshness	3.14 ± 0.72		0.685	
Convenience to prepare the meal	3.83 ± 0.72			0.862
Variety of choices	3.71 ± 0.76			0.793
Eigen value	-	4.992	1.343	1.010
Cronbach's alpha	-	0.864	0.849	0.717
M ± SD	-	2.94 ± 0.56	3.00 ± 0.58	3.77 ± 0.63

Values are presented as M ± SD.

<sup>1)</sup>Unit of measure: 1 = not satisfied at all, 5 = very satisfied.

**Table 4.** Exploratory factor analysis on concerns about food delivery service

Items (total, n = 549)	Mean ± SD	Health concerns	Hygiene concerns	Usability concerns	Hedonic concerns	Sustainability concerns
I'm worried about eating a lot of delivered food	3.37 ± 0.97	0.789				
I'm afraid that food delivery service will harm my health	3.49 ± 0.89	0.755				
I think there is a lack of nutritional information for delivered food	3.54 ± 0.82	0.733				
I think the ingredients in delivered food are not fresh	3.22 ± 0.75	0.624				
I'm concerned about food additives	3.66 ± 0.88	0.619				
I think the packaging of delivered food is not clean	2.88 ± 0.83		0.864			
I think the storage and storage methods of delivered food is not hygienic	3.07 ± 0.78		0.843			
I question the origin of the ingredients in delivered food	3.44 ± 0.81		0.658			
I think it is difficult to order food delivery service	2.15 ± 0.85			0.924		
I think it is difficult to pay for food delivery service	2.19 ± 0.87			0.903		
I think that food delivery service reduces the pleasure of cooking	2.91 ± 0.90				0.896	
I think that food delivery service reduces the pleasure of experiencing a variety of foods	2.81 ± 0.89				0.886	
I think food waste increases with food delivery service	3.78 ± 0.93					0.859
I think the use of single-use items increases with food delivery service	4.13 ± 0.83					0.810
Eigen value		4.998	2.142	1.479	1.063	1.029
Cronbach's alpha		0.827	0.814	0.858	0.807	0.763

delivered food takes away from the pleasure of cooking or enjoying the variety of food. Finally, the fifth factor was derived from 2 questions regarding whether delivered food increased food waste and disposable products. This factor related to environmental concerns, so it was named “sustainability concerns.”

**Table 5** shows the comparison of the 5 factors of consumer concerns regarding food delivery service based on the results of the EFA by demographic characteristics. Demographic factors included gender, age, education level, household income, household composition, and experience with food delivery service payment.

The average difference in the 5 concerns by gender was statistically significant. Females' “health concerns” (3.56 ± 0.67), “hygiene concerns” (3.20 ± 0.68), and “sustainability concerns” (4.12 ± 0.73) were significantly higher than those of men. However, for both male and female, “usability concerns” (male = 2.25 ± 0.82, female = 2.09 ± 0.78) and “hedonic concerns” (male = 2.93 ± 0.76, female = 2.78 ± 0.86) were 3 points or less, but for these 2 factors, males had significantly higher levels of concern than females.

The level of concern about food delivery service by age showed a statistically significant difference in “hygiene concerns” and “usability concerns.” Regarding hygiene concerns, the level of concern for respondents in their 50s (3.26 ± 0.72) and 60s (3.28 ± 0.61) was statistically significantly higher than those in their 20s (2.91 ± 0.73). In particular, concerns related to hygiene for those in their 20s was below the median score of 3 points. In addition, regarding usability concerns, the level of concern for respondents in their 60s (2.41 ± 0.74) was higher than those in their 20s (2.06 ± 0.89) and 30s (1.95 ± 0.88). In addition, there was a significant difference in the level of concern about usability for respondents in their 40s (2.31 ± 0.73) compared to those in their 30s. Considering that most food delivery service transactions are done through the Internet or mobile device, these results suggest that relatively older consumers were more concerned about food delivery service using information and communications technology than younger consumers.

The results also showed that there was a difference based on household composition. In particular, the level of concern about delivered food related to health was significantly higher

**Table 5.** Comparison of concerns about food delivery service by demographic variables

Characteristics (total, n = 549)	Health concerns	Hygiene concerns	Usability concerns	Hedonic concerns	Sustainability concerns
<b>Gender</b>					
Male	3.35 ± 0.64	3.07 ± 0.69	2.25 ± 0.82	2.93 ± 0.76	3.80 ± 0.79
Female	3.56 ± 0.67	3.20 ± 0.68	2.09 ± 0.78	2.78 ± 0.86	4.12 ± 0.73
<i>t</i> -value ( <i>P</i> -value)	-3.684 (< 0.001)	-2.158 (0.031)	2.373 (0.018)	2.223 (0.027)	-4.843 (< 0.001)
<b>Age (yrs)</b>					
20-29	3.42 ± 0.76	2.91 ± 0.73 <sup>a</sup>	2.06 ± 0.89 <sup>ab</sup>	2.73 ± 0.97	3.95 ± 0.79
30-39	3.54 ± 0.69	3.07 ± 0.64 <sup>ab</sup>	1.95 ± 0.88 <sup>a</sup>	2.86 ± 0.86	3.95 ± 0.80
40-49	3.35 ± 0.63	3.12 ± 0.71 <sup>ab</sup>	2.31 ± 0.73 <sup>bc</sup>	2.85 ± 0.64	4.00 ± 0.77
50-59	3.53 ± 0.64	3.26 ± 0.72 <sup>b</sup>	2.12 ± 0.69 <sup>abc</sup>	2.90 ± 0.74	4.03 ± 0.75
60-69	3.44 ± 0.60	3.28 ± 0.61 <sup>b</sup>	2.41 ± 0.74 <sup>c</sup>	2.94 ± 0.84	3.87 ± 0.79
<i>F</i> -value ( <i>P</i> -value)	1.665 (0.157)	5.245 (< 0.001)	6.272 (< 0.001)	0.990 (0.412)	0.655 (0.623)
<b>Education level</b>					
High school graduation or less	3.38 ± 0.67	3.16 ± 0.60	2.25 ± 0.76	2.92 ± 0.84	3.93 ± 0.83
College degree	3.47 ± 0.67	3.12 ± 0.72	2.13 ± 0.79	2.84 ± 0.81	3.95 ± 0.76
Graduate degree	3.52 ± 0.61	3.13 ± 0.64	2.33 ± 0.94	2.84 ± 0.80	4.04 ± 0.80
<i>F</i> -value ( <i>P</i> -value)	1.066 (0.345)	0.104 (0.902)	2.177 (0.114)	0.320 (0.726)	0.428 (0.652)
<b>Household income</b>					
Low (≤ 3 million KRW)	3.37 ± 0.70	3.07 ± 0.69	2.30 ± 0.88	2.89 ± 0.86	3.88 ± 0.90
Middle (≤ 6 million KRW)	3.48 ± 0.64	3.13 ± 0.69	2.13 ± 0.77	2.80 ± 0.80	4.01 ± 0.72
High (> 6 million KRW)	3.50 ± 0.66	3.19 ± 0.70	2.12 ± 0.78	2.92 ± 0.79	3.95 ± 0.76
<i>F</i> -value ( <i>P</i> -value)	1.698 (0.184)	1.195 (0.304)	2.625 (0.073)	1.203 (0.301)	1.165 (0.313)
<b>Household composition</b>					
Unmarried and living alone or with siblings	3.40 ± 0.77 <sup>ab</sup>	2.98 ± 0.70 <sup>a</sup>	2.12 ± 0.85 <sup>ab</sup>	2.82 ± 0.88	3.93 ± 0.93
Unmarried and living with parents or grand-parents	3.32 ± 0.70 <sup>a</sup>	2.91 ± 0.68 <sup>a</sup>	2.00 ± 0.82 <sup>a</sup>	2.74 ± 0.87	3.89 ± 0.79
Married without children	3.62 ± 0.60 <sup>b</sup>	3.28 ± 0.63 <sup>b</sup>	2.21 ± 0.76 <sup>ab</sup>	2.99 ± 0.85	4.05 ± 0.77
Married, divorced, widowed with children	3.49 ± 0.60 <sup>ab</sup>	3.25 ± 0.68 <sup>b</sup>	2.26 ± 0.77 <sup>b</sup>	2.88 ± 0.74	3.97 ± 0.71
<i>F</i> -value ( <i>P</i> -value)	4.053 (0.007)	9.980 (< 0.001)	3.018 (0.029)	1.764 (0.153)	0.739 (0.529)
<b>Status of food delivery service use</b>					
User	3.46 ± 0.65	3.03 ± 0.65	2.12 ± 0.82	2.83 ± 0.77	3.98 ± 0.78
Non-user	3.46 ± 0.70	3.35 ± 0.73	2.27 ± 0.75	2.91 ± 0.91	3.91 ± 0.77
<i>t</i> -value ( <i>P</i> -value)	0.003 (0.997)	-5.197 (< 0.001)	-2.006 (0.045)	-1.130 (0.259)	1.085 (0.279)
Total	3.46 ± 0.66	3.13 ± 0.69	2.17 ± 0.80	2.86 ± 0.82	3.96 ± 0.78

Values are presented as M ± SD. Unit of measure: 1 = strongly disagree, 5 = strongly agree.

Different letters within the same column represent significant differences between among groups according to Scheffe's multiple range test.

for respondents who were married without children (3.62 ± 0.60) compared to respondents who were not married and lived with their parents or grandparents (3.32 ± 0.70). In addition, the level of concern related to hygiene was significantly higher for married respondents (married without children = 3.62 ± 0.60, married, divorced, widowed with children = 3.49 ± 0.60) than for unmarried respondents (unmarried and living alone or with siblings = 3.40 ± 0.77, unmarried and living with parents or grandparents = 3.32 ± 0.70). The level of concern about usability for respondents who were married, divorced, and widowed with children (2.26 ± 0.77) was statistically significantly higher than for respondents who were unmarried and living with parents or grandparents (2.00 ± 0.82). However, the average level of concern about usability for the 2 groups was less than 2.5 points. Significant differences in age across the 4 household composition groups could reveal discrepancies among household composition groups: average age of unmarried and living alone or with siblings = 39.79 ± 13.06; unmarried and living with parents or grandparents = 30.66 ± 08.43; married without children = 51.40 ± 13.24; and married, divorced, widowed with children = 50.25 ± 09.50.

There were also differences in the level of concern depending on the respondents' experience of using food delivery service. Those who had no experience with food delivery service had a statistically significantly higher level of concern about hygiene (no experience = 3.35 ± 0.73, experienced = 3.03 ± 0.65) and usability (no experience = 2.27 ± 0.75, experienced = 2.12 ±



0.82) compared with those who had used food delivery service. However, for concerns about usability, both groups had a low average score of less than 2.5 points. The comparisons of means in consumer concerns according to the demographic characteristics of users and non-users are shown in **Supplementary Tables 1 and 2**.

Finally, the difference in the level of concern based on education level and household income was not statistically significant. This finding suggests that there is no difference in terms of economic level since food delivery service is widely popular in Korea.

### Factors affecting intention to use food delivery service

The results of multiple regression analyses are shown in **Table 6**. The analysis model included concerns about food delivery service and the demographic variables of gender, age, marital status, and log of income, referring to the age and consumption variables presented in **Table 5**. Considering that the difference between the older and younger groups was remarkable and that the difference according to marital status was significant, the group aged 50 or older and the married group were, respectively, configured as dummy variables. For food delivery service users, the level of concern about hygiene ( $\beta = -0.200$ ) and hedonic concerns ( $\beta = -0.143$ ) were negatively associated with the intention to use food delivery service. This finding indicates that the more consumers believe that the packaging and storage methods of delivered food are unsanitary, or the cleanness of the ingredients in the delivered food is not reliable, the lower their intention to use delivered food. In addition, the more they believe that the pleasure of cooking at home or experiencing various foods decreases, the more their intention to use the food delivery service decreases. Among these factors, the level of concern about hygiene had a greater effect on their intention to use delivered food. In addition, males who had used food delivery service reported a 0.180 higher intention than females.

For non-users of food delivery service, the higher the level of health concerns ( $\beta = -0.430$ ), the lower the intention to use food delivery service. Considering that the influence of the other 4 concerns (hygiene concerns, usability concerns, hedonic concerns, sustainability concerns) on the intention to use food delivery service did not show any statistical

**Table 6.** Regressions of the intention to use food delivery service on concerns about food delivery service

Variables	Intention to use food delivery service <sup>1)</sup>			
	Users (n = 375)		Non-users (n = 174)	
	B (SE)	P-value	B (SE)	P-value
Health concerns	0.137 (0.086)	0.114	-0.430 (0.149)	0.004
Hygiene concerns	-0.200 (0.085)	0.019	0.065 (0.126)	0.606
Usability concerns	0.006 (0.056)	0.905	0.109 (0.096)	0.259
Hedonic concerns	-0.143 (0.060)	0.017	-0.080 (0.081)	0.324
Sustainability concerns	-0.086 (0.060)	0.151	0.093 (0.110)	0.398
Male	0.180 (0.085)	0.036	-0.137 (0.144)	0.341
Age under 50	-0.121 (0.095)	0.201	0.361 (0.165)	0.030
Married	-0.075 (0.093)	0.422	0.126 (0.172)	0.467
Log of income	0.017 (0.065)	0.792	0.170 (0.094)	0.073
Constant	4.374 (0.497)	< 0.001	2.589 (0.701)	< 0.001
F-value	2.71	0.005	2.50	0.010
R-squared		0.063		0.120
Adj R-squared		0.040		0.073

Values are presented as coefficients (SEs).

<sup>1)</sup>A dependent variable, an intention to use food delivery service, was measured on the degree of agreement with 3 statements, "I will use food delivery service in the near future," "I am willing to spend my time and expense on using food delivery service," and "I will use food delivery service as much as I currently do even after coronavirus disease 2019 ends" on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). Three responses were averaged to form one variable.

significance, health concerns may be the most important reason for not using food delivery service. Additionally, there were differences by age. Respondents in their 50s and younger were 0.361 more likely to use food delivery service than respondents in their 60s and older.

## DISCUSSION

This study investigated Korean consumers' experiences of using food delivery service and their intention to use food delivery service. As the use of food delivery service has continued to grow rapidly, this service has become an important alternative to meet consumers' dietary and nutritional needs. This research adds to the current literature by investigating dietary behaviors and concerns related to food delivery service, specifically focusing on usage behaviors, satisfaction, and concerns and intention to use food delivery service.

We found that using food delivery service is not only for main meals at home or the office but also for snacks between meals or late-night snacks, and foods for camping or travel. Although the results indicated that most of our respondents ordered food delivery service for dinner with their family at home, consumers have become accustomed to using food delivery service for various occasions. Unlike the traditional delivery service which only offered limited food choices from nearby fast food or Chinese restaurants, current food delivery service options provide the same quality of food and tastes as consumers can experience in dine-in restaurants [18]. This finding is also in line with our findings that consumers are mostly satisfied with using food delivery service because it provides convenience, a wider choice of foods, and comparable tastes. Taking advantage of digital technology with multiple platforms and payment methods, food delivery service has attracted more consumers.

Our study highlights that Korean consumers still have various concerns about using food delivery service. We found 5 underlying factors that explain what concerns Korean consumers have about food delivery service in the following order: sustainability, health, hygiene, hedonic, and usability concerns.

The results demonstrate that Korean consumers are mindful of environmental consequences of food delivery service. A few studies have pointed out that packaging and food waste generated by food delivery service are concerning to consumers [19-21]. Thus, these studies have called for greater attention to the sustainability impact of the food delivery service sector. In particular, interest and concern about waste problems in Korea have led to a relatively higher awareness of food waste and plastics [22,23]. This heightened public interest may be reflected in public concern about the use of food delivery service. Stakeholders in food delivery service and policymakers may need to focus on developing an effective remedy for the growing waste from food delivery service.

With respect to health concerns, despite a wider array of menu options from food delivery service, consumers may still regard food delivery service as being only unhealthy options. The findings indicate that consumers are aware of and concerned about health, which was ranked as the second highest concern following their concerns about sustainability. Past studies that have examined nutritional value or health outcomes of food delivery service have also revealed that frequent use of food delivery service is associated with higher intake of fat, sugar, and salt [24]. Since pizza, fried chicken, and fast food have been the most popular food delivery service options for Korean consumers [25], our participants' perceptions about food

delivery service may be linked to food delivery service being unhealthy. Health concerns were significantly higher for female and married individuals. Thus, service providers in the online food delivery service industry need to provide healthier food choices by collaborating with various restaurants.

The findings also indicated that consumers are well aware of and concerned about hygiene. This finding implies that consumers have become more conscious about whether the foods on their table are produced in a safe and hygienic environment given the reports of increased deceptive behaviors among service providers [26]. The tendency to seek safe and hygienic food delivery service was greater during the COVID-19 pandemic since people were afraid of being contaminated by foods or infected by delivery personnel [27]. Females, 50 and older, and married individuals reported a significantly higher concern regarding the safety and hygiene of delivered food. Food delivery service providers should focus on ensuring the safety and hygiene measures implemented by restaurants to mitigate consumers' concerns [28].

Previous studies have suggested that individuals view cooking as an enjoyable behavior and a way to eat healthy, but cooking also requires culinary skills to buy or prepare the food [29,30]. Our results indicated that consumers were concerned about losing the joy (i.e., hedonic concern) of cooking or dining out with increased use of food delivery service. Ordering food delivery service typically replaces at-home cooking, so it may be that consumers believe that food delivery service would deprive them of the great joy of cooking or making culinary treats. However, during the pandemic-imposed quarantine, lockdowns, and social distancing, people might have had no choice but to use food delivery service even when they were eager to dine-out. Therefore, our results indicated that consumers perceived that ordering food delivery service was negatively related to the experiential value of cooking or dining out.

Another concern was the perceived usability of food delivery service, which could be attributed to the characteristics of the platforms or payment methods of online food delivery service. The use of online food delivery service is a combination of highly perishable products and the experience of ordering [31,32]. Diverse platforms and payment methods operated by food delivery service providers requires consumers to adjust to different ordering processes [33]. Furthermore, consumers who have access to a larger selection of restaurants and their menus need to process information about the menu items and restaurants, search for the best food options, and generate their order. This decision process may be challenging for consumers with lower awareness of the products or platforms [32]. Our results of the mean comparison tests showed that males, 60 yrs old and older, and married consumers reported significantly higher concerns about usability. Thus, service providers may need to focus on designing a more user-friendly experience including a user-friendly platform and convenient payment method.

Our regression results suggest different effects of perceived concerns on the intention to use food delivery service. For those who had used food delivery service, having a higher hygiene concern was negatively associated with intention to use food delivery service again. This may be due to a past unpleasant experience or frequent public exposure to reports related to hygiene issues. Although food delivery service providers have urged their restaurant partners to comply with food hygiene standards, most of the guidelines and measures are not mandatory [34]. Therefore, policymakers and regulators need to cooperate with business practitioners to facilitate effective monitoring systems to enhance the detection of safety and hygiene problems. A concern about losing the joy of cooking (i.e., hedonic concern) due to food delivery service also negatively influenced the intention to use food delivery service.

This is in accordance with previous findings that using food delivery service substitutes for cooking and in-restaurant dining [35]. To attract more consumers to food delivery service, service providers may need to consider various experiential factors such as delivering meal kits as a replacement to cooking from scratch or collaborating with social dining platforms to satisfy consumers' need for group dining [36,37]. Interestingly, a health concern was the only significant predictor of the intention to use food delivery service for those who had not used food delivery service. This finding implies that health concerns may be a critical inhibitor for consumers who perceive that food delivery service only provides unhealthy options and unbalanced nutrition. This finding implies that business practitioners in food delivery service could increase market penetration by reducing health concerns among non-users as well as hygiene and hedonic concerns among existing users.

Although this study provides interesting insights into the usage behaviors and factors affecting consumers' intention to use food delivery service, it has some limitations. First, while describing the overall behaviors of using food delivery service, our data were unable to capture the factors in greater detail since it did not allow multiple responses. Actual behaviors of those who frequently use food delivery service could be partially reflected in our findings. Future research should develop a more comprehensive questionnaire to understand usage behaviors of food delivery service. Second, due to the difference in the sample size between the 2 groups and data availability limitations, it was difficult for the current research to fully reflect the differences between users and non-users in a more rigorous way. Future research is needed to collect a larger sample so the results are more generalizable and to examine user behaviors in more depth based on how often they use food delivery service. Lastly, since our data were collected after the outbreak of the COVID-19 pandemic, our results may not be generalizable to normal conditions (non-COVID-19 restrictions) in the market. Thus, future work should further investigate the impacts of an increase in demand for food delivery service on dietary behaviors and lifestyle with an empirical comparison between pre- and post-pandemic behavior.

## SUPPLEMENTARY MATERIALS

### Supplementary Table 1

Comparison of concerns about food delivery service by demographic variables for users

[Click here to view](#)

### Supplementary Table 2

Comparison of concerns about food delivery service by demographic variables for non-users

[Click here to view](#)

## REFERENCES

1. Suhartanto D, Ali MH, Tan KH, Sjahroeddin F, Kusdibyo L. Loyalty toward online food delivery service: the role of e-service quality and food quality. *J Foodserv Bus Res* 2019;22:81-97.  
[CROSSREF](#)
2. Goh SK, NG SR, Wong SY, Chong L. Outsourcing to online food delivery services: perspective of F&B business owners. *J Internet Bank Commer* 2017;22:1-18.

3. Wood L. Global online food delivery services market report 2021: COVID-19 growth, impacts and change to 2030 [Internet]. New York (NY): Business Wire; 2021 [cited 2022 May 27]. Available from: <https://www.businesswire.com/news/home/20210429005768/en/Global-Online-Food-Delivery-Services-Market-Report-2021-COVID-19-Growth-Impacts-and-Change-to-2030---ResearchAndMarkets.com>.
4. The Korea Times. Online food delivery service market grows 79% in 2020 [Internet]. Seoul: The Korea Times; 2021 [cited 2022 May 27]. Available from: [https://www.koreatimes.co.kr/www/tech/2021/03/694\\_304829.html](https://www.koreatimes.co.kr/www/tech/2021/03/694_304829.html).
5. Daim TU, Basoglu AN, Gunay D, Yildiz C, Gomez F. Exploring technology acceptance for online food services. *Int J Bus Inf Syst* 2013;12:383-403.  
**CROSSREF**
6. Won J, Kang H, Kim B. The effect of food online-to-offline (O2O) service characteristics on customer beliefs using the technology acceptance model. *Culin Sci Hosp Res* 2017;23:97-111.  
**CROSSREF**
7. Lee EY, Lee SB, Jeon YJ. Factors influencing the behavioral intention to use food delivery service apps. *Soc Behav Personal* 2017;45:1461-73.  
**CROSSREF**
8. Preetha S, Iswarya S. Factors influencing the intension to use food online order and delivery appvia platforms-using TAM (Technology Acceptance Model). *Int J Recent Technol Eng* 2019;7:1141-6.
9. Rha JY, Lee B, Nam Y, Yoon J. COVID-19 and changes in Korean consumers' dietary attitudes and behaviors. *Nutr Res Pract* 2021;15:S94-109.  
**PUBMED | CROSSREF**
10. Hossain F, Adelaja AO. Consumers' interest in alternative food delivery service systems: Results from a consumer survey in New Jersey. *J Food Distrib Res* 2000;31:49-67.
11. Yeo VC, Goh SK, Rezaei S. Consumer experiences, attitude and behavioral intention toward online food delivery service (OFD) services. *J Retailing Consum Serv* 2017;35:150-62.  
**CROSSREF**
12. Wang O, Somogyi S, Charlebois S. Food choice in the e-commerce era: a comparison between business-to-consumer (B2C), online-to-offline (O2O) and new retail. *Br Food J* 2020;122:1215-37.  
**CROSSREF**
13. Ceniti C, Tilocca B, Britti D, Santoro A, Costanzo N. Food safety concerns in "COVID-19 era". *Microbiol Res (Pavia)* 2021;12:53-68.  
**CROSSREF**
14. Hong C, Choi H, Choi EK, Joung HW. Factors affecting customer intention to use online food delivery services before and during the COVID-19 pandemic. *J Hosp Tour Manage* 2021;48:509-18.  
**CROSSREF**
15. Fabrigar LR, Wegener DT, MacCallum RC, Strahan EJ. Evaluating the use of exploratory factor analysis in psychological research. *Psychol Methods* 1999;4:272-99.  
**CROSSREF**
16. Cudeck R. Exploratory factor analysis. In: Tinsley HEA, Brown SD, editors. *Handbook of Applied Multivariate Statistics and Mathematical Modeling*. Cambridge (MA): Academic Press; 2000. p.265-96.
17. Widaman KF. Exploratory factor analysis and confirmatory factor analysis. In: Cooper H, editor. *APA Handbook of Research Methods in Psychology*. Washington, D.C.: American Psychological Association; 2012.
18. Hirschberg C, Rajko A, Schumacher T, Wrulich M. *The Changing Market for Food Delivery Service*. Berlin: McKinsey & Company; 2016.
19. Molina-Besch K. Food delivery service packaging and tableware waste. *Nat Food* 2020;1:531-2.  
**CROSSREF**
20. Song G, Zhanga H, Duana H, Xub M. Packaging waste from food delivery service in China's mega cities. *Resour Conserv Recycl* 2018;130:226-7.  
**CROSSREF**
21. Li C, Miroso M, Bremer P. Review of online food delivery service platforms and their impacts on sustainability. *Sustainability* 2020;12:5528.  
**CROSSREF**
22. Global Recycling. South Korea: the aim is a resource-circulating society [Internet]. Alling: MSV Mediaservice & Verlag GmbH; 2019 [cited 2022 May 27]. Available from: <https://global-recycling.info/archives/3205>.
23. Broom D. South Korea Once Recycled 2% of Its Food Waste. Now It Recycles 95%. *Cologne: World Economic Forum*; 2019.

24. Maimaiti M, Zhao X, Jia M, Ru Y, Zhu S. How we eat determines what we become: opportunities and challenges brought by food delivery industry in a changing world in China. *Eur J Clin Nutr* 2018;72:1282-6.  
[PUBMED](#) | [CROSSREF](#)
25. Jeon SY, Park SE, Kim YJ. The most popular food delivery service orders in South Korea [Internet]. Seoul: Yonhapnews; 2017 [cited 2022 May 27]. Available from: <https://www.yna.co.kr/view/AKR20170905129800797>.
26. Ministry of Food and Drug Safety (KR). 2018 Ministry of Food and Drug Safety White Paper. Sejong: Ministry of Food and Drug Safety; 2018.
27. World Health Organization. COVID-19 and Food Safety: Guidance for Food Businesses. Geneva: World Health Organization; 2020.
28. Amin A, Arefin S, Alam R, Ahammad T, Hoque R. Using mobile food delivery service applications during COVID-19 pandemic: an extended model of planned behavior. *J Food Prod Mark* 2021;27:105-26.  
[CROSSREF](#)
29. Wolfson JA, Smith KC, Frattaroli S, Bleich SN. Public perceptions of cooking and the implications for cooking behaviour in the USA. *Public Health Nutr* 2016;19:1606-15.  
[PUBMED](#) | [CROSSREF](#)
30. Sidenvall B, Nydahl M, Fjellström C. The meal as a gift-The meaning of cooking among retired women. *J Appl Gerontol* 2000;19:405-23.  
[CROSSREF](#)
31. Kotler PT, Bowen JT, Makens J, Baloglu S. *Marketing for Hospitality and Tourism*. New York (NY): Pearson; 2017.
32. Gunden N, Morosan C, DeFranco A. Consumers' intentions to use online food delivery service systems in the USA. *Int J Contemp Hosp Manag* 2020;32:1325-45.  
[CROSSREF](#)
33. Annaraud K, Berezina K. Predicting satisfaction and intentions to use online food delivery service: what really makes a difference? *J Foodserv Bus Res* 2020;23:305-23.  
[CROSSREF](#)
34. Jones R. *The Future of Food Delivery Service Platforms*. London: Lexology; 2021.
35. Babar Y, Adeli A, Greenwood BN. Cooking or clicking: The impact of online food delivery service platforms on domestic food preparation. SSRN 2021.
36. Severson K. It's dinner in a box. But are meal delivery kits cooking [Internet]. New York (NY): The New York Times; 2016 [cited 2022 May 27]. Available from: <https://www.nytimes.com/2016/04/06/dining/meal-delivery-service-subscription-boxes.html>.
37. Davies A, Cretella A, Edwards F, Marovelli B. The social practices of hosting P2P social dining events: Insights for sustainable tourism. *J Sustain Tour* 2022;30:1004-19.  
[CROSSREF](#)