Response of the Public to Calorie Labeling in Food Delivery Application Menus

Sarah Alkhunein (smkhunein@sfda.gov.sa)
National Nutrition Committee (NNC), Saudi Food and Drug Authority (SFDA)
Areej Alkhaldy
Clinical Nutrition Department, Faculty of Applied Medical Sciences, King Abdulaziz University
Wedan Alghefari
Clinical Nutrition Department, Faculty of Applied Medical Sciences, King Abdulaziz University
Haya Alzeer
Department of Community Health Sciences, College of Applied Medical Sciences, King Saud University
Omar Alhumaidan
National Nutrition Committee (NNC), Saudi Food and Drug Authority (SFDA)
Sarah Alsalman
Department of Community Health Sciences, College of Applied Medical Sciences, King Saud University
Nojoud Alshathry
Department of Community Health Sciences, College of Applied Medical Sciences, King Saud University

Research Article

Keywords: Calories, Labeling, Applications, Delivery, Menu

Posted Date: June 16th, 2023

DOI: https://doi.org/10.21203/rs.3.rs-3048500/v1

Abstract

Background

The use of food delivery applications is widespread; however, to date, there have been no studies on the effect of menu labeling on public's dietary behavior and food choices. Therefore, this study aimed to explore the public preference and experience of ordering from food delivery applications, their response to the availability of calorie labeling in food delivery applications, and whether it impacts their food choices.

Methods

This is a cross-sectional study conducted between October and November of 2022. A total of 419 participants were recruited using an online questionnaire.

Results

The findings showed that most participants (59%) preferred to order using food delivery applications. Saving time and effort are the main reasons for using food delivery applications (61%). Caloric information in food delivery application menus is primarily utilized to monitor intake for weight maintenance (19%). The ability to calculate energy requirements and interest in viewing caloric information on food delivery application menus were linked to younger age and a higher level of education ($p < 0.05$).

Conclusions

These findings highlight the need to increase public awareness about calorie labeling on menus to aid the success and effectiveness of the calorie labeling in food delivery applications as a tool to promote balanced energy intake.

1. Background

Obesity is primarily caused by an imbalance between energy intake and expenditure [1]. It is a risk factor for many diseases, including diabetes mellitus, hypertension, and cardiovascular disease [2]. The prevalence of obesity has approximately tripled globally since 1975 [3]. Considering its association with several health issues, it is vital to investigate the factors that affect dietary behavior [4]. Dietary behavior is a broad term that encompasses food choices, dietary intake, and eating behavior. A single term for dietary behavior does not exist, as it is shared among various disciplines such as nutrition, epidemiology, and psychology [5]. Six determinants have been identified as influencing food choices: biological (hunger, appetite, and taste), economic (cost and income), physical (access, education, skills, and time), social (class, culture, and social context), psychological (mood, stress, and guilt), and attitudes, beliefs, and knowledge of food [6].

In terms of physical determinants, access to stores and the availability of items within them affect food choices [6]. The consumption of food prepared away from home is increasing, especially among children and young adults [7]. In addition, the economic growth in recent decades has led to a cultural shift to a modern Westernized

lifestyle [8]. It has become an investment target for owners or franchisers of fast-food chains, restaurants, and cafés. The food service market would expand by 6% over the next 5 years [9]. Owing to market growth, a mediator is needed to facilitate access to various restaurants.

Online food delivery applications and third-party platforms act as intermediaries between customers and restaurants [10]. According to a survey, the reasons that drove individuals to use online food delivery applications were quick and easy access (85%), saving time (84%), variety of restaurant options (83%), advertisements (65%), quality of service (64%), long working hours (61%), food menu photos and methods of food demonstration (53%), and the impact of social media (44%) [11].

As online food delivery platforms became widespread and more people started to use them, it was important for different government agencies such as the Saudi Food and Drug Authority (SFDA) to implement a menu calorie labeling policy to inform customers and help them consider better choices. In August 2018, the SFDA enacted the “Putting Calories on Food Establishments Menu’s Selling Away-From-Home Foods” policy. It applies to all food establishments, such as restaurants, cafés, ice cream shops, juice shops, bakeries, and cafeterias. The regulations require displaying calories in a clear manner beside each type of food. Some food types were excluded, such as temporary and daily foods and special orders. The calorie labeling policy for restaurant menus is a cost-free strategy that can prevent obesity and other chronic diseases [12].

Since the menu labeling policy was mandated at the end of 2018, several studies have assessed its effects on food choices. A cross –sectional study investigated the impact of caloric information in food delivery applications on the selection of meals by participants during COVID-19. They found that 60% of the participants did not consider calories, whereas only 13% paid attention to calories in the menu [13]. In addition, other study assessed the community's perspective on showing calories on food delivery platforms; approximately 34% of respondents revealed that they would choose low-calorie items, 26% would not choose low-calorie items, and 34% may choose low-calorie items [14]. Another study compared pre- and post-menu labeling policy implementation based on the sales of a famous fast-food chain from dine-in and online orders via different platforms. The data showed a slight increase in the average total number of calories per order, approximately 1% for dine-in orders and 7% for online orders. There was a slight decrease in the average beverage calories in both settings and fries in dine-in orders. The average calories per order on online platforms were higher than dine-in orders by 10% pre-labeling and 16% post-labeling policy. Generally, there was no remarkable effect on the total number of calories per order after menu labeling policy implementation [15].

In Saudi Arabia, the number of food delivery applications and individuals who are using them are increasing; with no study examining the response of public toward the menu labeling in food delivery applications. This study is important as the result of this survey could be used for future research to understand the effect of menu labeling on food delivery applications on individuals dietary behavior and food choices. Therefore, this study aimed to explore the public preference and experience of ordering from food delivery applications, their response to the availability of calorie labeling in food delivery applications, and whether it impacts their food choices.

2. Methods

2.1 Study design

This was a cross-sectional, an online questionnaire-based study. The study was conducted between October and November 2022. This study was approved by the Biomedical Ethics Research Committee of King Abdulaziz University (Jeddah, Saudi Arabia) (Reference No. 370 – 22). An online informed consent form was signed electronically by all participants of the study before commencing with the online survey. Password-protected files on secure servers were used to retain the participant information, and no information was shared with a third party without the principal investigator's written agreement.

2.2 Participants and recruitment

A total of 419 adult nationals and residents of the Kingdom of Saudi Arabia aged 18 years or older were included as a convenience sample. The participants were required to respond to an online survey conducted using Google Forms. Snowball sampling was used to distribute the online surveys through several social media sites, including Twitter and WhatsApp. The National Nutrition Committee's account tweeted the survey link, while the authors distributed the survey link via WhatsApp to all individuals on their personal contact lists, including family members and friends, and requested that they do the same for everyone they knew who lived in Saudi Arabia.

2.3 Sample size calculation

The minimum required sample size was calculated as 385 according to the finite population equation [16] using a margin of error = 0.05, and population size data obtained from the General Authority for Statistics on the numbering of adults (≥ 18 years old) in 2019 in Saudi Arabia (25,828,206) with an estimation that 50% of target participants would agree to participate in the study [17].

2.4 Study questionnaire

The questionnaire was developed by the study research team with a nutritional background to collect relevant information from the participants. Content validity was assessed through experts evaluations (n = 8) in the field of nutrition, and a content validity index of 0.81 was achieved. In addition, a pilot study was conducted to empirically test the questionnaire with 10 people to ensure the clarity of the questions. The questionnaire was revised based on experts feedback, public feedback, and comments. The internal consistency of each scale was tested using Cronbach's alpha test. The values ranged from 0.57–0.70. A correlation coefficient with an average value of 0.74 was preferred for test-retest reliability.

The first section of the questionnaire included questions regarding sociodemographic characteristics of the participants such as gender, age, marital status, level of education, monthly income, work status, field of study, and geographic location. In addition, the participants' background information such as self-reported weight and height (used to calculate BMI) and medical status was collected. The second section of the questionnaire gathered information about the types of restaurants, frequency of food ordering from restaurants, and possible reasons for ordering from restaurants. The third section investigated the effect of displaying calories in food delivery applications on public's dietary behavior and food choices. The questions in this section asked the participants whether they noticed any calorie information in food delivery applications, whether they used it, and whether it affected their food selection. The fourth section inquired about possible reasons for ordering from food delivery applications. In the last section, we inquired about the frequency of meal ordering from food delivery applications to collect consumption data.

2.5 Statistical analysis

Data were checked and entered using standardized entry codes written in the Statistical Package for the Social Sciences (SPSS, Version 23.0; IBM Corp., Armonk, NY, USA) v26 data file. Data were presented as frequencies and proportions. Descriptive statistics were used to examine demographic characteristics and food frequency. To test the difference between two variables, a chi-square test of independence was used with a p-value < 0.05 denoting statistical significance. The Bonferroni correction was used for multiple comparisons.

3. Results

3.1 Participant characteristics

A total of 419 food consumers participated in this study. Their sociodemographic characteristics are summarized in Table 1. Most of the participants were female (83.1%), and their ages ranged between 18 and 72 years (mean = 30.2 years; standard deviation = 10.5 years). Almost two-thirds were single (61.3%), held a bachelor's degree (66.1%), and lived in the central region of Saudi Arabia (68%). More than one-third (37%) were employed, and 33.4% were students. Twenty-two percent of the participants were in the medical field and 17.9% were in nutrition and food sciences, while the remaining participants had a range of different backgrounds (**Table 1**). The monthly income of 34.9% of the participants was below 2000 Saudi Riyals per month, whereas 23.4% exceeded 10000 Saudi Riyals per month. The prevalence rates of overweight and obesity among the participants were 25.3% and 16%, respectively. A history of chronic health problems was reported by 19.6% of the participants.

Table 1. Sociodemographic characteristics of the participants (n = 419)

Variables	N	%
Age, y		
Range	18-72	
Mean ± SD	30.2 ± 10.5	
Gender		
Male	71	16.9
Female	348	83.1
Marital status		
Single	257	61.3
Married	145	34.6
Divorced	10	2.4
Widowed	7	1.7
Highest educational level		
Below secondary school	16	3.8
Secondary school/equivalent	78	18.6
Bachelor`s degree	277	66.1
Postgraduate degree	48	11.5
Job status		
Student	140	33.4
Employed	155	37.0
Unemployed	101	24.1
Self-employed	8	1.9
Retired	15	3.6
Field of study		
Nutrition/food sciences	75	17.9
Medical	92	22.0
Science	41	9.8
Literacy	42	10.0
Management	69	16.5
Non-specific	100	23.8
Monthly income, SR		
<2000	146	34.9

2000-5000	104	24.8
5001-7000	44	10.5
7001-10000	27	6.4
>10000	98	23.4
Body Mass index [a]		
Underweight	31	7.4
Normal	215	51.3
Overweight	106	25.3
Obesity	67	16.0
Medical Diagnosis		
No	337	80.4
Yes	82	19.6

n (%) = Data presented as number and percentage; SR= Saudi Riyal

[a] Self-reported weight and height were used to calculate BMI. The BMI categories are defined as follows: healthy weight (BMI 18.5 to 24.9 kg/m2), overweight (BMI 25.0 to 29.9 kg/m2), and obese (BMI ≥ 30 kg/m2).

3.2 Preference of ordering from food delivery applications

More than half of the participants (58.9%) preferred ordering from food delivery applications rather than directly from restaurants. The reported reasons for this included saving time and effort (61.3%) and ease of access to restaurants and shops compared to direct ordering from a restaurant (53.4%). Most participants (64%) claimed that their use of food delivery applications increased during the COVID-19 pandemic (**Table 2**).

Table 2. Preference of ordering from food delivery applications (n=419)

	n	%
1. Do you prefer to order directly from the restaurant or food delivery apps? (n=419)		
Food delivery applications	247	58.9
Restaurants	172	41.1
2. What is the reason behind using food delivery apps? (n=247)		
The different price and offers compared with ordering directly from the restaurant	99	23.6
Saving time and effort	257	61.3
The ease of access to restaurants and shops compared with ordering from a restaurant directly	224	53.4
The variety of options for restaurants and shops available on the apps	172	41.1
3. Has your use of food delivery apps increased during the COVID-19 pandemic? (n=419)		
No	151	36.0
Yes	268	64.0

n (%) = Data presented as number and percentage

3.3 Frequency of ordering from food delivery applications

The restaurants most frequently utilized via food delivery applications were those serving fast food (69.7%), followed by coffee shops (47%) and those serving desserts (40.8%), traditional food (39.9%), and international food (39.6%). The main reasons for choosing a specific restaurant were taste (61.6%), craving for a specific food (59.4%), meal price (45.6%), delivery price (43.4%), and level of hygiene and quality (43.2%). The most frequently ordered meal from food delivery applications was dinner (65.8%). More than half (53%) of the participants used food delivery applications once per week, and the most frequent time for ordering from food delivery applications was in the evening (7 pm – 12 am) (61.6%). Most participants (78.1%) ordered food for themselves and family members or friends (**Table 3**).

Table 3. Types of restaurants in food delivery applications and frequency of ordering by the participants (n=419)

	n	%
1. What type of restaurants or shops do you order from?		
Fast-food restaurants	292	69.7
International food restaurants	166	39.6
Traditional food restaurants	167	39.9
Healthy food restaurants	97	23.2
Vegetarian restaurants	12	2.9
Desserts shops	171	40.8
Beverages shops	100	23.9
Coffee shops	197	47.0
Others	25	6.0
2. What is the reason behind choosing a specific restaurant from the application?		
Meal price	191	45.6
Delivery price	182	43.4
Delivery speed	125	29.8
Healthiness	70	16.7
Taste	258	61.6
Reviews from others	101	24.0
Pictures displayed on menus	68	16.2
Craving a specific food	249	59.4
The desire of others to eat certain food	159	37.9
Level of hygiene and quality	181	43.2
Other reasons	20	4.8
3. What type of meal do you order the most from food delivery applications?		
Breakfast	5	1.2
Lunch	85	20.3
Dinner	276	65.8
Snacks	41	9.8
Beverages	12	2.9
4. How frequently do you use food delivery applications?		
Once per week	222	53.0
2-4 times per week	167	39.9
5-6 times per week		

Once per day	16	3.8
2 or more times per day	11	2.6
	3	0.7
5. What time of the day do you mostly order from food delivery applications?		
Morning (6 am - 12 pm)	6	1.4
Afternoon (1 pm - 6 pm)	83	19.8
Evening (7 pm - 12 am)	258	61.6
Post-midnight (1 am - 5 am)	21	5.0
No specific time	51	12.2
6. When you order from food delivery apps, you order:		
For myself	68	16.2
For myself, and a family member or friend	327	78.1
For a family member or friend only	24	5.7

n (%) = Data presented as number and percentage

3.4 Frequency of ordering meals from food delivery applications according to restaurant type

The meals most frequently ordered from food delivery applications per week were fast food (53.1%), international food (44.4%), traditional food (47.0%), and healthy food (35.4%) (**Figure 1**).

3.5 Perception and understanding of energy labeling displays in food delivery application menus

Overall, slightly more than half (50.6%) of participants knew how to calculate their daily calorie requirements. Under half (44.9%) were interested in viewing caloric information on food delivery application menus and 46.6% noticed any caloric information displayed on the menu when ordering from a food delivery application (**Table 4**).

Participants who knew how to calculate personal daily calorie requirements were, on average, significantly younger (28.63 years) than those that did not know how to do so (31.77 years) ($p = 0.002$). Older participants also tended not to notice caloric information displayed on menus when ordering from food delivery applications (32.7 years) compared with those who sometimes noticed (27.94 years) or always noticed this information (31.74 years) ($p < 0.001$). As shown in Table 4, participants who were not interested in viewing caloric information on food delivery application menus were significantly older than those who were sometimes or always interested (31.92 vs. 28.82 and 30.78 years, respectively; $p = 0.040$).

Participants with no history of chronic health problems were more likely to know how to calculate personal daily calorie requirements than their counterparts (53.7% vs. 37.8%, $p = 0.01$). Participants with a normal body mass index were more likely to know how to calculate personal daily calorie requirements than were obese participants (55.8% vs. 31.3%; $p = 0.006$) (**Table 4**). Males were more likely than females to notice any caloric information displayed on the menu when ordering from food delivery applications (46.5% vs. 28.7%; $p = 0.001$).

Highly educated participants were more likely to know how to calculate their personal daily calorie requirements than those with lower levels of education ($p < 0.001$). Those who studied nutrition or food sciences had the greatest knowledge about calculating daily calorie requirements (89.3%), whereas the lowest knowledge was observed among those who had undertaken non-specific studies (15.6%) ($p < 0.001$). Most highly educated participants (70.8%) expressed interest in viewing caloric information on food delivery application menus, whereas only 42.3% of secondary school/equivalence-educated persons expressed interest in viewing such information ($p = 0.001$).

Half of the participants who undertook a non-specific field of study, compared to 21.3% and 29.3% of those who studied nutrition/food science and medical sciences, respectively, were interested in viewing caloric information on food delivery application menus ($p = 0.023$). Half of the self-employed participants, compared with only 20% of the employed persons, were interested in viewing caloric information on food delivery application menus ($p = 0.004$).

Table 4. Participants` interest in viewing caloric information on food delivery application menus (n=419)

	Knowledge of how to calculate personal daily calorie requirements		Noticing any caloric information displayed on the menu when ordering from a food delivery application			Interested in viewing caloric information on food delivery application menus		
	No	Yes	No	Sometimes	Yes	No	Sometimes	Yes
Total	207	91	91	195	133	102	188	129
Gender								
Male (n=71)	40 (56.3)	14 (19.7)	14 (19.7)	24 (33.8)	33 (46.5)	20 (28.2)	32 (45.1)	19 (26.8)
Female (n=348)	167 (48.0)	77 (22.1)	77 (22.1)	171 (49.1)	100 (28.7)	82 (23.6)	156 (44.8)	110 (31.6)
p-value	0.200*	0.011*	0.011*			0.617*		
Age in years								
Mean±SD	31.77 ± 11.83	32.70 ± 12.62	32.70 ± 12.62	27.94 ± 8.68	31.74 ± 10.70	31.92 ± 11.77	28.82 ± 8.87	30.78 ± 11.36
	0.002**	<0.001**	<0.001**			0.040**		
Marital status								
Single (n=257)	115 (44.7)	47 (18.3)	47 (18.3)	133 (51.7)	77 (30.0)	58 (22.6)	124 (48.2)	75 (29.2)
Married (n=145)	81 (55.9)	39 (26.9)	39 (26.9)	56 (38.6)	50 (34.5)	40 (27.6)	59 (40.7)	46 (31.7)
Divorced (n=10)	6 (60.0)	3 (30.0)	3 (30.0)	5 (50.0)	2 (20.0)	2 (20.0)	5 (50.0)	3 (30.0)
Widowed (n=7)	5 (71.4)	2 (28.6)	2 (28.6)	1 (14.3)	4 (57.1)	2 (28.6)	0 (0.0)	5 (41.7)
p-value	0.091	0.084*	0.084*			0.146*		
Job status								
Student (n=140)	13 (81.2)	26 (18.6)	26 (18.6)	73 (52.1)	41 (29.3)	26 (18.6)	61 (43.6)	53 (37.9)
Employed (n=155)	55 (70.5)	36 (23.2)	36 (23.2)	67 (43.2)	52 (33.5)	42 (27.1)	82 (52.9)	31 (20.0)
Unemployed (n=101)	124 (44.8)	23 (22.8)	23 (22.8)	45 (44.6)	33 (32.7)	25 (24.8)	42 (41.6)	34 (33.7)
Self-employed (n=8)	15 (31.3)	0 (0.0)	0 (0.0)	7 (87.5)	1 (12.5)	3 (37.5)	1 (12.5)	4 (50.0)
Retired (n=15)		6 (40.0)	6 (40.0)	3 (20.0)	6 (40.0)	6 (40.0)	2 (13.3)	7 (46.7)
p-value	<0.001	0.107*	0.107*			0.004*		

Field of study								
Nutrition/food sciences (n=75)	8 (10.7)	14 (18.7)	14 (18.7)	41 (54.6)	20 (26.7)	17 (22.7)	42 (56.0)	16 (21.3)
Medical (n=92)	31 (33.7)	16 (17.4)	16 (17.4)	43 (46.7)	33 (35.9)	17 (18.5)	48 (52.2)	27 (29.3)
Science (n=41)	24 (58.5)	8 (19.5)	8 (19.5)	19 (46.3)	14 (34.1)	5 (12.2)	22 (53.7)	14 (34.1)
Literacy (n=42)	27 (64.3)	14 (33.3)	14 (33.3)	17 (40.5)	11 (26.2)	12 (28.6)	18 (42.8)	12 (28.6)
Management (n=69)	42 (60.9)	13 (18.8)	13 (18.8)	35 (50.7)	21 (30.4)	19 (27.5)	28 (40.6)	22 (31.9)
Non-specific (n=32)	27 (84.4)	9 (28.1)	9 (28.1)	13 (40.6)	10 (31.3)	8 (25.0)	8 (25.0)	16 (50.0)
Others (n=68)	48 (70.6)	17 (25.0)	17 (25.0)	27 (39.7)	24 (35.3)	24 (35.2)	22 (32.4)	22 (33.4)
p-value	<0.001	0.660*	0.660*			0.023		
Monthly income in Saudi Riyals								
<2000 (n=146)	78 (53.4)	33 (22.6)	33 (22.6)	72 (49.3)	41 (28.1)	38 (26.0)	59 (40.4)	49 (33.6)
2000-5000 (n=104)	48 (46.2)	19 (18.3)	19 (18.3)	55 (52.9)	30 (28.8)	24 (23.1)	48 (46.2)	32 (30.8)
5001-7000 (n=44)	20 (45.5)	10 (22.7)	10 (22.7)	16 (36.4)	18 (40.9)	10 (22.7)	17 (38.6)	17 (38.6)
7001-10000 (n=27)	18 (66.7)	5 (18.5)	5 (18.5)	13 (48.2)	9 (33.3)	10 (37.0)	10 (37.0)	7 (25.9)
>10000 (n=98)	43 (43.9)	24 (24.5)	24 (24.5)	39 (39.8)	35 (35.7)	20 (20.4)	54 (55.1)	24 (24.5)
p-value	0.194*	0.561*	0.561*			0.331		
Body mass index								
Underweight (n=31)	15 (48.4)	6 (19.4)	6 (19.4)	17 (54.8)	8 (25.8)	6 (19.4)	12 (38.7)	13 (41.9)
Normal (n=215)	95 (44.2)	42 (19.5)	42 (19.5)	103 (47.9)	70 (32.6)	52 (24.2)	100 (46.5)	63 (29.3)
Overweight (n=106)	51 (48.1)	27 (25.5)	27 (25.5)	48 (45.3)	31 (29.2)	24 (22.6)	46 (43.4)	36 (34.0)
Obesity (n=67)	46 (68.7)	16 (23.9)	16 (23.9)	27 (40.3)	24 (35.8)	20 (29.9)	30 (44.7)	17 (25.4)
p-value	0.006*	0.747*	0.747*			0.661*		

*Chi-square test **Independent samples t-test ˚Fisher's exact test

3.6 Impact of displaying calories in food delivery applications on public food choices

Displaying caloric information on menus in food delivery applications positively affected the food choices of 50.3% of participants (**Figure 2**). More than one-third of the participants (37.5%) used caloric information mostly to avoid exceeding their total daily calorie allowance to maintain weight and to estimate the amount of nutrients in a meal (20.4%). Participants with postgraduate degrees were more likely than the lowest-educated participants to declare that displaying caloric information on food delivery application menus positively affected their food choices ($p = 0.030$). Most employed participants (63%), compared with only 25% of self-employed participants, stated that displaying caloric information on menus in food delivery applications positively affected their food choices ($p = 0.033$).

4. Discussion

This study is the first in Saudi Arabia to focus on calorie labeling in food delivery application menus, and it aimed to explore the public preference and experience of ordering from food delivery applications, their response to the availability of calorie labeling in food delivery applications, and whether it impacts their food choices. There were 419 questionnaire respondents with a mean age of 30 years. Almost half of them were within a normal weight range and held a university degree or higher. Overall, the result of this study showed that saving time and effort were the major reasons for using food delivery applications.

Caloric information in food delivery application menus was primarily utilized to monitor intake for weight maintenance. The ability to calculate energy requirements and interest in viewing caloric information on food delivery application menus were linked to younger age and a higher level of education. Behavioral intention and customer experience are interrelated; therefore, positive experiences lead to more users[18]. Food delivery applications satisfy various social and individual customer demands; thus, the behavioral intention to use is influenced by convenience and ease of use[19–22]. Accordingly, more than half of the participants (58.9%) in this study preferred to order through food delivery applications and not from restaurants, either to save time and effort or because of the ease of access to restaurants. The result in this study is consistent with findings from other studies and a qualitative study on frequent food delivery application users in the United Kingdom [14,23,24]. However, two studies in Nepal and Malaysia found that saving time, but not effort, was significantly associated with food delivery application use [25,26]. Food delivery services have grown rapidly as a result of the COVID-19 pandemic [27,28]. Most participants (64%) claimed that their use of food delivery applications increased during the COVID-19 pandemic, which is consistent with the findings of similar studies in Saudi Arabia [13,14] but one study found no change in use[29].

In recent decades, the fast-food industry has experienced significant growth, and the consumption of fast food has become widespread [30]. Predictably, fast-food restaurants were the most popular option among this study respondents (69.7%), which is in line with earlier findings in Saudi Arabia and internationally [26,28,31,32]. This finding supports the argument that food delivery applications could negatively affect the food environment by offering fast and easy access to unhealthy food options [33]. Moreover, the digital food environment of food delivery applications has been shown to advertise ultra-processed foods more than healthier foods by promoting combos, offering discounts and free deliveries, and presenting photos [27,34–36]. In addition, this study showed that coffee shops ranked as the second most popular option among respondents (47%). In Saudi Arabia, coffee shops mainly sell Western-style coffee, which can have significant amounts of calories from added sugar and/or

saturated fat [38]. Trends in coffee consumption often show that coffee is preferred with added sugar or another form of sweetener [39]. It has been a great shift from drinking the calorie-free Saudi coffee that is embedded in Saudi culture and is made at home using only coffee beans and spices to the Western coffee drinks. Food choice is a multifaceted process shaped by a complex interplay of intrinsic and extrinsic factors [40 [37].

Research has shown that individuals with different food-choice motives exhibit different food product preferences [41]. The primary reasons behind the respondents' restaurant choices were taste and cravings, followed by meal and delivery prices, which are predictable but also worrisome because people instinctively associate unhealthy foods with better taste [42]. Interestingly, a study analyzing families' demand for food prepared away from home determined that price was the most attractive factor for families when choosing a restaurant, followed by taste [43]. One meal prepared away from home adds approximately 134 calories to the daily energy intake [44]. Two international systematic reviews found that eating food prepared away from home was linked to high socioeconomic status and caused a decrease in consumption of micronutrients, primarily vitamin C, calcium, and iron, as well as increased intake of total energy and energy from fat [45,46]. The most common time to order was during the evening, from 7 p.m. to 12 a.m., which is consistent with the typical dinnertime in the region. Subsequently, dinner was the most frequently ordered meal (65.8%), which is consistent with previous findings in Saudi Arabia and Kuwait [13,14,31]. Research has shown that home-cooked dinners are linked to higher diet quality compared to any other meal and eating dinners prepared away from home reduces the total consumption of vegetables by 8.7% [44,47]. Knowledge of personal energy requirements is a fundamental principle of nutrition literacy, without which controlling one’s energy intake may be challenging. Half of the respondents could calculate their personal energy requirements and such knowledge was found to be correlated with younger age, higher level of education, normal BMI classification, no chronic disease, and majoring in nutrition or food science. In the United States, it was correlated with being female, white, and having a higher level of education and income but not with any BMI classification [48].

Menu labeling enables consumers to make informed food choices. Calorie labeling could aid consumers in accurately estimating the caloric content of ordered foods, which are often served in large amounts compared to homemade meals [49]. An analysis of food delivery application menus around the world found that most food items were energy-dense and had low nutritional content [36,50,51]. A systematic review and meta-analysis of international evidence found conflicting associations between noticing caloric information on menus and its effects on foods ordered or selected [52]. In our sample, less than half of the respondents were interested in viewing caloric information on food delivery application menus, or had noticed it. Earlier studies in Saudi Arabia found that 50–60% of consumers were not interested in viewing or did not notice caloric information on food delivery application menus, while the rest were either very interested or somewhat interested [13,29]. Interest in viewing caloric information on food delivery application menus was linked to younger age and higher level of education, as in a previous study in Saudi Arabia [29]. In the United States, those who frequently noticed menu labeling in restaurants were more likely to be female, younger, overweight or obese, and to have a higher level of education and income [53]. Notably, males were more likely than females to notice caloric information on food delivery application menus, which is inconsistent with previous findings in Saudi Arabia and internationally, where females were most likely to consider calories in menus. This could be due to the uneven gender representation in our sample (83.1% females) [53–57]. Research has shown that displaying caloric information on menus significantly reduces the number of calories ordered and consumed, indicating that it serves as an inexpensive and wide-reaching public health policy[33]. Half of the participants responded positively to the

displayed caloric information on food delivery application menus, and they mostly utilized it to monitor their caloric intake to maintain body weight and estimate the nutritional content of ordered meals. Previous research conducted in Saudi Arabia found that noticing caloric information altered consumers' order choice, portion size, and limited fast-food ordering[14,29,58]. A population-based study in the United States found that caloric information on menus was mainly used to avoid ordering energy-dense items and to minimize ordered portions[57]. Research on caloric information in menus is lacking because it is often designed as an observational study, from which no causal inferences can be drawn, or conducted in laboratory settings, which may fail to reflect real-world situations[59].

The findings of this study should be interpreted with caution, since the sample may not be representative due to inadequate gender distribution and convenience sampling. Nevertheless, the findings offer a starting point for the public's response to calorie labeling in food delivery application menus and demonstrates the need to increase public awareness about calorie labeling on menus to aid the success and effectiveness of calorie labeling in food delivery applications as a tool to promote balanced energy intake, and in turn the population’s health.

5. Conclusions

In conclusion, the public's response to noticing and viewing caloric information on food delivery application menus was varied. Caloric information was mostly used for weight maintenance and estimation of nutritional content when ordering. Dinner was the most frequently ordered meal and fast-food restaurants and coffee shops were the most popular options. Saving time and effort were the chief reasons behind the use of food delivery applications, whereas taste and cravings were the primary drivers behind the respondents' restaurant choices, which were commonly fast-food restaurants and coffee shops. The ability to calculate energy requirements and interest in viewing caloric information on food delivery application menus were linked to younger age and a higher level of education. These findings highlight the need to increase public awareness about calorie labeling on menus to aid the success and effectiveness of the calorie labeling in food delivery application as a tool to promote balanced energy intake

Abbreviations

BMI Body mass index

COVID-19 Coronavirus disease 2019

SFDA Saudi Food and Drug Authority

Declarations

“The views expressed in this paper are those of the author(s) and do not necessarily reflect those of the SFDA or its stakeholders. Guaranteeing the accuracy and the validity of the data is a sole responsibility of the research team”.

Consent to publication: Not applicable.

Ethics approval and consent to participate: This study was approved by the Biomedical Ethics Research Committee of King Abdulaziz University (Jeddah, Saudi Arabia) (Reference No. 370-22). An online informed consent form was signed electronically by all participants of the study. We confirm that all methods were carried out in accordance with relevant guidelines and regulations.

Availability of data and materials: The data that support the findings of this study are available upon reasonable request. Please contact Ms. Sarah Alkhunein via an Email: Smkhunein@sfda.gov.sa .

Competing interests: The authors have no competing of interest to declare.

Funding: This research received no external funding.

Authors' contributions: SK, AA, WA, HA, OA, SS, and NA conceptualised the study. AA, and WA designed the data analysis plan. SK managed the data collection. WA conducted the analysis. SK, AA, WA, HA, OA, SS, and NA wrote the first draft and collated all the inputs. All authors read and approved the final manuscript.

Acknowledgements: The authors would like to thank Ms.Yasmine Almossa and Ms. Sarah Alkwayleet for their contribution in validity, reliability, and internal-consistency testing of the questionnaire.

References

1. Daniels, S. R. (2009). Complications of obesity in children and adolescents. International Journal of Obesity, 33(1), S60-S65. World Health Organization (WHO). (2020, April 1). Obesity and overweight. https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight
2. Schelbert, K. B. (2009). Comorbidities of obesity. *Primary Care: Clinics in Office Practice, 36*(2), 271-285.
3. World Health Organization (WHO). (2020, April 1). Obesity and overweight. https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight
4. Althumiri, N. A., Basyouni, M. H., AlMousa, N., AlJuwaysim, M. F., Almubark, R. A., BinDhim, N. F., Alkhamaali, Z., & Alqahtani, S. A. (2021). Obesity in Saudi Arabia in 2020: Prevalence, distribution, and its current association with various health conditions. Healthcare, 9(3), 311. https://doi.org/10.3390/healthcare9030311
5. Marijn Stok, F., Renner, B., Allan, J., Boeing, H., Ensenauer, R., Issanchou, S., Kiesswetter, E., Lien, N., Mazzocchi, M., Monsivais, P., Stelmach-Mardas, M., Volkert, D., & Hoffmann, S. (2018). Dietary Behavior: An Interdisciplinary Conceptual Analysis and Taxonomy. Frontiers in psychology, 9, 1689. https://doi.org/10.3389/fpsyg.2018.01689
6. Shepherd, R. (1999). Social determinants of food choice. Proceedings of the Nutrition Society, 58(4), 807-812.
7. ALFaris, N. A., Al-Tamimi, J. Z., Al-Jobair, M. O., & Al-Shwaiyat, N. M. (2015). Trends of fast food consumption among adolescent and young adult Saudi girls living in Riyadh. Food & Nutrition Research, 59(1), 26488. https://doi.org/10.3402/fnr.v59.26488
8. Alturki, H. A., Brookes, D. S., & Davies, P. S. (2018). Comparative evidence of the consumption from fast-food restaurants between normal-weight and obese Saudi schoolchildren. Public Health Nutrition, 21(12), 2280-2290. https://doi.org/10.1017/s1368980018000757

9. Jones Lang LaSalle. (2020). The Future of Foodservice in KSA.
10. Consumer Reports. (2020, May 21). DoorDash, Grubhub, Postmates, and Uber eats: How food delivery services perform. Retrieved November 15, 2020, from https://www.consumerreports.org/food-delivery-services/food-delivery-services-apps-review/
11. AlShammari, Alzahrani, Alobodi, Alrubaian, & Alzamil. (2022). Use of Food Delivery Applications and Its Impacts on Obesity Among Saudi Population in Riyadh City. IAJPS, 9(7). https://doi.org/10.5281/zenodo.6821306
12. Larson, N., Haynos, A. F., Roberto, C. A., Loth, K. A., & Neumark-Sztainer, D. (2018). Calorie Labels on the Restaurant Menu: Is the Use of Weight-Control Behaviors Related to Ordering Decisions?. Journal of the Academy of Nutrition and Dietetics, 118(3), 399–408. https://doi.org/10.1016/j.jand.2017.11.007
13. Algheshairy, R. M., Alhomaid, R. M., Almujaydil, M. S., Alharbi, H. F., & Alsanei, W. A. (2022). Influence of using food delivery applications on adult Saudi female dietary habits and preferences during COVID-19 lockdown restrictions: Knowledge and attitude survey. https://doi.org/10.21203/rs.3.rs-1467008/v1
14. Alhusseini, N., Alammari, D., Sabbah, B. N., Almubayedh, A. A., Arabi, T., Rashid, H., ... & Ramadan, M. (2022). OBESITY AND FOOD DELIVERY APPLICATIONS: LESSONS LEARNED FROM COVID-19 IN SAUDI ARABIA. JMSR, 9(1), 1098-1104.
15. Alfawzan, M., & Aljarallah, A. (2020). The Impact of Calories Labeling Policy in Saudi Arabia: Comparing Physical and Online Channels.
16. Etikan, I., & Babatope, O. (2019). A Basic Approach in Sampling Methodology and Sample Size Calculation. *Med Life Clin, 1*(1), 1006.
17. General Authority for Statistics. (2019). *Population by Age, Groups, and Gender.* https://www.stats.gov.sa/sites/default/files/population_by_age_groups_and_gender_en.pdf
18. Olorunniwo, F.; Hsu, M.K.; Udo, G.J. Service Quality, Customer Satisfaction, and Behavioral Intentions in the Service Factory. *Journal of Services Marketing* **2006**, *20*, 59–72, doi:10.1108/08876040610646581.
19. Novita, D.; Husna, N. THE INFLUENCE FACTORS OF CONSUMER BEHAVIORAL INTENTION TOWARDS ONLINE FOOD DELIVERY SERVICES. *TECHNOBIZ : International Journal of Business* **2020**, *3*, 40, doi:10.33365/tb.v3i2.840.
20. Wiastuti, R.D.; Prawira, O.; Lusyana, L.; Lestari, N.S.; Masatip, A.; Ngatemin, N. THE RELATIONSHIP BETWEEN CONVENIENCE MOTIVATION, ATTITUDE, AND BEHAVIORAL INTENTION OF FOOD DELIVERY APPLICATIONS' USERS. *GeoJournal of Tourism and Geosites* **2022**, *41*, 548–554, doi:10.30892/gtg.41228-862.
21. Yeo, V.C.S.; Goh, S.K.; Rezaei, S. Consumer Experiences, Attitude and Behavioral Intention toward Online Food Delivery (OFD) Services. *Journal of Retailing and Consumer Services* **2017**, *35*, 150–162, doi:10.1016/J.JRETCONSER.2016.12.013.
22. Chowdhury, R. Impact of Perceived Convenience, Service Quality and Security on Consumers' Behavioural Intention towards Online Food Delivery Services: The Role of Attitude as Mediator. *SN Business & Economics 2023 3:1* **2023**, *3*, 1–23, doi:10.1007/S43546-023-00422-7.
23. Keeble, M.; Adams, J.; Burgoine, T. Investigating Experiences of Frequent Online Food Delivery Service Use: A Qualitative Study in UK Adults. *BMC Public Health* **2021**, doi:10.1186/s12889-022-13721-9.

24. Tahani AlShammari; Azzah Alzahrani; Nora Alobodi; Mashael Alrubaian; Ruaa Alzamil USE OF FOOD DELIVERY APPLICATIONS AND ITS IMPACTS ON OBESITY AMONG SAUDI POPULATION IN RIYADH CITY. *IAJPS* **2022**, doi:10.5281/ZENODO.6821306.
25. Pokhrel, L.; Shah, R. Factors Affecting Behavioural Intention of Online Food Delivery Service Consumers in Kathmandu Valley. *Journal of Business and Social Sciences Research* **2022**, *7*, 79–94, doi:10.3126/jbssr.v7i2.51494.
26. Allah Pitchay, A.; Ganesan, Y.; Zulkifli, N.S.; Khaliq, A. Determinants of Customers' Intention to Use Online Food Delivery Application through Smartphone in Malaysia. *British Food Journal* **2022**, *124*, 732–753, doi:10.1108/BFJ-01-2021-0075.
27. Jia, S.S.; Gibson, A.A.; Ding, D.; Allman-Farinelli, M.; Phongsavan, P.; Redfern, J.; Partridge, S.R. Perspective: Are Online Food Delivery Services Emerging as Another Obstacle to Achieving the 2030 United Nations Sustainable Development Goals? *Front Nutr* **2022**, *9*, 295, doi:10.3389/FNUT.2022.858475/BIBTEX.
28. Lin, R. The Effects of Covid-19 on the Online Food Delivery Industry. *Proceedings of the 2021 3rd International Conference on Economic Management and Cultural Industry (ICEMCI 2021)* **2021**, *203*, 203–207, doi:10.2991/ASSEHR.K.211209.033.
29. Alkhaldy, A.A.; Alhumaidan, O.A.; Alkhunein, S.M.; Alkhalaf, M.M.; Bookari, K.A.; Arrish, J.M. The Impact of the COVID-19 Pandemic on Public Interest in the Energy Labelling on Restaurant Menus. *Nutrients* **2023**, *15*, doi:10.3390/NU15020466.
30. Amer, S.A.; Alasmari, S.A.; Amer, M.A.; Aleisa, N.; Abd-Ellatif, E.E. Assessment of Fast and Junk Food Consumption and Addiction Among Saudi Population. National Descriptive Study 2020. *Current Research in Nutrition and Food Science* **2022**, *10*, 19–30, doi:10.12944/CRNFSJ.10.1.02.
31. Almansour, F.D.; Allafı, A.R.; Zafar, T.A.; Al-Haifı, A.R. Consumer Prevalence, Attitude and Dietary Behavior of Online Food Delivery Applications Users in Kuwait. *Acta Biomed* **2020**, *91*, e2020178–e2020178, doi:10.23750/ABM.V91I4.8543.
32. Stephens, J.; Miller, H.; Militello, L. Food Delivery Apps and the Negative Health Impacts for Americans. *Front Nutr* **2020**, *7*, doi:10.3389/FNUT.2020.00014/PDF.
33. Duthie, C.; Pocock, T.; Curl, A.; Clark, E.; Norriss, D.; Bidwell, S.; McKerchar, C.; Crossin, R. Online On-Demand Delivery Services of Food and Alcohol: A Scoping Review of Public Health Impacts. *SSM Popul Health* **2023**, *21*, 101349, doi:10.1016/j.ssmph.2023.101349.
34. Horta, P.M.; Souza, J. de P.M.; Rocha, L.L.; Mendes, L.L. Digital Food Environment of a Brazilian Metropolis: Food Availability and Marketing Strategies Used by Delivery Apps. *Public Health Nutr* **2021**, *24*, 544–548, doi:10.1017/S1368980020003171.
35. Horta, P.M.; Matos, J.D.P.; Mendes, L.L. Digital Food Environment during the Coronavirus Disease 2019 (COVID-19) Pandemic in Brazil: An Analysis of Food Advertising in an Online Food Delivery Platform. *British Journal of Nutrition* **2021**, *126*, 767–772, doi:10.1017/S0007114520004560.
36. Wang, C.; Korai, A.; Jia, S.S.; Allman-Farinelli, M.; Chan, V.; Roy, R.; Raeside, R.; Phongsavan, P.; Redfern, J.; Gibson, A.A.; et al. Hunger for Home Delivery: Cross-Sectional Analysis of the Nutritional Quality of Complete Menus on an Online Food Delivery Platform in Australia. *Nutrients* **2021**, *13*, 905, doi:10.3390/nu13030905.
37. Jalloun, R.A.; Alhathlool, M.H. Arabic Coffee Consumption and the Risk of Obesity among Saudi's Female Population. *JSSFN) Journal of the Saudi Society for Food and Nutrition (JSSFN)* **2020**, *13*, 59.

38. United States. Department of Health and Human Services; United States. Department of Agriculture; United States. Dietary Guidelines Advisory Committee Dietary Guidelines for Americans, 2015-2020. 122.
39. Alfawaz, H.A.; Khan, N.; Yakout, S.M.; Khattak, M.N.K.; Alsaikhan, A.A.; Almousa, A.A.; Alsuwailem, T.A.; Almjlad, T.M.; Alamri, N.A.; Alshammari, S.G.; et al. Prevalence, Predictors, and Awareness of Coffee Consumption and Its Trend among Saudi Female Students. *Int J Environ Res Public Health* **2020**, *17*, 7020, doi:10.3390/ijerph17197020.
40. Köster, E.P. Diversity in the Determinants of Food Choice: A Psychological Perspective. *Food Qual Prefer* **2009**, *20*, 70–82, doi:10.1016/j.foodqual.2007.11.002.
41. Wądołowska, L.; Babicz-Zielińska, E.; Czarnocińska, J. Food Choice Models and Their Relation with Food Preferences and Eating Frequency in the Polish Population: POFPRES Study. *Food Policy* **2008**, *33*, 122–134, doi:10.1016/j.foodpol.2007.08.001.
42. Raghunathan, R.; Naylor, R.W.; Hoyer, W.D. The Unhealthy = Tasty Intuition and Its Effects on Taste Inferences, Enjoyment, and Choice of Food Products. *J Mark* **2006**, *70*, 170–184, doi:10.1509/jmkg.70.4.170.
43. Kotb, A.; Alnafissa, M.; Alderiny, M.; Ahmed, S. An Analysis of Household Demand for Food Away from Home (FAFH) in Riyadh, Saudi Arabia: A Right-Left Truncated Generalized Poisson Regression Model. *Arab Universities Journal of Agricultural Sciences* **2020**, *0*, 0–0, doi:10.21608/ajs.2020.23104.1161.
44. Todd, J.E.; Mancino, L.; Lin, B.-H. The Impact of Food Away from Home on Adult Diet Quality. *SSRN Electronic Journal* **2010**, doi:10.2139/ssrn.1557129.
45. Lachat, C.; Nago, E.; Verstraeten, R.; Roberfroid, D.; Van Camp, J.; Kolsteren, P. Eating out of Home and Its Association with Dietary Intake: A Systematic Review of the Evidence. *Obesity Reviews* **2012**, *13*, 329–346, doi:10.1111/j.1467-789X.2011.00953.x.
46. Wellard-Cole, L.; Davies, A.; Allman-Farinelli, M. Contribution of Foods Prepared Away from Home to Intakes of Energy and Nutrients of Public Health Concern in Adults: A Systematic Review. *Crit Rev Food Sci Nutr* **2022**, *62*, 5511–5522, doi:10.1080/10408398.2021.1887075.
47. Tucker, A.C.; Martinez-Steele, E.; Leung, C.W.; Wolfson, J.A. Associations Between Household Frequency of Cooking Dinner and Ultraprocessed Food Consumption and Dietary Quality Among US Children and Adolescents. *Childhood Obesity* **2023**, doi:10.1089/chi.2022.0200.
48. McKinnon, R.A.; Oladipo, T.; Ferguson, M.S.; Jones, O.E.; Maroto, M.E.; Wolpert, B. Reported Knowledge of Typical Daily Calorie Requirements: Relationship to Demographic Characteristics in US Adults. *J Acad Nutr Diet* **2019**, *119*, 1831-1841.e6, doi:10.1016/j.jand.2019.04.024.
49. Sobaih, A.E.E.; Abdelaziz, A.Sh. The Impact of Nutrition Labelling on Customer Buying Intention and Behaviours in Fast Food Operations: Some Implications for Public Health. *Int J Environ Res Public Health* **2022**, *19*, 7122, doi:10.3390/ijerph19127122.
50. Partridge, S.R.; Gibson, A.A.; Roy, R.; Malloy, J.A.; Raeside, R.; Jia, S.S.; Singleton, A.C.; Mandoh, M.; Todd, A.R.; Wang, T.; et al. Junk Food on Demand: A Cross-Sectional Analysis of the Nutritional Quality of Popular Online Food Delivery Outlets in Australia and New Zealand. *Nutrients* **2020**, *12*, 3107, doi:10.3390/nu12103107.
51. Poelman, M.P.; Thornton, L.; Zenk, S.N. A Cross-Sectional Comparison of Meal Delivery Options in Three International Cities. *Eur J Clin Nutr* **2020**, *74*, 1465–1473, doi:10.1038/s41430-020-0630-7.

52. Littlewood, J.A.; Lourenço, S.; Iversen, C.L.; Hansen, G.L. Menu Labelling Is Effective in Reducing Energy Ordered and Consumed: A Systematic Review and Meta-Analysis of Recent Studies. *Public Health Nutr* **2016**, *19*, 2106–2121, doi:10.1017/S1368980015003468.
53. Lee-Kwan, S.H.; Pan, L.; Maynard, L.M.; McGuire, L.C.; Park, S. Factors Associated with Self-Reported Menu-Labeling Usage among US Adults. *J Acad Nutr Diet* **2016**, *116*, 1127–1135, doi:10.1016/j.jand.2015.12.015.
54. Krieger, J.W.; Chan, N.L.; Saelens, B.E.; Ta, M.L.; Solet, D.; Fleming, D.W. Menu Labeling Regulations and Calories Purchased at Chain Restaurants. *Am J Prev Med* **2013**, *44*, 595–604, doi:10.1016/j.amepre.2013.01.031.
55. Alotaibi, N.M.; Alshammari, G.M.; Alabdulkarem, K.B.; Alotaibi, A.A.; Mohammed, M.A.; Alotaibi, A.; Yahya, M.A. A Cross-Sectional Study of Gender Differences in Calorie Labeling Policy among Students: Dietary Habits, Nutritional Knowledge and Awareness. *Nutrients* **2023**, *15*, 879, doi:10.3390/nu15040879.
56. Alkhaldy, A.A.; Taha, D.S.; Alsahafı, S.E.; Naaman, R.K.; Alkhalaf, M.M. Response of the Public and Restaurant Owners to the Mandatory Menu Energy-Labelling Implementation in Restaurants in Saudi Arabia. *Public Health Nutr* **2020**, *23*, 3435–3447, doi:10.1017/S1368980020000245.
57. Larson, N.; Haynos, A.F.; Roberto, C.A.; Loth, K.A.; Neumark-Sztainer, D. Calorie Labels on the Restaurant Menu: Is the Use of Weight-Control Behaviors Related to Ordering Decisions? *J Acad Nutr Diet* **2018**, *118*, 399–408, doi:10.1016/j.jand.2017.11.007.
58. AlAmer, N.; AlOmar, R.; AlKaltham, S.; AlYami, R.; AlRashidi, F.; AlJrri, M.; Abdel Wahab, M. Perceived Effect of Calorie Count Display on Customers' Eating Behaviors in Food Facilities of Eastern Province, Saudi Arabia: A Mixed Method Study. *J Multidiscip Healthc* **2020**, *Volume 13*, 1849–1861, doi:10.2147/JMDH.S283568.
59. Swartz, J.J.; Braxton, D.; Viera, A.J. Calorie Menu Labeling on Quick-Service Restaurant Menus: An Updated Systematic Review of the Literature. *International Journal of Behavioral Nutrition and Physical Activity* **2011**, *8*, 135, doi:10.1186/1479-5868-8-135.

Figures

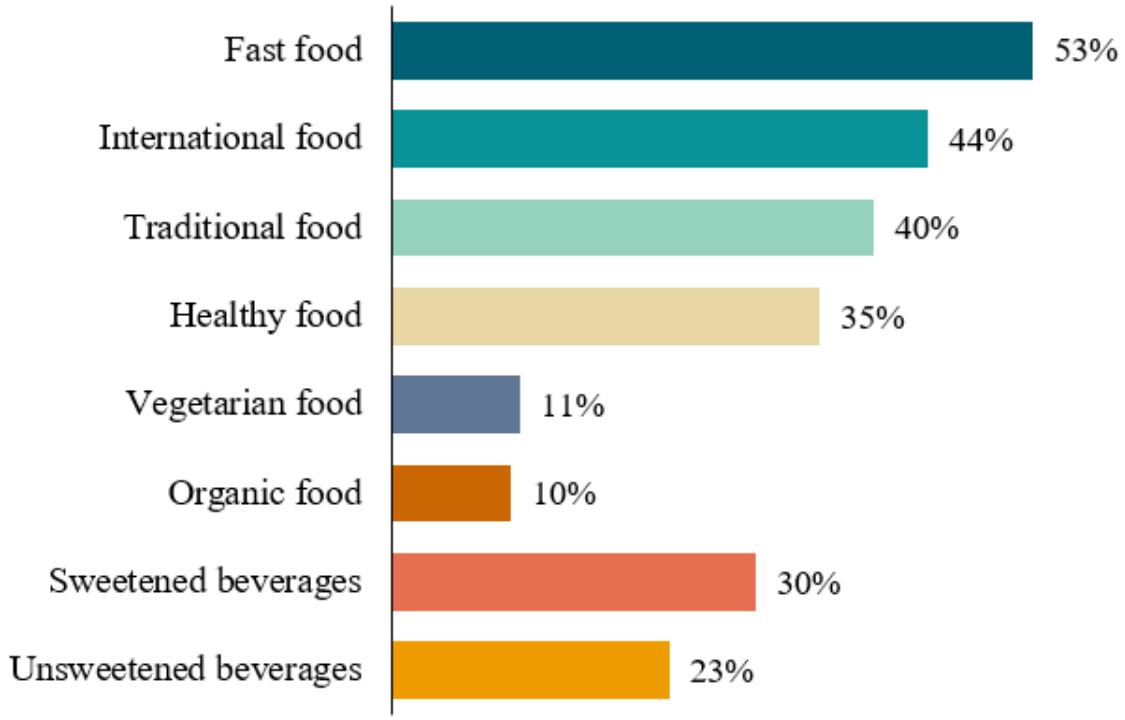

Figure 1

Frequency of ordering meals from food delivery applications per week (n=419)

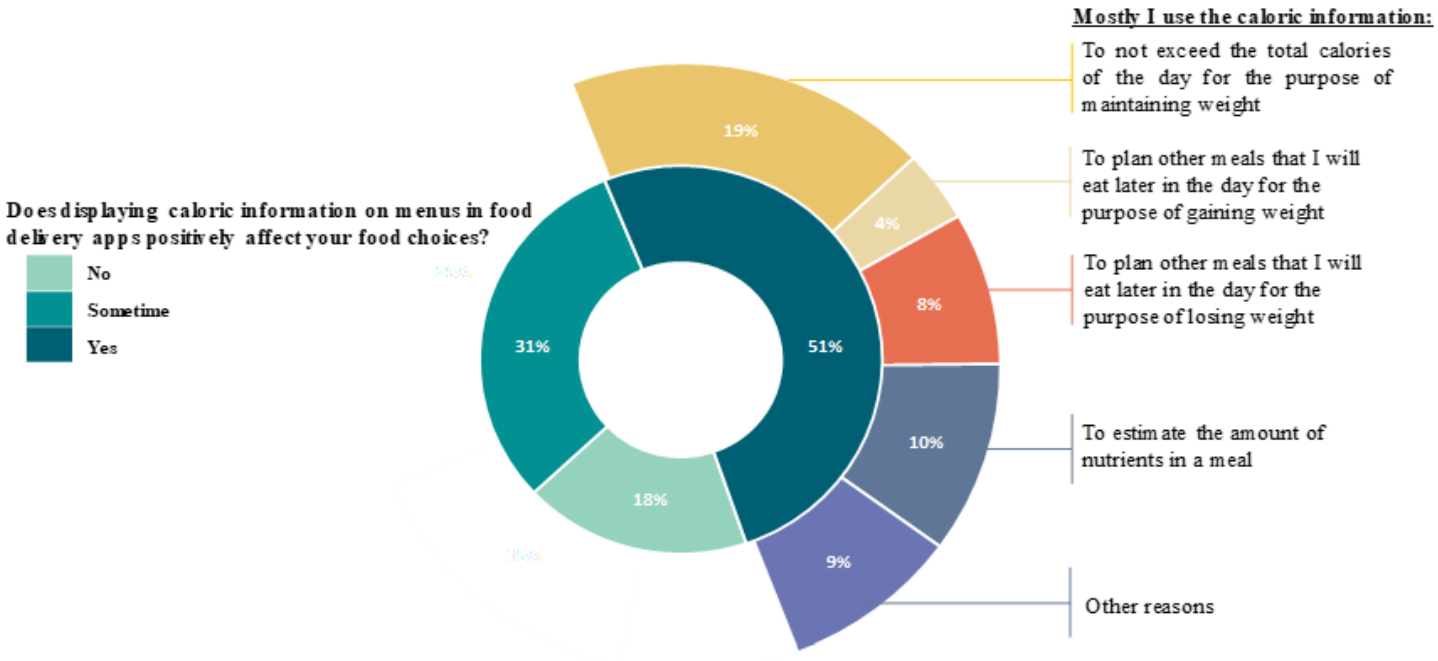

Figure 2

The impact of displaying calories in food delivery applications on public food choices (n=328(