

Online Food Delivery Services Among Young Adults in Depok: Factors Affecting the Frequency of Online Food Ordering and Consumption of High-risk Food

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Abstract

Background

The increasing desire of the community towards fulfilling the practical needs of life is currently accommodated by the rapid development of communication technology in the last five years in Indonesia. One example is the emergence of various food delivery applications. This will affect the pattern of daily food consumption in the community. Therefore, this study determined the personal and socio-environmental factors that influence the frequency of online food ordering (OFO) behavior and also high-risk food consumption through online food delivery services (OFDS) among young adults in Depok City.

Methods

This research was a cross-sectional study conducted with 686 participants of young adults aged 20–39 years that lived in Depok City, West Java Province, Indonesia, for minimal the last six months. They were administered a questionnaire through Alchemer, formerly SurveyGizmo. Descriptive statistics were employed for all variables measured. A T-test and a Chi-square test were conducted to determine the factors influencing the OFO frequency and high-risk food consumption through OFDS. Predictor variables were generated using multi-logistic regression models. The predictor for the frequency of OFO behavior was satisfaction toward OFDS ($\beta = 3.3$; CI: 2.4–4.7; p-value = 0.000), while those for high-risk food consumption were personal and socio-environmental factors ($\beta = 1.8$; CI: 1.3–2.5; p-value = 0.001 and $\beta = 1.7$; CI: 1.2–2.4; p-value = 0.001, respectively).

Results

The personal and socio-environmental factors related to the frequency of OFO behavior were attitudes toward risk, benefit, barriers, features of OFDS, satisfaction with OFDS, socio-environmental influence, perception about OFDS, and online food preference. Furthermore, the factors associated with high-risk food consumption through OFDS were attitudes toward benefit, features, satisfaction with OFDS, socio-environmental influence, perception about OFDS, online food preference, and knowledge of OFDS.

Conclusions

Satisfaction, social environment, and food preference play essential roles in OFDS. The findings demonstrated the urgency of conducting further studies to elaborate on the association of OFDS with non-communicable diseases.

Background

The development of communication technology, particularly sophisticated applications (apps) supported by smartphones, has affected numerous e-commerce transactions, including online food delivery services (OFDS).⁽¹⁾ The community, especially the millennial generation, prefers to use mobile apps to order food online from their preferred restaurant and get food delivered at their doorstep.^(2,3) Through an app downloaded on their smartphone, customers can easily order any cuisine without having to leave their house.⁽⁴⁾

OFDS is a process of placing food orders from local restaurants or food cooperatives through website pages or mobile apps and then getting them delivered to their doorstep.⁽⁵⁾ The recent development of the Internet has facilitated online food ordering (OFO) and delivery through marketplace apps [platforms that offer access to multiple restaurants and handle delivery goods (e.g., GoFood and GrabFood)].⁽⁶⁾ The real-time connectivity of food delivery apps on mobile devices provides busy users with high speed and convenience advantages. In addition, Lee et al.⁷ found that the customer's habit of using OFDS significantly influences their intention of using OFDS regularly. It is also affected by how the OFDS performs and the social environment.⁷ Talabpetch⁽⁸⁾ showed that an online food providers' convenience has resulted in most businesswomen in Thailand availing these services frequently.

According to a survey conducted by the Nielsen Research Institute, 95% of Indonesians enjoy ready-to-eat types of food,⁽⁹⁾ of which 58% order food online through food delivery apps installed on their mobile phones. The survey was conducted on 1000 respondents (aged 18–45 years), spread across the following major cities in Indonesia: Jakarta–Bogor–Depok–Tangerang–Bekasi, Semarang, Surabaya, Makassar, and Medan. The data on the use of delivery services for the last three months were collected and revealed that 41% of the respondents ordered food through OFDS, whereas 85% ordered through GoFood, GrabFood, and similar applications.⁽⁹⁾

Despite the opportunities generated by this commerce, OFDS has also played a significant role in decreased physical activity of people, as well as excess calorie intake and adverse health outcomes.⁽¹⁰⁾ These services have also affected the eating behavior of people. Healthy eating behavior is an essential determinant of a person's overall health.⁽¹¹⁾ This dietary behavior is complex and influenced by many factors, such as personal, social, cultural, environmental, and economic factors.⁽¹²⁾ Because the dietary pattern is a significant risk factor for developing obesity, diabetes, and cardiovascular diseases, understanding the particular behavior and motivational factors that encourage selecting and purchasing a particular food item is essential to tackle the epidemic of those non-communicable diseases (NCD).^(13,14) Given these circumstances, intervention is required to create a food environment that establishes healthy eating behavior.⁽¹⁵⁾

The present study adopts the social cognitive theory, developed by Bandura, as its framework. This theory hypothesizes that individual behavior results from a constant interaction between the external environment and internal psychosocial characteristics (in terms of cognitive, affective, and biological factors).⁽¹⁶⁾ The present study aims to examine the effect of this interaction on OFO frequency and high-risk food consumption through OFDS among young adults in Depok City, West Java.

Methods

Study design and samples

The study participants met the following inclusion criteria: young adults aged 20–39 years and residents of Depok city, or living in Depok for the last six months. Based on the statistical calculation performed using two-sided hypothesis testing for a single population proportion, the sample was 320 through 620 respondents. Ten percent of the minimal sample size ($N = 32$) was used for pre-testing the questionnaire and measuring the validity and reliability of the instruments used.

Phase 1: Development of scales and items

A set of quantitative and qualitative procedures were conducted to develop the scales. In addition, a literature review was conducted to examine the content and psychometric properties of similar social cognitive constructs related to the frequency of OFO behavior and high-risk food consumption through OFDS. Nutrition specialists were asked to analyze and review the preliminary questions. A total of 124 items covering 15 sociodemographic topics were generated during the review process. The following were used as dependent variables: 1) 24 items to measure the OFO frequency, which was categorized as more frequent and less frequent, and 2) 11 items to measure the consumption of a high-sugar and high-fat type of food items ordered through OFDS. The independent variables were divided into personal and environmental factors. Personal/cognitive factors are knowledge about OFDS practices; knowledge about nutrition content; and perception, attitude, and respondents' food preference. Furthermore, the environmental factors are the socio-environmental factors that influenced young adults' decision to use OFDS.

Scale construction

Personal factor

For the 16 items of instruments, the respondents were asked to rate their knowledge regarding food nutrition (19 items) and OFO practice (4 items), where each correct option was assigned one point. The respondents were asked to rate their perception (6 items) regarding OFD practices on a four-point Likert-type scale (1 = strongly disagree; 4 = strongly agree). For the subscale, the participants' attitudes toward OFDS were examined, which included attitudes toward risk (3 items), benefit (5 items), barriers (5 items), features (3 items), and satisfaction with OFDS (4 items), and were rated through a four-point Likert-type scale. For the food preferences (total 17 items), the participants were asked to rate the provided cuisines on a six-point Likert-type scale (1 = dislike a lot; 2 = dislike; 3 = neither likes nor dislikes; 4 = likes; 5 = likes a lot; 6 = can't be determined).

Socio-environmental factors

Eight socio-environmental items were rated on a four-point Likert-type scale (1 = strongly disagree; 4 = agree) to analyze the food eating behavior of young adults. We used the terms family (e.g., parents and siblings), friends, influencer (e.g., artist and celebrity), advertisement, availability of traditional or modern market, availability of food's store, availability of drive through food corner, and availability of online food stores in neighborhood to trigger participants to assess the socio-environmental factors around them that might affect their food eating behavior.

Frequency of OFO behavior and high-risk food consumption through OFDS

To assess the frequency of OFO behavior of the participants, we employed a questionnaire comprising eight questions. The participants were asked to indicate their OFO frequency under the following four categories: 1–3 times/month, 4–6 times/month, 7–10 times/month, and more than 10 times/month. For further analysis, these categories were coded as numbers 1–4, where the highest number indicated the highest OFO frequency. Meanwhile, for high-risk food consumption through OFDS, we asked the participants to rate the food groups, namely fast food, vegetables, fruits, noodles, chicken, fried rice, and processed bread, as 0 = never, 1 = somewhat, and 2 = most.

Content validation, reliability, criterion, and construct validity

Validity and reliability tests were conducted with 32 participants, initiated through cognitive interviews conducted by five nutrition experts and five public health specialists in health communication for content validity. The objective was to gain language and nutrition interpretation through their judgment. We obtained minor comments and revised them. Next, quantitative testing was performed with 32 participants through an online link distributed using Alchemer, formerly called SurveyGizmo. The objective was to determine the reliability and acceptability of the questionnaire. The internal reliability of the participants was assessed using Cronbach's alpha coefficient, which obtained a very good score of 0.71.

Phase 2: Data collection

A cross-sectional study was conducted over three weeks between October and November 2020 in Depok City. The questionnaire was filled out by 686 participants—which were recruited through an electronic chat and social media, based on comprehensive sampling methods, to canvass a known group of participants. The questionnaire was administered through a registered online survey platform named Alchemer, formerly called SurveyGizmo. Using SPSS version 22, descriptive statistics were employed to examine all used variables, followed by a T-test and a Chi-square test conducted to analyze the significance of each variable against OFO frequency behavior and high-risk food consumption through OFDS. Then, each variable was subjected to multi-logistic regression to assess their corresponding predictable factors. This study obtained ethical approval from The Research and Community Engagement Ethical Committee of Faculty of Public Health Universitas Indonesia number 597/UN2.F10.D11/PPM/00.02/2020. This study was conducted following the Declaration of Helsinki, including providing informed consent from all participants and ensured that their anonymity was maintained.

Results

Table 1 lists the sociodemographic characteristics of the participants. The link survey was filled out by 686 participants, of which 79.4% were females, aged 20–29 years (63.1%). In addition, most respondents were unmarried (52.5%), 68.1% had higher education (graduate from college or university), and 41.7% were employees.

Table 1 Sociodemographic characteristics (N = 686)

Characteristics	N	%
Gender		
Male	141	20.6
Female	545	79.4
Age group		
20-29	433	63.1
30-39	253	36.9
Employment		
Student	230	33.6
Employee	286	41.7
Unemployed/other	170	24.7
Marital status		
Married	326	47.5
Unmarried	360	52.5
Number of ordering usually in a month		
1 – 3 times	308	45.0
4 – 6 times	198	28.9
> 7 times	180	26.2
Last education status		
Elementary and Junior School	6	0.8
High School	207	30.2
College/University	472	68.1

Distribution of respondents by type of food ordered

Table 2 compares the frequencies of ordering various food items and beverages. Within the last month, the most frequently ordered food items and beverages were fast food (35.1%), followed by chicken dishes (33.9%), bubble tea (24.2%), coffee (23.0%), and sweet cakes (22.6%). Meanwhile, sweet cake (59.3%), fast food (59.1%), and bubble tea (57.0%) were predominantly ordered more than a month ago. In contrast, fruits were on the minor list of orders, as most participants (45.2%) never ordered them.

Table 2 Distribution of type of food ordered by respondents (N = 686)

Type of Food Ordered	Never n (%)	Yes	
		More than a month ago n (%)	Within a month n (%)
Bubble tea	129 (18.8)	391 (57.0)	166 (24.2)
Coffee Drink	223 (32.6)	305 (44.4)	158 (23.0)
Fast Food	39 (5.7)	406 (59.1)	241 (35.1)
Chicken dishes	73 (10.6)	381 (55.5)	232 (33.9)
Rice mix	176 (25.7)	385 (56.1)	125 (18.2)
Sweet cakes	124 (18.1)	407 (59.3)	155 (22.6)
Noodles	184 (26.9)	370 (53.9)	132 (19.2)
Fruits	310 (45.2)	288 (42.0)	88 (12.8)

Frequency of OFO behavior, high-risk food consumption through OFDS, and personal and socio-environmental factors

The results of a bivariate analysis (Table 3) conducted in this study indicated significant persistent results between the attitudes toward benefit, food preference, satisfaction toward OFO, and socio-environmental influence on the frequency of OFO behavior and high-risk food consumption through OFDS. Each independent factor was treated as a composite score. Then, knowledge about OFDS and nutrition content and other independent variables were then classified as low (< mean score) and sufficient (\geq mean scores of 62 and 45, respectively; otherwise, low). Attitudes toward risk, benefit, barriers, and features of OFDS were classified as positive (\geq mean scores of 71, 77, 68, and 79, respectively; otherwise, negative) and positive (=mean score). Meanwhile, satisfaction using OFDS, socio-environmental influences, perception toward OFDS, and food preference were the factors classified as positive (\geq mean scores of 72, 58, 72, and 75, respectively; otherwise, negative). An increased positive attitude toward the benefit of using OFDS increased the likelihood of the participants consuming high-risk foods by almost two times compared to the times before the introduction of these services (OR 1.89, 95% CI: 1.37–2.60).

Similarly, an improved perception about OFDS increased the likelihood of the participants consuming high-risk food by approximately 1.5 times (OR 1.41, 95% CI: 1.03–1.95). In addition, higher preference for high-risk foods, satisfaction toward OFO, and socio-environmental effects were related to increased consumption of high-risk food (OR 2.14, 95% CI: 1.57–2.93; OR 1.86, 95% CI: 1.36–2.54; and OR 1.97, 95% CI: 1.44– 2.70, respectively). The risk of using OFO varied from approximately 1.5 to more than four times. Interestingly, the lower attitudes of risk and barriers toward OFDS were only related to increased OFO frequency and unhealthy food consumption. At the same time, participants with better knowledge about OFDS tended to exhibit higher unhealthy food consumption (OR 1.43, 95% CI: 1.05–1.95).

Table 3 Bivariate analysis on the frequency of order and high-risk food consumption through OFDS (N=686)

Variables	Frequency of Order				High-Risk Food Consumption through OFDS			
	Less	More	OR 95% CI	P-value	Lower or Similar	Higher	OR 95% CI	P-value
	n (%)	n (%)			n (%)	n (%)		
All (N= 686)	308 (45.0)	377 (55.0)			271 (39.5)	414 (60.5)		
Knowledge about nutrition			1.20	0.241			0.87	0.384
Low (<62)	130 (47.8)	142 (52.2)	(0.88-1.63)		102 (37.5)	170 (62.5)	(0.64 – 1.19)	
High (≥62)	179 (43.2)	235 (56.8)			169 (40.8)	245 (59.2)		
Attitude on risk of using OFDS			0.72	0.032*			0.90	0.516
Negative (<71)	155 (41.3)	220 (58.7)	(0.53 - 0.97)		144 (38.4)	231 (61.6)	(0.66 – 1.23)	
Positive (≥71)	154 (49.5)	157 (50.5)			127 (40.8)	184 (59.2)		
Attitude on benefit of using OFDS			1.96	<0.0001***			1.89	<0.0001***
Negative (<77)	210 (51.7)	196 (48.3)	(1.43 - 2.68)		185 (45.6)	221 (54.4)	(1.37 – 2.60)	
Positive (≥77)	99 (35.4)	181 (64.6)			86 (30.8)	193 (69.2)		
Attitude on barriers of using OFDS			1.41	0.026*			1.03	0.857
Low (<68)	174 (49.2)	180 (50.8)	(1.04 - 1.91)		141 (39.8)	213 (60.2)	(0.76 – 1.40)	
High (≥68)	135 (40.7)	197 (59.3)			130 (39.2)	202 (60.8)		
Attitude towards features OFDS			1.45	0.016*			1.69	0.001**
Negative (<79)	189 (49.1)	196 (50.9)	(1.07 - 1.97)		173 (44.9)	212 (55.1)	(1.24 – 2.3)	
Positive (≥79)	120 (39.9)	181 (60.1)			98 (32.6)	203 (67.4)		
Satisfaction of using OFDS			3.83	<0.0001***			1.86	<0.0001***
Satisfied (<72)	212 (60.7)	137 (39.3)	(2.78 - 5.27)		163 (46.7)	186 (53.3)	(1.36 – 2.54)	
Unsatisfied (≥72)	97 (28.8)	240 (71.2)			108 (32.0)	229 (68.0)		
Social and environmental influence OFDS			1.42	0.024*			1.97	<0.0001***
Low (<58)	141 (50.2)	140 (49.8)	(1.05 - 1.93)		138 (49.1)	143 (50.9)	(1.44 – 2.70)	
High (≥58)	168 (41.5)	237 (58.5)			133 (32.8)	272 (67.2)		
Perception about OFDS			1.61	0.003**			1.41	0.033*
Negative (<72)	209 (49.5)	213 (50.5)	(1.18 - 2.20)		180 (42.7)	242 (57.3)	(1.03 – 1.95)	
Positive (≥72)	100 (37.9)	164 (62.1)			91 (34.5)	173 (65.5)		
Preference of online food choices			1.56	0.004**			2.14	<0.0001***
Low (<75)	157 (51.1)	150 (48.9)	(1.15 - 2.12)		152 (49.5)	155 (50.5)	(1.57 – 2.93)	
High (≥75)	152 (40.1)	227 (59.9)			119 (31.4)	260 (68.6)		

Variables	Frequency of Order				High-Risk Food Consumption through OFDS			
	Less	More	OR 95% CI	P-value	Lower or Similar	Higher	OR 95% CI	P-value
	n (%)	n (%)			n (%)	n (%)		
Knowledge about OFDS			1.29	0.101			1.43	0.023*
Low (<45)	180 (47.9)	196 (52.1)	(0.95 - 1.75)		163 (43.4)	213 (56.6)	(1.05 - 1.95)	
Sufficient (≥45)	129 (41.6)	181 (58.4)			108 (34.8)	202 (65.2)		

*p-value < 0.05; **p-value < 0.01; ***p-value < 0.001

Relations among frequency of OFO behavior, high-risk food consumption, and personal and socio-environmental factors

The relations among all factors related to the frequency of OFO behavior and high-risk food consumption through OFDS were analyzed using a multi-logistic regression model (Table 4). After adjusting for the covariates, the participants with high satisfaction with using OFDS ($\beta = 3.3$; 95% CI: 2.4–4.7) exhibited a significantly higher OFO frequency than those who did not. The participants who were influenced by socio-environmental factors ($\beta = 1.8$; 95% CI: 1.3–2.5) and had a high preference for using OFDS ($\beta = 1.7$; 95% CI: 1.2–2.4) exhibited significantly increased high-risk food consumption through OFDS than those who did not.

Table 4 Multiple logistic regression of frequency of OFO behavior and high-risk food consumption through OFDS (N=686)

Variable	Frequency of OFO Behavior			High-risk food consumption through OFDS		
	Sig.	Exp(B)	95% CI	Sig.	Exp(B)	95% CI
Knowledge about nutrition	0.323	1.2	0.8-1.7	0.314	0.8	0.6-1.2
Attitude on risk of using OFDS	0.039	0.7	0.5-1.0	0.788	1.0	0.7-1.3
Attitude on benefit of using OFDS	0.201	1.3	0.9-1.8	0.094	1.4	0.9-2.0
Attitude on barriers of using OFDS	0.035	1.4	1.0-2.0	0.702	1.1	0.8-1.5
Attitude on feature of OFDS	0.359	1.2	0.8-1.7	0.041	1.4	1.0-2.0
Satisfaction of using OFDS	0.000**	3.3	2.4-4.7	0.034	1.5	1.0-2.1
Perception about OFDS	0.851	1.0	0.7-1.4	0.737	0.9	0.7-1.3
Environment and social influences	0.397	1.2	0.8-1.6	0.001*	1.8	1.3-2.5
Preferences of OFDS choices	0.144	1.3	0.9-1.8	0.001*	1.7	1.2-2.4
Knowledge about OFDS	0.333	1.2	0.8-1.6	0.155	1.3	0.9-1.8

* p-value < 0.01; **p-value < 0.00

Discussion

Most participants in this study were women, which was in line with the research conducted in India and Indonesia, particularly in Palembang.(3,17) The study results require intervention, considering that several studies have indicated a significant relation between the frequencies in using OFO , is more dominant for women.(1,13) Among all respondents, 63.1% were in the 20–29 year age group. The same age group was also used in the measurements performed in Palembang (15–24 years) and India (18–25 years).(17,18) This dominant age group is in accordance with the background of Depok, which is filled with students, even though the second-largest population of the participants in this study was employees.

We conducted a comprehensive assessment of the personal and socio-environmental factors influencing the frequency of OFO behavior and high-risk food consumption through OFDS. We found that satisfaction with OFDS acts as a cognitive predictor of the frequency of OFO behavior. Customer satisfaction is defined by Kotler as the mental state of a customer that results from the comparison between the customers' expectations before a purchase and performance perception after the purchase.(19) According to this definition, positive experiences of personal transactions with online services encourage the repetitive use of these services. As a subjective assessment of product performance based on prior expectations, customer satisfaction is also known as one of the essential objectives of building consumer relationships closely related to their experience.(20,21) When customers are satisfied with either the food (presentation, variety, taste, and healthy options) or e-service quality (the extent to which a website supports efficient and effective purchase and delivery of products and services), they are more likely to place repeated orders on the same service and recommend it to other potential customers.(22–24) However, given that most OFDS offer fast food, with expanded variety, portion size, energy, and sodium content over the last 30 years, this satisfaction value is closely related to increased intake of high-risk food, which can lead to various health impacts in the future.(25–27)

In this study, the respondents with a high level of satisfaction made 3.8 times more frequent transactions. If customers feel satisfied with the transaction, their frequency of purchases will also increase. This is in line with some researchers who have studied the relations between customer satisfaction and the quality, security, and efficiency of billing systems and the design or appearance of an app. All of them indicated a strong association between consumer satisfaction and OFO frequency.(28–30) These findings agree with those obtained previously for the qualitative studies conducted in South Korea, which suggest that convenient foods are being preferred because of their short preparation time, taste, availability, accessibility, and tempting food environment (simplicity of obtaining the desired food whenever required even in the middle of the night just on a fingertip).(31)

Moreover, we found socio-environmental influences and preferences of OFDS as predictors of high-risk food consumption through OFDS. The domain of our inquiries was related to social aspects such as encouragement from family and friends, influencers, and advertisements. As for the environment, we inquired about access to vegetables and availability of restaurants and outlets to buy ready-to-eat food items. The easy availability of outlet facilities could be an encouraging factor, which makes it easier for respondents to order any food type. Young adults can easily obtain this information from social media and their peers.(12,32) In addition, advertisements through TV programs, restaurant pages, and food are currently trending in the promotion of appetizing and tempting food, which unfortunately has poor nutritional value.(21,33)

Meanwhile, a significant relation has been established between choice of food type and OFO frequency and high-risk food consumption through OFDS. Rozin and Villmecke distinguished "preferences" and "likes" of food, where preference refers to the choice from what is available or the choice of one food item over another. In contrast, "liking" refers to hedonic affective reactions against food, which are usually directed by testimonies, recommendations, or rating scales. (34) A study conducted in China found an increase in the frequency of use of OFDS toward eating preferences for high-risk foods, which resulted in overnutrition and obesity.(35) In our study, most food items ordered by respondents within a month were fast food (Table 2). According to the National Institutes of Health (NIH), the consumption of fast food, known as ready-to-eat food, has a higher possibility of killing humans prematurely compared to smoking.(36) Jiang et al. stated that a significant factor affecting the OFO frequency is high-risk foods, which are high in fat and sugar.(35,37,38)

Conclusion

This study presents the personal and socio-environmental factors that determine the frequency of OFO behavior and consumption of high-risk food through OFDS. Young Adults are very vulnerable to being influenced by social, environmental and advertising factors, including the influence of consuming food online. Order frequency, risk food order, and risk food consumption will increase if they get satisfaction in food order services. There is also a strong influence from the social-environmental factor and a significant preference of online food order choices.

However, this cross-sectional study cannot determine the cause-effect relation, and the findings cannot be generalized for the remaining young adult population in Depok City. Furthermore, advertising, as a strong influence on sharing the behavior of high-risk food consumption through OFDS, can be considered a channel to share healthy food consumption behavior with young adults. Regarding the future risk of NCD and the continuous program to prevent NCD, the government, through the Ministry of Health, needs to educate the community, particularly young adults, regarding the nutrition literacy level of healthy food consumption and high-risk food consumption.

Abbreviations

OFO : Online Food Ordering

OFDS : Online Food Delivery Services

NCD : Non-Communicable Diseases

NIH : National Institutes of Health

Declarations

Ethics approval and consent to participate

This study obtained ethical approval from The Research and Community Engagement Ethical Committee of Faculty of Public Health Universitas Indonesia number 597/UN2.F10.D11/PPM/00.02/2020. We took informed consent from all participants and ensured their anonymity.

Consent for publication

Not applicable. Does not contain any details, images, or videos relating to an individual person

Availability of data and material

The questionnaire was administered through a registered online survey platform named Alchemer (<https://www.alchemer.com>), formerly called SurveyGizmo. The data analysis was by using SPSS version 22.

Competing interests

None. The authors declare no competing interests.

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