RESEARCH ARTICLE

The effect of fast food calorie labels on calories ordered by college students in Quezon City

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ABSTRACT

Background: There is an increasing trend of obesity in the Philippines with approximately 28.8% of adults considered overweight and 9.6% obese. This is presumably due to a shift in eating patterns towards dining out in restaurants and fast food chains for their convenience. Excess fast food consumption results in diets that are calorie dense yet nutritionally deficient due to their high levels of fat, sugar, and salt leading to increased prevalence of associated diseases such as Type 2 diabetes and cardiovascular diseases.

Objective: The researchers determined the effect of presenting the caloric information of fast food items on the total calories ordered among college students in private and public higher education institutions in Quezon City.

Methodology: A double-blind experimental research was performed with 179 students by convenience sampling. The participants were randomly assigned to a control group (without caloric labels) and an experimental group (with caloric labels). An online questionnaire was sent to each subject containing their menu and order form along with questions on their demographical data (age, sex, food allowance, BMI, physical activity).

Results: Using single linear regression, none of the demographic characteristics were found to be confounding variables. Using multiple linear regression analysis, it was found that the experimental group ordered significantly less calories (p-value = 0.013).

Conclusion: The results of the study conclude that those presented with calorie labels ordered less calories than the control.

Keywords: *nutrition, college, fast food, calories*

Introduction

According to surveys done by the DOST-FNRI and NielsenIQ on the health and nutritional status of Filipino adults, the shift in eating patterns among Filipinos may have contributed to a higher prevalence of the overweight (28.8%) and obese (9.6%) among adults aged 20-59 years old [1,2]. The survey revealed that among populations belonging to different socio-economic classes in urban locations, more Filipinos are resorting to dining out than eating at home. Fast food is becoming one of the most common options for dine-out. This is especially true for single-member households who lack the time to prepare home-cooked and healthy meals since fast food restaurants and convenience stores offer convenience, and ready-to-eat meal options [3].

Given the high prevalence of obesity in the Philippines, this shift in eating patterns is a growing public health concern. Increased fast food consumption is linked to higher energy intake and poorer diet quality leading to the heightened prevalence of obesity, cardiovascular diseases, and Type 2 diabetes [4-6]. Hence, public health researchers have focused on identifying factors that promote responsible food serving and healthier consumption [7]. Researches and proposed bills by government officials believed that menu labeling may potentially impact consumers and encourage them to choose lower calorie offerings instead [8]. Empirical verification of the link between presence of caloric information of fast food items and food choices of college students remains rare.

Studies have investigated the effect of caloric labels on the purchase decisions of customers ever since New York City required restaurants to include caloric value in their menus last 2006. Some studies did not find any significant change after the implementation, although there is still a decrease in mean caloric purchase [9-11]. The proposal to conduct longer studies with more interventions was made, since the impact of caloric menu labels on people's purchase-making decisions may take time to manifest [12]. In contrast, some studies concluded a significant difference [13]. Another study showed that consumers order a marginal of 15 to 300 calories less when nutritional menu labels are present [14].

Age, sex, diet, level of physical activity, food allowance, and body mass index (BMI) are some of the key reported factors affecting the dietary practice and food choice of college students aside from convenience [16-19]. The largest chunk of fast food consumers among adults is from ages 20-29 years old [20]. Meanwhile, data regarding underage consumers are lacking. Undergraduate women chose healthier food choices and were more knowledgeable in using food labels [21]. In addition, students who were more physically active also had healthier dietary habits and were more aware of their food choices [22]. In contrast, people who have a higher BMI have been linked to increased consumption of unhealthy fast food items [23]. Food allowance and socioeconomic status also play a role when it comes to food-making decisions since a greater budget means a wider variety of food options [19].

Among the middle class in Metro Manila, it was reported that convenience and cost-effectiveness were the key factors for eating out, whereas the presence of domestic helpers tends to counteract this trend [20]. Fast food consumption among Filipino college students has steadily increased over the decades and this may be due to the growing number of college students who live away from home [24]. The aggregate profile of fast food consumers in Metro Manila were young adults (20-29 years old); majority of whom were females, and college-educated or college students [25]. In a state university in Quezon City, 90% of surveyed college students patronized fast food establishments more than local street food eateries when dining out [25].

Nutritional value was one of the most important factors considered by college students when buying fast food [16]. However, this is often disregarded due to the evident lack of nutritional labels in fast food chains. Moreover, affordability, convenience, and taste are said to be correlated to the students' unhealthy dietary behaviors [26].

Because of the conflicting results and lack of local studies, investigating the influence of fast food menu calorie labels on the calorie purchases of college students from public and private higher education institutions in Quezon City may help in bridging the knowledge gap and serve as a reference for future studies. In relation, the diversity of the demographic population and proximity of Trinity University of Asia (TUA) and University of the Philippines Diliman (UPD) to fast food chains were taken into account in choosing these schools as representative colleges.

The study was done to determine the effect of fast food calorie labels on food ordered by college students at private and public higher education institutions in Quezon City. Specifically, the study aimed to determine the demographic data (sex, course, year level, weekly food allowance, BMI, and level of physical activity) of college students recruited, identify possible confounding variables among the demographic data collected (sex, year level, weekly food allowance, BMI, and level of physical activity), and discuss the relationship of fast food menu calorie labels and calories ordered among the study and control groups.

Methodology

Study Participants

The inclusion criteria for a study participant were the following: 1) college undergraduate, 2) aged 18-24 years old, 3) studying at the Trinity University of Asia (TUA) or the University of the Philippines-Diliman (UPD), and 4) eats in fast food chains (no specific frequency). The exclusion criteria were: 1) did not give informed consent, 2) follows a strict diet due to personal or medical reasons, and 3) non-Asian foreign students. Non-Asian students were excluded from the study because Asian BMI standards were used for the data analysis. The BMI classification used for Filipinos is consistent with that of other Asian populations, which is why other non-Filipino but Asian students were allowed to participate in the study.

Materials and instrumentations

Primary data was collected through an online questionnaire using Google Forms. The data gathered from the respondents included verification details, subject profile, and their food choices. Under verification details, the subject's unique control number which was generated by the researchers and the name of the researcher who contacted them were asked. For the subject profile, the following were provided by the respondents: age, sex, course or degree program, year level,

weekly food allowance, height, weight, and level of physical activity. Weekly food allowance was defined as the amount of money allocated for food purchased outside the home, by a respondent, per week. The level of physical activity was asked with a table containing the classifications (according to duration and intensity) adopted from the U.S. Department of Health and Human Services Physical Activity Guidelines [28].

For the food choices, a fast food menu and an order form were presented to the participants. The menu for the control group contained the name, picture, and household measurement (e.g., one cup) of each item. The menu for the experimental group was similar to the control with the addition of calorie labels in the form of the item's calorie count, placed under its name. The calories were computed by the Registered Nutritionist-Dietitians (RNDs) of the research group. The presence of these calorie labels in the menu of the experimental group was the intervention of this study.

The four sections of the menu were as follows: i.) Main food items (including chopsuey with rice, wonton mami, burger steak with rice, fish burger, crispy fish meal, palabok, hamburger, cheeseburger, chicken sandwich, spaghetti, 1-piece chicken with rice, and 2-piece chicken with rice); ii.) Sides (including kangkong with bagoong, wonton soup, steamed vegetables, onion rings, macaroni salad, fries, coleslaw, corn and carrot, and caesar salad); iii.) Desserts (including halo-halo, coffee jelly, brownie, fresh fruit cup, peach pie, ice cream cup); and iv.) Drinks (including soda, diet soda, iced tea, juice, coffee, and bottled water).

Study Procedure

This study is an experimental research that investigated the effect of fast food menu calorie labels on the total amount of calories in all ordered items per respondent, termed as calories ordered, by college students of TUA and UPD.

Convenience sampling was done for both universities to reach the desired sample size. However, the means of recruitment of the subjects from each university differed. For TUA, the researchers coordinated with the Research Committee of the university. The TUA sent out emails to the student body asking for anyone who would be interested to participate in the study to email the researchers. For UPD, convenience sampling was done by using snowball sampling among student organizations and courses to recruit subjects.

An online informed consent form (ICF) was crafted by the researchers using Google Forms. The link to this form was sent out to the interested participants via email, together with the study's background, inclusion/exclusion criteria, and the contact number of a researcher. Eligible participants who filled out the online ICF were reflected in the researchers' database. They were then considered the subjects of this study.

There were two study groups involved: the control group (Group A) and the experimental group (Group B). The assignment of subjects to the two groups was randomized. The respective questionnaires (as discussed in the "Materials and instrumentations" section) were then sent out to their corresponding recipient group (i.e., the questionnaire containing the menu with calorie labels to Group B and the menu without the calorie labels to Group A). Participants were asked to tick an item for each section in the menu, with the option to tick "N/A" for none. Everything that the respondent ordered was summed up and accounted for by the database.

In this study, double-blinding was done as both participants and the statistical analyst were blinded. The participants were informed that they would be given different menus but were not informed of the difference and if they were given the control or experimental treatment.

Subjects who have expressed their interest and were sent the ICF link but did not reply within 7 days or have been sent the questionnaire by the researchers but unable to answer them, were withdrawn from the study. There were 35 who filled out the consent form but did not answer the questionnaire, hence were considered lost to follow-up.

This study employed a posttest-only questionnaire for the subjects (27). The independent variable in the study was the presentation of calorie labels of fast food items while the dependent variable was the calories ordered by the subjects. Pilot testing of the questionnaire was conducted on 30 undergraduate students studying in Quezon City but not associated with TUA or UPD. This was to ensure that necessary adjustments and improvements on both the questionnaire and data collection process were done before the actual implementation of the study.

Sample Size Estimation

The sample size was computed using the G*Power 3.1.9.2 application with the input values of: significance level a=5%, effect size d=0.4, power of 80%, and an allocation ratio of 1. The previous studies with varying results showed minor to moderate effect size d=0.4 of caloric labeling on caloric intake among study participants [12,13]. An addition of the standard 20% was added to the

computed sample size thus, the sample size targeted for the study was n=156*1.20=188 undergraduate students where each study group would have about n1==n2=94 participants from different courses or degree programs.

Description of Outcome Measures

The variable measured was calories ordered which is defined as the total amount of calories of all ordered items per respondent. This is a dependent and continuous variable that will allow the researchers to assess the net effect of the independent variables (presentation or non-presentation of calorie labels) through a linear regression analysis. The primary measurement used to evaluate if menu calorie labels had an effect on calories ordered by the respondents were the p-values (level of significance = 0.05) and coefficients in regression analysis. Confidence intervals were indicated as well. The coefficients described the relationship between the independent (menu calorie labels) and dependent variable (calories ordered).

Data Analysis

The following statistical parameters were calculated for the demographical data using Stata 16: age (mean and standard deviation), sex (frequency, percentage), food allowance (median), BMI (mean, standard deviation), and physical activity (percentage).

Food allowance data was further divided above and below the median to classify the participants into groups. Median was used instead of mean because there were outliers with higher food allowance. This could be due to the difference in allowance of those living in dorms requiring higher weekly allowance compared to those with nearby family residence. The percentage and frequency of the participants who have a food allowance of above median and below median were also computed. For each of the demographic characteristics, p-values were calculated by Chi-square tests and Student's t-test for categorical and continuous variables, respectively, to assess if there was a significant difference between the control and experimental groups. The significance level used was 0.05. Simple linear regression was then done to identify possible confounders. A significance level of 0.05 was used. This procedure was repeated with the same significance level to confirm if the potential confounding variables identified previously had a significant effect on the outcome.

Multiple linear regression analysis was then used to determine the relationship between caloric display and the total calories ordered. The p-value of the regression coefficients was tested against a significance level of 0.05.

Ethical considerations

The study and all its documents were reviewed and approved by the St. Luke's Medical Center Institutional Ethics Review Committee with ethics clearance number SL-20256.

Results

Table 2 shows the different characteristics (age, BMI, sex, physical activity, food allowance, and year level) of respondents by group from a given population (N = 179). Group A, which was the control group, with 102 respondents, was compared with Group B, which was the experimental group, with 77 respondents. Statistics of the given characteristics were tabulated for each group.

A total of 32 blank responses from Group A and 27 blank responses from Group B were deleted from the food allowance results. For the year level, (3) blank responses were deleted from Group B. Non-responses were automatically rejected by the software used, Stata 16.

Table 1. *Classifications for Physical Activity (28)*

Classification	Duration and intensity of activity
Inactive	No moderate*- or vigorous**-intensity physical activity beyond basic movement from daily life activities
Insufficiently Active	Some moderate*- or vigorous**-intensity physical activity but less than 150 minutes of moderate-intensity physical activity a week or 75 minutes of vigorous-intensity physical activity or the equivalent combination
Active	150 minutes to 300 minutes of moderate*-intensity physical activity a week
Vigorously active	More than* 300 minutes of moderate*-intensity physical activity a week

***Moderate-intensity activity:** equivalent in effort to brisk-walking
****Vigorous-intensity activity:** equivalent in effort to running or jogging

Table 2. *Characteristics of Respondents by Group (N = 179)*

Characteristics	Categories	Group A (N = 102)	Group B (N = 77)	p-value[a]
Age: Mean (SD)		21.01 (1.27)	20.75 (1.19)	0.1716
BMI	Underweight (n = 30)	20 (66.67%)	10 (33.33%)	0.602
	Normal (n = 80)	46 (57.50%)	34 (42.50%)	
	Overweight (n = 20)	10 (50.00%)	10 (50.00%)	
	Obese (n = 49)	26 (53.06%)	23 (46.94%)	
Sex	Male (n = 69)	37 (53.62%)	32 (46.38%)	0.43
	Female (n = 109)	65 (59.63%)	44 (40.37%)	
Physical Activity	Inactive (n = 29)	17 (58.62%)	12 (41.38%)	0.563
	Insufficiently Active (n = 64)	36 (56.25%)	28 (43.75%)	
	Active (n = 56)	35 (62.50%)	21 (37.50%)	
	Vigorously Active (n = 30)	14 (46.67%)	16 (53.33%)	
Food Allowance	Below Median (n = 74)	44 (59.46%)	30 (40.54%)	0.751
	Above Median (n = 46)	26 (56.52%)	20 (43.48%)	
Year Level	First Year (n = 16)	11 (68.75%)	5 (31.25%)	0.173
	Second Year (n = 45)	20 (44.44%)	25 (55.56%)	
	Third Year (n = 50)	30 (60.00%)	20 (40.00%)	
	Fourth Year (n = 38)	21 (55.26%)	17 (44.74%)	
	Fifth Year (n = 22)	17 (77.27%)	5 (22.73%)	
	Sixth Year (n = 5)	3 (60.00%)	2 (40.00%)	

Abbreviation: BMI Body Mass Index
Data are in frequency and percentage (%) unless otherwise stated.
*Statistically significant at 0.05
[a]p-values were calculated by Chi-square tests and Student's t-test for categorical and continuous variables, respectively

Table 3. *Simple Linear Regression Analysis of Confounders with Total Calories*

Variables	Categories	(SE)	p-value	95% Confidence interval for	
				Lower limit	Upper limit
Age		- 15.14 (12.58)	0.230	-39.96	9.69
BMI (Ref = Underweight)	Normal	-11.73 (44.88)	0.794	-100.31	76.85
	Overweight	44.08 (60.52)	0.467	-75.36	163.53
	Obese	-7.62 (48.60)	0.876	-103.54	88.30
Sex (Ref = Male)	Female	-21.41 (32.22)	0.507	-85.00	42.17
Physical Activity (Ref = Inactive)	Insufficiently Active	-36.54 (46.94)	0.437	-129.18	56.11
	Active	-36.64 (47.98)	0.446	-131.33	58.05
	Vigorously Active	-3.95 (54.61)	0.942	-111.73	103.83
Food Allowance (Ref = Below Median)	Above Median	-46.16 (38.93)	0.238	-123.26	30.94
Year Level (Ref = First Year)	Second Year	53.12 (61.23)	0.387	-67.76	173.99
	Third Year	56.91 (60.42)	0.348	-62.36	176.20
	Fourth Year	12.49 (62.69)	0.842	-111.27	136.25
	Fifth Year	7.02 (69.12)	0.92	-129.42	143.47
	Sixth Year	-81.66 (107.78)	0.450	-294.43	131.10

a Statistically significant at 0.05

Table 4. *Multiple Linear Regression Analysis of Probable Confounder (Age) with Total Calories Adjusted by Caloric Label*

Variables	Categories	(SE)	p-value	95% Confidence interval for	
				Lower limit	Upper limit
Intercept		1206.08 (263.00)	<0.0001*	687.03	1725.13
Age		-18.21 (12.48)	0.146	-42.84	6.42
Calorie label (Ref = Group A)	Group B	-74.80 (31.20)	0.018*	-136.37	-13.23

a Statistically significant at 0.05

Table 5. *Multiple Linear Regression Analysis of Probable Confounder (Weekly Food Allowance Classified by Median) with Total Calories Adjusted by Caloric Label*

Variables	Categories	(SE)	p-value	95% Confidence interval for	
				Lower limit	Upper limit
Intercept		840.46 (28.24)	<0.0001*	784.54	896.39
Food Allowance (Ref = Below Median)	Above Median	-43.71 (38.33)	0.256	-119.62	32.20
Calorie label (Ref = Group A)	Group B	-83.28 (37.80)	0.030*	-158.14	-8.42

*Statistically significant at 0.05

The characteristics of the respondents between Groups A and B were found to have no significant difference since the p-value for each characteristic is > 0.05.

The total calories ordered for Groups A (control) and B (experimental) were as follows: Group A with a mean total calories ordered of 823.53 kcal, which is greater compared to Group B with 753.40 kcal. In Group A, the minimum and maximum amount of total calories ordered ranged from 201 to 1277 kcal. In Group B, the range was 292 to 1178 kcal. The median values based on the minimum and maximum total calories ordered for Groups A and B were 538 kcal and 443 kcal, respectively. The overall distribution of the data is skewed to the right. In a right-skewed or positively skewed distribution, the mean is higher than the median.

Linear Regression Analysis for Total Calories Ordered

Evaluation of Confounders

Simple linear regression was used to evaluate the potential confounders for the relationship between caloric label and total calories ordered. Age and median weekly food allowance have a p-value of <0.25 (p = 0.23 and p = 0.238, respectively) making them probable confounders according to the rule of thumb threshold.

Table 3 shows that for every year older, participants ordered 15.14 calories less than their younger counterparts. Furthermore, those with a food allowance above the median ordered 46.16 less calories compared to those with allowances below the median.

BMI, sex, level of physical activity, and year level were found to be non-confounders having p> 0.25 (refer to Table 3).

Table 4 shows that if all x-values (age) = 0, an average of 1206.08 calories are ordered. Multiple regression analysis for age reveals a mean of 18.21 calories less ordered per year. Group B (mean age = 20.75) selected an average of 74.8 calories less compared to Group A (mean age = 21.01).

Table 5 shows that if all x-values (weekly allowance) = 0, an average of 840.46 calories are ordered. Multiple regression analysis for the participants' weekly allowance reveals a mean of 43.71 calories less ordered if their allowance is above the median value. Group B (above median food allowance) selected an average of 83.28 calories less compared to Group A (below median food allowance).

The two probable confounders (*i.e.*, age and weekly food allowance) were not included in the model since they have p-values >0.1 (rule of thumb threshold; 0.146 and 0.256, respectively) upon confirmatory testing. This means they are not confounding variables and they do not exert a statistically significant effect on the dependent variable. Food allowance may not have been a confounding variable in this study due to the lack of great difference in pricing of the lower calorie options compared to the higher calorie options. In other words, both the lower-calorie options and the higher-calorie options were in a similar price range and that spending more did not necessitate eating healthier or lower calories. It can also be argued that since the study was conducted using an online form, the participants may have

ordered food without much consideration of their budget. In real-life settings, the participants would feel the effect of trading food for money.

Final Model

The final model consisted of the exposure (caloric label) and the outcome variable (total calories ordered). The linear model is presented as follows:

Expected Calorie Count = 829.69 - 76.29 (Group A)

This shows that the average calories ordered of a student belonging to Group B was lower by 76.29 compared to a student in Group A. At p = 0.013, there is sufficient evidence to conclude that caloric labeling is significantly associated with total calories ordered.

Discussion

The results show that caloric labeling significantly reduced the total calories ordered by 18 to 24-year-old undergraduate students from TUA and UPD. After assuring independence, normality, and equality of variance assumption, as well as homogeneity are met, the study's data is considered valid. The study also did not include outliers as their results may be considered confounding.

Previous studies done on the topic have had mixed results, with some stating significant differences in food choices resulting in decreased calorie count, while others had only marginal or no difference at all [9-11, 14]. Other studies also looked at certain demographic factors such as age, sex, activity level, food allowance, BMI, and their relationship to food choices [16-19]. Based on the initial simple linear regression analysis performed, there were two probable confounders: age and weekly food allowance. These two could have increased or decreased the amount of calories purchased [16-19]. Age could be a factor since older individuals would most likely have a higher educational attainment. The factor of age becomes less intuitive in the context of this study since only a selected age group (18-24 years old) was included. A separate study stated that the 20-29 age bracket were the largest consumers of fast food and if the current survey were to include those, then age might have been a significant confounder [20]. Weekly food allowance would arguably be a more compelling confounder, since a higher spending budget would mean a wider range of food choices. However, upon using the multiple linear regression analysis, both age and weekly food allowance were excluded since they were not considered significant. This study did not find any association between sex and active lifestyle against the calories ordered which were found significant in related studies [21,23].

The only variables included in the final model were exposure (caloric labels) and outcome (total calories ordered). The survey was able to demonstrate the effectiveness of caloric labels in affecting the amount of food and calories ordered. The experimental group ordered an average of 76.29 kcal less than the control group.

These findings coincide with the "health belief model" stating that nutritional information can guide consumers into making healthier choices [27]. Caloric labels act as a cue to action that help prompt individuals to make more well-informed choices regarding their health. Nutritional labels are clearly just one of the factors which influence these choices and simpler reasons such as apathy or mere pleasure-seeking desires can be just as valid, prompting further research for better ways of informing consumers [27].

The results concur with the study where a significant difference in the food choices of college students was observed when caloric information has been presented – such that female students who received caloric information consumed 146 calories less per meal compared to their uninformed counterparts. However, the provision of such information had no statistically significant effect on their male participants [15].

The study shows that in an ideal scenario, once caloric labeling is introduced, college students are more likely to choose a lower-calorie meal. This may also imply that college students are aware of lower-calorie meals as being a healthier food choice. In fact, college students identify healthy food items by their common features such as low calorie, low grease, and low cholesterol [29]. Studies have also shown that basic nutritional education is an effective tool for Filipino undergraduate students. Around half of Filipino college students began to consistently read the nutrition labels of pre-packaged food after taking a general education course on nutrition. This shows awareness of the amount of calories they consume [30].

Since college students deemed a lower-calorie meal as more nutritious, this is one possible explanation as to why the experimental group was more inclined to purchase a "healthier" low-calorie meal [16]. This study could justify the usage of caloric labeling in food establishments close to a college or university. This may also indicate that college

students are likely to make more informed decisions regarding their food or meal.

A limitation of this study is that it did not focus on a wider student population, and the fact that the study only included undergraduate students means that the overall educational attainment of the population is similar. If the study were to be conducted in a more heterogeneous population, then it would reflect a more real-world scenario. Another limitation of the study would be the online presentation of the menu which may be different from real-world scenarios where the participants would actually be in the establishment ordering.

Conclusion

The study was able to determine the effect of fast food calorie labels on calories ordered by college students at Trinity University of Asia and UP - Diliman. The presence of calorie labels significantly reduced the total calories ordered by college students.

The growing industry of fast food and the increasing trend in the portion of the population who are above normal weight will pose health problems if the trend continues. Interventions must be made to prevent future health problems among the Filipino population. The results of the study show that participants who had calorie labels on their menu ordered significantly less than those who did not have any calorie labels on their menu. This suggests that adding calorie labels on fast food menus could be an intervention to help increase awareness of their diet. This is beneficial for those who are trying to lose weight and those trying to maintain it, as it would help them in achieving their caloric requirement. With successful weight control, health problems associated with weight gain such as Type 2 diabetes and cardiovascular diseases could be avoided. This could then save patients on healthcare costs. Additionally, aside from awareness of weight management, calorie labels also promote consumer empowerment by providing them with information about what they are about to purchase and consume.

The researchers recommend future studies to examine if the same observations can be made in the working class. While the results of the study show a decrease in calories ordered with the intervention, further education on nutrition and weight management should also involve the macronutrients and micronutrients of the food the public orders. With no significant confounding variables among age, sex, weekly food allowance, year level, BMI and physical activity, it is important to assess if the knowledge, attitude, and practices towards fast food ordering affect the total calories they order.

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