

ORIGINAL ARTICLE

Changes in Snack Food Intake during COVID-19 Lockdown: An Online Survey in Sri Lanka

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ABSTRACT

Background: Based on high transmissibility of coronavirus disease-19 (COVID-19), nationwide lockdowns were undertaken to halt the spread of virus associated with changes in snack behavior. This study aimed to observe changes in snack behavior in Sri Lankan adults.

Methods: This cross-sectional study was conducted from 27th May to 02nd June 2021. A pre-tested, self-administered questionnaire was shared via online social networking platforms using Google forms.

Results: Totally, 3601 respondents participated in the study, of which 60.1% were females, and 82.1% were Sinhalese. The majority of the respondents increased consumption of coffee/tea (53.7%), and biscuit (42.3%); where a substantial proportion reported decreased consumption of cake (49.8%), sweets (49.0%), snacks (47.5%), desserts (46.2%), and sugar-sweetened beverages (48.7%). Participants of 31-35 years age (OR=1.445; 95% CI: 1.119-1.865, $p=0.005$) and 36-40 years age (OR=1.409; 95% CI: 1.065-1.864, $p=0.016$) reported the significantly higher biscuit consumption. Respondents in 31-35 years age (OR=1.265; 95% CI: 1.004 to 1.592, $p=0.046$) significantly increased coffee/tea intake. Among ethnic groups, Sinhalese (OR=1.509; 95% CI: 1.164 to 1.955, $p=0.002$) and Tamils (OR=1.408; 95% CI: 1.007 to 1.969, $p=0.045$) showed significant odds to increased coffee/tea drinking pattern. The respondents with monthly family income levels of less than 200,000 LKR (1000 USD) significantly liked to report increased consumption of biscuits and coffee/tea.

Conclusion: COVID-19 lockdown impacted snack consumption behavior among Sri Lankan adults. The consumption of coffee/tea and biscuit increased too.

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Introduction

Snacks are defined as small amounts of food or drink usually consumed between main meals (1). Snacking has been suggested as a special dietary

behavior that imparts various health benefits, such as appetite control, body weight regulation, and blood glucose control in adults. Healthy snacks contain the recommended nutrients and are low in fats, sugars,

and salt content. Snacks that are high in energy and poor in nutrients are called ‘empty calories’ and potentially contribute to positive energy balance (2). Irregular and unhealthy snack eating is associated with extreme risks of cardiovascular, neurological, and metabolic complications (2, 3). The stimulus to snack is described by a few authors under several dynamics such as hunger, location, social, food culture and environment, distracted eating, and hedonic eating (4).

Due to the high transmissibility of novel coronavirus disease-19 (COVID-19), many governments enforced social isolation and nationwide lockdowns of several degrees as an attempt to halt the spread of the virus which was associated with drastic changes in snack behavior (5, 6). As reported in New Zealand, a higher proportion of respondents aged younger than 50 years increased their sweet and salty snack intake (44% and 36%, respectively), when compared to those aged 50 years or older (36% and 28%, respectively, $p < 0.001$) during the first lockdown due to COVID-19 (7). Work from home during the declaration period increased the intake of snacks by 8% among *CALO mama* health app users in Japan (8). Comparatively, before COVID-19, people were much more likely to usually have a late-night snack or meal in Kuwait (9). A recent meta-analysis stated that although the reported changes in snacking had shown a tendency towards an increase, 34.0-62.2% reported no changes in either frequency or portion of snacking consumption throughout the day during the lockdown period (5).

The Sri Lankan government announced a nationwide lockdown as a strict measure to respond to the third wave of pandemic commencing 21st May 2021 as Sri Lanka reached its peak of COVID-19. This resulted in many changes in daily life and routines such as digital education, work at home, limitation of outdoors, stockpiling food, boredom, and stress due to listening to media continuously about COVID-19 updates (10-12). Although hanging onto social isolation was necessary to reduce the spread of COVID-19 from a public health perspective, their impact on personal dietary behaviors and defining its long-term health consequences are challenging.

Therefore, the objective of the present study was to examine the impact of the COVID-19 lockdown on the snack behavior of adults in Sri Lanka.

Materials and Methods

This study was conducted as a part of a national-level cross-sectional study during the COVID-19 lockdown from 27th May to 02nd June 2021 in Sri Lanka. A self-administered questionnaire which was developed as a web-based survey tool was

used utilizing a convenience sampling method to investigate changes in their lifestyle-related behavior during the COVID-19 lockdown period. Participants were recruited via online social networking platforms (Facebook, Instagram, Twitter, and WhatsApp) with a shared link to the questionnaire and a request to circulate the survey broadly to adults to recruit more participants. All participants were fully informed about the study requirements and were required to accept the data sharing and privacy policy before participating in the study. The study objective and context were provided at the start of the survey and digital consent was provided. It was anonymous and participation was voluntary. This survey was not subjected to the ethics committee approval because of the anonymous nature of the online survey. The study was conducted in full agreement with the national and international regulations, and the Declaration of Helsinki (2000) (13). The respondents were included when they were (i) age ≥ 16 years, (ii) living in Sri Lanka, and (iii) being of Sri Lankan nationality to be included in the study. Respondents were excluded from the study who had (i) illnesses or other conditions that changed the regular dietary pattern, including pregnancy, and (ii) incomplete questionnaire.

An online questionnaire was designed to assess any modifications to lifestyle patterns during the COVID-19 pandemic in Sri Lanka. The questionnaire included both multiple-choice and open-ended questions. They were structured by an expert panel to determine the consumer profile, and the impact of COVID-19 restrictions on their lifestyle behavior. The survey form was prepared using the Google Forms application. The questionnaire consisted of three different sections of socio-demographic characteristics, diet and lifestyle-related questions. For the present study, socio-demographic data and snack food intake data in diet-related section were used. The adopted questionnaire was pre-tested prior to survey data collection. A detailed description of the study population, methods, questionnaire and the changes observed in other lifestyle patterns have been published elsewhere (14-17).

Standard socio-demographic data were collected in the first section of the questionnaire. Age was derived from the self-reported year of birth and categorized into five age groups of 18-25, 26-30, 31-35, 36-40, and older than 40 years. Gender was reported as either male, female, or prefer not to say. Ethnicity was recorded as Sinhala, Sri Lankan Tamil, Indian Tamil, Sri Lankan Moors and others for those who did not belong under any of the given categories and then they were categorized into Sinhala, Tamil, Moors,

and others during the data analysis. Educational attainment was measured as the highest achieved level of education, ranging from secondary education or below, tertiary education, and degree or above level of education. Participants were further stratified in terms of monthly family income level ranging from less than 25000 LKR (125 USD as at 27th May 2021), and more than 200,000 LKR (1000 USD as at 27th May 2021) by combining income groups: <10,000 LKR (50 USD as at 27th May 2021) and 10,000-24,999 LKR (50-124.99 USD as at 27th May 2021). The participants were asked to select the residing district from a drop down list with the 25 districts in Sri Lanka and the list was arranged in alphabetical order. Then the residing districts of participants were grouped as Colombo, Gampaha, Kandy, and others in data analysis. The nature of the residential area was reported and categorized as municipal council area, city council area, and rural area. The employment categories were employed, unemployed, retired, full-time student or pupil, and others.

The second section of the questionnaire included questions that focused on changes that occurred in food intake behaviors throughout the COVID-19 lockdown. The changes in consumption of almost all food categories including high-carb food, protein food, fat and dairy food, fruit and vegetables and other food behaviors (snack food) were recorded and the responses were obtained as “increased”, and “decreased” to “no change” compared to the consumption level prior to COVID-19 lockdown. The snack behaviour related data was extracted for the present study. The response options for changes in snack food intake ranged from “increased”, and “decreased” to “no change”. The snacks food categories were sweets (toffees, chocolate, etc.), desserts (pudding, ice cream, etc.), snacks (salted nuts, chips, mixtures) biscuits, cake (icing, butter, etc.), sugar-sweetened beverages, fruit juice, and coffee/tea.

Data were statistically analyzed using Statistical Package for the Social Sciences (SPSS, version 23.0, IBM, Chicago, IL, USA). Descriptive statistics were conducted to describe the socio-demographic variables and examine the significant differences for categorical variables. Results were presented as frequency and percentages for categorical variables. Cross-tabulations and multinomial logistic regression analyses were employed to investigate the association between dependent variables and other socio-demographic factors. The odds ratio (OR) with 95% confidence intervals (95% CI) were presented for multinomial logistic regression analyses. It was considered as significant when $p \leq 0.05$, for all statistical analysis.

Results

The socio-demographic characteristics of study participants were presented in Table 1. A total of 3601 respondents participated in the study, of which 60.1% were females, and 82.1% were Sinhalese. The majority aged between 26-30 years old (24.8%) and the mean age was 33.05 ± 9.74 years. Most of them resided in the Colombo district (38.0%) and a higher proportion of the respondents were living in rural areas (40.3%). In terms of education level, 70.3% of the participants were highly educated for a degree level or above. Nearly half of the participants (49%) had a net monthly family income of more than 100,000 LKR (1000 USD) per month.

Snacks consumption of all study participants was depicted in Figure 1. The present findings indicated substantial changes in snack consumption patterns among Sri Lankans during the COVID-19 confinement measures. Nearly half (53.7%) of the respondents had substantially increased consumption of coffee/tea, and 42.3% had increased biscuit consumption. Interestingly, nearly half of the respondents decreased the consumption of cake (icing, butter, 49.8%), sweets (toffees, chocolate, 49.0%), snacks (salted nuts, chips, mixtures, 47.5%), desserts (pudding, ice cream, 46.2%) and sugar-sweetened beverages (48.7%) during the restriction period. However, 40.8% of respondents did not shift in either direction in the consumption of fruit juice.

The results of the multinomial logistic regression analyses were presented in Table 2. All age groups were more likely to have increased biscuit consumption compared to the elderly group of more than 40 years age. Furthermore, 31-35 years (OR=1.445; 95% CI: 1.119-1.865, $p=0.005$) and 36-40 years (OR=1.409; 95% CI: 1.065-1.864, $p=0.016$) age categories reached the significantly higher levels of biscuit consumption in comparison to the elderly group of more than 40 years age. Residents in Colombo (OR=1.021; 95% CI: 0.836-1.247, $p=0.838$) and Gampaha (OR=1.031; 95% CI: 0.804-1.323, $p=0.809$) districts were more likely to report increased consumption of biscuits, but the increment was not significant compared to residents in other districts. Participants in the city area (OR=1.059; 95% CI: 0.863 to 1.301, $p=0.582$) more likely reported increased consumption of biscuits in comparison to residents in rural areas. Compared with other nationalities, Sinhalese (OR=1.120; 95% CI: 0.845 to 1.484, $p=0.430$) and Tamils (OR=1.222; 95% CI: 0.849 to 1.760, $p=0.281$) had a higher likelihood increase biscuits consumption behavior with reference to Moors and other ethnicities. Moreover, the respondents with monthly family income levels of less than 200,000 LKR (1000 USD)

Table 1: Demographic characteristics of the study population.

Variable	Total (N=3601)	
	n	%
Gender		
Male	1438	39.9
Female	2163	60.1
Age		
18-25 years	785	21.8
26-30 years	892	24.8
31-35 years	747	20.7
36-40 years	488	13.6
>40 years	689	19.1
District		
Colombo	1369	38.0
Gampaha	490	13.6
Kandy	341	9.5
Other	1401	38.9
Area of residence		
Municipal council area	1169	32.5
City council area	979	27.2
Rural area	1453	40.3
Ethnicity		
Sinhala	2958	82.1
Tamil	351	9.8
Moors and others	292	8.1
Education level		
Secondary education or below	138	3.8
Tertiary education	932	25.9
Degree or above	2531	70.3
Employment status		
Employed	2507	69.6
Unemployed	365	10.1
Retired	54	1.5
Full time student or pupil	592	16.4
Other	83	2.3
Monthly family income (in LKR)		
< 25,000	310	8.6
25,000-49,999	589	16.4
50,000-99,999	936	26.0
100,000-199,999	869	24.1
>200000	897	24.9

significantly more likely reported increased consumption of biscuits. Among them, respondents in middle monthly family income groups; 25,000-49,999 LKR (125.00-249.99 USD) (OR=1.525; 95% CI: 1.159 to 2.007, $p=0.003$), 50,000-99,999 LKR (250.00-499.99 USD) (OR=1.417; 95% CI: 1.130 to 1.777, $p=0.002$), and 100,000-199,999 LKR (500.00-999.99 USD) (OR=1.246; 95% CI: 1.000 to 1.552, $p=0.050$), had significantly higher likelihood for the increased biscuit consumption behavior. Similarly, people who were employed (OR=1.747; 95% CI: 0.961 to 3.177, $p=0.067$) had a higher likelihood for increased biscuit intake during COVID-19 lockdown in comparison to respondent who relied on other income sources.

In terms of increased coffee or tea drinking behavior, respondents in the 31-35 years age group (OR=1.265; 95% CI: 1.004 to 1.592, $p=0.046$) significantly increased coffee/tea intake during COVID-19 lockdown in comparison to the eldest group. Respondents in the Gampaha district (OR=1.220; 95% CI: 0.972 to 1.533, $p=0.087$) more likely reported increased intake of coffee/tea with reference to residents from other districts. Moreover, Sinhalese (OR=1.509; 95% CI: 1.164 to 1.955, $p=0.002$) and Tamils (OR=1.408; 95% CI: 1.007 to 1.969, $p=0.045$) significantly increased their consumption when compared to Moors and other ethnic group. Interestingly, all income groups were significantly more in reporting an increased coffee

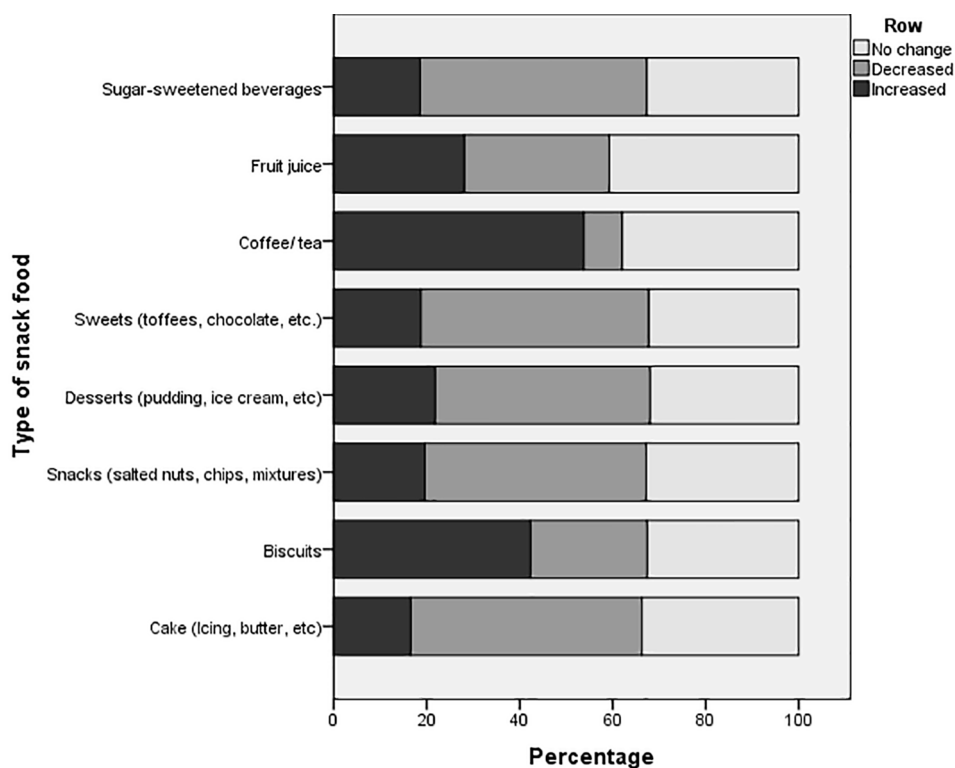


Figure 1: Changes in snack consumption during COVID-19 lockdown.

or tea drinking pattern than their counterparts with the highest monthly family income level (>200,000 LKR/1000 USD). Furthermore, < 25,000 LKR (125 USD) (OR=1.466; 95% CI: 1.072 to 2.006, $p=0.017$), 25,000-49,999 LKR (125.00-249.99 USD) (OR=1.542; 95% CI: 1.205 to 1.975, $p=0.001$), 50,000-99,999 LKR (250.00-499.99 USD) (OR=1.335; 95% CI: 1.085 to 1.642, $p=0.006$), and 100,000-199,999 LKR (500.00-999.99 USD) (OR=1.313; 95% CI: 1.073 to 1.606, $p=0.008$), had significantly higher likelihood for the elevated levels of coffee or tea drinking behavior when compared to respondents with highest monthly family income level of more than 200,000 LKR (1000 USD). Apart from that, employed respondents reported a higher likelihood for increased coffee or tea (OR=1.146; 95% CI 0.711-1.846, $p=0.575$) intake during COVID-19 lockdown in comparison to respondents relied on other income sources.

Discussion

The present findings indicated that snack consumption patterns have been changed among Sri Lankans during the COVID-19 lockdown period which is an acute period of global public health consequences. Indeed, coffee/tea and biscuit consumption increased significantly ($p<0.05$) whereas a significant decrease ($p<0.05$) in intake of cake, sweets, snacks, desserts, and sugar-sweetened beverages were observed. However, the study also found that fruit juice consumption remained the same.

In parallel to the present findings, the evidence of a recent meta-analysis has revealed that the snacking behavior remained unchanged for the majority of the studied population during the lockdown (5). Conversely, some of these changes in snack consumption were not in line with many previous results. In Italians, both favorable and unfavorable changes were observed with the reduction in sugary drinks (16.3%) and an increase in consumption of sweets or pastries (36.9%) due to the imposed COVID-19 confinement measures (11). As revealed by another study among Italians, an increase in chocolate, ice cream, desserts (42.5%), and salty snacks (23.5%) were reported (18). A study in Mumbai, India found that 34% of respondents had no changes, 38% increased intake and 28% decreased intake of snacks during the COVID-19 lockdown period. They have further reported 48% of no changes, 32% increased consumption and 20% decreased consumption of tea or coffee intake (19).

The healthy changes in response to the COVID-19 epidemic were reported in France due to decreased snacking (18.2%) (20). Half of the respondents reduced their intake of confectionery and salty snacks, almost one-third of the respondents reduced their intake of ice cream, and one-fifth of the respondents decreased their intake of sugar-sweetened beverages and alcohol in Polish adults (21). Among Lithuanians, snacking was increased among 45.1% of participants, 45.1% remained unchanged,

Table 2: OR for the likelihood of increased consumption of biscuits and coffee/tea by socio-demographic variables.

	Biscuit			Coffee/Tea		
	OR	(95% CI)	<i>p</i> value	OR	(95% CI)	<i>p</i> value
Age group						
18-25	1.345	(0.962-1.881)	0.083	1.161	(0.859-1.571)	0.332
26-30	1.202	(0.938-1.540)	0.145	0.923	(0.740-1.152)	0.478
31-35	1.445	(1.119-1.865)	0.005	1.265	(1.004-1.592)	0.046
36-40	1.409	(1.065-1.864)	0.016	1.279	(0.992-1.649)	0.058
>40 ^a	1			1		
District						
Colombo	1.021	(0.836-1.247)	0.838	0.982	(0.818-1.178)	0.841
Gampaha	1.031	(0.804-1.323)	0.809	1.220	(0.972-1.533)	0.087
Kandy	0.994	(0.746-1.324)	0.965	0.855	(0.658-1.111)	0.241
Other ^a	1			1		
Nature of living area						
Municipal	0.970	(0.785-1.197)	0.774	0.914	(0.753-1.109)	0.361
City	1.059	(0.863-1.301)	0.582	0.821	(0.682-0.989)	0.038
Rural ^a	1			1		
Ethnicity						
Sinhala	1.120	(0.845-1.484)	0.430	1.509	(1.164-1.955)	0.002
Tamil	1.222	(0.849-1.760)	0.281	1.408	(1.007-1.969)	0.045
Moors and other ^a	1			1		
Education						
Secondary or below	0.837	(0.548-1.281)	0.413	0.721	(0.490-1.061)	0.097
Tertiary	1.007	(0.827-1.227)	0.942	0.950	(0.795-1.134)	0.568
Degree or higher ^a	1			1		
Family Monthly Income level (LKR)						
< 25,000	1.196	(0.849-1.684)	0.306	1.466	(1.072-2.006)	0.017
25,000-49,999	1.525	(1.159-2.007)	0.003	1.542	(1.205-1.975)	0.001
50,000-99,999	1.417	(1.130-1.777)	0.002	1.335	(1.085-1.642)	0.006
100,000-199,999	1.246	(1.000-1.552)	0.050	1.313	(1.073-1.606)	0.008
>200,000 ^a	1			1		
Employment status						
Employed	1.747	(0.961-3.177)	0.067	1.146	(0.711-1.846)	0.575
Unemployed	1.650	(0.871-3.125)	0.124	0.925	(0.552-1.548)	0.765
Retired	1.179	(0.477-2.918)	0.721	0.558	(0.260-1.195)	0.133
Full time student/pupil	1.625	(0.858-3.077)	0.136	1.010	(0.599-1.701)	0.971
Other ^a	1			1		1

^aReference variable.

intake of carbonated and sugary drinks was declined by 19.4% of respondents, and consumption of commercial pastries was decreased by 26% (22). During the pandemic in Brazil, consumption of savory snacks increased from 9.5% to 13.2%, and chocolate/sweet biscuit/pieces of tart from 41.3% to 47.1%; where the greatest proportional increase in consumption of all unhealthy food occurred among the young adults (18-29 years old) Brazilians (23).

Increased consumption of snacks and sweets was reported, while sweet consumption was significantly associated with weight/BMI changes in Northern Italy (24). Interestingly, in Spain which is a Mediterranean country adoption of a healthier dietary patterns and increased adherence to the Mediterranean diet was

reported during the restriction period. They further elaborated that 52.9% included unchanged snacking frequency among the Mediterranean diet adhered population. Among Mediterranean diet adherence changed respondents, 39.3% were unchanged and 37.1% increased snacking frequency (25). In a study among the Spanish population, homemade desserts, and snacks, and confectioneries intake increased during confinement and this increment was lower than that of other studies (26).

The explained results of increased consumption of snacks such as coffee, tea, and biscuits may be explained by the feelings of boredom, anxiety, and stress due to the COVID-19 pandemic and less physical movements due to social confinement

measures. The frequent overeating behaviors in the absence of hunger may be due to elongated stay at home with limitless access to food frequently. Skipping breakfast and late-night snacking were reported in Italians where the possible explanations for this behavior comprised a lack of time, intentionally skipping breakfast to cut calories, and lack of appetite (11). However, other possible explanations for skipping breakfast during COVID-19 may include staying up late, which leads to late-night snacking, and oversleeping during the day (11).

In Kuwait's population, the main reason for changes in food consumption was due to the lockdown as sedentary behaviors such as watching television and using electronics, anxiousness, fear, and having spilled stocks of food were indicated as the reasons for the increase in food consumption (27). However, a previous research has shown that individuals with a higher weight tend to snack significantly and more often in the evening, and this is more detrimental to a healthy weight when compared to snacking at other times of day (28). The present study demonstrated that quarantine might pose a significant dietary risk, particularly due to increased consumption of biscuits, coffee, and tea. The tendency towards increased biscuit, and tea/coffee consumption might lead to higher sugar and energy intake which is consequently associated with higher prevalence of adult diabetes and obesity. This may be further promoted even though the social restrictions were withdrawn. Therefore, immediate nutritional and healthy living awareness programs and campaigns would be obliged to reduce the future burden of non-communicable diseases not only in Sri Lanka but also in other South Asian countries (28).

The strengths of our study included the online survey that permitted us to grasp a satisfactorily large sample of the population from different municipalities of the entire country rapidly during the lockdown period. Nevertheless, it may not represent all social strata and may exclude vulnerable populations. It may lead to under or overestimation of variable proportions. The majority of the sample was represented by women and highly educated people. Furthermore, self-reported online survey data may cause less reliable and bias problems in the study.

Conclusion

COVID-19 lockdown caused both positive and negative changes in snack behavior in Sri Lankan population. The increased consumption of biscuits and coffee/tea was observed in Sri Lanka during COVID-19 lockdown. The modified snacking

patterns would increase the prevalence of obesity and ultimately the non-communicable chronic diseases. The present findings highlight the need for investigations into appropriate dietary guidelines to counteract the potential negative impacts of COVID-19 on healthy dietary patterns.

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Conflict of Interest

None declared.

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