



Original article

## The Frequency and Healthfulness of Food and Beverages Advertised on Adolescents' Preferred Web Sites in Canada

 Monique Potvin Kent, Ph.D. <sup>\*</sup>, and Elise Pauzé, M.Sc.

*School of Epidemiology and Public Health, Faculty of Medicine, University of Ottawa, Ottawa, Ontario, Canada*
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### ABSTRACT

**Purpose:** The purpose of this study was to document the frequency and healthfulness of pop-up and banner food advertisements displayed on third-party Web sites preferred by adolescents in Canada.

**Methods:** Syndicated Internet advertising exposure data licensed from comScore was used to identify adolescents' (ages 12–17) 10 most popular Web sites and determine the frequency of food and beverage display advertisements on these Web sites from June 2015 to May 2016. The nutrition information for all advertised products was collected, and the healthfulness of all food and beverage ads was assessed using the Pan-American Health Organization (PAHO) and the U.K. Nutrient Profile Models (NPM).

**Results:** In total, there were 14.4 million food advertisements on all 10 Web sites from June 2015 to May 2016. The most frequently advertised food categories were cakes, cookies, and ice cream (32.5%); cold cereal (20.5%); restaurants (18.0%); and sugar-sweetened beverages (12.0%). Most advertised products (93.3%) were categorized as excessive in either fat, sodium, or free sugars according to the PAHO NPM, and 83.5% of ads were categorized as “less healthy” according to the U.K. NPM. Specifically, 81.3% of ads were excessive in free sugars, 22.1% were excessive in sodium, 14.1% were excessive in saturated fat, and 11.8% were excessive in total fat according to the PAHO NPM.

**Conclusions:** Canadian adolescents are potentially exposed to a high frequency of unhealthy food and beverage display advertisements on their preferred Web sites. Regulations restricting food and beverage marketing to children need to include digital media and should consider protecting adolescents up to the age of 17.

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### IMPLICATION AND CONTRIBUTIONS

Legislation restricting food advertising to youth should apply to Web sites popular with adolescents even if they are intended for mixed audiences. Given the borderless nature of the Internet, international coordination, as was mobilized for the control of tobacco, will likely be needed to protect youth from unhealthy food advertising online.

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<sup>\*</sup> Address correspondence to: Monique Potvin Kent, Ph.D., School of Epidemiology and Public Health, Faculty of Medicine, University of Ottawa, 600 Peter Morand Cres., Room 301J, Ottawa, Ontario, Canada K1G5Z3.

E-mail address: [mpotvink@uottawa.ca](mailto:mpotvink@uottawa.ca) (M. Potvin Kent).

Rates of obesity among school-aged children including adolescents have been rising globally over the last four decades, with nutrition-related chronic diseases among youth increasing in tandem [1,2]. Given that food and beverage (hereafter only referred to as food) marketing has been established as a potent environmental determinant of dietary behaviors and childhood obesity [3,4], international and national health organizations have called on governments to adopt policies to limit the marketing of unhealthy foods to children [5,6].

To date, most research and policy discussions on restricting food marketing have focused on younger children [3]; however, emerging research is making a compelling case for extending

protections to adolescents [7,8]. Indeed, studies have shown that adolescents are particularly vulnerable to food marketing given their stage of neurocognitive and psychosocial development, which makes them more impulsive, emotionally volatile, prone to risky behavior, and heavily influenced by their peers [7,8]. These traits are being increasingly exploited by food marketers, particularly in digital media, where ad spending is growing [9,10].

In Canada, the prevalence of obesity among adolescents aged 12–17 tripled between 1979 and 2010 [11]. Currently, the combined prevalence of overweight and obesity among this age group is 27% [12]. The potential for advertisers to reach Canadian youth online is great, as access to the Internet is practically universal and almost a third (30%) of youth aged 12–17 in grades 6–12 are spending upwards of 2 hours of their daily leisure time on computers [13,14]. Currently, there are no regulations in Canada protecting adolescents from the marketing of unhealthy foods, and much of the research examining food advertising in the country has focused on television advertising to children aged 12 and under [15]. To our knowledge, no research in Canada has examined adolescent exposure to food advertising in digital media. To fill this gap, this study documented the frequency and healthfulness of pop-up and banner food ads displayed on third-party Web sites preferred by Canadian adolescents.

## Methods

### Identifying adolescents' preferred Web sites

Syndicated Internet advertising exposure data for June 2015 to May 2016 were licensed from comScore. This company has an online measurement panel of 40,000 Canadians and collects data on the Web sites they visit, their engagement with online content, and which display advertisements (i.e., pop-up or banner ads) are shown on Web pages they view. The panel's data are weighted based on various demographic characteristics and are used to estimate the online behavior of the Canadian population using the Internet. The 10 most popular Web sites with advertising for March–May 2016 were determined using comScore's Media Metrix Key Measures Report for children ages 12–17 years from all provinces, except Quebec. Quebec adolescents were excluded as the primary language in Quebec is French and therefore preferred Web sites may differ significantly from the rest of the country, where English predominates. The most popular sites were defined as those that had a minimum of 50,000 unique adolescent visitors and whose percentage of adolescent visitors reached a minimum of 15%. This audience threshold was chosen because it is the one applied by Quebec's Consumer Protection Act, which prohibits all commercial marketing to children under 13 in that province [16]. Ten Web sites with advertising met these criteria and were included in this study (Table 1).

### Frequency of display advertising

The frequency of food display ads on each Web site from June 2015 to May 2016 was identified by generating comScore's Ad Metrix Advertiser Report for six food-related advertiser categories (i.e., food and grocery, frozen food, alcoholic beverages, restaurants, dairy, and beverages). comScore's Ad Metrix module captures all display ads that were displayed on Web pages visited by their Canadian panelists, including advertisements originating from food companies located outside of Canada. Ad Creative Reports were generated for each advertiser on every Web site.

**Table 1**

List of top 10 adolescent (12–17 years of age) preferred Web sites<sup>a</sup>, Canada (except Quebec), March–May 2016

	Web site	Total unique adolescent visitors per month	Reach <sup>b</sup> (%)	Composition of unique visitors <sup>c</sup> (%)
1	Coolmathgames.com	114,000	6.2	17.6
2	Enotes.com	63,000	3.5	20.7
3	Clubpenguin.com	57,000	3.1	21.1
4	Miniclip.com	96,000	5.3	15.6
5	Counter-strike.net	81,000	4.5	17.7
6	Sparknotes.com	75,000	4.1	18.2
7	Shmoop.com	66,000	3.6	21.7
8	Armorgames.com	53,000	2.9	20.9
9	Wattpad.com	53,000	2.9	17.7
10	Citationmachine.net	52,000	2.9	23.6

<sup>a</sup> Defined as Web sites with at least 50,000 monthly adolescent visitors where individuals of this age group make up at least 15% of Web sites' unique visitors.

<sup>b</sup> Percent of Canadian adolescent Internet users (outside Quebec) who visited the Web site.

<sup>c</sup> Percent of unique monthly Web site visitors who are adolescents aged 12–17.

The number of ads displayed in Canada on examined Web sites and their content (i.e., name of products or brand logos advertised) was documented.

### Classifying display advertisements

Each ad was classified by food company and ad type ("product" if one was featured or "brand" if only a logo was featured). Categorization by food company was done based on the brand and product portfolios of Canadian food companies (which may slightly differ from their counterparts in other countries). Ads that were reported as belonging to a food advertiser by comScore but whose content could not be seen due to technical glitches were included in the study and categorized as unspecified (neither brand nor product). Ads were also coded into 15 food categories including cakes, cookies, and ice cream; restaurants; cold cereal; sugar-sweetened beverages; tea or coffee; cheese, candy, and chocolate; water; bread and pasta; alcohol; yogurts; snacks; 100% juice; mixed category (i.e., featuring products from multiple food categories); and other.

### Nutritional analysis

The nutritional information was collected for all advertised products (with the exception of alcohol) and was taken from, in order of priority, the Canadian company Web site, the Nutrition Facts table on the product, the U.S. company Web site, or the Canadian Nutrient File. Information collected included energy, total fat, saturated fat, trans fat, sodium, carbohydrates, fiber, sugar, and protein per stated serving. The volume of beverages (milliliter) was converted into grams using their specific density (g/mL) [17], and the nutritional information for all products was expressed based on 100-g servings. The healthfulness of products featured in the display ads was assessed using the Pan American Health Organization (PAHO) Nutrient Profile Model (NPM) and the U.K. NPM [18,19]. All product ads were classified according to whether they were excessive in total fat ( $\geq 30\%$  of total energy), saturated fat ( $\geq 10\%$  of total energy), trans fat ( $\geq 1\%$  of total energy), sodium ( $\geq 1$  mg per 1 kcal), and free sugars ( $\geq 10\%$  of total energy) as per the PAHO NPM [18]. They were also classified as excessive or not in at least 1 of these nutrients.

Product ads were also classified as “healthy” or “less healthy” using the UK NPM, a validated tool that scores products based on their content in energy, saturated fat, total sugar, sodium, fruit/vegetables/nuts, fiber, and protein [19–21].

A fifth (19.2%) of ads featured either a brand name or logo (10.9%) or were categorized as unspecified (8.3%). Since nutritional information could not be collected for these ads, they could not be classified using the NPMs.

### Statistical analysis

Statistical analyses were conducted using SPSS Statistics for Windows version 24 (IBM Corp., Armonk, NY). The number and frequency of ads on all 10 adolescent-preferred Web sites in Canada from June 2015 to May 2016 was determined by company and food category. The nutritional data of advertised products during this period were weighted by the number of ad impressions (i.e., the number of times it appeared on all 10 Web sites), and the healthfulness of ads as classified by the PAHO and U.K. NPMs was described for the total sample. The median nutrient content per 100-g serving of foods advertised from June 2015 to May 2016 on all 10 Web sites was also determined.

### Results

In total, there were 14,466,065 food ads on adolescents' top 10 preferred Web sites from June 2015 to May 2016. [Coolmath-games.com](http://Coolmath-games.com) accounted for most ads (34.3%), followed by [miniclip.com](http://miniclip.com) (28.3%), [citationmachine.net](http://citationmachine.net) (13.5%), and [wattpad.com](http://wattpad.com) (6.4%) (data not shown). As shown in Table 2, the five most frequently advertised food categories were cakes, cookies, and ice cream (32.5%); cold cereal (20.5%); restaurants (18.0%, 97.3% of which were for fast food); sugar-sweetened beverages (12.0%); and tea or coffee (3.9%). Of the sugar-sweetened beverage advertisements (n = 1,677,383), 88.9% were for energy drinks, 4.6% were for sweetened coffee drinks, 4.1% were for fruit drinks, and 2.4% were for soft drinks.

A total of 34 companies advertised on all 10 Web sites. The number and description of product ads on all Web sites by select companies are reported in Table 3. Those who advertised the most were Kellogg's (47.4%), Red Bull GmbH (10.3%), and Restaurant

**Table 2**

Frequency of food/beverage display ads on all 10 preferred adolescent Web sites by food category, June 2015–May 2016

	Total	
	n	%
Cakes, cookies, and ice cream	4,520,053	32.5
Cold cereal	2,852,161	20.5
Restaurants	2,508,915	18.0
Sugar-sweetened beverages	1,677,383	12.0
Tea or coffee	538,238	3.9
Mixed category	482,000	3.5
Cheese	354,419	2.5
Candy and chocolate	253,370	1.8
Other	238,100	1.7
Water	110,232	.8
Bread and pasta	105,442	.8
Alcohol	97,790	.7
Yogurt	94,390	.7
Snacks	92,113	.7
100% juice	0	0
<b>Total</b>	<b>13,924,606</b>	<b>100</b>

**Table 3**

Frequency of food/beverage display ads on all 10 preferred adolescent Web sites by company and food product, June 2015–May 2016

Company	Number of food/beverage display ads	
	n	%
Kellogg	6,862,238	47.4
Pop-Tarts	4,001,233	
Froot Loops	1,738,572	
Frosted Flakes	996,404	
All Bran Bran Buds Cereal	75,185	
Rice Krispies Cereal	20,000	
Special K Nourish Bars	16,000	
Rice Krispies Squares	1,000	
Red Bull GmbH	1,490,383	10.3
Red Bull Energy Drink	1,409,000	
Restaurant Brand International Inc.	1,416,868	9.8
Tim Hortons Roll Up the Rim to Win	660,000	
Tim Hortons Pulled Pork Sandwich	143,000	
Tim Hortons Breakfast Sandwiches	104,000	
Tim Hortons Caramel Iced Coffee	53,000	
Tim Hortons Crispy Chicken Sandwich	49,000	
Tim Hortons Salads, Caesar, and Garden	36,000	
Tim Hortons Iced Coffee	29,000	
Tim Hortons Maple Iced Capp	22,000	
Tim Hortons Steak Mushroom Melt Panini	19,000	
Tim Hortons Oreo Iced Capp	16,000	
Tim Hortons Coffee	15,000	
Tim Hortons Chipotle Steak Wrap	14,000	
Tim Hortons Maple or Chocolate Chill	13,000	
Tim Hortons Jalapeno Chicken Sandwich	9,000	
Tim Hortons Orange Pineapple Smoothie	1,000	
Loblaws Inc.	836,373	5.8
PC Organic Coconut Oil	47,000	
PC Organic products: ancient grain cereal, brown rice pasta, cheddar cheese popcorn, quinoa, strained baby food	57,000	
PC Organic baby foods	54,000	
Kraft	600,329	4.1
Nabob coffee	199,548	
Kraft Singles	190,459	
Kraft Dinner	81,000	
Philadelphia Cream Cheese, multiple flavors	65,000	
Maxwell House coffee	57,322	
Kraft Miracle Whip	6,000	
Philadelphia Whipped, multiple flavors	4,000	
Cracker Barrel Shreds	2,000	
Danone Inc.	546,857	3.8
Danette pudding	448,164	
Oikos, yogurt, fruit flavored	43,000	
Activia, yogurt drink, fruit flavored	22,000	
Activia, vanilla yogurt	1,000	
Doctor's Associates Inc.	441,755	3.1
Subway Butter Chicken Flatbread sandwich	142,000	
Subway NHL Hoist the Cup contest	53,000	
Subway Atlantic Lobster Sub	48,000	
Subway Lucky Lobster Drink Contest	46,000	
Subway Roast Beef Sub	31,000	
Subway Prime Rib Melt	25,000	
Subway Star Wars Drink Cups	21,000	
Subway Rotisserie-Style Chicken Sub	20,000	
Subway Sweet Chicken Teriyaki Sub	8,000	
Subway Chicken Bacon Melt	6,000	
Subway Subday BMT	1,000	
McDonald's restaurants (Toronto, ON)	407,158	2.8
McDonald's CBO Burger	75,000	
McDonald's McCafé coffee	72,000	
McDonald's Salad Bowls	44,000	
McDonald's Morning McWrap	36,000	
McDonald's Real Fruit Smoothie and Iced Frappe	11,000	
McDonald's Cadbury Crème Egg McFlurry	9,000	
McDonald's Egg McMuffin	9,000	

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**Table 3**  
Continued

Company	Number of food/ beverage display ads	
	n	%
McDonald's Fries	8,000	
McDonald's Maple Latte, Maple Pastry and Blueberry Maple Pie	7,000	
McDonald's Holiday Warmers Burgers	5,000	
McDonald's McTasters	5,000	
McDonald's Bic Mac	4,000	
McDonald's Holiday Drink and Cookie	3,000	
McDonald's Mighty Angus	3,000	
McDonald's Coca-Cola and Iced Coffee	3,000	
McDonald's McDouble or Junior Chicken Meal	2,000	
McDonald's Country Chicken Burger	1,000	
McDonald's Big Taste Foodie Festival	1,000	
McDonald's Real Fruit Smoothie	1,000	
Nestle	350,083	2.4
Nespresso, coffee	81,071	
Kit Kat chocolate bars	72,616	
Delissio pizza	35,100	
Smarties	32,672	
Nestle Pure Life, bottled water	25,000	
Nestle Pure Life, sparkling water	17,000	
Carnation Instant Breakfast Essentials	1,000	
PepsiCo	200,631	1.4
Starbucks Iced Coffee, bottled product	77,000	
Tropicana Lemonade with Tangerine	62,000	
Lay's Chips Flavour Contest	31,000	
Tropicana Watermelon Lemonade	7,000	
Other	1,313,244	9.0
Total	14,466,065	100

Brand International (9.8%). Pop-Tarts (Kellogg) was the most advertised product (27.7% of total ads), followed by Froot Loops (Kellogg; 12.0%), Red Bull Energy Drink (Red Bull GmbH; 9.7%), Frosted Flakes (Kellogg) (6.9%), and Tim Horton's Roll-Up the Rim to Win (a prize giveaway associated with the purchase of coffee; Restaurant Brand International Inc.; 4.6%) (data not shown).

As shown in Table 4, most ads (93.3%) were categorized as excessive in either fat, sodium, or free sugars according to the PAHO NPM, and 83.5% of ads were categorized as "less healthy" according to the U.K. NPM. Specifically, 81.3% of ads were categorized as excessive in free sugars, 22.1% were categorized as excessive in sodium, and 14.1% were categorized as excessive in saturated fat. The median nutrient content per 100 g of advertised foods was 400 calories (range: 0–942 kcal, IQR = 271), 3.7 g of fat (range: 0–100 g, IQR = 10), 1.9 g of saturated fat (range: 0–94 g, IQR = 3), 0 g of trans fat (range: 0–9, IQR = 0), 320 mg of sodium (range: 0–1737 mg, IQR = 319), 2.0 g of fibre (range: 0–39 g,

**Table 4**

Number and percentage of food/beverage products on adolescents' top 10 preferred Web sites by nutritional quality, June 2015–May 2016

	Number of food/beverage display ads	
	n	%
PAHO nutrient profile model		
Excessive in total fats	1,359,000	11.8
Excessive in saturated fats	1,635,000	14.1
Excessive in trans fats	456,000	3.9
Excessive in sodium	2,552,567	22.1
Excessive in free sugars	9,398,800	81.3
Excessive in at least one nutrient	10,778,800	93.3
U.K. nutrient profile model		
Less healthy (U.K. NPM)	9,647,800	83.5

IQR = 2), 32 g of sugar (range: 0–73 g, IQR = 23), and 4 g of protein (range: 0–26 g, IQR = 0).

## Discussion

More than 14.4 million banner and pop-up ads appeared on the 10 adolescent-preferred Web sites from June 2015 to May 2016, and most advertised products were deemed unhealthy (83.5%) and high in either sugar, fat, or sodium (93.3%). These results mirror the poor nutritional quality of foods advertised to Canadian children under 12 during their preferred television programs and in display advertisements on third-party Web sites in Canada and the United States [15,22,23]. Such advertising is detrimental as it may normalize the consumption of unhealthy food among youth [24]. Overall, four of five ads featured foods excessive in sugar, and 20% featured foods excessive in sodium. The promotion of such products is concerning, given that most Canadian adolescents consume more sodium and sugar than amounts recommended [25,26]. In addition, the persistence of these dietary behaviors into adulthood increases the likelihood of developing obesity and other diet-related chronic diseases, such as hypertension and diabetes [27–29].

Health Canada recently concluded a public consultation on food marketing restrictions and has proposed an age threshold of under 17 years [30]. This threshold aligns with recommendations made by the Stop Marketing to Kids Coalition, whose policy position is endorsed by over 50 Canadian health organizations [6]. Given that the majority of products advertised to adolescents in this study were high in sugar, fat, and sodium and there is compelling evidence that youth are vulnerable to advertising [7,8,31], our findings provide further evidence that marketing restrictions should be aimed at children under the age of 17.

Of note, only 10 Web sites met our selection criteria and were identified as having at least 50,000 adolescent visitors per month (which is equivalent to 1.9% of Canadian Internet users of this age group), where adolescents make up 15% or more of Web site visitors [32]. In other words, few Web sites frequented by a significant number of adolescents appeal exclusively to this age group. This means that any marketing restriction based on a Web site's composition of youth visitors as high as 15%, such as the one applied in Quebec for children younger than 13, will do little to protect them from unhealthy food and beverage display advertising. Thus, it may be more appropriate for future legislation to restrict advertising on Web sites visited by a minimum number of adolescent visitors even if these Web sites are meant to appeal

to mixed audiences. This is in fact being considered by Health Canada, who have proposed restricting food marketing on digital platforms such as Google, Facebook, and YouTube to protect children and youth [30]. Countries attempting to adopt statutory restrictions on food marketing will be limited in their ability to impose restrictions on companies located outside their jurisdictions. Because of the borderless nature of the Internet, this poses a major challenge in restricting food advertising online. Even if such restrictions were to be adopted, monitoring compliance would be challenging as the country of origin of many advertisements can be difficult to determine with certainty, as seen in this study. To avoid loopholes, some have argued that global coordination and treaties, such as those developed for the control of tobacco, are needed to effectively protect children from unhealthy food marketing [33]. Agreeing on the population in need of protection is one area of consideration that requires consensus for such global efforts to be successful [33]. This study adds to the body of evidence emphasizing the need to include children as old as 17 in such protections.

Another significant finding in our research was that 1 in 10 products advertised on adolescents' top 10 preferred Web sites was for Red Bull Energy Drink. Red Bull GmbH advertised on 4 of 10 Web sites examined and accounted for 31.5% of food ads on [wattpad.com](http://wattpad.com), 20.1% on [coolmath-games.com](http://coolmath-games.com), 8.3% on [citationmachine.net](http://citationmachine.net), and 5.5% on [schmoop.com](http://schmoop.com). Energy drink marketing is often youth oriented [34]. Many energy drink brands associate themselves with extreme sports, art, music, and culture, particularly through sponsorship, which purposefully projects a cool, rebellious, and creative image that likely appeals to adolescents [34]. This imagery is heavily reinforced in digital media, particularly on social media and brand Web sites popular with youth [34].

In Canada, sales of energy drinks have increased by 635% between 2004 and 2015 [35]. According to a recent study, approximately 13%–17% of Canadian youth aged 12–17 reported consuming caffeinated energy drinks over the previous week [36]. The consumption of these beverages among youth raises health concerns due to their sugar and caffeine content. The consumption of sugar-sweetened beverages, which accounts for 7%–8% of calories consumed by Canadian adolescents [37], has been shown to promote weight gain [38]. Furthermore, many adverse health outcomes related to the consumption of energy drinks have been reported among youth, including symptoms of caffeine dependence, withdrawal, and toxicity in some cases [39]. In Canada, the marketing of energy drinks to children is prohibited only to children under 12; however, Health Canada advises against the consumption of these beverages among individuals younger than 18 [40]. The frequency of energy drink ads in digital media demonstrated in this research study, coupled with their negative impact on health, highlight the need for government regulation in this area.

In addition, 95,000 alcohol ads featuring either Absolute Vodka (Corby) or Bacardi Rum (Barcardi Limited) were identified on 1 of the 10 examined Web sites ([coolmathgames.com](http://coolmathgames.com)). This is concerning given that several longitudinal studies have shown that exposure to alcohol advertising has been associated with early initiation and hazardous consumption of alcoholic beverages among youth [31].

#### Strengths and limitations

This study is the first to examine the frequency and healthfulness of food pop-up and banner ads on adolescents' preferred

Web sites in Canada. This was accomplished using comScore data, which constitutes the best available data on display advertising in the country. Although the accuracy of these data is unknown, it should be noted that large food and beverage companies use comScore's data to inform their marketing decisions. By examining data over a full year, this study sought to avoid any biases related to seasonal fluctuations in ad spending. Among its limitations, this study only examined display advertising on 10 Web sites; therefore, results may not be generalizable to other Web sites and media, as well as other types of digital ads (e.g., video). This study also did not examine the marketing techniques used in the display food advertisements. Consequently, their persuasive appeal among youth cannot be reported. Also, because of sophisticated technology that allow advertisers and Web sites to target their ads at specific segments of Internet users using data on their previous Web-browsing behavior (i.e., behavioral targeting), it is difficult to know which ads are seen specifically by adolescents on a given Web site. Unfortunately, comScore's data on display advertising is only available for Canada as a whole and cannot be segmented by age. As a result, it is impossible to determine adolescents' exposure to unhealthy food and beverage advertising on the examined Web sites. Future research should examine the content of advertisements to identify the means by which adolescents are targeted online.

The study findings indicate that Canadian adolescents are likely exposed to a high frequency of unhealthy food and beverage display advertisements on their preferred Web sites. Clearly, digital media needs to be included in the development of statutory marketing restrictions and children and youth up to the age of 17 need to be protected.

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