

# Reporting of *trans*-fat on labels of Brazilian food products

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## Abstract

**Objective:** The present study investigated how *trans*-fat is reported on the packaging of foods sold in a Brazilian supermarket.

**Design:** The present descriptive, cross-sectional study analysed the ingredient list, nutrition facts label and claims of no *trans*-fat on the packaging.

**Setting:** A large supermarket in Florianópolis, Brazil.

**Subjects:** All food products available at the supermarket.

**Results:** Of the 2327 study products, more than half had components containing *trans*-fat in the ingredient list, especially hydrogenated vegetable fat and its alternative names. A small percentage of food products reported some *trans*-fat content on the nutrition facts label and roughly a quarter of the food products claimed to contain no *trans*-fat on the front of the packaging. There was very low agreement among the *trans*-fat content reported in the nutrition facts label, claims of no *trans*-fat made on the packaging and the ingredient list.

**Conclusions:** There was low agreement among the different ways of reporting *trans*-fat, suggesting that it is not possible to rely on the nutrition facts label or no *trans*-fat claims printed on the packaging of Brazilian food products. Hence, the Brazilian legislation on food labels needs to change to improve the reliability of food labels and to help control the *trans*-fat intake of the population.

**Keywords**  
Trans-fatty acids  
Food labels  
Processed foods  
Consumer

Studies show that the consumption of processed foods has been increasing<sup>(1,2)</sup> and many processed foods contain *trans*-fat<sup>(3–8)</sup>. Because of the negative impact of *trans*-fat on human health<sup>(9–15)</sup>, in 2004 the WHO launched the Global Strategy on Diet, Physical Activity and Health and one of its goals is to eliminate *trans*-fat from the diet<sup>(16–20)</sup>.

Since 2003, Brazilian Resolution 360<sup>(21)</sup> has required food manufacturers to report the *trans*-fat content per serving on the nutrition facts label. Recommended serving sizes were established by Resolution 359<sup>(22)</sup>, published in the same year. The said Resolution defined the serving size to be the average amount of food that should be consumed by healthy people aged 36 months or older to promote a healthy diet.

According to Resolution 360, companies may make claims of 'zero trans' or 'trans free' on the packaging if the amount of *trans*-fat per serving is  $\leq 0.2$  g, an amount considered insignificant by the Resolution<sup>(21)</sup>. Hence, when the amount of *trans*-fat is  $\leq 0.2$  g per serving, a company does not need to inform the product's *trans*-fat content on the nutrition facts label, so it is impossible to know the *trans*-fat content of products that use ingredients with *trans*-fat.

Studies that analysed the nutrition facts label on the packaging of food products sold in supermarkets have found

that the information provided on the label is not always clear and reliable. They also emphasized the need for legislation that enables consumers to make healthier food choices and for labels that help to educate consumers<sup>(23–26)</sup>.

In this context, the objective of the present study was to investigate how *trans*-fat is reported on the packaging of food products sold in a Brazilian supermarket.

## Methods

### Data collection

The current descriptive, cross-sectional study analysed the packaging of all processed food products sold in a randomly chosen supermarket in the city of Florianópolis, located in the southern region of Brazil. This supermarket belongs to a large supermarket chain with twenty-one stores in the southern region of Brazil, six of which are located in Florianópolis. The products sold in these stores are similar to those sold in other large supermarket chains throughout the country.

Fresh foods, such as meats, vegetables and fruits, are not subject to the Brazilian legislation on labels, so they were excluded from the study. Products without added

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fat in their composition, such as flours and rice, were also excluded. Classification was based on the ingredients reported on the packaging and their definition by the Brazilian food legislation.

A previously tested form was used for collecting the information reported on the packaging, such as product identity (product, commercial name, flavour, brand) and information on *trans*-fat (presence of components containing *trans*-fat in the ingredient list, presence of the item 'trans fat' on the nutrition facts label, amount of *trans*-fat per serving on the nutrition facts label, claims of 'no trans fat' on the packaging).

The information on the packaging of identical products of different sizes was recorded separately because their list of ingredients also differed.

Data were collected in May 2010 by trained dietitians. The management of the supermarket allowed the research.

### Data analysis

The collected data were input into two separate databases which were later checked for possible errors and validated.

Three indicators were used for determining the presence *trans*-fat in the product: (i) the ingredient list; (ii) the amount of *trans*-fat reported on the nutrition facts label; and (iii) claims of no *trans*-fat on the packaging. With regard to the ingredient list, *trans*-fat was considered present when the list contained any type of hydrogenated fat/oil or any ingredient that chemically corresponds to hydrogenated fat, such as margarine or vegetable fat/cream<sup>(27)</sup>. 'Vegetable cream' and 'vegetable fat' probably contain *trans*-fat because they are common in products with *trans*-fat<sup>(27)</sup>. Also, the nutrition facts label was analysed with the consumer in mind, since consumers may not know whether the fats listed in the ingredient list are hydrogenated if incomplete terms are used; for example, when 'vegetable fat' is reported in place of 'hydrogenated vegetable fat'. The use of full ingredient names by the food industry should be mandatory, such as 'hydrogenated vegetable fat', which contains *trans*-fat, or 'palm vegetable fat', which does not contain *trans*-fat. Food companies should also be required to report and highlight the presence of *trans*-fat on the label.

Claims of no *trans*-fat were considered present when they were highlighted on the front of the packaging, regardless of wording.

The food products were divided into six groups according to Brazilian Resolution 359<sup>(22)</sup>: Group A = bakery products, grains and grain-based products; Group B = dairy; Group C = meat-based products; Group D = oils, fats and processed nuts; Group E = sugars, sugary foods and snacks (the Resolution refers to these foods as those whose energy comes mostly from carbohydrates and fats, such as cakes, cookies, ice cream, candy and chocolate, among others); and Group F = sauces, seasoning blends, stock cubes, dry soups and refrigerated/frozen dinners.

The kappa statistic was used for analysing the agreement among items containing *trans*-fat in the ingredient list (considered the gold standard for the current study), the amount of *trans*-fat reported on the nutrition facts label and claims of no *trans*-fat on the packaging. Agreement was considered very low when  $\kappa = 0.00-0.20$ ; low when  $\kappa = 0.21-0.40$ ; moderate when  $\kappa = 0.41-0.60$ ; high when  $\kappa = 0.61-0.80$ ; and very high when  $\kappa = 0.81-1.00$ . The positive (PPV) and negative predictive values (NPV) were also calculated. The statistical software package Stata version 11.0 was used for the statistical analyses.

### Results

A total of 2327 food products were analysed; of these, 50.5% ( $n = 1175$ ) reported one or more components containing *trans*-fat in the ingredient list. There were 1318 citations of ingredients with *trans*-fat in these 1175 products (Table 1). In 25.4%, specific names with the word 'hydrogenated' were used for items containing *trans*-fat, and in 74.6%, alternative names were used. Most of the ingredients containing *trans*-fat were listed specifically as 'hydrogenated vegetable fat' (91.0% of the specific names), 'vegetable fat' and 'margarine' (78.4% and 18.0% of the alternative names, respectively). Other specific names used for *trans*-fat-containing ingredients per product group were 'hydrogenated vegetable oil' and 'liquid and hydrogenated vegetable oil' for Group D (oils, fats and processed nuts) and 'partially hydrogenated soyabean fat' for Group F (sauces, seasoning blends, stock cubes, dry soups and refrigerated/frozen meals), representing respectively 5.9 and 11.8% (Group D) and 8.0% (Group F) of the components with *trans*-fat in the ingredient list. Other alternative names were also frequent, such as 'milk mix', especially for Group B (dairy products).

Considering all study products ( $n = 2327$ ), the groups with the highest percentage of products containing *trans*-fat (one or more ingredients) were Group E (sugars, sugary foods and snacks) and Group A (bakery products, grains and grain-based products), with 66.9% and 58.8%, respectively. These percentages were slightly lower in Group F (refrigerated/frozen dishes; 49.8%), Group C (meat-based products; 44.3%) and Group D (oils, fats and processed nuts; 37.2%). Group B (dairy products) contained the lowest percentage of products with *trans*-fat (6.2%).

In descending order, the groups with the highest percentages of alternative names for *trans*-fat-containing ingredients (one or more components) were Group C (meat-based products; 93.0%), Group F (refrigerated/frozen dishes; 83.3%), Group A (breads and grains; 75.4%), Group B (dairy products; 73.9%), Group E (sugars, sugary foods and snacks; 66.7%) and Group D (oils, fats and processed nuts; 41.4%).

Meanwhile, only 18.1% of the food products reported actual the *trans*-fat content on the nutrition facts label

**Table 1** Names used and number/percentage of citations of components with *trans*-fat in the ingredient list, stratified by food group: processed food products (*n* 2327) available in a large supermarket in Florianópolis, Brazil, May 2010

	Citations per food group							
	All citations		A	B	C	D	E	F
	<i>n</i>	%	%	%	%	%	%	%
<b>Specific names of components with <i>trans</i>-fat</b>								
Partially hydrogenated soyabean fat	2	0.6	–	–	–	–	–	8.0
Hydrogenated fat	1	0.3	–	–	–	–	0.6	–
Hydrogenated soyabean fat	4	1.2	–	–	–	–	2.3	–
Partially hydrogenated fat	1	0.3	–	–	–	–	–	4.0
Partially hydrogenated and/or interesterified fat	1	0.3	–	–	–	–	0.6	–
Hydrogenated vegetable fat	305	9.0	91.7	100.0	100.0	82.4	91.4	88.0
Partially hydrogenated vegetable fat	1	0.3	0.9	–	–	–	–	–
Hydrogenated	1	0.3	0.9	–	–	–	–	–
Hydrogenated vegetable margarine	1	0.3	0.9	–	–	–	–	–
Hydrogenated corn oil	1	0.3	0.9	–	–	–	–	–
Hydrogenated cotton, soyabean and palm oil	1	0.3	0.9	–	–	–	–	–
Hydrogenated vegetable oil	8	2.4	0.9	–	–	5.9	3.4	–
Liquid and hydrogenated vegetable oil	2	0.6	–	–	–	11.8	–	–
Partially hydrogenated vegetable oil	6	1.8	2.8	–	–	–	1.7	–
Total ( <i>n</i> )	335	109	6	3	17	175	25	
<b>Alternative names of components with <i>trans</i>-fat</b>								
Vegetable cream	5	0.5	0.6	–	–	–	0.7	–
Milk mix with vegetable fat (lists vegetable fat as 2nd ingredient)	11	1.1	–	–	–	–	1.0	5.0
Fat	1	0.1	–	–	–	–	–	0.7
Vegetable fat	771	78.4	67.7	83.3	62.8	100.0	88.0	80.7
Sunflower vegetable fat	5	0.5	1.4	–	–	–	–	–
Soyabean vegetable fat	1	0.1	0.3	–	–	–	–	–
Margarine	177	18.0	27.6	–	37.2	–	10.3	13.6
Vegetable margarine	9	0.9	2.5	–	–	–	–	–
Milk mix for drinks (lists vegetable fat as 3rd ingredient)	3	0.3	–	16.7	–	–	–	–
Total ( <i>n</i> )	983	362	18	43	12	408	140	

Food groups: Group A = bakery products, grains and grain-based products; Group B = dairy; Group C = meat-based products; Group D = oils, fats and processed nuts; Group E = sugars, sugary foods and snacks; Group F = sauces, seasoning blends, stock cubes, dry soups and refrigerated/frozen dishes.

and 22.2% of the food products claimed to have no *trans*-fat on the front of the packaging. A very small percentage (0.3%) of food products did not contain any information on *trans*-fat (Table 2). These products were in Group A (breads and grains, specifically frozen pasta), Group B (dairy, specifically cream cheese) and Group E (sugars, sugary foods and snacks, specifically cookies).

Table 2 shows the number of study products by food group and the respective percentages of products that reported ingredients containing *trans*-fat in the ingredient list, *trans*-fat on the nutrition facts label and claims of no *trans*-fat on the front of the packaging.

Figure 1 shows the percentage of products that reported *trans*-fat on the nutrition facts label and that made claims of no *trans*-fat on the packaging, by food group, and the agreement between these data and the ingredient list.

For nearly all food groups, the percentage of false negatives (products that reported zero *trans*-fat on the nutrition facts label or made claims of no *trans*-fat on the packaging but contained items with *trans*-fat in the ingredient list) varied from 40 to 60%. False negatives were low only for dairy products that did not list *trans*-fat on the nutrition facts label and non-existent for products

in the dairy group and group of oils and fats that made no *trans*-fat claims on the packaging.

Table 3 shows the agreement among the presence of ingredients containing *trans*-fat, the *trans*-fat content reported on the nutrition facts label and claims of no *trans*-fat on the packaging.

The amount of *trans*-fat (zero or otherwise) reported on the nutrition facts label presented very low agreement ( $\kappa = 0.16$ ) with listed ingredients containing *trans*-fat. The lowest  $\kappa$  values were found for the products of Group B (dairy products), Group C (meat-based products), Group D (oils, fats and processed nuts) and Group F (refrigerated/frozen dishes). Low  $\kappa$  values were a consequence of low nutrition information accuracy, as well as of the low predictive value of this information, which was worse for products that did not list *trans*-fat on the nutrition facts label (NPV = 54.5%) than for those that did (PPV = 72.9%). Although the nutrition information of dairy products (Group B) was very limited, this information was more reliable for identifying products without *trans*-fat (NPV = 94.4%) than that reported in breads and grains (Group A) and sugary foods and snacks (Group E), whose better  $\kappa$  values than those of the other groups showed the lowest NPV (<50% in both cases). There was no agreement

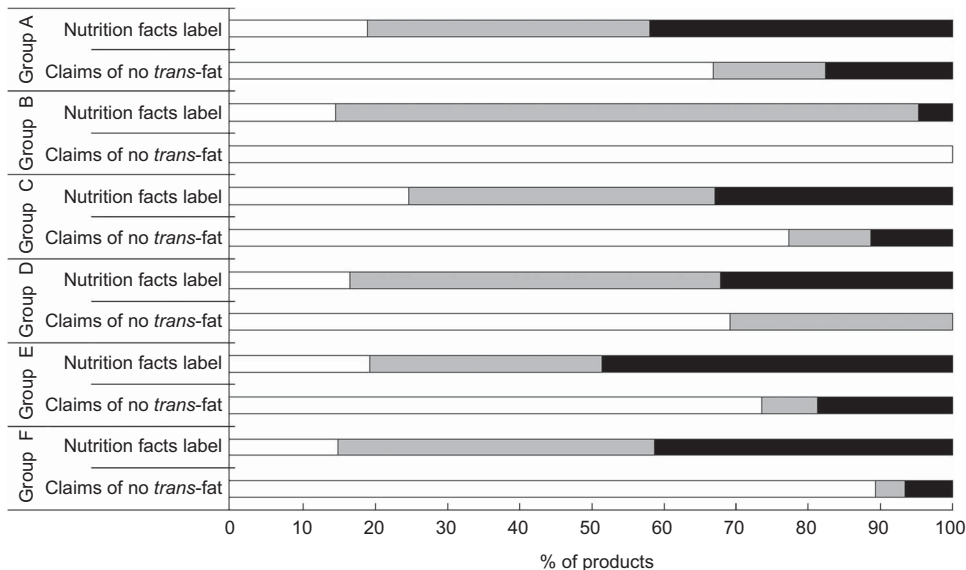
**Table 2** Number of study products and percentage of products listing items with *trans*-fat in the ingredient list, with *trans*-fat listed on the nutrition facts label and with claims of no *trans*-fat on the packaging, stratified by food group: processed food products (*n* 2327) available in a large supermarket in Florianópolis, Brazil, May 2010

Food group	Food products	<i>n</i>	<i>Trans</i> -fat report (%)							
			Ingredients list		Nutrition facts label			Claims of no <i>trans</i> -fat		
			No	Yes		No	Yes	Not informed	No	Yes
				Specific name	Alternative name					
A	Granola bar	42	40.5	2.4	57.1	100.0	0.0	0.0	71.4	28.6
	Frozen fries	9	100.0	0.0	0.0	100.0	0.0	0.0	77.8	22.2
	Crisps	8	37.5	0.0	62.5	100.0	0.0	0.0	12.5	87.5
	Frozen cheese biscuit	1	0.0	100.0	0.0	0.0	100.0	0.0	100.0	0.0
	Crackers	74	20.3	35.1	44.6	82.4	17.6	0.0	52.7	47.3
	Bread cones	2	100.0	0.0	0.0	100.0	0.0	0.0	50.0	50.0
	Breakfast cereal	19	94.7	0.0	5.3	100.0	0.0	0.0	100.0	0.0
	<i>Farofa</i> *	7	100.0	0.0	0.0	100.0	0.0	0.0	0.0	100.0
	Instant noodles	68	8.8	8.8	82.4	98.5	1.5	0.0	80.9	19.1
	Frozen pasta	24	12.5	0.0	87.5	37.5	45.8	16.7	100.0	0.0
	Pizza dough	9	44.5	33.3	22.2	55.6	44.4	0.0	100.0	0.0
	Dry pasta	9	100.0	0.0	0.0	100.0	0.0	0.0	89.0	11.0
	Fresh pasta	61	32.8	45.9	21.3	70.5	29.5	0.0	100.0	0.0
	Pancake mix	1	0.0	100.0	0.0	100.0	0.0	0.0	100.0	0.0
	Bread mix	13	61.5	15.4	23.1	76.9	23.1	0.0	53.8	46.2
	Cheese bread mix	3	0.0	33.3	66.7	0.0	100.0	0.0	66.7	33.3
	Instant mashed potato	1	100.0	0.0	0.0	100.0	0.0	0.0	100.0	0.0
	Breading mix	1	100.0	0.0	0.0	100.0	0.0	0.0	100.0	0.0
	Bread	89	60.7	6.7	32.6	100.0	0.0	0.0	11.2	88.8
	Garlic bread	3	0.0	0.0	100.0	33.3	66.7	0.0	66.7	33.3
	Frozen cheese bread	7	14.3	0.0	85.7	85.7	14.3	0.0	85.7	14.3
	Microwave popcorn	20	0.0	25.0	75.0	100.0	0.0	0.0	0.0	100.0
	Frozen <i>polenta</i> *	2	50.0	50.0	0.0	100.0	0.0	0.0	100.0	0.0
	Bakery products	151	43.0	7.3	49.7	53.0	47.0	0.0	98.7	1.3
	Snacks (chips and puffs)	77	62.3	10.4	27.3	100.0	0.0	0.0	48.1	51.9
	Frozen sandwich	10	50.0	40.0	10.0	0.0	100.0	0.0	100.0	0.0
Toast	13	7.7	7.7	84.6	100.0	0.0	0.0	7.7	2.3	
B	Milk mix	20	85.0	5.0	10.0	100.0	0.0	0.0	100.0	0.0
	Yoghurt	171	97.1	0.6	2.3	98.8	1.2	0.0	100.0	0.0
	Coffee powder	16	62.4	6.3	31.3	62.5	37.5	0.0	100.0	0.0
	Cheese	124	95.2	0.0	4.8	75.0	25.0	0.0	100.0	0.0
	Cream cheese	26	100.0	0.0	0.0	65.4	34.6	0.0	100.0	0.0
	<i>Requeijão</i> (creamy cheese)	17	82.4	17.6	0.0	41.2	41.2	17.6	100.0	0.0
C	Frozen meatballs	3	100.0	0.0	0.0	66.7	33.3	0.0	100.0	0.0
	Frozen breaded meats	49	34.7	2.0	63.3	77.6	22.4	0.0	73.5	26.5
	Hamburger	19	79.0	10.5	10.5	63.2	36.8	0.0	57.9	42.1
	Pâté	26	73.1	0.0	26.9	80.8	19.2	0.0	96.2	3.8
D	Whipped cream	6	33.4	33.3	33.3	83.3	16.7	0.0	100.0	0.0
	Margarine/vegetal fat	29	93.1	6.9	0.0	89.7	10.3	0.0	17.2	82.8
	Butter	11	100.0	0.0	0.0	36.4	63.6	0.0	100.0	0.0
	Processed nuts	32	28.1	40.6	31.3	93.7	6.3	0.0	100.0	0.0
E	Candy	58	74.1	20.7	5.2	84.5	15.5	0.0	100.0	0.0
	Cookie	248	24.6	23.4	52.0	75.0	24.6	0.4	51.6	48.4
	Snack cake	45	0.0	40.0	60.0	82.2	17.8	0.0	40.0	60.0
	Candy of condensed milk	2	0.0	0.0	100.0	100.0	0.0	0.0	100.0	0.0
	Ice cream cones	1	0.0	0.0	100.0	100.0	0.0	0.0	0.0	100.0
	Chocolate	159	25.1	14.5	60.4	95.6	4.4	0.0	84.3	15.7
	Icing	11	90.9	9.1	0.0	81.8	18.2	0.0	100.0	0.0
	Sweet cream	6	100.0	0.0	0.0	100.0	0.0	0.0	83.3	16.7
	Peanut candy	24	79.1	4.2	16.7	100.0	0.0	0.0	95.8	4.2
	Chewing gum	22	100.0	0.0	0.0	100.0	0.0	0.0	100.0	0.0
	Sprinkles	15	46.7	40.0	13.3	53.3	46.7	0.0	93.3	6.7
	Cake mix	36	33.3	63.9	2.8	63.9	36.1	0.0	91.7	8.3
	Dessert mix	31	77.4	9.7	12.9	93.5	6.5	0.0	100.0	0.0
	Ice cream powder	3	0.0	0.0	100.0	100.0	0.0	0.0	100.0	0.0
	Desserts	8	0.0	87.5	12.5	0.0	100.0	0.0	100.0	0.0
	Ice cream	84	6.0	19.0	75.0	65.5	34.5	0.0	76.2	23.8
F	Stock cubes	30	16.7	0.0	83.3	100.0	0.0	0.0	20.0	80.0
	Dry soups with creamer	5	80.0	0.0	20.0	100.0	0.0	0.0	100.0	0.0

**Table 2** Continued

Food group	Food products	n	Trans-fat report (%)							
			Ingredients list		Nutrition facts label			Claims of no <i>trans-fat</i>		
			No	Yes	No	Yes	Not informed	No	Yes	
				Yes						
				Specific name	Alternative name					
						No	Yes	Not informed	No	Yes
	Frozen lasagne	30	6.7	3.3	90.0	36.7	63.3	0.0	100.0	0.0
	Fondue mix	5	100.0	0.0	0.0	100.0	0.0	0.0	100.0	0.0
	Frozen sauce	4	0.0	0.0	100.0	50.0	50.0	0.0	100.0	0.0
	Sauce	20	65.0	10.0	25.0	100.0	0.0	0.0	95.0	5.0
	Frozen pizza	37	97.3	0.0	2.7	51.4	48.6	0.0	100.0	0.0
	Vacuum-packed dinner	23	95.7	4.3	0.0	100.0	0.0	0.0	73.9	26.1
	Frozen dinner	20	70.0	10.0	20.0	85.0	15.0	0.0	100.0	0.0
	Dry soup mix	67	40.3	1.5	58.2	100.0	0.0	0.0	100.0	0.0
	Seasoning	52	44.2	30.8	25.0	100.0	0.0	0.0	98.1	1.9
	Frozen pie	8	37.5	25.0	37.5	62.5	37.5	0.0	100.0	0.0
Total		2327	49.5	13.9	36.6	81.6	18.1	0.3	77.8	22.2

Food groups: Group A = bakery products, grains and grain-based products; Group B = dairy; Group C = meat-based products; Group D = oils, fats and processed nuts; Group E = sugars, sugary foods and snacks; Group F = sauces, seasoning blends, stock cubes, dry soups and refrigerated/frozen dishes. \*Farofa is a toasted manioc flour mixture but maize flour is used sometimes and flavours vary. Polenta is boiled cornmeal that can be eaten puréed or shaped into sticks and fried.



**Fig. 1** Percentage of products reporting *trans-fat* on the nutrition facts label and making claims of no *trans-fat* on the packaging and agreement of these data with the ingredient list, stratified by food group: processed food products (*n* 2327) available in a large supermarket in Florianópolis, Brazil, May 2010. □, with *trans-fat*; ▒, ■, without *trans-fat* (▒, true negatives; ■, false negatives). Food groups: Group A = bakery products, grains and grain-based products; Group B = dairy; Group C = meat-based products; Group D = oils, fats and processed nuts; Group E = sugars, sugary foods and snacks; Group F = sauces, seasoning blends, stock cubes, dry soups and refrigerated/frozen dishes

between claims of no *trans-fat* ( $\kappa = 0.00$ ) and NPV (42.0%). These agreements varied little among the different food groups. Only in Group D (oils, fats and processed nuts) was this information reliable for accurately identifying products with no *trans-fat* in the ingredient list.

**Discussion**

The present analysis showed that half of the study food products had *trans-fat*-containing components in the

ingredient list; in 75% of these products, these ingredients were listed with alternative names. This shows that there are numerous and varied food products containing *trans-fat* in Brazilian supermarkets and that most of them list *trans-fat*-containing ingredients with alternative names. This may mislead consumers and allow them to make bad food choices.

These findings are concerning because *trans-fat* is harmful to the body, especially with respect to the development of dyslipidaemia and CVD<sup>(14,15)</sup>. Hence, the

**Table 3** Agreement among the presence of *trans*-fat-containing items in the ingredient list, *trans*-fat reported on the nutrition facts label and claims of no *trans*-fat on the packaging, stratified by food group: processed food products (*n* 2327) available in a large supermarket in Florianópolis, Brazil, May 2010

Reporting	Accuracy (%)	$\kappa$	NPV (%)	PPV (%)
Nutrition facts label	57.8	0.16	54.5	72.9
Group A	56.1	0.21	48.3	89.1
Group B	81.8	0.05	94.4	9.1
Group C	53.6	0.02	56.2	45.8
Group D	56.4	0.00	61.5	30.8
Group E	50.3	0.18	39.7	94.5
Group F	52.5	0.05	51.6	57.8
Claims of no <i>trans</i> -fat	46.9	0.00	42.0	48.3
Group A	56.6	0.08	46.7	41.6
Group B	3.1	0.00	50.0	6.2
Group C	44.3	0.00	50.0	42.7
Group D	68.0	0.42	100.0	53.7
Group E	55.9	0.00	29.1	65.5
Group F	7.8	0.00	37.5	48.3

NPV, negative predictive value; PPV, positive predictive value.

Food groups: Group A = bakery products, grains and grain-based products; Group B = dairy; Group C = meat-based products; Group D = oils, fats and processed nuts; Group E = sugars, sugary foods and snacks; Group F = sauces, seasoning blends, stock cubes, dry soups and refrigerated/frozen dishes.

legislation on food labels must establish and impose the use of standard names for oils and fats, since the use of alternative names may prevent consumers from detecting the presence of *trans*-fat in processed foods and thereby prevent them from eliminating this type of fat from their diet, as recommended by the WHO<sup>(16)</sup>.

The groups that were most likely to have *trans*-fat-containing components in their list of ingredients were the sugar, sugary foods and snacks group, especially cookies, sweets and ice cream; the bread and grains group, especially instant and frozen noodles; and the refrigerated/frozen dinner group. Monteiro *et al.*<sup>(28)</sup> called these products 'ultra-processed foods', convenience foods that require additional additives and fats to increase palatability and shelf-life.

The presence of these foods in the diet of the Brazilian population has increased; for example, the consumption of cookies and refrigerated/frozen dinners increased by 400% and 80%, respectively, between the years of 1974–1975 and 2002–2003<sup>(1)</sup>. In 2008–2009, the relative consumption of refrigerated/frozen dinners and mixes increased by 37% in comparison with the previous survey<sup>(2)</sup>. In the USA, the Economic Research Service found that added sugars and sweeteners available for consumption increased by 19% and grains available for consumption increased by 41% from 1970 to 2005<sup>(29)</sup>.

*Trans*-fat was not listed on the nutrition facts label of eight (0.3%) food products. This is not in conformity with the Brazilian legislation which determines that it must be listed, regardless of amount, in all processed food products<sup>(21)</sup>. In a study done between 2007 and 2008, Tao *et al.*<sup>(25)</sup> found that only 30.9% of the food products available in a Chinese supermarket contained a nutrition

facts label and of these, only 4.7% included *trans*-fat. Inclusion of a nutrition facts label became compulsory in China in 2008, so 69.1% of the studied products were in violation of the Chinese legislation. However, *trans*-fat does not need to be included separately on the nutrition facts label.

A small percentage (18.1%) of the study products reported an amount of *trans*-fat other than zero on the nutrition facts label and roughly a quarter of the products made claims of no *trans*-fat on the packaging, especially those in the bread and grains group and the oil and fats group. In the USA, Brandt *et al.*<sup>(30)</sup> found that 12% of the 1227 study products sold in supermarkets reported having *trans*-fat, especially those in the breads and grains group. These same authors noticed that more than 75% of the food products made no *trans*-fat claims on the packaging, especially granola bars (26%) and breads and baked goods (20%). In the USA, companies are still allowed to make claims of no *trans*-fat on the packaging when the amount of *trans*-fat in the product is <0.5 g per serving.

Companies' and the WHO's objectives regarding the provision of *trans*-fat information on food packaging are likely different<sup>(16)</sup>. It is interesting for companies to emphasize the possible healthiness of a product on its packaging since they know that processed foods have a significant participation in the population's diet<sup>(1,2,29)</sup>.

The low agreement between the presence of *trans*-fat-containing ingredients and zero *trans*-fat reported on the nutrition facts label and claims of no *trans*-fat made on the packaging further demonstrates that companies and the WHO indeed have different objectives regarding *trans*-fat information on food packaging. In the present study, the percentage of false negatives (products that made claims of no *trans*-fat or reported zero *trans*-fat on the nutrition facts label but listed *trans*-fat-containing ingredients) was high, ranging from 40 to 60% for all except the dairy group.

Milk and meats from ruminants may contain *trans*-fat naturally because of the biohydrogenation process that occurs in the rumen but this does not mean that these products are necessarily free from man-made *trans*-fat<sup>(31,32)</sup>. Lambert<sup>(33)</sup> reported that natural and man-made *trans*-fats have different structures and functions and distinct effects on blood lipids: natural *trans*-fat is beneficial to health<sup>(34–38)</sup> while man-made *trans*-fat is not. In the present study, none of the dairy products made claims of no *trans*-fat on the packaging. Since these products may contain natural *trans*-fat, it would not be correct to make such claims<sup>(39)</sup>.

The agreement among the presence of *trans*-fat-containing ingredients, the amount of *trans*-fat reported on the nutrition facts label and claims of no *trans*-fat on the packaging was very low or non-existent, showing that the latter two are not really reliable. In a study of Brazilian food packaging containing claims of no *trans*-fat, Aued-Pimentel *et al.*<sup>(40)</sup> found that the claims were inaccurate in

18% of the products, since they contained 0.3 to 1.8 g of *trans*-fat per serving.

Howlett *et al.*<sup>(41)</sup> stated that not knowing about *trans*-fat and poor interpretation of the *trans*-fat content reported on the nutrition facts label can be misleading and emphasized that consumers need not only to have access to the nutrition facts label and list of ingredients but also must know how to interpret them so that they can effectively find *trans*-fat-free products.

It is also important to know that *trans*-fat-free foods are not necessarily healthy. Gagliardi *et al.*<sup>(7)</sup> studied food products sold in supermarkets in São Paulo, Brazil, that made claims of no *trans*-fat on the packaging and found that their *trans*-fat content was low, but the amount of saturated fats was significant. These authors pointed out that the only reason companies can make claims of no *trans*-fat on the packaging is because the Brazilian legislation tolerates up to 0.2 g of *trans*-fat per serving, as mentioned previously.

One possible limitation of the present study is the use of the list of ingredients for determining the presence of *trans*-fat in a product without running chemical analyses. However, the study considered that consumers only have access to what is reported on the packaging, so its accuracy should be ensured by the manufacturer and tested for compliance with the legislation. Another possible limitation of the study was the inclusion of products sold in a single store, but since the store belongs to a large chain, most of the products sold by this chain are sold by other chains and stores throughout the country, so this fact does not affect the external validity of the study.

The list of ingredients was interpreted taking into account the different names of possible *trans*-fat-containing ingredients listed in the scientific literature<sup>(27)</sup>, but when vegetable fat is automatically considered hydrogenated, false positives may occur. Finally, according to studies that used chemical analysis to determine the presence of *trans*-fat in different food products, the results presented here, based exclusively on the list of ingredients, are most likely underestimating the true *trans*-fat content of these foods. In other words, the percentage of processed foods with *trans*-fat would be even higher and the reliability of the information on the packaging and nutrition facts label would be lower.

## Conclusions

*Trans*-fat can be reported in Brazilian food products in three different ways: (i) in the ingredient list by reporting ingredients that contain this kind of fat; (ii) on the nutrition facts label by reporting the amount of *trans*-fat per serving; and (iii) by making claims of no *trans*-fat on the packaging.

The present study found that the ingredient list usually contradicts the zero *trans*-fat per serving reported on the nutrition facts label and the claims of no *trans*-fat made on the packaging. Hence, it is impossible to know if a

product contains *trans*-fat based on the latter two. Even if consumers read the ingredient list, they may still be unable to tell if an ingredient contains *trans*-fat because of the different ingredient names used by the food industry.

Therefore, the Brazilian legislation on food labels needs to be revised, especially regarding the amount of *trans*-fat reported per serving on the nutrition facts label and the claims of no *trans*-fat made on the packaging. Additionally, the names used for listing hydrogenated oils and fats in the ingredient list need standardization. Finally, the relevant governmental agencies must apply constant surveillance of labels to prevent violations.

In order to encourage and give people the means of controlling their *trans*-fat intake and thereby reduce their susceptibility to chronic diseases, the information on food packaging must be made very clear and free from ambiguity.

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