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Predictors of usage and fatty acid composition of cooking fats in Bogotá, Colombia

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Abstract

Objective: To examine correlates of home usage of commercially available cooking fats in Bogotá, Colombia and to determine their fatty acid composition.
Design: Cross-sectional survey.
Setting: Bogotá, Colombia.
Subjects: A representative sample of low- and middle-income families (*n* 2408).
Results: The types of fat primarily used for cooking at home were mixed vegetable oils (66 %), sunflower oil (21 %) and other oils/fats including margarine (13 %). In multivariate analysis, usage of sunflower oil as the primary cooking fat was positively related to home ownership, age of the father and health as a reason for choosing the main cooking fat, and inversely associated with the number of people per room and an index of household food insecurity. The *trans* fat content of sunflower oil was unexpectedly higher (mean 4·2 %, range 2·2–8·6) than that of the vegetable mixture oils (mean 3·1 %, range 1·1–6·5).
Conclusions: Vegetable oils are the primary home cooking fats in Bogotá, Colombia. Higher socio-economic status is associated with usage of sunflower oil. Paradoxically, oblivious to the higher *trans* content of sunflower oil and the negligible amount of *n*-3 fatty acids, families commonly reported 'health' as a reason to choose sunflower over other oils.

Keywords
Commercial oils
Trans fatty acids
n-3 fatty acids
Food composition
Colombia

There is compelling evidence that *trans* fatty acid intake increases the risk of CHD[1–4]. *Trans* fatty acid intake is also associated with diabetes and possibly with obesity[5–7]. In a recent meeting, a Pan American Health Organization (PAHO)/WHO task force called for the elimination of *trans* fatty acids from the food supply in the Americas and recommended that unsaturated fats should be the preferred alternative, including *n*-3 PUFA[4]. However, little is known about the intake of *trans* fatty acids or *n*-3 PUFA in many Latin American countries.

The oil or fat used for cooking at home is one of the main and regular sources of fatty acids in the diet. Furthermore, Latin American countries are experiencing a nutrition transition towards a higher intake of edible oils[8]. The most widely used oils in Latin America are soyabean oil and palm oil, followed by corn oil in Central America and sunflower in South America[9]. These oils are usually mixed, partially hydrogenated and marketed as vegetable oils. Therefore the amount of specific fatty acids (like *trans* fatty acids or *n*-3 PUFA) is often unknown. If PAHO recommendations are to be followed, more information on the predictors of intake and composition of cooking oils and fats is required from these populations[4]. We conducted a study among low- and middle-income families from Bogotá, Colombia, in order to determine the most commonly used cooking fats and oils, the correlates of usage and the fatty acid composition of the most commonly available cooking oils and fats.

Materials and methods

Study population

We conducted a survey of cooking fats use and intake in families from Bogotá, as part of an ongoing nutrition study of primary-school children. In the present study, we recruited a representative sample of children aged 5 to 12 years who were enrolled in the public primary school system by February 2006. A cluster random sampling strategy was used, where clusters were defined as the classes of all 361 public primary schools in the city by the end of 2005. We randomly selected 166 classes out of a

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total of 8500 identified, to reach the target sample size of 4000 children. During the first week of February, we sought consent to participate in the study and obtained a positive response from 3032 families corresponding to 3202 children. The primary schooling coverage in Bogotá is high (88 % in 2005). The majority of children of primary school age in the city (57 %) are enrolled in the public school system. Most of these children (89 %) are from low- and middle-income families[10]. Our survey is therefore representative of low- and middle-income families from Bogotá who had children enrolled in the public primary school system in 2006.

Data collection

We collected baseline information from the children's families with the use of a self-administered questionnaire that was to be completed by the mother or primary care provider. Only one questionnaire was filled in per household. This questionnaire included questions on maternal age, education, parity, marital status, paternal age and education, indicators of household socio-economic status and a sixteen-item food security assessment survey, modified from the US Household Food Security Module[11]. This form also included questions on the main type of oil or fat that was most commonly used for cooking at home and the reasons for using it.

To identify the fatty acid content of the most used oils, we obtained samples of all commercially available oils and fats commonly consumed in Colombia from supermarkets and neighbourhood markets in Bogotá. Samples were aliquoted into 2 ml glass vials with Teflon caps and stored at −80°C until analysis at the Biomarker Analysis Laboratory at the Harvard School of Public Health.

The study was approved by the Human Subjects Committee of the Harvard School of Public Health and the Ethics Committee of the National University of Colombia Medical School.

Operational definitions

The number of samples analysed for each type of oil or fat was as follows: six for sunflower oil, eleven for mixed vegetable oils, two for palm shortening, two for canola oil, nine for margarines and two for butter. Mixed vegetable oils are mixtures of soyabean oil, corn oil and palm oil mostly, and are marketed as vegetable oils.

Fatty acid analysis

Lipids that contained non-esterified or esterified fatty acids were extracted from 2 ml of hexane–isopropanol mixture (3:2, v/v) or 2 ml of 6 % sodium sulfate mixture containing the sample. Fatty acids were esterified with a methylating reagent containing methanol (2 ml) and acetyl chloride (0·1 ml) as previously described[12,13]. After esterification, the methanol and acetyl chloride were evaporated off and the fatty acid methyl esters were redissolved in isooctane. Fatty acids were determined by GC, using the same conditions as in our previous studies[12,13]. Peak retention times and area percentages of total fatty acids were identified by injecting known standards (NuCheck Prep, Elysium, MN, USA) and analysed with the ChemStation A·08·03 software from Agilent Technologies (Foster City, CA, USA). A total of forty-six fatty acids were analysed. As part of the laboratory quality control, a control oil sample was run periodically. CV for the main fatty acids were: 1·58 for 16 : 0, 0·25 for 18 : 0, 0·10 for 18 : 1*n*-9, 0·63 for 18 : 2*n*-6, 0·97 for 18 : 3*n*-6 and 0·52 for *c*,*t*-18 : 2*n*-6.

Statistical analyses

The baseline survey was filled in and returned by 2466 of the households enrolled (81 %). We excluded fifty-eight questionnaires that lacked information on the main variable of interest (primary cooking fat); hence the final sample size was 2408.

The primary endpoint of interest was the main type of oil or fat used for cooking at home. Predictors included demographic characteristics of the mothers and fathers, indicators of household socio-economic status and food insecurity. The latter was categorized into four groups according to the sum of affirmative responses to the sixteen-item survey: food-secure (one or two affirmative responses), food-insecure without hunger (three to five affirmative responses), food-insecure with moderate hunger (six to twelve affirmative responses) or food-insecure with severe hunger (thirteen or more affirmative responses).

We assessed the significance of differences in socio-demographic characteristics by type of primary cooking oil with the use of χ^2 and ANOVA tests for categorical and continuous variables, respectively. Pairwise comparisons were adjusted using the Bonferroni method. Owing to its unexpected high content of *trans* fatty acids, we next evaluated predictors of sunflower oil use. We estimated adjusted prevalence ratios for sunflower oil use and 95 % confidence intervals with the use of a generalized estimating equation with the log-binomial distribution specification. An exchangeable correlation structure was applied to account for clustering due to sampling. In this model, we introduced as predictors the variables that were significantly associated with sunflower oil use in univariate analysis. All data were analysed with the Statistical Analysis Systems statistical software package (SAS Institute Inc., Cary, NC, USA).

Results

Most families consumed mixed vegetable oils (66 %), followed by sunflower oil (21 %) and other oils/fats (13 %), which included mostly palm shortening, margarine and others. Canola oil has recently been introduced on the market and is not yet highly consumed (0·17 %).

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Table 1 Sociodemographic characteristics by primary type of oil used for cooking at home: low- and middle-income families with children enrolled in the public primary school system, Bogotá, Colombia, 2006

	Mixed oils* (*n* 1579)		Sunflower oil (n 505)		Other oils/fats (*n* 324)		
Characteristic	Mean	SD	Mean	SD	Mean	SD	*P*†
Mother's age (years)	35·0[a]	6·8	36·2[b]	7·0	35·5[a,b]	6·5	0·004
Mother's education (years)	8·6[a]	3·2	9·0[a]	3·3	8·1[b]	3·5	0·0002
Father's age (years)	38·4[a]	8·0	40·0[b]	8·6	38·9[a,b]	8·2	0·001
Number of people at home	4·9	1·9	4·9	2·0	5·2	2·1	0·09
Average daily income per person ($US)‡	1·8[a]	1·0	2·2[b]	1·7	1·5[c]	1·2	<0·0001
Monthly amount of money spent on food at home ($US)	104[a]	56	124[b]	77	95[a]	58	<0·0001
Percentage of family income allocated to food per month	47·3	22·7	47·3	21·7	48·0	25·6	0·90
Average daily amount of money spent on food per person ($US)	0·77[a]	0·45	0·91[b]	0·52	0·66[c]	0·43	<0·0001
Average number of people sleeping in a room	2·6[a]	1·4	2·2[b]	1·3	2·8[c]	1·4	<0·0001
Number of household assets§	3·9[a]	1·6	4·4[b]	1·6	3·5[c]	1·7	<0·0001
Mother is married (%)	25·9		28·6		26·3		0·49
Home ownership (%)	31·2[a]		43·2[b]		26·3[a,c]		<0·0001
Food insecurity index							<0·0001
Food-secure (%)	22·5[a]		32·4[b]		15·4[c]		
Food-insecure without hunger (%)	48·0[a]		49·1[a,b]		38·6[c]		
Food-insecure with moderate hunger (%)	19·2[a]		13·6[b]		20·6[a,b]		
Food-insecure with severe hunger (%)	10·3[a]		4·9[b]		25·5[c]		
Reasons to use main type of oil/fat for cooking							
Price (%)	65·7[a]		37·3[b]		77·7[c]		<0·0001
Health (%)	9·0[a]		28·6[b]		11·0[a,c]		<0·0001
Taste (%)	25·8[a]		47·1[b]		21·0[a,c]		<0·0001
Quality (%)	2·0		2·6		0·3		0·06
Tradition (%)	31·2[a]		23·9[b]		14·6[c]		<0·0001

[a,b,c] Mean values within a row with unlike superscript letters were significantly different ($P<0·05$).
*Mixed oils are mixtures of soyabean oil, corn oil and palm oil mostly, and are marketed as vegetable oils.
†Global *P* values.
‡Conversion exchange rate: Colombian Peso per $US = 0·00043 (average during survey dates).
§From a total of six including bike, refrigerator, blender, television, stereo and washing machine.

Olive oil and corn oil (not mixed) are rarely consumed in this population (0·04 % and 0·08 %, respectively). Table 1 presents the sociodemographic characteristics of the population by main type of cooking oil/fat. As expected by the market price (mixed vegetable oils are cheaper than sunflower oil), participants who reported usage of sunflower oil as the primary cooking fat had higher income and education, less food insecurity and spent more money on food than did non-users. Cheaper price was a frequent reason for choosing mixed oils or other oils/fats over sunflower, while health and taste were more common reasons among sunflower oil users.

We next evaluated predictors of sunflower oil use with a multivariate log-binomial model (Table 2). Usage of sunflower oil as the primary cooking fat was positively related to home ownership, age of the father and health reasons, and inversely associated with the number of people per room in the household and an index of household food insecurity.

The fatty acid composition of cooking oils and fats most commonly consumed in Colombia is presented in Table 3. Most of the study participants (86 %) reported one of the thirty-four oils/fats that we analysed as their main type of cooking fat. The remaining 14 % were mostly participants who did not specify a brand name; a minority of families (*n* 40) reported the use of animal fat as the main cooking fat. The composition of mixed oils likely reflects a mixture of soyabean oil, corn oil and palm oil. Margarines showed high variability in their composition, consistent with a wide variety of margarines on the market including different mixtures of palm, soyabean, sunflower, cotton and canola oils. The proportion of *trans* fatty acids in margarines ranged from 0·95 % to 10·23 %. The fatty acid composition of not mixed oils was as expected. However, the content of *trans* fatty acids in sunflower oil was higher than that in mixed vegetable oils. The amount of *trans* fatty acids in sunflower and mixed oils varied by brand with a range from 2·22 % to 8·64 % for sunflower oil and from 1·11 % to 6·53 % for mixed vegetable oil. Canola oil, although not commonly consumed, is included for comparison purposes and because it is gaining in popularity.

Discussion

Mixed vegetable oils were the main cooking fat in this population, followed by sunflower oil. Mixed vegetable oils are combinations of soyabean oil, corn oil and palm oil, and therefore contain high percentages of SFA. They are frequently used by the poorest people. The amount of *trans* fatty acids in sunflower oil was unexpectedly higher than that in mixed vegetable oils. Sunflower oil users appeared to be of higher socio-economic status compared

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Table 2 Predictors of sunflower oil intake by low- and middle-income families with children enrolled in the public primary school system, Bogotá, Colombia, 2006*

	n	Adjusted prevalence ratio	95 % CI
Home ownership			
No	1494	1·00	
Yes	746	1·29	1·12, 1·49
Father's age†			
<40 years	1254	1·00	
≥40 years	707	1·23	1·06, 1·43
Food security‡			
Food-secure	533	1·00	
Food-insecure without hunger	1056	0·89	0·75, 1·06
Food-insecure with moderate hunger	408	0·71	0·54, 0·91
Food-insecure with severe hunger	243	0·44	0·29, 0·67
Average number of people sleeping in a room§			
≤2	1216	1·00	
3	635	0·77	0·63, 0·94
4	225	0·68	0·47, 1·00
≥5	164	0·55	0·36, 0·85
Health is a reason for using a particular type of oil			
No	1939	1·00	
Yes	301	2·33	1·99, 2·74

*Among observations without missing values (*n* 2240).
†Two hundred and seventy-four missing values in the category (indicator method).
‡Adjusted *P* for trend < 0·0001.
§Adjusted *P* for trend = 0·003.

with users of other oils. Paradoxically, oblivious to the higher *trans* fats content of sunflower oil and the negligible amount of *n*-3 PUFA, 'health' was commonly reported as the main reason to choose sunflower over other oils.

The average percentage of *trans* fatty acids in mixed vegetable oils, sunflower oil and margarines is above current PAHO recommendations (<2 % of total fats)[4]. The content of *trans* fatty acids in sunflower oil, although not extremely high, is unexpected and higher than that of similar oils marketed in other Latin American countries including Costa Rica and Argentina[13,14]. Although sunflower oil is not commonly hydrogenated, it is known that deodorization, a common step in the refining process, can produce *trans* PUFA[15–17]. This is consistent with our finding of a higher proportion of 18 : 2 *trans* fatty acids in sunflower oil. Thus, we speculate that the reason for the higher-than-expected content of *trans* fat in Colombian sunflower oil may be the use of high temperatures in the process of deodorization by the industry.

Colombian margarines have, on average, lower concentrations of *trans* fatty acids than margarines in other Latin American countries[13,14,18]; however, they are much higher in SFA. Margarines in Colombia are low in *trans* fatty acids because they are mostly palm oil-based. All margarines with low *trans* fat content have, on average, 50 % or more of SFA. Because they are already highly saturated, they do not need further partial hydrogenation and therefore their *trans* fat content is low. However, the content of *trans* fatty acids is higher in some margarines with low SFA content (approximately 10 % of *trans* fatty acids). It should be noted that current recommendations call for a decrease in the *trans* fatty acids content of margarines without a concurrent increase in SFA[19] and efforts from the industry have proved that this is possible[20]. Even though margarine is not commonly reported as the main cooking fat (only by 2·7 % of the families), it is often reported as a secondary cooking fat (by 16·5 %) and, consequently, it is an important source of *trans* fatty acids and SFA in Colombia.

As reported in a study among ninety-seven adults of the region of Santander in Colombia, dietary intake of PUFA is low in this population (3·7 % of total energy intake) compared with MUFA (8·1 % of total energy intake) and SFA (9·1 % of total energy intake)[21]. Furthermore, Colombia has one of the lowest intakes of long-chain *n*-3 fatty acids worldwide[22]. Therefore, the amount of α-linolenic acid (an essential *n*-3 PUFA) in commercially available fats and oils in Colombia is particularly critical in this population, since it might represent their main source of *n*-3 PUFA. Mixed vegetable oils and canola oil would be the best sources of *n*-3 fatty acids for this population, although canola oil is still an expensive commodity. Interestingly, people of higher socio-economic status, who could afford more expensive options, tended to prefer sunflower oil, which has negligible amounts of *n*-3 fatty acids. We did not collect specific information on why families perceive sunflower oil as a healthier option but it is unlikely that they are aware of the fatty acid composition of these oils and their health effects. Therefore, our data are in agreement with the well-known role of industry in influencing people's behaviour through advertising[23].

The Colombian population will likely benefit from a mixed vegetable oil with higher concentration of α-linolenic acid and lower *trans* and saturated fatty acid contents at an

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Table 3 Fatty acid composition (g/100 g) of the most frequently consumed oils and fats in Colombia

	Mixed oils (*n* 12)		Sunflower (*n* 6)		Palm (*n* 3)		Canola (*n* 2)		Margarine (*n* 9)		Butter (*n* 2)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
SFA												
8 : 0	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·14	0·13
10 : 0	0·00	0·00	0·00	0·00	0·17	0·20	0·00	0·00	0·12	0·15	0·83	0·23
12 : 0	0·08	0·06	0·01	0·02	4·60	5·49	0·02	0·00	3·61	3·70	2·03	0·01
13 : 0	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·12	0·00
14 : 0	0·23	0·10	0·08	0·04	2·37	1·81	0·07	0·01	1·91	1·43	10·13	0·05
15 : 0	0·02	0·00	0·02	0·00	0·05	0·00	0·02	0·00	0·04	0·01	1·48	0·05
16 : 0	15·30	2·54	5·84	0·56	38·29	2·81	4·88	0·64	30·09	12·44	29·83	0·14
17 : 0	0·09	0·01	0·05	0·01	0·09	0·01	0·07	0·00	0·09	0·01	0·70	0·19
18 : 0	3·89	0·35	3·98	0·50	5·43	0·91	1·91	0·07	7·79	1·43	13·85	0·30
19 : 0	0·01	0·01	0·00	0·00	0·03	0·01	0·01	0·01	0·13	0·09	0·22	0·07
20 : 0	0·31	0·03	0·23	0·02	0·28	0·02	0·47	0·00	0·30	0·03	0·14	0·01
21 : 0	0·06	0·04	0·04	0·02	0·00	0·00	0·02	0·03	0·00	0·01	0·03	0·01
22 : 0	0·24	0·04	0·42	0·08	0·05	0·01	0·22	0·02	0·14	0·12	0·04	0·01
23 : 0	0·02	0·02	0·02	0·01	0·01	0·01	0·00	0·00	0·01	0·01	0·01	0·01
24 : 0	0·07	0·02	0·11	0·01	0·05	0·00	0·06	0·03	0·06	0·03	0·01	0·00
Total SFA	20·34	2·72	10·80	0·41	51·42	5·58	7·75	0·74	44·29	14·84	59·55	0·11
MUFA												
14 : 1*n*-5	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·80	0·00
15 : 1*n*-5	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00
16 : 1*n*-7	0·10	0·01	0·08	0·02	0·13	0·03	0·26	0·01	0·11	0·02	1·59	0·10
17 : 1*n*-7	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0.00	0·00	0·00	0·00
18 : 1*n*-9	23·96	2·81	26·55	2·01	35·70	4·68	54·66	2·20	33·74	5·59	26·19	0·74
18 : 1*n*-7	1·25	0·07	0·58	0·11	0·60	0·03	3·33	0·27	1·10	0·76	0·42	0·00
20 : 1*n*-12	0·40	0·42	0·02	0·02	0·01	0·01	0·28	0·01	0·04	0·05	0·05	0·06
20 : 1*n*-9	0·15	0·02	0·12	0·01	0·11	0·01	0·92	0·25	0·17	0·22	0·03	0·00
24 : 1*n*-9	0·01	0·01	0·02	0·04	0·00	0·01	0·08	0·05	0·02	0·03	0·00	0·01
Total MUFA	25·86	2·48	27·38	2·13	36·55	4·72	59·53	2·29	35·17	6·44	29·07	0·89
PUFA												
n-3												
18 : 3*n*-3	3·84	0·65	0·18	0·08	0·17	0·02	7·98	0·22	0·71	1·55	0·57	0·03
20 : 3*n*-3	0·00	0·00	0·00	0·00	0·00	0·00	0·01	0·01	0·00	0.00	0·00	0·00
20 : 5*n*-3 (EPA)	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·06	0·00
22 : 5*n*-3 (DPA)	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·09	0·01
22 : 6*n*-3 (DHA)	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00
Total *n*-3	3·84	0·65	0·18	0·08	0·17	0·02	7·99	0·23	0·71	1·55	0·72	0·02
n-6												
18 : 2*n*-6	46·44	3·84	57·24	4·39	9·12	2·33	22·67	1·54	11·00	8·41	1·70	0·17
18 : 3*n*-6	0·03	0·09	0·01	0·02	0·00	0·00	0·05	0·08	0·00	0·00	0·03	0·00
20 : 2*n*-6	0·02	0·01	0·00	0·01	0·00	0·00	0·07	0·01	0·00	0·01	0·01	0·01
20 : 3*n*-6	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·01	0·02	0·06	0·01
20 : 4*n*-6	0·00	0·01	0·00	0·00	0·02	0·02	0·00	0·00	0·01	0·01	0·08	0·00
22 : 2*n*-6	0·00	0·01	0·00	0·00	0·00	0·00	0·00	0·01	0·00	0·00	0·00	0·00
22 : 4*n*-6	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00
Total *n*-6	46·50	3·88	57·25	4·37	9·14	2·33	22·80	1·63	11·02	8·40	1·87	0·16
n-7												
c-18 : 2*n*-7	0·06	0·04	0·06	0·02	0·00	0·01	0·03	0·01	0·01	0·01	1·50	0·05
Trans *fatty* acids												
t-18 : 1*n*-12	0·27	0·14	0·22	0·12	0·63	0·33	0·35	0·04	1·98	1·15	0·99	0·06
t-18 : 1*n*-9	0·25	0·18	0·20	0·11	0·33	0·23	0·40	0·08	1·51	1·02	1·23	0·24
t-18 : 1*n*-7	0·12	0·07	0·13	0·11	0·16	0·12	0·18	0·03	0·83	0·58	1·53	0·04
Total *t*-18 : 1	0·63	0·36	0·55	0·31	1·12	0·68	0·93	0·15	4·32	2·71	3·75	0·26
t,*t*-18 : 2*n*-6	0·09	0·06	0·11	0·06	0·02	0·01	0·05	0·01	0·06	0·04	0·01	0·01
c,*t*-18 : 2*n*-6	1·26	0·71	1·80	1·19	0·26	0·03	0·43	0·03	0·42	0·39	0·16	0·00
t,*c*-18 : 2*n*-6	1·13	0·61	1·72	1·12	0·24	0·03	0·38	0·04	0·37	0·37	0·35	0·04
Total *t*-18 : 2	2·48	1·36	3·63	2·34	0·52	0·07	0·86	0·09	0·85	0·78	0·53	0·04
t-14 : 1*n*-5	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·02	0·00
t-16 : 1*n*-7	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·01	0·90	0·01
t-20 : 1*n*-9	0·00	0·00	0·00	0·00	0·00	0·01	0·00	0·00	0·02	0·04	0·00	0·00
Total *trans* fatty acids	3·11	1·62	4·17	2·43	1·65	0·68	1·79	0·24	5·20	3·16	5·20	0·20

DPA, docosapentaenoic acid.

affordable price, given the apparently low dietary intake of fish in Bogotá[22]. This could be achieved by increasing the content of soyabean oil in the mixtures while avoiding hydrogenation. Because taste was an important reason to choose sunflower oil, special attention to customer preferences should be taken into account when marketing healthy oils. Also, it has been described that lower-income households give more priority to foods that are

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socially acceptable than to the quality of nutrients in the food[8]. Nutrition education campaigns would be needed to help the consumer choose healthy fats. In particular, giving information to the consumers at the point of purchase has been shown to be effective[8]. Stricter regulation of advertising health claims is also likely to be a useful strategy to improve people's selection of healthier cooking oils.

We estimate that, overall, 53 % and 23 % of the families used cooking fats with >2 % and >4 % *trans* fatty acids, respectively; while 41 % of the families used cooking fats with <4 % of α-linolenic acid. We did not collect individual information on daily intake of oils and did not analyse the composition of fats used in industrial baking. Therefore, it is not possible to calculate the average individual daily intake of *trans* fatty acids in this population from our study. None the less, our analysis is still useful to provide valuable information on the composition of the oils consumed by low- and middle-income families in Colombia and the predictors of choosing one type of oil over another. In many developed countries the content of *trans* fatty acids in fats has decreased considerably[24–28]. However, it is not known how current recommendations are affecting the industrial practices in developing countries, where resources are scarce and nutrition policy development and enforcement are difficult to attain. Populations in developing countries are unaware of the quality of fat that they are consuming and how it can affect their health. Governments in Latin American countries are encouraged to adopt PAHO recommendations in order to achieve the *Trans*-fats free Americas initiative's goals and promote the intake of healthy fats among their populations.

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