Contribution of food groups to energy, grams and nutrients-to-limit: the Latin American Study of Nutrition and Health/Estudio Latino Americano de Nutrición y Salud (ELANS)

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Abstract

Objective: To quantify the energy, nutrients-to-limit and total gram amount consumed and identify their top food sources consumed by Latin Americans.
Design: Data from the Latin American Study of Nutrition and Health (ELANS).
Setting: ELANS is a cross-sectional study representative of eight Latin American countries: Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Peru and Venezuela.
Participants: Two 24-h dietary recalls on non-consecutive days were used to estimate usual dietary intake of 9218 participants with ages between 15–65 years. 'What We Eat in America' food classification system developed by United States Department of Agriculture was adapted and used to classify all food items consumed by the ELANS population. Food sources of energy, added sugars, SFA, Na and total gram amount consumed were identified and ranked based on percentage of contribution to intake of total amount.
Results: Three-highest ranked food categories of total energy consumed were: rice (10·3 %), yeast breads (6·9 %), and turnovers and other grain-based items (6·8 %). Highest ranked food sources of total gram amount consumed were fruit drinks (9·6 %), other 100 % juice (9·3 %) and rice (8·3 %). Three highest ranked sources for added sugars were other 100 % juice (24·1 %), fruit drinks (16·5 %), and sugar and honey (12·4 %). SFA ranked foods were turnovers and other grain-based (12·6 %), cheese (11·9 %), and pizza (10·3 %). Three top sources of Na were rice (13·9 %), soups (9·1 %) and rice mixed dishes (7·3 %).
Conclusion: Identification of top sources of energy and nutrients-to-limit among Latin Americans is critical for designing strategies to help them meet nutrient recommendations within energy needs.

Diet, obesity and other chronic non-communicable diseases are of a serious public health concern due to their high prevalence and adverse effects on psychosocial and physical health[1–3]. Latin American countries are not impervious to this public health crisis[4]. Unfortunately, efforts to address poor diets and curb other unhealthy-related

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practices have shown limited success in these countries[5,6]. Therefore, attention is being paid to health policies and behavioural change interventions that aim to foster healthy eating, including altering the food supply and environment[7,8]. In Latin American and Caribbean countries, the division of Nutrition from the FAO released a report for all the food guidelines from the Latin American and Caribbean countries in 2014, with the aims to (i) gain knowledge of the current status of the food guidelines from the Latin American and Caribbean countries and (ii) identify what is needed in terms of public health policies for the population to improve diet[9]. The focus of this report is on the improvement of the population diet quality, which includes policies on the reduction of fat, added sugars and Na content, that is, nutrient-to-limit food sources[9]. Moreover, the report provides an update of the dietary guidelines in the Latin American Countries and improves information about foods and beverages. This can be helpful for the nutrition facts table revisions and the implementation of mandatory front-of-package labelling for foods high in nutrients-to-limit[10].

Understanding current food sources of energy intake and nutrients-to-limit, that is, SFA, added sugars and Na[11] among adolescents and adults in Latin American countries can provide insights into targets for healthy food policies and behavioural change interventions to support healthy food supplies, environment and eating patterns[9,11]. Although detailed energy and nutrient food sources among Latin Americans have been published[12,13], there is a gap on studies that use a standardised classification system to examine food sources. While standardised classification for certain aspects of dietary intake exists within single disciplines (e.g. nutrition/dietetics or epidemiology), no consistent classification system that is shared across disciplines is currently available. Therefore, one system can be used to represent different things across disciplines and researchers and might overlap food sources within different classification systems[7]. For example, some researchers have classified items based on specific food groups, such as sugar-sweetened beverages, fruits, vegetables and unhealthy snacks, while others have used the nutrient composition (e.g. vitamins and minerals) or total energy content of an individual diet[7,8]. Studies that used different approaches to classify dietary intake make it difficult to compare adherence to dietary guideline recommendations[14]. Thus, consistency and a standardised classification system may be needed for Latin American countries[14].

The National Health and Nutrition Examination Survey (NHANES) has drawn a unique classification system to categorise all foods consumed for the US population based on major food groups, subgroups and categories[15]. This system, named 'What We Eat in America (WWEIA)' provides a way to examine eating patterns and their impact on energy and nutrient intakes[15]. Food groupings are based on foods as they are consumed compared to the included components of disaggregated items, which provides a different view of the populations' foods and nutrients consumed. This categorisation system estimates the nutrient contribution from mixed dishes and foods consumed alone but does not evaluate the overall nutrient contribution from foods. Other food classification systems[16] disaggregate foods using recipes for mixtures to provide an estimate of the total nutrient contribution from the food sources.

Previous analyses of Latin American countries have identified only major food groups of energy intake and a few nutrients-to-limit sources in adult populations[12,13]. There is a lack of studies that identify more specific groups and/or categories of foods in population-based studies. The availability of a multi-centre cross-sectional survey data from the 2015 'Latin American Study of Nutrition and Health (ELANS)' provided the opportunity to examine the top food categories of energy, gram amount consumed and nutrients of public health concern in a Latin America representative urban sample, using a disaggregated approach to classify food sources. The objective of this study was to verify the consumption and sources of energy, total gram amount, SFA, added sugars, and Na in adolescents and adults from eight Latin American countries: Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Peru and Venezuela.

Methods

The Latin American Study of Nutrition and Health (*Estudio Latino Americano de Nutrición y Salud*; ELANS) is a cross-sectional survey with a multistage probability sample, stratified by geographical location (only urban cities), sex, age and socio-economic status; of non-institutionalised individuals of eight Latin American countries: Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Peru and Venezuela. Urban areas were included rather than rural areas to provide a population homogeneity and because most of the included countries have up to 90 % of individuals living in these areas. Briefly, ELANS aimed at identifying the weight status and lifestyle behaviours of Latin Americans. The survey examined approximately 9000 persons from September 2014 to June 2015. Trained interviewers collected the data via reported questionnaires (e.g. dietary and physical activity recalls) and objective measurements (e.g. weight and height) according to standardised procedures[17]. The ELANS was approved by the Western Institutional Review Board (#20140605). All participants provided written informed consent/assent form to participate in this survey.

Study sample

One participant within the selected household was randomly selected based on the 'last'[18] and 'next-birthday'[19] methods from each selected household. These methods are considered to be not intrusive and rely on the lack of correlation in the population between birth month and the

eligible person characteristics of interest as a source of randomness. Thus, participants from the ELANS sample were selected based on 50 % of the cases using the 'next-birthday', and the other 50 % the 'last-birthday' methods, controlling quotas for sex, age and socio-economic status in order to obtain a representative sample. The representativeness of the sample size was established with a confidence level of 95 % and a maximum error of 3·49 %. Sample weighting was applied at each country level. SES was evaluated by a self-report questionnaire using a country-dependent format and based on the legislative requirements or established local standards layouts. The ELANS used protocols and procedures that ensured confidentiality and protect individual participants from identification. More details of this study can be found in a previous publication[17].

Dietary data

Dietary intake data were obtained from two non-consecutive 24-h dietary recalls per person through an interview using a standardised multiple-pass method[20]. The foods and beverages intake recorded were transformed into energy, macronutrients and micronutrients values using the software *Nutrition Data System for Research* version 2013 (NDS-R, University of Minnesota, USA). The local foods reported by the participants from each country used a standardised procedure to match the equivalence of energy and nutrients from the NDS-R database, using local food composition tables, nutrition labels and/or the nutrition facts panel. A concordance rate of at least 80–120 % for energy and macronutrient content was required to establish an equivalence of local foods to foods available in NDS-R. Added sugars were previously defined[9,11] as all sugars used as ingredients in processed and prepared foods such as breads, cakes, soft drinks, jams, chocolates and ice cream, or eaten separately or added to foods at the table (according to the Latin American Dietary Guidelines). Energy, added sugars, saturated fat and Na were determined using the Multiple Source Method[21] (https://msm.dife.de/) for estimating usual dietary intakes of population and individuals. The multiple source method (MSM) is used to convert individual intakes derived from the two 24-h recalls to usual intake distributions[21]. The prevalence of overconsumption for added sugar, saturated fat and Na was determined using the WHO nutrients recommendations. Na intake should be below 2000 mg/d[22] and was adjusted for energy. Added sugar[23] and saturated fat[24] should be below 10 % of total energy intake. Energy intake was compared to the Institute of Medicine (IOM) recommendations based on participants' sex[25]. Trained interviewers collected the recall data in Portuguese (in the case of Brazil) or in Spanish (for the other Latin American countries). Participants were asked to report all the foods and beverages eaten on the previous day. The detailed description of the dietary interview methods can be found elsewhere[17,26].

WWEIA food classification

To investigate the food sources of energy, total grams consumed and nutrients-to-limit, the '*What We Eat In America food Classification System* (WWEIA)'[27] was adapted and used to classify all foods consumed by the Latin Americans. The WWEIA was designed by the NHANES/United States Department of Agriculture to calculate the contribution of energy and nutrients from the food categories[27]. Thus, a database was developed to provide the energy and nutrients of all the foods and beverages consumed by the US population. This database contains approximately 8600 food items, that is, unique food codes. Under the WWEIA food category classification system, each food code is assigned to one of the 153 WWEIA food categories (e.g. 'milk, whole'; 'beef, excludes ground'; 'pasta dishes, excludes macaroni and cheese'), which are organised within subgroups (n 46, e.g.' milk'; 'meats'; 'mixed dishes – grain-based') and major categories (n 15, e.g. 'Milk and Dairy', 'Protein Foods', 'mixed dishes'). The NHANES population targeted individuals starting with 2 years of age, hence why, three major food groups are included: (i) baby foods; (ii) baby beverages and (iii) human milk.

Cross-cultural adaptation

Previous consent was given to adapt the WWEIA food classification system to the Latin America context. To adapt the WWEIA food classification system to the Latin American context, we verified all the foods consumed by each of the eight countries and these were added to the relevant WWEIA food groups, and when necessary, we create additional food groups to report local foods consumed in Latin America (most of them were Mixed Dishes – Latin American, beans-based items). A specialist panel comprising of six experts in the area of nutrition, dietary intake, methods and/or cultural adaption reviewed all the databases and the classification of all the items consumed into the correct groups. Fruitful conversations between the experts were made until consensus was reached (see online supplementary material, Supplemental Figure 1). In order to retain its international comparability, the original WWEIA foods were kept in each of the groups even though they were not necessarily most frequently consumed or are not available in the Latin American countries (e.g. egg/breakfast sandwich, diet sports/energy drinks and different types of milk according to fat content – usually in these countries there are only three types of milk: whole (3 %), reduced-fat (0·6–2·9 %) and non-fat milk (≤0·5 %)). Furthermore, there is a wide variety of fruits in the Latin American country, and each country can differ in terms of fruits. We opted not to create a specific group for these fruits. Fruits widely consumed in the Latin American

countries were kept in the category 'other fruits/fruit salads'. One major food group was excluded because they were not commonly consumed in this target population – older than 15 years: baby foods/beverages. From these 14 main groups with 42 subgroups (e.g. 'bread, rolls, tortillas'; '100 % juices'; and 'fruits'), 109 categories (e.g. 'yeast breads', 'citrus juice', and 'peaches and nectarines') were included to determine the rank order of relative proportions to total energy, total grams consumed and nutrient-to-limits (added sugars, saturated fat and Na) of foods/beverages consumed. The maintained and modified food main groups, subgroups and categories, according to the experts' opinion, can be seen in Supplemental Table 1.

Sociodemographic variables

Participants were grouped into three age categories (15–19 years, 20–59 years and ≥ 60 years), with stratification by sex (male and female). Socio-economic status was evaluated by questionnaire using a country-dependent format and based on the legislative requirements or established local standard layouts. This was evaluated by creating a categorical (low-, middle- and high-income) variable on the basis of the low-income measure, which compares the equivalised per-person income of each country/household with established thresholds for Latin Americans, drawn from national indexes used in each country[17].

Statistical analyses

Analyses were conducted using SAS Studio 3.8 (SAS Institute Inc., 2012–2018). Energy, added sugars, saturated fats and Na means (standard errors) were calculated and compared to the dietary recommendations[22–24]. Descriptive statistics of usual intake on a population level as estimated by the MSM[21] based on the two 24-h dietary recalls (means and percentages, with their standard error) for food sources on a population level were determined for energy, Na, SFA, added sugars and total grams consumed reported. Mean per capita energy, total grams consumed, Na, saturated fat and added sugar consumed from each food group were expressed as percentage of the total to allow relativity across sex and age groups.

Results

ELANS sample

A total of 10 134 participants initially participated in the first day of the interview. At the second interview, the study sample included 9680, being that 4·5 % were not present or refused to participate at this point of the data collection. Of the 9680 individuals, 462 (9·0 %) were excluded from data analysis due to inconsistencies or partial missing data. Thus, the final analytical sample consisted of 9218 adolescents and adults.

The mean age (standard error) of the sample used for analyses was 35·8 (SE 0·1) years, with 52·2 % of respondents being female and 84·6 % pertaining to a middle-low-income SES. The majority of the participants (60·1 %) reported having completed at least some high-school degree, 29·3 % reported having some college/university degree and only 1·1 % reported not having any educational background. Over one-third (37·2 %) of Latin American adults were classified as normal weight, 34·4 % overweight and 25·1 % obese.

Energy and nutrients-to-limit intakes of the participants

The average intake and nutrients-to-limit of the participants are presented in online supplementary material, Supplemental Figure 1. The average energy intake for the overall ELANS sample was 8334·11 (95 % CI 1979·2, 2004·6) kJ/d. Among the countries, Ecuador presented the highest energy intake 9257·31 (95 % CI 2170·7, 2254·5) kJ/d and Chile the lowest (M = 1732·7, 95 % CI 1696·4, 7401·49 kJ/d).

The percentage for total energy intake (% TEI) of added sugar for the overall ELANS sample was 13·2 %. Comparing the eight countries, Argentina presented the highest values for added sugars (16·8 %), while Ecuador the lowest value (10·2 %). In relative terms of TEI for SFA, the average intake for the ELANS sample was 9·7 % of total energy consumed. Argentina presented the highest (11·6 %), while Peru (6·4 %) the lowest intake. For Na, Ecuador (4900·1 mg/d) showed almost two times more than the average intake for the entire ELANS sample (2612·8 mg/d) and Peru had the lowest intake (1006·0 mg/d).

Energy, total grams consumed and nutrients-to-limit food sources

Energy intake

Table 1 shows the dietary sources of energy consumed from the WWEIA food categories adapted to the Latin America reality. The five highest ranked categories contributed to 35·0 % of total energy intake for the participants in the ELANS, including: 10·3 % rice, 6·9 % yeast breads, 6·8 % turnovers and other grain-based (e.g. *empanadas*), 5·7 % soups (e.g. *sancocho de gallina* – 'Chicken soup with vegetables/corn') and 5·3 % rice mixed dishes (e.g. *arroz chaufa de chancho/carne* – 'fried rice with beef/vegetables'). The percentage of contribution of the five highest ranked food categories contributing to total energy was the highest for Peru and Ecuador, with, 42·2 % and 39·3 %, respectively. Peru food sources were rice (16·5 %), sugars and honey (7·1 %), yeast breads (6·5 %), rice mixed dishes (6·2 %) (e.g. *aeropuerto* – 'Peruvian fried rice with noodles, beef and vegetables'), and chicken, whole pieces (5·9 %). Ecuador food sources were rice (17·3 %), soups (8·1 %) (e.g. *locro de cuero* - 'Ecuadorian soup made with pig skin'), rolls and buns (5·3 %), meat mixed dishes (4·7 %) (e.g. *papas con cuero* – 'Ecuadorian dish made with pork skin and potatoes'), and bananas (3·9 %). On the other hand, the percentage of contribution to the five highest ranked food categories contributing to total energy intake were lowest for Colombia with 28·0 % of total energy intake

Table 1 Food sources* of energy (kcal))†, mean contribution and as percentage of energy intake among Latin Americans adults and older adults aged 15 to 65 years (n 9090), Latin American Study of Health and Nutrition

Rank	Main group	Subgroup	Category	Cons	Mean	SE	PCT
ELANS (n 9090)							
1	Grains	Cooked grains	Rice	4387	297·4	2·3	10·3
2	Grains	Breads, rolls and tortillas	Yeast breads	4763	182·5	1·6	6·9
3	Mixed dishes	Mixed dishes, grain-based	Turnovers and other grain-based items	1784	474·9	9·4	6·8
4	Mixed dishes	Mixed dishes, soups	Soups	3835	200·7	3·6	5·7
5	Mixed dishes	Mixed dishes, drain-based	Rice mixed dishes	1602	445·5	7·3	5·3
Argentina (n 1200)							
1	Grains	Breads, rolls and tortillas	Yeast breads	2586	205·6	139·2	9·7
2	Protein foods	Meats	Beef, excludes ground	1078	421·5	262·9	8·1
3	Mixed dishes	Mixed dishes – pizza	Pizza	388	937·5	643·2	6·4
4	Beverages, non-alcoholic	Sweetened beverages	Soft drinks	1808	184·9	127·5	6·1
5	Mixed dishes	Mixed dishes – grain-based	Turnovers and other grain-based items	627	507·1	403·8	5·4
Brazil (n 2000)							
1	Grains	Cooked grains	Rice	4680	158·1	1·5	9·9
2	Grains	Breads, rolls and tortillas	Yeast breads	3460	187·7	1·6	8·8
3	Protein foods	Meats	Beef, excludes ground	1879	313·1	4·9	7·9
4	Beverages, non-alcoholic	Sweetened beverages	Soft drinks	2110	163·4	2·1	4·7
5	Alcoholic beverages	Alcoholic beverages	Beer	444	731·5	37·1	4·4
Chile (n 870)							
1	Grains	Breads, rolls and tortillas	Yeast breads	1885	254·3	3·0	15·7
2	Grains	Breads, rolls and tortillas	Rolls and buns	929	280·9	5·3	8·5
3	Beverages, non-alcoholic	Sweetened beverages	Soft drinks	978	132·1	2·7	4·2
4	Beverages, non-alcoholic	Sweetened beverages	Fruit drinks	753	149·9	3·5	3·7
5	Protein foods	Meats	Beef, excludes ground	397	264·4	8·7	3·4
Colombia (n 1230)							
1	Grains	Cooked grains	Rice	3050	186·4	1·6	9·6
2	Grains	Breads, rolls and tortillas	Yeast breads	1453	202·7	4·4	5·0
3	Mixed dishes	Mixed dishes – M/P/S	Meat mixed dishes	528	524·3	17·8	4·7
4	Fruit	Fruits	Bananas	1408	182·4	4·9	4·4
5	Protein foods	Meats	Beef, excludes ground	1026	247·0	4·3	4·3
Costa Rica (n 790)							
1	Grains	Cooked grains	Rice	1845	249·4	3·1	15·1
2	Mixed dishes	Mixed dishes – grain-based	Rice mixed dishes	490	351·2	7·9	5·6
3	Grains	Breads, rolls and tortillas	Yeast breads	1138	142·1	2·9	5·3
4	Protein foods	Plant-based protein foods	Beans, peas and legumes	1210	125·2	2·4	4·9
5	Protein foods	Poultry	Chicken, whole pieces	443	260·7	12·8	3·8
Ecuador (n 800)							
1	Grains	Cooked grains	Rice	2408	258·3	3·1	17·3
2	Mixed dishes	Mixed dishes – soups	Soups	1301	259·1	4·0	8·1
3	Grains	Breads, rolls and tortillas	Rolls and buns	859	222·4	5·6	5·3
4	Mixed dishes	Mixed dishes – M/P/S	Meat mixed dishes	254	689·1	29·5	4·7
5	Fruit	Fruits	Bananas	583	242·5	12·8	3·9
Peru (n 1100)							
1	Grains	Cooked grains	Rice	2566	332·0	3·1	16·5
2	Sugars	Sugars	Sugars and honey	5192	70·3	0·7	7·1
3	Grains	Breads, rolls and tortillas	Yeast breads	2091	162·8	1·9	6·5
4	Mixed dishes	Mixed dishes – grain-based	Rice mixed dishes	571	614·2	14·5	6·2
5	Protein foods	Poultry	Chicken, whole pieces	2006	151·3	2·1	5·9
Venezuela (n 1100)							
1	Grains	Quick breads and bread products	Pancakes, waffles and french toast	2097	186·4	3·1	8·9
2	Mixed dishes	Mixed dishes – grain-based	Turnovers and other grain-based items	534	522·6	13·4	6·3
3	Milk and dairy	Cheese	Cheese	1932	135·3	1·8	5·9
4	Grains	Breads, rolls and tortillas	Yeast breads	944	236·7	4·2	5·1
5	Grains	Cooked grains	Rice	1482	148·5	2·0	4·8

Cons, number of times foods have been consumed by the entire population; PCT, percentage of contribution; M/P/S, meat/poultry/seafood.
*The five highest ranked food categories according to percentage of contribution to total energy intake.
†To convert to kJ, multiply kcal values by 4·184.

and included rice (9·6 %), yeast breads (5·0 %), meat mixed dishes (4·7 %) (e.g. *pastel de carne* – 'Hispanic meat pie with ground beef and seasonings'), bananas (4·4 %) and beef, excludes ground (4·3 %).

Total grams consumed
The five first food/beverages sources on relative proportions had 42·8 % of total grams consumed in the ELANS sample. Sweetened beverages contributed 9·6 % being fruit

drinks the most consumed category. The other four highest ranked sources were 9·3 % from 100 % other juices, 8·3 % rice, 8·1 % beer and 7·5 % soups (e.g. *hervido de res*, 'Hispanic soup with beef, vegetables and corn'). Argentina (68·0 %) and Ecuador (55·5 %) had the highest proportions for total grams consumed. In Argentina, the five beverage sources were 22·5 % tap water, 22·3 % tea, 10·8 % fruit drinks, 9·8 % soft drinks and 2·6 % beer. In Ecuador, there were both food and beverages sources: tap water (29·4 %), soups (9·2 %, e.g. *menestra de frejol canário* – 'minestrone with mung beans'), rice (8·0 %), soft drinks (5·2 %) and meat mixed dishes (3·7 %) (e.g. *estofado de res con grasa* – 'beef stew with fat'). Alternatively, Colombia (38·3 %) and Chile (40·1 %) showed a lowest percentage of contribution of the five ranked food categories contributing to total grams consumed. Colombia sources were 8·6 % fruit drinks (sweetened beverages), 8·2 % for soups (e.g. *sopa de Pasta* – 'spaghetti soup with tomato paste and chicken/meat broth'), 7·6 % rice, 7·1 % coffee and 6·8 % soft drinks. Chile sources were 14·5 % soft drinks, 9·6 % fruit drinks (sweetened beverages), 7·1 % yeast breads, 5·4 % beer, and 3·5 % rolls and buns. Results are presented in Table 2.

Added sugars intake

The added sugar food categories are presented in Table 3. The top five categories accounted for a total of 64·5 % of added sugar intake for the overall ELANS participants. The top sources were 24·1 % other fruit (100 %) juice, 16·5 % fruit drinks (sweetened beverages), 12·4 % sugars and honey, 6·2 % cakes and pies, and 5·3 % doughnuts, sweet rolls, pastries. The percentage of contribution of the five highest ranked food categories contributing to added sugar was the highest for Peru and Argentina, 85·1 % and 83·3 %, respectively. The food sources in Peru were sugars and honey (56·1 %), soft drinks (19·1 %), cakes and pies (4·2 %), fruit drinks (3·4 %, sweetened beverages), and yogurt, whole (2·3 %). The sources in Argentina were soft drinks (34·3 %), sugars and honey (27·7 %), fruit drinks (12·7 %), cookies and brownies (5·4 %), and cakes and pies (3·2 %). Alternatively, Costa Rica had the lowest percentage of contribution (65 %) and included sugars and honey (21·5 %), soft drinks (17·9 %), other 100 % juices (12·4 %), fruit drinks (7·8 %) and tea (6·9 %).

SFA intake

The food categories of total SFA intake are presented in Table 4. The five highest food sources showed 46·8 % of SFA consumed by the ELANS participants and included 12·6 % turnovers and other grain-based items (e.g. *empanadas* – 'Hispanic meat/vegetable/cheese baked pastry'), 11·9 % cheese, 10·3 % pizza, 7·5 % beef, excludes ground, and 4·5 % meat mixed dishes (e.g. *mondongo* – 'stew tripe with vegetables'). Venezuela (52·9 %) and Argentina (48·7 %) have the highest percentage of contribution of the five highest ranked food categories contributing to SFA intake. Venezuela food sources were cheese (24·6 %),

turnovers and other grain-based items (11·2 %, *tequeños* 'Venezuelan fried bread cheese sticks'), beef, excludes ground (6·7 %), meat mixed dishes (5·8 %, e.g. *carne guisada* – 'Hispanic stew beef') and chicken, whole pieces (4·6 %). Argentina food sources were pizza (13·4 %), beef, excludes ground (12·6 %), turnover and other grain-based items (9·5 %, e.g. *tarta de jamón y queso (2 tapas)* – 'ham and cheese pie'), cheese (8·7 %), and doughnuts, sweet rolls and pastries (4·5 %, e.g. churros). Alternatively, Costa Rica had the lowest percentage of contribution of five ranked food sources with 30·2 % of total SFA and included sausages (7·9 %), cheese (5·9 %), beef, excludes ground (5·8 %), chicken, whole pieces (5·3 %), and eggs and omelets (5·3 %).

Sodium intake

Table 5 presents the food categories on relative proportions for total Na consumed. The five highest ranked food categories consumed by the overall ELANS population accounted for 43·1 % and included 13·9 % rice, 9·1 % soup (e.g. *sopa de carne seca* – 'jerk beef soup'), 7·3 % rice mixed dishes (e.g. *arroz con camaron* – rice with prawn), 6·9 % yeast breads, and 5·9 % beans, peas, and legumes. The percentage of contribution of the five highest ranked food categories contributing to Na was the highest for Peru (73·0 %) and included rice (42·0 %), rice mixed dishes (15·0 %, e.g. *arroz chaufa con pollo y hot dog* – 'Peruvian fried rice with chicken and frankfurter'), yeast breads (10·4 %), chicken, whole pieces (2·5 %), and, rolls and buns (2·4 %). On the other hand, Ecuador (38·3 %) and Argentina (39·3 %) showed the lowest percentage of contribution of the ranked food categories contributing to Na intake. Ecuador major food sources included 10·4 % cheese, 7·8 % beef, excludes ground, 7·2 % meat mixed dishes (e.g. *estofa de cerdo con grasa* – 'pork stew with fat'), 6·6 % soups (e.g. *sopa/colada de haba* – 'broad bean soup') and 6·4 % whole milk. Argentina food sources were 13·4 % yeast breads, 9·5 % pizza, 7·5 % turnovers and other grain-based items (e.g. *empanada de carne frita* – Hispanic fried beef baked pastry), 4·6 % beef, excludes ground, and 4·3 % chicken, whole pieces.

Discussion

This study was conducted to provide an overview of the food sources of energy, nutrients-to-limit (i.e. added sugars, Na and SFA) and total grams consumed among Latino Americanos from eight countries. The top food sources on energy and dietary components demonstrated the importance in efforts to support healthy eating, such as healthy food policies and behavioural change strategies. In addition, it was observed that food sources were overlapped among dietary components. For example, mixed dishes containing meat or rice were among the five highest ranked categories of energy, Na and SFA in the current

Table 2 Food sources* of total grams amount consumed, mean contribution and percentage of total grams amount consumed among Latin Americans adults aged 15–65 years (n 9090), Latin American Study of Health and Nutrition (ELANS)

Rank	Main group	Subgroup	Category	Cons	Mean	SE	PCT
ELANS (n 9090)							
1	Beverages, non-alcoholic	Sweetened beverages	Fruit drinks	1889	589·2	95·9	9·6
2	Beverages, non-alcoholic	100 % juice	Other fruit juice	3603	303·4	3·2	9·3
3	Grains	Cooked grains	Rice	4387	219·5	1·6	8·3
4	Alcoholic beverages	Alcoholic beverages	Beer	660	1416·3	68·9	8·1
5	Mixed dishes	Mixed dishes, Soups	Soups	3835	246·5	3·9	7·5
Argentina (n 1200)							
1	Water	Plain water	Tap water	4327	472·5	4·74	22·5
2	Beverages, non-alcoholic	Coffee and tea	Tea	3967	510·9	6·4	22·3
3	Beverages, non-alcoholic	Sweetened beverages	Fruit drinks	1558	631·7	115·8	10·8
4	Beverages, non-alcoholic	Sweetened beverages	Soft drinks	1808	492·9	7·5	9·8
5	Alcoholic beverages	Alcoholic beverages	Beer	253	930·9	42·3	2·6
Brazil (n 2000)							
1	Beverages, non-alcoholic	Sweetened beverages	Soft drinks	2110	389·7	5·1	12·9
2	Alcoholic beverages	Alcoholic beverages	Beer	444	1701·5	86·2	11·9
3	Beverages, non-alcoholic	Coffee and tea	Coffee	4135	135·5	1·4	8·8
4	Grains	Cooked grains	Rice	4680	102	0·9	7·5
5	Milk and dairy	Milk	Milk, whole	2382	145·8	2·4	5·5
Chile (n 870)							
1	Beverages, non-alcoholic	Sweetened beverages	Soft drinks	978	348·2	6·4	14·5
2	Beverages, non-alcoholic	Sweetened beverages	Fruit drinks	753	300·1	7·2	9·6
3	Grains	Breads, rolls, tortillas	Yeast breads	1885	88·8	1	7·1
4	Alcoholic beverages	Alcoholic beverages	Beer	124	1028·7	121·7	5·4
5	Grains	Breads, rolls and tortillas	Rolls and buns	929	88·5	1·6	3·5
Colombia (n 1230)							
1	Beverages, non-alcoholic	Sweetened beverages	Fruit drinks	1557	287·5	3·6	8·6
2	Mixed dishes	Mixed dishes – soups	Soups	932	475·6	8·2	8·2
3	Grains	Cooked grains	Rice	3050	129·9	1·2	7·6
4	Beverages, non-alcoholic	Coffee and tea	Coffee	2523	147·6	3·7	7·1
5	Beverages, non-alcoholic	Sweetened beverages	Soft drinks	1064	331·9	7·9	6·8
Costa Rica (n 790)							
1	Beverages, non-alcoholic	Coffee and tea	Coffee	1842	298·4	3·1	18·5
2	Grains	Cooked grains	Rice	1845	183·7	2·3	11·4
3	Beverages, non-alcoholic	Sweetened beverages	Soft drinks	555	412·4	9·9	7·7
4	Beverages, non-alcoholic	100 % juice	Other fruit juice	398	327·3	7·4	4·4
5	Alcoholic beverages	Alcoholic beverages	Beer	97	1221·7	156·2	3·9
Ecuador (n 800)							
1	Water	Plain water	Tap water	3797	388·6	4·9	29·4
2	Mixed dishes	Mixed dishes – soups	Soups	1301	412·3	5·6	9·2
3	Grains	Cooked grains	Rice	2408	167·4	1·9	8
4	Beverages, non-alcoholic	Sweetened beverages	Soft drinks	770	338·4	6·3	5·2
5	Mixed dishes	Mixed dishes – M/P/S	Meat mixed dishes	254	757·3	25·4	3·7
Peru (n 1100)							
1	Water	Plain water	Tap water	4239	362·9	4·4	22·5
2	Grains	Cooked grains	Rice	2566	244·1	2·2	9·2
3	Beverages, non-alcoholic	100 % juice	Other fruit juice	1486	358·5	5·8	7·2
4	Beverages, non-alcoholic	Coffee and tea	Tea	1370	325·9	4·3	6
5	Beverages, non-alcoholic	Sweetened beverages	Soft drinks	1140	338·2	5·1	5·6
Venezuela (n 1100)							
1	Beverages, non-alcoholic	Coffee and tea	Coffee	1820	259·7	3·1	12·1
2	Beverages, non-alcoholic	Diet beverages	Diet sport and energy drinks	1202	391·4	4	12·2
3	Grains	Quick breads and bread products	Pancakes, waffles and French toast	2097	170·8	1·9	9·2
4	Alcoholic beverages	Alcoholic beverages	Beer	214	1382·6	132·6	7·6
5	Grains	Cooked grains	Rice	1482	112·2	1·5	4·1

Cons, number of times foods have been consumed by the entire population; PCT, percentage of contribution; M/P/S, meat/poultry/seafood.
*The five highest ranked food categories according to percentage of contribution to total grams consumed.

study, but the rank order for these sources differs were changed between countries and dietary components[28]. The ELANS and each country population were exceeding the WHO dietary recommendations for added sugars[23], SFA[24] and Na[22] intake, the only exception was Peru that was consuming Na within the recommendations.

Attention should be called to the WHO reference for sugars, which is for 'free sugar' and not for 'added sugar'. The term 'free sugars' may be used interchangeably with 'added sugars', implying all sugars that are added during manufacturing and preparation as well as sugars that are naturally occurring in honey, syrups, 100 % juice and other

Table 3 Food sources* of added sugar (grams), mean contribution and as a percentage of total added sugar intake, among Latin American adults and older adults aged 15–65 years (n 9090), Latin American Health and Nutrition Study (ELANS)

Rank	Main group	Subgroup	Category	Cons	Mean	SE	PCT
ELANS (n 9090)							
1	Beverages, non-alcoholic	100 % juice	Other fruit juice	3603	12·9	0·3	24·1
2	Beverages, non-alcoholic	Sweetened beverages	Fruit drinks	1889	15·9	2·3	16·5
3	Sugars	Sugars	Sugars and honey	1608	13·9	0·4	12·4
4	Snacks and sweets	Sweet bakery products	Cakes and pies	429	29·9	1·6	6·2
5	Snacks and sweets	Sweet bakery products	Doughnuts, sweet rolls and pastries	912	10·8	0·5	5·3
Argentina (n 1200)							
1	Beverages, non-alcoholic	Sweetened beverages	Soft drinks	1808	44·3	0·7	34·3
2	Sugars	Sugars	Sugars and honey	3032	21·4	0·41	27·7
3	Beverages, non-alcoholic	Sweetened beverages	Fruit drinks	1772	16·7	2·4	12·7
4	Snacks and sweets	Sweet bakery products	Cookies and brownies	708	17·9	0·5	5·4
5	Snacks and sweets	Sweet bakery products	Cakes and pies	290	30·1	1·7	3·2
Brazil (n 2000)							
1	Beverages, non-alcoholic	Sweetened beverages	Soft drinks	2110	39·5	0·5	36·2
2	Sugars	Sugars	Sugars and honey	4937	12	0·2	25·7
3	Beverages, non-alcoholic	Sweetened beverages	Fruit drinks	1704	11·5	0·6	8·5
4	Snacks and Sweets	Sweet bakery products	Cakes and pies	443	29·6	1·7	5·7
5	Snacks and Sweets	Sweet Bakery Products	Cookies and brownies	290	24·4	1·2	3·1
Chile (n 870)							
1	Beverages, non-alcoholic	Sweetened beverages	Soft drinks	978	31·8	0·7	33·6
2	Sugars	Sugars	Sugars and honey	1532	14·3	0·2	23·7
3	Beverages, non-alcoholic	Sweetened beverages	Fruit drinks	753	15·3	0·7	12·4
4	Snacks and sweets	Sweet bakery products	Cakes and pies	213	35·4	2·1	8·2
5	Snacks and sweets	Sweet bakery products	Cookies and brownies	205	17·6	1·1	3·9
Colombia (n 1230)							
1	Beverages, non-alcoholic	Sweetened beverages	Soft drinks	1064	31·7	0·8	20·8
2	Sugars	Sugars	Sugars and honey	2432	11·9	0·2	17·8
3	Sugars	Sugars	Jams, syrups and toppings	1535	16·9	0·5	15·9
4	Beverages, non-alcoholic	Sweetened beverages	Fruit drinks	1557	11·9	0·7	11·4
5	Milk and dairy	Flavoured milk	Flavoured milk, whole	643	18·8	0·7	7·4
Costa Rica (n 790)							
1	Sugars	Sugars	Sugars and honey	1678	14	0·3	21·5
2	Beverages, non-alcoholic	Sweetened beverages	Soft drinks	555	35·4	0·9	17·9
3	Beverages, non-alcoholic	100 % juice	Other fruit juice	398	34·2	1·1	12·4
4	Beverages, non-alcoholic	Sweetened beverages	Fruit drinks	641	13·3	1	7·8
5	Beverages, non-alcoholic	Coffee and tea	Tea	436	17·4	1·3	6·9
Ecuador (n 800)							
1	Sugars	Sugars	Sugars and honey	2227	12·3	0·2	30·3
2	Beverages, non-alcoholic	Sweetened beverages	Soft drinks	770	32·6	0·6	27·8
3	Beverages, non-alcoholic	100 % juice	Other fruit juice	634	10·5	0·3	6·6
4	Beverages, non-alcoholic	100 % juice	Citrus juice	599	7·9	0·7	4·6
5	Beverages, non-alcoholic	Sweetened beverages	Fruit drinks	312	11·9	1·1	4·1
Peru (n 1100)							
1	Sugars	Sugars	Sugars and honey	5192	17·9	0·2	56·1
2	Beverages, non-alcoholic	Sweetened beverages	Soft drinks	1140	28·5	0·5	19·1
3	Snacks and sweets	Sweet bakery products	Cakes and pies	248	30·3	1·3	4·2
4	Beverages, non-alcoholic	Sweetened beverages	Fruit drinks	309	19·2	1·3	3·4
5	Milk and dairy	Yogurt	Yogurt, whole	146	25·7	1·4	2·3
Venezuela (n 1100)							
1	Beverages, non-alcoholic	Sweetened beverages	Soft drinks	1202	35·7	0·4	27·7
2	Beverages, non-alcoholic	100 % juice	Other fruit juice	972	36·6	0·6	20·8
3	Sugars	Sugars	Sugars and honey	2161	14·4	0·3	20·2
4	Beverages, non-alcoholic	Sweetened beverages	Fruit drinks	308	33·4	2·8	6·6
5	Beverages, non-alcoholic	Coffee and tea	Tea	266	24	1·3	4·1

Cons, number of times foods have been consumed by the entire population; PCT, percentage of contribution; M/P/F, meat/poultry/fish.
*The five highest ranked food categories according to percentage of contribution to total added sugar intake.

fruit concentrates[29]. Added sugars are defined as all sugars that are added during processing and preparation (e.g. white and brown sugar/sucrose, glucose, high-fructose corn syrup, dextrose, fructose, honey, invert sugar, and lactose)[30]. Added sugars do not include lactose from dairy products and from sugars naturally occurring in fruit juices and concentrates, and unprocessed foods, such as fruit, vegetables, legumes, potatoes, fish, meat, poultry and eggs. Therefore, total energy intake for added sugars should be limited towards the lower boundary for free sugars recommendations.

The ELANS population have shown an increased intake for SFA within the recommendations, and their major sources are 'protein foods', 'milk and dairy' and 'mixed

Table 4 Food sources* of SFA (grams), mean contribution and as percentage of total SFA intake, among Latin American adults and older adults aged 15–65 years (*n* 9090), Latin American Study of Health and Nutrition (ELANS)

Rank	Main group	Subgroup	Category	Cons	Mean	SE	PCT
ELANS (*n* 9090)							
1	Mixed dishes	Mixed dishes, Grain-based	Turnovers and other grain-based items	1784	8·9	0·2	12·6
2	Milk and dairy	Cheese	Cheese	2695	5·5	0·1	11·9
3	Mixed dishes	Mixed dishes, pizza	Pizza	642	20·1	0·7	10·3
4	Protein foods	Meats	Beef, excludes ground	1430	6·7	0·1	7·5
5	Mixed dishes	Mixed dishes, M/P/F	Meat mixed dishes	1001	6	0·2	4·5
Argentina (*n* 1200)							
1	Mixed dishes	Mixed dishes – pizza	Pizza	388	25·3	0·9	13·4
2	Protein foods	Meats	Beef, excludes ground	1078	8·5	0·2	12·6
3	Mixed dishes	Mixed dishes – grain-based	Turnovers and other grain-based items	627	11·7	0·4	9·5
4	Milk and dairy	Cheese	Cheese	1005	6·1	0·2	8·7
5	Snacks and sweets	Sweet bakery products	Doughnuts, sweet rolls and pastries	831	3·9	0·2	4·5
Brazil (*n* 2000)							
1	Protein foods	Meats	Beef, excludes ground	1879	6·9	0·1	16·6
2	Milk and dairy	Milk	Milk, whole	2382	3·1	0	9·5
3	Fats and oils	Fats and oils	Butter and animal fats	638	8·9	0·3	7·2
4	Milk and dairy	Cheese	Cheese	839	5	0·2	5·3
5	Fats and oils	Fats and oils	Margarine	1672	2·4	0·1	5·1
Chile (*n* 870)							
1	Milk and dairy	Cheese	Cheese	687	7	0·2	13·2
2	Fats and oils	Fats and oils	Butter and animal fats	824	4·2	0·1	9·5
3	Grains	Breads, rolls and tortillas	Rolls and buns	929	3·6	0·1	9
4	Protein foods	Meats	Beef, excludes ground	397	6·2	0·2	6·7
5	Protein foods	Cured meats/poultry	Sausages	266	5·9	0·4	4·3
Colombia (*n* 1230)							
1	Protein foods	Meats	Beef, excludes ground	1026	6·3	0·1	9·4
2	Milk and dairy	Milk	Milk, whole	1514	3·7	0·1	8·1
3	Mixed dishes	Mixed dishes – M/P/S	Meat mixed dishes	528	9·5	0·4	7·2
4	Protein foods	Eggs	Eggs and omelets	1507	3·1	0·1	6·8
5	Protein foods	Cured meats/poultry	Sausages	449	8·7	0·3	5·7
Costa Rica (*n* 790)							
1	Protein foods	Cured meats/poultry	Sausages	376	6·2	0·3	7·9
2	Milk and dairy	Cheese	Cheese	443	3·9	0·2	5·9
3	Protein foods	Meats	Beef, excludes ground	243	6·9	0·3	5·8
4	Protein foods	Poultry	Chicken, whole pieces	443	3·5	0·2	5·3
5	Protein foods	Eggs	Eggs and omelets	603	2·5	0·1	5·3
Ecuador (*n* 800)							
1	Milk and dairy	Cheese	Cheese	634	5·8	0·2	10·4
2	Protein foods	Meats	Beef, excludes ground	425	6·5	0·2	7·8
3	Mixed dishes	Mixed dishes – M/P/S	Meat mixed dishes	254	10·5	0·3	7·2
4	Mixed dishes	Mixed dishes – soups	Soups	1301	2·1	0·1	6·6
5	Milk and dairy	Milk	Milk, whole	526	4·3	0·1	6·4
Peru (*n* 1100)							
1	Protein foods	Poultry	Chicken, whole pieces	2006	1·8	0	10·4
2	Protein foods	Meats	Beef, excludes ground	505	5·2	0·2	7·3
3	Protein foods	Eggs	Eggs and omelets	1007	2·5	0·1	6·9
4	Milk and dairy	Milk	Milk, whole	564	3·9	0·1	6·2
5	Milk and dairy	Cheese	Cheese	561	3·9	0·1	6
Venezuela (*n* 1100)							
1	Milk and dairy	Cheese	Cheese	1932	6·1	0·1	24·6
2	Mixed dishes	Mixed dishes – grain-based	Turnovers and other grain-based items	534	10	0·4	11·2
3	Protein foods	Meats	Beef, excludes ground	409	8·31	0·2	6·7
4	Mixed dishes	Mixed dishes – M/F/S	Meat mixed dishes	332	9·7	0·4	5·8
5	Protein foods	Poultry	Chicken, whole pieces	683	3·6	0·1	4·6

Cons, number of times foods have been consumed by the entire population; PCT, percentage of contribution; M/P/S, meat/poultry/seafood.
*The five highest ranked food categories according to percentage of contribution to total SFA intake.

dishes (mainly from meat sources)'. Other population-based evidence has also found comparable intakes of SFA with the dietary recommendations. For example, a study using the NHANES[31] with over 16 000 US children, adolescent and adult populations showed similar trends with a mean of 11·4 % of energy coming from SFA. The Canadian Community Health Survey (CCHS) with a representative sample with adults (M = 45·0 ± 0·3 years old)[32] found that mean intake of SFA was 10·4 %. Age differences between samples should be considered when interpreting these results. Furthermore, differences in food sources consumed by country were corroborating with the Canadian sample[32] – Canadians from the thirteen provinces were differing in their SFA food rankings. Thus,

Table 5 Food sources* of sodium (micrograms), mean contribution and as percentage of total sodium intake, among Latin American adults and older adults aged 15–65 years (n 9090), Latin American Study of Health and Nutrition (ELANS)

Rank	Main group	Subgroup	Category	Cons	Mean	SE	PCT
ELANS (n 9090)							
1	Grains	Cooked grains	Rice	4387	708·4	6·8	13·9
2	Mixed dishes	Mixed dishes, soups	Soups	3835	563·7	14·8	9·1
3	Mixed dishes	Mixed dishes, grain-based	Rice mixed dishes	1602	1075·4	22·7	7·3
4	Grains	Breads, rolls and tortillas	Yeast breads	4763	319·3	2·9	6·9
5	Protein foods	Plant-based protein foods	Beans, peas and legumes	5213	246·6	2·7	5·9
Argentina (n 1200)							
1	Grains	Breads, rolls and tortillas	Yeast breads	2586	365·4	4·9	13·4
2	Mixed dishes	Mixed dishes – pizza	Pizza	388	1770·2	61·6	9·5
3	Mixed dishes	Mixed dishes – grain-based	Turnovers and other grain-based items	627	900·3	31·9	7·5
4	Protein foods	Meats	Beef, excludes ground	1078	307·9	8·9	4·6
5	Protein foods	Poultry	Chicken, whole pieces	911	326·4	8·9	4·3
Brazil (n 2000)							
1	Grains	Cooked grains	Rice	4680	345·4	3·9	13·8
2	Grains	Breads, rolls and tortillas	Yeast breads	3460	332·2	2·9	9·8
3	Protein foods	Plant-based protein foods	Beans, peas and legumes	3701	279·4	3·1	8·8
4	Protein foods	Meats	Beef, excludes ground	1879	476·5	7·2	7·6
5	Protein foods	Poultry	Chicken, whole pieces	1836	346·6	6·5	5·4
Chile (n 820)							
1	Grains	Breads, rolls and tortillas	Yeast breads	1885	454·3	5·3	19·5
2	Grains	Breads, rolls, tortillas	Rolls and buns	929	464·4	8·7	9·8
3	Grains	Cooked grains	Rice	524	519	9·2	6·2
4	Milk and dairy	Cheese	Cheese	687	323·5	10·4	5·1
5	Mixed dishes	Mixed dishes – typical dishes	Typical dishes	137	1380·6	203·2	4·3
Colombia (n 1230)							
1	Mixed dishes	Mixed dishes – soups	Soups	932	1495·1	28·9	16·9
2	Grains	Cooked grains	Rice	3050	354·6	5·6	13·6
3	Grains	Breads, rolls and tortillas	Yeast breads	1453	363·5	7·9	6·6
4	Protein foods	Eggs	Eggs and omelets	1507	225·1	5·7	4·3
5	Protein foods	Cured meats/poultry	Sausages	449	733·9	25·9	4·1
Costa Rica (n 790)							
1	Grains	Cooked grains	Rice	1845	433·5	7·3	17·7
2	Mixed dishes	Mixed dishes – grain-based	Rice mixed dishes	490	683·8	21·6	7·4
3	Grains	Breads, rolls and tortillas	Yeast breads	1138	263·3	5·4	6·6
4	Protein foods	Plant-based protein foods	Beans, peas and legumes	1210	217·1	4·5	5·8
5	Protein foods	Poultry	Chicken, whole pieces	443	509·6	29	5
Ecuador (n 800)							
1	Milk and dairy	Cheese	Cheese	634	327·8	9·7	10·4
2	Protein foods	Meats	Beef, excludes ground	425	368·8	14·9	7·77
3	Mixed dishes	Mixed dishes – M/P/S	Meat mixed dishes	254	1428·5	60·4	7·22
4	Mixed dishes	Mixed dishes – soups	Soups	1301	1278·8	19·5	6·61
5	Milk and dairy	Milk	Milk, whole	526	98·4	1·8	6·39
Peru (n 1100)							
1	Grains	Cooked grains	Rice	2566	915·2	8·6	42·7
2	Mixed dishes	Mixed dishes – grain-based	Rice mixed dishes	571	1576·4	36·4	15
3	Grains	Breads, rolls and tortillas	Yeast breads	2091	276·8	3·7	10·4
4	Protein foods	Poultry	Chicken, whole pieces	2006	68·9	0·9	2·5
5	Grains	Breads, rolls and tortillas	Rolls and buns	487	277·5	7·5	2·4
Venezuela (n 1100)							
1	Grains	Quick breads and bread products	Pancakes, waffles and French toast	2097	519·6	9·1	16·5
2	Milk and dairy	Cheese	Cheese	1932	301·1	4·2	8·9
3	Grains	Cooked grains	Rice	1482	391·2	5·8	8·5
4	Mixed dishes	Mixed dishes – grain-based	Turnovers and other grain-based items	534	852·9	24·9	6·9
5	Grains	Breads, rolls and tortillas	Yeast breads	944	429·1	7·8	6·1

Cons, number of times foods have been consumed by the entire population; PCT, percentage of contribution; M/P/S, meat/poultry/seafood.
*The five highest ranked food categories according to percentage of contribution to total sodium intake.

participants' country and/or administrative divisions may be taken into account when developing public health strategies, considering their sociocultural aspects.

A high consumption of dietary Na was observed with the Latin American individuals, but lower than the world average intake (4000 mg/d)[33]. Some gaps comparing to WHO recommendations might exist[34]. Discrepancies between high-income and low- and middle-income countries (i.e. Latin America countries) may be because of different ways to plan, prepare and consume foods. In Latin America, for example, a higher amount for table salt may be added to home-based preparations, along with sources deriving from industrialised items (i.e. ready-to-eat meals). Food sources with 'added sodium' may be defined as all Na added during preparation and processing. Sources may include savory snacks, sweetened beverages

and other ready-to-eat meals (e.g. canned and frozen items), in addition to the salt added to the home-based preparation. Therefore, measurements to limit and monitor salt and Na intake are needed[34]. Also, family-based strategies are needed to promote healthy eating and reduce intake of Na and other nutrients-to-limit in Latin America[35,36].

The identification of percentage of contribution of the top ranked food categories of energy, total grams consumed and nutrient-to-limit sources using a standardised food classification system (adapted to the Latin American reality) might provide important implications for the Latin America governments to provide efforts to mandate regulatory changes, including the food labels. The government can provide resources to develop the evidence base for nutrition fact panel more likely to cope with better food choices[37]. From all the Latin American countries evaluated in the ELANS study, Chile is the pioneer in the region on the development of the Food Labeling system. This is an innovative policy that implemented a nutritional profile to reduce the intake of energy, total sugars, saturated fat and Na through the incorporation of a front-of-package 'high in' warning label. The Chilean Food Labeling had an impact in the market and in the nutritional content of packaged foods. A greater percentage of foods 'high in' nutrients-to-limit and energy were withdrawn from the market. A substantial number of products were reformulated, especially in the dairy, solid fats, sugary drinks and flour-based food groups[38]. Given the Chilean case, for other Latin American countries, it is necessary to make efforts and continue developing public health policies to support and promote healthy food environments.

In the past years, the adaption of existing evidence-based tools to different realities have received greater attention[39,40]. When the ELANS started, an expertise panel provided guidance to evaluate diet and other lifestyle behaviours for policy-making. These priorities in the ELANS aimed to understand the critical role of the context to develop, adapt and deliver strategies that are appropriate, implementable, effective and sustainable for Latin America countries. Adapting the 'What We Eat in America' food classification system should address the dietary intake and behaviours to the reality of the Latin America countries. These may help to maintain the population sociocultural identities and provide a sustainable approach for healthy eating, for example, maintaining their eating traditions – that have their roots on Spanish or Portuguese cultures[41].

Strengths of the present study are the use of a large, national representative database to examine food sources of selected nutrients. The total urban population was employed to define main regions proportionally in each country first and then to select cities representing each region, that is, main cities and other representatives of the region, mixing a random method and sampling criteria, and trying to fulfil urban population coverage to the maximum possible[17]. The limitations included the use

of reported measurements that may over- or under-report dietary intake[42]. Results need to be interpreted with caution because adolescents and adults might be over-reporting their intakes of healthier foods and under-reporting their intakes of food sources of nutrients-to-limit in the diet, particularly when using 24-h recall[43]. Moreover, under-reporting is higher in overweight or obese individuals[44,45]. To reduce the impact of misreporting, data were expressed as percentage of contributions of food and beverage sources to energy, nutrient-to-limit and total grams consumed[46]. Although participants' age and sex were not taken into account when considering the analysis, majority of population were on the adult age range, which may affect the estimation of population mean of dietary intake[42,46]. Finally, the study used cross-sectional data from which casual relationships cannot be drawn.

Conclusion

Evidence from Latin America countries has shown an increased intake on nutrients-to-limit and in the prevalence of obesity and other non-communicable diseases; thus, understanding dietary food sources in these populations is important[47,48]. The present study provides detailed information on the food sources contributing to total energy, total grams consumed, Na, SFA and added sugars consumed by a representative sample of Latin American adolescents and adults aged 15–65 years from eight countries. A large proportion of total energy consumed was from energy-dense food groups (e.g. sugar-sweetened beverages and salty pastries) but also came from some food sources contributing to important vitamins and minerals (e.g. home-based preparations – soups and meat mixed dishes, milk, and beef)[46]. Awareness of food sources may be useful to create or refine dietary strategies within public health initiatives to improve the diets of individuals living in the Latin America countries.

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Supplementary material

For supplementary material accompanying this paper, visit https://doi.org/10.1017/S136898002100152X

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