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Foreword

Facts and perspectives of the first National Dietary Survey

This supplement aims to disseminate results obtained from the first dietary survey carried out in Brazil, in which food records for two non-consecutive days were obtained for each interviewee. The supplement contains six studies which address aspects linked to analyzing the prevalence of consumption of different foods, inadequate intake in different age groups, guidelines for analyzing the sample design of this research and the impact of eating out. The National Dietary Survey (INA - *Inquérito Nacional de Alimentação*) was part of the Household Budget Survey (POF — *Pesquisa de Orçamentos Familiares*), carried out by the Brazilian Institute of Geography and Statistics (IBGE – *Instituto Brasileiro de Geografia e Estatística*). The INA registered food consumption from two non-consecutive days for 34,003 individuals residing in 13,569 households corresponding to 25% of the POF sample.[10]

HISTORICAL BACKGROUND AND EVALUATION OF THE EVOLUTION OF FOOD CONSUMPTION

Evaluating dietary consumption was no easy task. Diet is a complex phenomenon and the distributions of values obtained using the tools available are subject to errors inherent to the tool, the interviewee and the interviewer. The characteristics of these errors, defines as systematic and random, should be known and controlled so that the results are precise and have power to reveal associated risks.

Historically, the effort to bring up the discussion and the methodologies of assessing food intake is connected to the work of Professor Emeritus, University of Toronto, George Beaton, whose ideas influenced researchers at the Iowa State University (ISU). The ISU researchers developed the first methods for correcting the distribution of food intake variables and continued to influence how these methods develop and improve.[5] This effort culminated in the publication of Dietary Reference Intakes (DRIs) in the 1990s. These volumes contain information on distribution parameters for needs, consumption and toxicity, which provided the foundations for implementing dietary benchmarks in evaluating and planning food intake.

Later, the involvement of researchers educated at ISU, and other establishments, in the United States National Cancer Institute (NCI), enabled analytical tools to be developed that deal with asymmetric distributions of inflated zeros in the case of foods or nutrients irregularly consumed by the population, such as whole grains, dark leafy grains, selenium or vitamin A.[13,17] In the same context, the group of researchers involved in the EPIC (European Prospective Investigation into Cancer and Nutrition) study developed in Europe, are also notable for their contribution to another analytical tool, the MSM (Multiple Source Method).[4,6,7] These groups took dietary research to new heights in analysis and application.

In the 1970s, Brazil carried out the largest national study on food intake with the National Survey of Household Expenditure (ENDEF — *Estudo Nacional da Despesa Familiar*).[9] This effort was not followed by continuity

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in periodic evaluations of food intake. Thus, the household budget surveys which followed (POF, 1987/88, 1995/96, 2002/03) harnessed indirect data on consumption by obtaining data on families' food purchasing habits. It is worth noting that the POFs from the 1980s and 1990s were primarily designed to update the structures of consumer price indices. In this historical context of evolution, in 2008-2009, when the fifth, nationwide edition of the POF took place, evaluation of individual consumption was included for the first time through the INA.[10] The INA provided the breakthrough of obtaining consumption directly, both within the home and outside, for adolescents and adults (residents age 10 and over). The five regions of the country (North, Northeast, South, Southeast and Midwest) and the households' geographical locations, either urban or rural, are considered in the POF sample. In the analyses, the POF 2008-2009 expansion factors and the complexity of the cluster sample design should be taken into consideration.

EVALUATION OF FOOD CONSUMPTION

Usual or habitual consumption of a nutrient or a food is defined as the mean of long term consumption various days for each individual.[13] Within this concept, what the 2008-2009 POF aimed to obtain was usual consumption, rather than daily (24h).[10] The mean of various days' observation of intake may provide data on usual consumption, but it is not easy to obtain for a group of individuals or for the population. Studies of populations' consumption require large, representative samples, for this reason the number of days consumption investigated is reduced for each individual, due to operational costs, the demand placed on the respondents and the quality of information obtained.[1] Few data, in general two non-consecutive days, allied with large variations poses an enormous analytical challenge. Aspects related to the sources of variations and errors in investigating food intake have been debated and have evolved in recent years.[3] Alicia Carriquiry, an ISU researcher who worked for several years on establishing analytical methods of food consumption, published a review article discussing these aspects.[1] According to Carriquiry,[1] no method or instrument currently available is capable of dealing with the sources of variations and providing effective usual individual consumption. The statistical models available to date can perform adjustments that improve the estimates of the usual intake. Possible adjustments include correcting day to day variability intra-person variability), adjusting the correlation between consecutive days of consumption, when the study design does not enable obtaining non-consecutive days; correcting confounding factors of consumption such as day of the week, sequence of the interview, and interview methodology (face to face, by telephone etc); correcting asymmetry in distribution of consumption; inflation of zeros for food or nutrient intake not often consumed; and/or correction of sample design (sample weight in cluster samples).[1,3]

The best characterization of the structure of errors of the most commonly used sample tools, such as the 24h recall, or food record, or the food frequency questionnaire allowed the implementation of corrections by statistical modelling that improve the shapes of distributions and favor more precise estimates.[3,17] Thus, there are currently more robust and informative methods of evaluating consumption which justify the effort in obtaining individual data. Obtaining data on food intake using food records or 24 hr recall (R24h) for two or more days for the individuals or subgroup of individuals in a sample allows intra-personal consumption variability and other variables of the experiment design to be corrected using statistical modelling methods.[3]

Data on individual food intake, correctly obtained and analyzed, are essential in establishing recommendations to guide health and nutrition policies, as well as when there is an interest in establishing relationships between a health outcome and habitual behavior, controlling them for possible confusing factors. Thus,

epidemiological studies are decisive in indicating behavior which promote better quality of life for the population.

THE ARTICLES' CONTENT

In de Souza et al's article, "*Alimentos mais consumidos no Brasil*" (Most consumed foods in Brazil), data on prevalence of food intakes are presented, at home and when eating out, based on data on Brazilians individual consumption. The twenty most prevalent foods consumed in the country are presented according to gender, age group, region and income band. In the analysis, the authors include data obtained from the POF's first day's food record and the objective was to describe the foods most commonly consumed by Brazilians. The results show that these were rice, coffee, beans, bread and beef.

Eating out has increased in Brazil, almost a third of spending on food takes place outside the home (results of spending on food from the most recent POF). Therefore, Bezerra et al's article, "*Consumo de alimentos fora do domicílio*" (Consumption of food away from home), was included in this series with the aim of describing and identifying factors associated with eating out in Brazil. In this analysis, information from the POF first day's food records was also used, including all food prepared and/or eaten outside of the home. Eating out was reported by 40% of interviewees, being more frequent: in younger people; among males; those living in urban areas; and those with higher per capita income. The food groups with the highest percentages of consumption outside of the home were alcoholic drinks, fried and roasted snacks, pizza, soft drinks and sandwiches.

In the article by de Veiga et al, "*Inadequação de nutrientes em adolescentes*" (Inadequate nutrient intake in Brazilian adolescents), part of the INA sample is used to describe calorie and nutrient consumption and the prevalence of inadequate micro-nutrient intake by Brazilian adolescents (10 to 18 years old). Commonly consumed nutrients were included, those which less than 5% of the sample did not report consuming (< 5% zeros). In this context, analytical methodology was used with correction for intra-person variability and prevalence of inadequate intake of seven nutrients (calcium, phosphorus, zinc and vitamins A, B12, E and C) was determined using cut off points of the estimated average requirement (EAR). For sodium, risk of consumption above the upper intake level (UL) was considered. For iron, the authors used a probabilistic sampling approach, as distribution of average requirement for adolescents is asymmetrical and so EAR cut off points cannot be used. The analyses took into account expansion factors and the cluster sample design of the POF. The authors stratified the results by the adolescents' gender and age group and described intake in terms of percentiles (10, 25, 50, 75 and 90) and prevalence of inadequate intake. The results showed high rates of prevalence for calcium and vitamin E and medium rates for sodium, phosphorus and vitamins A and C. Rates of prevalence were highest among adolescents aged 14 to 18.

Evaluating macronutrient consumption and inadequate micronutrient intake in Brazilian adults, "*Inadequação de micronutrientes em adultos*" (Inadequacy of micronutrients in adults), Araujo et al show that calorie intake is higher among men and those who live in urban areas and in the north. Inadequate intake of micronutrients, on the other hand, was most frequent among women and those who lived in rural areas and in the north east.

To estimate macro and micronutrient intake, specially compiled tables were used to analyze food and dishes reported in the 2008-2009 POF, and the method developed by the National Cancer Institute was used to estimate means and distribution percentiles of usual dietary intake of nutrients. As with the analyses of the adolescents, prevalence of inadequate intake of micronutrients in adults

was estimated by the proportion of individuals with intake lower than EAR value. When no EAR value was available (manganese and potassium), values above adequate intake (AI) were used and in these cases, inadequate intake could not be evaluated. For inadequate intake of iron, which had an asymmetrical distribution, a probabilistic approach was used; for sodium, values above the UL were used to calculate prevalence rates of inadequate intake.

The micronutrients which had the highest prevalence of inadequate intake among adults were vitamins A, D and E and the minerals calcium, sodium and magnesium. These also had the highest rates of inadequate intake among the elderly in another article in this supplement, by Fisberg et al, "*Ingestão inadequada de nutrientes em idosos*" (Inadequate nutrient intake in Brazilian elderly), using the same methodology as used to analyze intake for adults. It is worth noting that inadequate intake among the elderly in Brazil was similar for women and men and also between the different regions.

In the article by Barbosa et al, "Assessing usual dietary intake in complex sample", the objective was to highlight an adaptation of the NCI method for the sample design used in the POF, aiming to present mean distribution of usual consumption and distribution of percentiles with medians of standard error. The dietary components used in the analysis were total calorie consumption and the quantity of fruit consumed (grams/day). The NCI method has two stages, the first adjusts distribution of intake and the second estimates the product obtained of quantity with the likelihood of ingestion.[17] When applying the NCI method to POF data, the authors used balanced repeated replication to obtain standard errors and confidence intervals for the mean and for the percentiles of calorie and fruit intake. This research is an important contribution in the area of dietary analysis.

IMPACT OF THE NATIONAL DIETARY SURVEY

Using population dietary data is important in establishing food assistance programs, monitoring the nutritional state of the population, establishing dietary guidelines and government intervention policies, as well as contributing to nutritional research.

Conducting research into food intake is also important for comparing patterns and evolution of food intake, customs, habits and dietary behavior between countries and areas of the world. Therefore, the importance of the INA is shown as it means the inclusion of Brazil in those countries which monitor individual dietary intake such as the United States (Nhanes),[2] Canada,[12] the United Kingdom,[19] France,[18] Germany,[15] Belgium,[16] Denmark,[14] and South Korea.[11]

CONCLUSION

The INA is the fruit of collaboration between researchers from various Brazilian institutions. This first survey on food intake patterns at an individual level should be followed by regular repetitions to ensure trends in food and nutrient intake are identified and monitored. Developing more robust analytical tools and improving the survey will enable predictive assessments of the population's health and nutrition to be made. The articles in this supplement show the INA's potential to serve as an early warning system for producing policies and actions in health and nutrition.

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