

## Software to record 24-hour food recall: application in the Study of Cardiovascular Risks in Adolescents

*Programa para registro de recordatório alimentar de 24 horas: aplicação no Estudo de Riscos Cardiovasculares em Adolescentes*

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**ABSTRACT:** *Introduction:* The Study of Cardiovascular Risk in Adolescents (ERICA) is a national multicenter study whose purpose is to describe the cardiovascular risk profile, including obesity, changes in lipid and glucose metabolism, and blood pressure, of about 75,000 Brazilian adolescents. *Objective:* To describe the development of a tool for data collection of 24-hour food recall (REC24h) in ERICA and to report its performance in the pilot study. *Methods:* The Multiple Pass Method was used for the development of the computer program that guides REC24h interview. REC24h-ERICA uses a database composed of 1,626 food items including preparation methods and units of predefined portion sizes. Food consumption data are obtained through interviews and entered directly into REC24h-ERICA, avoiding the use of paper. *Results:* The pilot study included 1,367 adolescents, of which 1,047 (77%) responded to REC24h. The researchers did not report difficulties in program use, the average duration of interviews was 20 minutes and the interviewers inserted 50 new food items. *Conclusion:* The program developed was proven suitable for use in large-population studies, even in a country like Brazil, where there is great diversity in eating habits.

**Keywords:** Program development. Food consumption. Adolescent. Eating. Software. Feeding.

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**RESUMO: Introdução:** O Estudo de Riscos Cardiovasculares em Adolescentes (ERICA) é um estudo multicêntrico nacional cujo objetivo é traçar o perfil de risco cardiovascular, incluindo obesidade, alterações do metabolismo lipídico, glicídico e da pressão arterial de cerca de 75 mil adolescentes brasileiros. **Objetivo:** Descrever o instrumento desenvolvido para coleta de dados de recordatório alimentar de 24 horas (REC24h) no ERICA e relatar os resultados obtidos no estudo piloto. **Métodos:** Para o desenvolvimento do programa computacional que norteou a entrevista para aplicação do REC24h utilizou-se a técnica denominada *Multiple Pass Method*. O REC24h-ERICA utiliza a base de dados composta por 1.626 itens alimentares incluindo as formas de preparo e as unidades de medidas caseiras pré-definidas. Os dados de recordatório alimentar são coletados através de entrevista e digitados diretamente no REC24h-ERICA, evitando assim o uso de papel. **Resultados:** O estudo piloto incluiu 1.367 adolescentes, dos quais 1.047 (77%) responderam ao REC24h. Os pesquisadores não encontraram dificuldades para uso do programa, a duração média das entrevistas foi de 20 minutos e foram inseridos 50 alimentos novos pelos entrevistadores de campo. **Conclusão:** O programa desenvolvido mostrou-se adequado para uso em grandes estudos populacionais, mesmo em um país como o Brasil, onde existe grande diversidade de padrões alimentares.

**Palavras-chave:** Desenvolvimento de programas. Consumo de alimentos. Adolescente. Ingestão de alimentos. Software. Alimentação.

## INTRODUCTION

The objective of this communication is to describe the instrument developed to apply REC24h in ERICA and to report the results obtained in the pilot study.

The Study of Cardiovascular Risk in Adolescents (ERICA) is a national multicenter study whose purpose is to describe the cardiovascular risk profile, including obesity, changes in lipid metabolism, glucose, and blood pressure, of about 75,000 Brazilian adolescents. To assess food consumption in ERICA, we used the 24-hour food recall (REC24h). For the REC24h to be applied in a standardized manner in a sample of this magnitude and heterogeneity, a program for direct data input on portable computer was developed: ERICA-REC24h.

The purpose of this paper is to describe the instrument developed to apply REC24h in ERICA and to report the results of the pilot study.

## METHODS

To develop the program that guided interviews to apply REC24h, the Multiple Pass Method was used<sup>1</sup>. This technique stimulates the respondent to remember the food they consumed the day before through the following five steps:

1. quick listing of food and beverages consumed;
2. questions regarding food that is usually omitted;
3. time of consumption of food listed;
4. detailed description of food and quantities, reviewing the information about time, and occasion of consumption;
5. final review of information and probe on food that was consumed and were not reported.

ERICA-REC24h was developed from a database consisting of 1,626 food items, including preparation methods and portion sizes predefined by the Brazil Nutri software, developed by the Ministry of Health in partnership with the Institute of Social Medicine (Universidade do Estado do Rio de Janeiro). The database used in the National Dietary Survey (INA, acronym in Portuguese) was developed by the Brazilian Institute of Geography and Statistics, in 2008 – 2009<sup>2,3</sup>.

The program starts with filling out a question about the use of sugar/sweeteners in beverages, with the following choices: sugar; sweetener; both or nothing. After that, all food and drinks consumed by the adolescents the day before is inserted in the software, along with the location, “home,” “school,” or “on the street,” and the time of consumption.

Following which, each food item cited by the teenagers is detailed. Preparation data are then inserted, as well as type and quantity of food. “Preparation” describes the food preparation mode, for example, roasted, fried, raw, cooked, and steamed. “Unit” refers to the measure used to consume food, for example, cups, spoons, plates, knife tip, unit, among others. “Quantity” informs the number of measures the teenager had of each food item.

To prevent the loss of information in the case of food items not available on the list, the program allows the inclusion of new items.

To facilitate the registration of quantities consumed, the program offers images of household measures (such as mugs, spoons, bottles, handles, plates, bowls, cups, and glasses).

To improve the accuracy of data collection and to minimize the underestimation of consumption at the end of REC24h use, the system displays a warning message for the researcher to check with the adolescents if any food consumed the day before was not reported, particularly those usually omitted, such as candy, chewing gum, beverages, sweets, and cookies<sup>4</sup>. Furthermore, in case of an interval of more than 3 hours without eating anything or if the participant reported less than 5 food items over the past 24 hours, messages to confirm such information are generated.

After data transfer, a database with all food items consumed by adolescents is obtained. With the database ready, the new food items must be evaluated. It is possible to associate each of them with other food or synonym existing in the program’s database, or to dismember a preparation into components that are part of the database.

While considering the consumption of sugar in beverages, addition of 10 g of sugar per 100 mL of fruit juice, coffee, latte, tea, and mate when individuals reported usual consumption of sugar, and 5 g of sugar per 100 mL of these drinks when they reported regular consumption of both sugar and sweetener, have been used as standardized measures in ERICA, similar to INA procedures.

The amount of food must be then converted to mass (in grams) and/or volume (milliliters) to relate data consumption of food with a nutritional facts table<sup>5</sup>, thus estimating the intake of macro and micronutrients.

The ERICA-REC24h was used in the pilot study of ERICA held in five Brazilian cities: Rio de Janeiro (RJ), Feira de Santana (BA), Botucatu (SP), Campinas (SP), and Cuiabá (MT) in the first half of 2012. In each city, students aged 12 to 17 years from three schools (two public and one private) divided into three groups were assessed. The pilot study aimed to

evaluate the logistics and the instruments to be used in the national survey. In each team, two properly trained researchers were responsible for carrying out REC24h. The study was approved by the Research Ethics Committee (CEP) of each municipality where the study was conducted (CEP of Institute for Studies in Public Health, Universidade Federal do Rio de Janeiro — 01/2009, CEP of Medical Sciences School, University Estadual de Campinas — 161/2009, CEP of University Hospital Júlio Müller, Universidade Federal do Mato Grosso — 767/2010, CEP of Universidade Estadual de Feira de Santana — 337/2010, CEP of Botucatu Medical School, Universidade Estadual Paulista — 69/2009).

## RESULTS

Participants of the pilot study were 1,367 adolescents, of which 1,047 (77%) responded to REC24h, and 54% of the sample composed of females. Mean age was 13.8 years (standard deviation 1.5 years). Among the school children assessed, 31.2% were children whose mothers had low education level (incomplete high school).

During field work, 50 new food items were inserted by the interviewers. Analysis of food showed that: 2 items were inserted by spelling error of the researcher; 11 were entered because of the difference in the name of the food; 20 were entered by the researcher by detailing of “taste,” when the list makes no such differentiation; 13 items entered were associated with similar items and 3 were broken down into food items from the list; 1 item was inserted with regional classification (“Josefina”), which was later on associated with an item included in the program list (“Sausage”).

The researchers did not report difficulties while using the software, and the interviews lasted 20 minutes on an average. There was no need to implement changes in the software after the pilot study.

## CONCLUSION

ERICA-REC24h was proven adequate when the time of application and simplicity was taken in to consideration, as the system had friendly features that make reporting the food intake easier. The training of supervisors and field researchers and the use of household measures and alert messages in the program were strategies that ensured the quality of food consumption-related data. ERICA-REC24h enabled the direct collection of a large amount of data, eliminating the use of paper, and the need for typing. New food items could also be inserted and analyzed.

The program was found to be suitable for use in population-based studies, even in a country like Brazil, where there is great difference in the eating habit patterns. It has been adapted (free version) for use in other studies, and the manual to access and to use the program is available on ERICA Web site ([www.ERICA.ufrj.br](http://www.ERICA.ufrj.br)), in the multimedia tab. The results

obtained on food consumption through ERICA enabled a greater insight into the eating habits of young Brazilians and its association with cardiovascular risk factors throughout the country and different regions.

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## REFERENCES

1. Conway JM, Ingwersen LA, Vinyard BT, Moshfegh AJ. Effectiveness of the US Department of Agriculture 5-step multiple-pass method in assessing food intake in obese and nonobese women. *Am J Clin Nutr* 2003; 77(5): 1171-8.
2. Instituto Brasileiro de Geografia e Estatística. Pesquisa de Orçamentos Familiares 2008 - 2009: análise do consumo alimentar pessoal no Brasil. Rio de Janeiro: IBGE; 2011. Disponível em: [http://www.ibge.gov.br/home/estatistica/populacao/condicaoodevida/pof/2008\\_2009\\_analise\\_consumo/pofanalise\\_2008\\_2009.pdf](http://www.ibge.gov.br/home/estatistica/populacao/condicaoodevida/pof/2008_2009_analise_consumo/pofanalise_2008_2009.pdf)
3. Souza AM, Pereira RA, Yokoo EM, Levy RB, Sichieri R. Alimentos mais consumidos no Brasil: Inquérito Nacional de Alimentação 2008-2009. *Rev Saúde Pública* 2013; 47(Suppl 1): 190s-9s.
4. Ingwersen LA, Raper NR, Anand J, Moshfegh AJ. Validation study shows importance of probing for forgotten foods during a dietary recall. *J Am Diet Assoc* 2004; 104: 13.
5. Instituto Brasileiro de Geografia e Estatística. Pesquisa de Orçamentos Familiares (POF), 2008-2009. Tabela de composição nutricional dos alimentos consumidos no Brasil. Rio de Janeiro: IBGE; 2011. Disponível em: [http://www.ibge.gov.br/home/estatistica/populacao/condicaoodevida/pof/2008\\_2009\\_composicao\\_nutricional/pofcomposicao.pdf](http://www.ibge.gov.br/home/estatistica/populacao/condicaoodevida/pof/2008_2009_composicao_nutricional/pofcomposicao.pdf)

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