

## **Tracking the Nutritional Transition in Bolivia. A Descriptive Study**

by

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**KEYWORDS.** — Bolivia; Women; Adolescents; Nutritional Transition; Overweight.

**SUMMARY.** — The objective of the present study is to identify some of the characteristics of the nutritional transition in Bolivia. Using data from the Development and Health Surveys (DHS), the changes in the nutritional status of Bolivian women in childbearing age could be determined. While undernutrition almost disappeared in this group, an important increase of 10 % in the prevalence of overweight was observed in the period between 1994 and 1998. A gap of information on the nutritional status of other population groups was also identified. Therefore, a survey was carried out in a sample of 525 adolescents attending public and private schools of La Paz, the main Bolivian city. The findings suggest that overweight is highly prevalent in this age group (22 %). The results also suggest that female adolescents are more likely to cluster stunting and overweight.

The present study also shows the trends in food availability at household level that were obtained from the data provided by the Household Surveys of 1999, 2000, 2001 and 2002. The methodology proposed by the European Data Food Networking Initiative (DAFNE) was applied.

Disparities in food availability within the country could be observed. Rural households have systematically fewer amounts of food available than urban households do. The wealthier the households are, the higher the availability of most food groups except for potatoes and cereals. These findings suggest that Bolivian poorer households will prefer the more energy-dense and cheaper food sources.

In conclusion, overweight and stunting coexist in the same population; however, obesity is still very low. The most alarming finding is the steadily increase in energy-dense sources of food, accompanied by a decrease mainly in food of plant origin. All together, the observed changes in availability of the main food groups suggest that

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the nutritional transition is incipient in Bolivia. Therefore, interventions are urgent in order to prevent undesirable nutrition-related health outcomes such as obesity and other chronic diseases.

## Introduction

### THE NEED OF AN IMPROVED APPROACH TO NUTRITIONAL SURVEILLANCE

Many are the reported causes for the dysfunction of what has been understood as "Nutritional Surveillance" during the past decades. The three main aspects responsible for this dysfunction are *inefficiency, high cost* and *lack of sustainability* (MAIRE *et al.* 2001, BEGHIN *et al.* 2002). Therefore, an improved approach to Nutrition Surveillance has been developed in order to extend the concern from the undernutrition issues to three new domains: micronutrient deficiencies, food security and the nutritional transition where a relevant role can be played (MAIRE *et al.* 2001).

Data on nutritional status of the population is scarce worldwide. Thanks to the regular health surveys, information is mainly available in children and women of childbearing age. This is true for Bolivia and many other developing countries where the undernutrition-related problems are still of concern. Despite the availability of data, very few studies in Bolivia focused on the overweight-obesity prevalence at a population level. The prevalence of obesity worldwide is considered as an epidemic. Hence, this study lies within the philosophical frame of the World Health Organization's "Global strategy for the prevention and control of non-communicable diseases" (Director-General WHO 2002) and the newly developed approach to nutritional surveillance (BEGHIN *et al.* 2002).

Bolivia is one of the poorest countries of Latin America with more than half of the total population living under the national poverty line and in urban areas. In this context, the Bolivian National Institute of Statistics carried out three health surveys, in 1988, 1994 and 1998, from which up-to-date information on nutrition, demographics and health is available. Anthropometrics are available for children in all survey years, and only in the latter two for women who have had a child in the previous 3-5 years. Since datasets were available for secondary analysis and no previous reports existed on the changes in prevalence of overweight and obesity in the adult population, an opportunity was open to investigate these features and their associated socioeconomic and ecological factors (PEREZ-CUETO & KOLSTEREN 2004, MARTORELL *et al.* 1998).

Nutritional surveys are the most specific tool for nutritional surveillance. However, they are time, labour and resources consuming. In Bolivia, the household surveys developed by the MECOVI (Measurement of Living Conditions in Latin

America and the Caribbean) programme provide valuable information on sociodemographic characteristics that can be linked to food availability and hence they can be used for surveillance purposes (PEREZ-CUETO 2003).

The idea to use Household Survey for monitoring food availability and nutritional information in Bolivian households is based on the experience of the European Data Food Networking that has been using Household Budget Surveys (HBS) data, which contain similar information than Household Surveys, for the assessment of nutritional information. This methodology makes use of HBS to estimate and monitor food availability at individual level having as a main objective the between and within countries comparison (LAGIOU & TRICHOPOULOU 2001).

The main methodological differences between the MECOVI surveys and the HBS are that an interviewer records the former, while a household member records HBS. Food availability is registered in a Food Frequency type of Questionnaire in the MECOVI surveys, while in HBS the households record food purchases, own production and gifts during a specific period.

#### DEFINITION OF THE NUTRITIONAL TRANSITION

The concept of nutritional transition comes within the general frame of the epidemiological transition, both in developed and developing countries. The nutritional transition is characterized by an increase in the prevalence overweight and obesity at a population level. The main cause for this increase is an imbalance of energy due to a shift from traditional and probably healthier eating patterns towards the so-called Western diet, and a reduction in physical activity due to urbanization and lifestyle (BERNSTEIN *et al.* 2004). The main consequence of this transitional situation is the dramatic increase in the prevalence of chronic non-communicable diseases such as cardiovascular disease (FREEDMAN *et al.* 1999), type II diabetes (BARCELO *et al.* 2001) mellitus and a certain number of cancers (BIANCHINI *et al.* 2002).

The objective of this paper is to describe some of the characteristics of the nutritional transition in Bolivia, in terms of the epidemiology of overweight coexisting with undernutrition-related problems, and in terms of the current food availability patterns at household level.

### Nutritional Status of the Population

#### WOMEN IN CHILDBEARING AGE

Shifts towards greater BMI (Body Mass Index) and coexistence of underweight and overweight in the same society have been observed in the Bolivian

population (PEREZ-CUETO & KOLSTEREN 2004). Table 1 shows the mean values of the Body Mass Index in Bolivian women according to their age group. The observed differences are statistically significant between the two years ( $P < 0.05$ ) in all groups except the 40-44 one.

**Table 1**

Mean values of the Body Mass Index in Bolivian women according to their age group

5-year age groups	Survey 1994 Mean (SD)	Survey 1998 Mean (SD)	P value *
15-19 years	23 (2)	23 (3)	0.003
20-24 years	24 (4)	24 (3)	<0.001
25-29 years	24 (4)	25 (4)	0.014
30-34 years	25 (4)	25 (4)	0.003
35-39 years	25 (4)	26 (4)	0.007
40-44 years	25 (4)	26 (4)	0.250
45-49 years	24 (2)	26 (6)	0.036

\* ANOVA Test.

Table 2 shows the prevalence of underweight, overweight and obesity among Bolivian women in childbearing age. Differences are statistically significant between both surveys with the exception of obesity. These findings, in agreement with those displayed in table 1, suggest that an important increase in the prevalence of overweight has happened in a short period. In general terms, overweight and obesity together were present in 45 % of the surveyed women, while the prevalence of underweight was almost irrelevant. These figures suggest also that obesity and other chronic and degenerative diseases

**Table 2**

Prevalence of underweight, overweight and obesity  
among Bolivian women in childbearing age 1994-1998

Nutritional status	Survey 1994	Survey 1998	P value*
Undernutrition BMI < 18.5 kg/m <sup>2</sup>	2%	1%	< 0.001
Normal 18.5 ≤ BMI < 25 kg/m <sup>2</sup>	63%	54%	< 0.001
Overweight 25 ≤ BMI < 30 kg/m <sup>2</sup>	26%	35%	< 0.001
Obesity BMI ≥ 30 kg/m <sup>2</sup>	9%	10%	0.246

\*  $\chi^2$  Test at the 0.05 level.

(BIANCHINI *et al.* 2002, MARTORELL *et al.* 1998) may become a burden for public health budgets in the near future (THOMPSON & WOLF 2001). Obesity impairs quality of life (KOLOTKIN *et al.* 2001) and has been identified as a strong predictor of mortality from all causes combined (SOLOMON & MANSON 1997) amongst which cardiovascular disease (MURRAY & LOPEZ 1997) and some cancers (BIANCHINI *et al.* 2002).

## ADOLESCENTS

In Bolivia, the availability of anthropometric data of adolescents is scarce. The only sources of representative information on female adolescents who had had a child in the past three years are the regular Development and Health Surveys. However, nutritional status in terms of BMI may be confounded by the recent birth of the child. Therefore, between August and September 2003, a survey was carried out in a sample of adolescents attending public and private schools of the Capital city of La Paz (PEREZ-CUETO *et al.* 2004).

The main findings of the study are that female gender and wealth are associated to overweight. Overweight was defined using the cut-off points suggested by the International Obesity Task Force (IOTF) (COLE *et al.* 2000). Stunting was defined according to the World Health Organization's recommended cut-offs (WHO Expert Committee 1995). Table 3 shows the nutritional status of a sample of 525 adolescents from La Paz, Bolivia. The table describes two important aspects of the nutritional transition: first, the coexistence of a non-neglectable proportion of stunted and overweight subjects in the same population; secondly, it shows that 7.6 % ( $\pm 1.3$ ) of the adolescents in the sample are both stunted and overweight, but also that girls are more likely to cluster both characteristics.

**Table 3**  
Nutritional status of a sample of 525 adolescents from La Paz, Bolivia

Nutritional status	Boys prevalence (95 % CI)	Girls prevalence (95 % CI)	<i>P</i> value of the difference between boys and girls <sup>a</sup>
Stunted	23.5 (18.1-28.9)	35.8 (30.6-41.2)	<0.001
Overweight <sup>b</sup>	12.2 (8.0-16.4)	26.1 (21.0-31.2)	<0.001
Obesity <sup>b</sup>	3.4 (1.1-5.7)	1.4 (0-2.8)	0.13
Overweight & stunted	3.8 (1.3-6.2)	8.7 (3.4-14)	0.022

<sup>a</sup>  $\chi^2$  test of two proportions at the 0.05 level.

<sup>b</sup> Overweight and obesity were defined using the IOTF cut-off points (COLE *et al.* 2000).

The coexistence of stunting and overweight in the same population and even within the same household has been documented as one of the symptoms of the nutritional transition in developing societies. Wealthier Chinese households consuming a diet high in fat and protein were more likely to have overweight and underweight members at the same time (DOAK *et al.* 2002). Adolescent BMI predicts cardiovascular risk in later life (JEFFREYS *et al.* 2003, OREN *et al.* 2003, RAMAN 2002). Even more, overweight in adolescence has been suggested as a more powerful predictor of morbidity risks than overweight in adulthood (MUST *et al.* 1992, DIETZ 2004). Therefore, the present findings suggest that female adolescents living in La Paz may be almost four times more at risk of obesity and therefore of chronic disease later in life than their male peers, and that the high prevalence of overweight may affect their later social and economic status (GORTEMAKER *et al.* 1993, SOBAL 1994).

Therefore, urgent actions in the field of nutrition should be undertaken in Bolivia in order to prevent future undesirable health outcomes, focusing particularly on females. These findings also reveal the need of enhanced surveillance of the nutritional status of Bolivian males and elderly people, for whom the risk of nutrition-related chronic diseases may be of greater concern.

### **Food Availability and Westernization of Diet**

The next step in the study was to find some possible ecological explanations to the current nutritional status of women and adolescents. Therefore, a thorough analysis of the food available at household level was performed using the MECOVI datasets.

Based on the data provided by the four national representative surveys (1999, 2000, 2001 and 2002), and applying the methodology proposed by the European Data Food Networking Initiative, the availability of thirteen food groups has been estimated. Figure 1 shows the trends in mean availability of selected food groups for the survey years. Food availability in Bolivian households has shown a regular behaviour in the studied period (1999-2002). Dramatic changes have not been observed. The preferred food groups are cereals, tubers, fruits, vegetables, meat and milk. The high levels of the first four food groups suggest a preference for foods of plant origin, while national availability of meat & meat products and milk & dairy products is moderate.

Of concern is the steady increase observed in availability of added lipids while the availability of milk, meat, fruits, vegetables and cereals decreased in Bolivian households in the period and taking 1999 as reference. These figures reveal another feature of the nutritional transition: a steady increase in energy-dense sources of food, accompanied by a decrease mainly in foods of

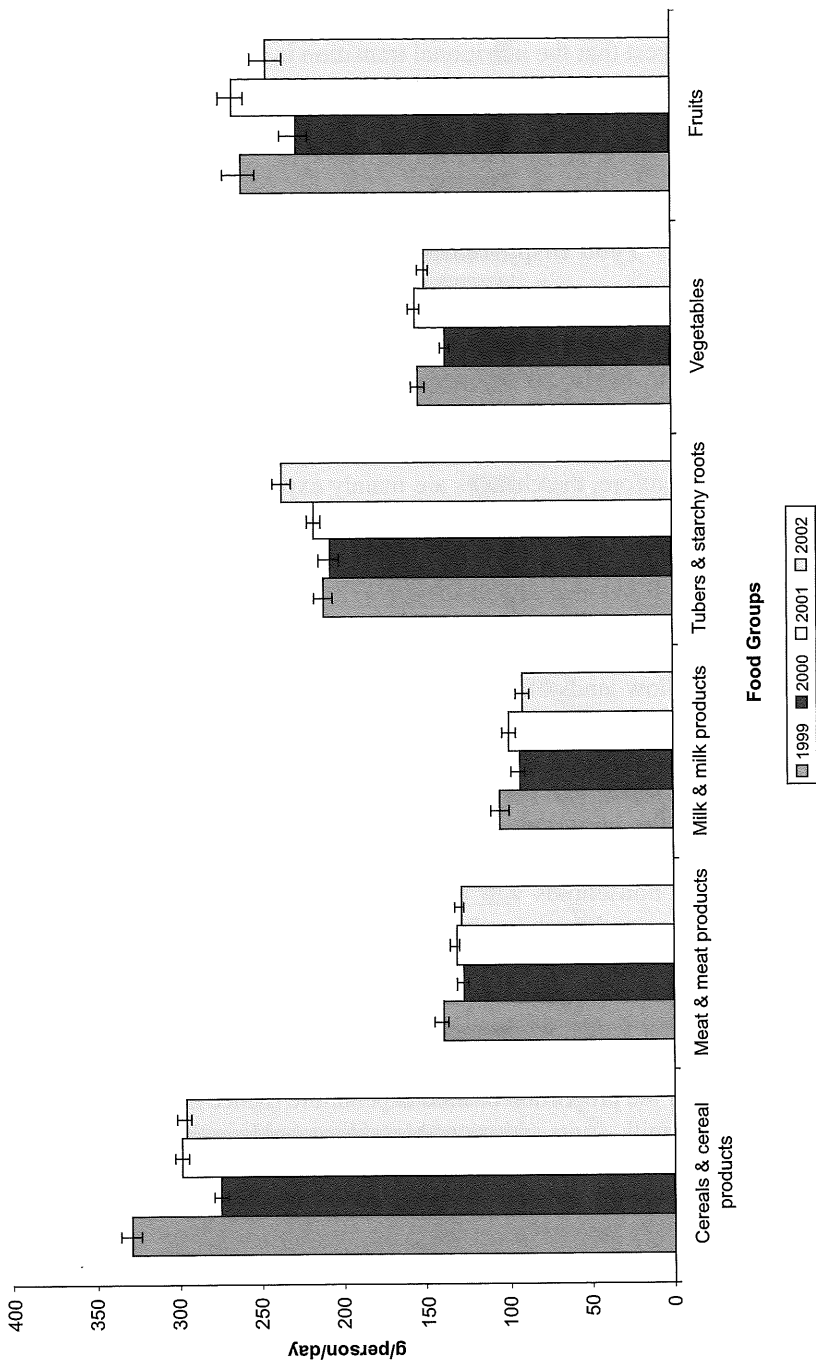


Fig. 1. — Trends in food availability of selected food groups (1999-2002).

vegetal origin. However, the changes observed in availability of the main food groups suggest that the nutritional transition is incipient in Bolivia. This agrees furthermore with the findings in prevalence of overweight and obesity. Obesity is still low prevalent in the country, which may be ecologically associated with the traditional food pattern available at household level.

### **Food Disparities within the Country**

The analysis of the data obtained from the HS allows depicting disparities in food availability at household level by region, locality, educational level (LAGIOU & TRICHOPOULOU 2001, LIBERATOS *et al.* 1988) of the household head and by quintile of proportion of food expenditures (JAMES *et al.* 1997).

In rural Bolivia, the availability of most of the food groups remained steady in the period; therefore, the changes are mainly explained by the purchases of urban households. However, in contrast to the national aggregated trend, rural households increased significantly their availability of cereals, tubers and meat.

The Bolivian highlands and valleys show a similar behaviour. In both regions, a tendency to decrease the availability of cereals, meat, milk, fruits and vegetables, together with a tendency to increase potato availability, was observed. In the low lands of the country, the contrary trends were observed.

The most striking disparities in Bolivia are found in the availability of foods according to the educational level of the household head. Figure 2 reveals a proportional gradient of availability: the higher the educational achievement of the household head, the higher the availability of food at home. This is true for all food groups except for tubers and starchy roots. Lower educated households will purchase significantly more potatoes and cassava than those with higher education.

A similar observation can be taken from the analysis of the quintiles of the proportion of food expenditures. Wealthy households spend proportionally less of their budgets on foods, while poorer ones devote most of their income to food (JAMES *et al.* 1997, TRICHOPOULOU *et al.* 2002). The households in the lower quintiles of the proportion of food expenditure (hence the wealthier ones) have more meat, milk, fruits and vegetables. Households in the higher quintiles will have significantly more quantities of cereals, tubers and added lipids.

### **Conclusions**

The present study allows to classify Bolivia as a country in early stages of the nutritional transition: low prevalence of obesity, and a still traditional food



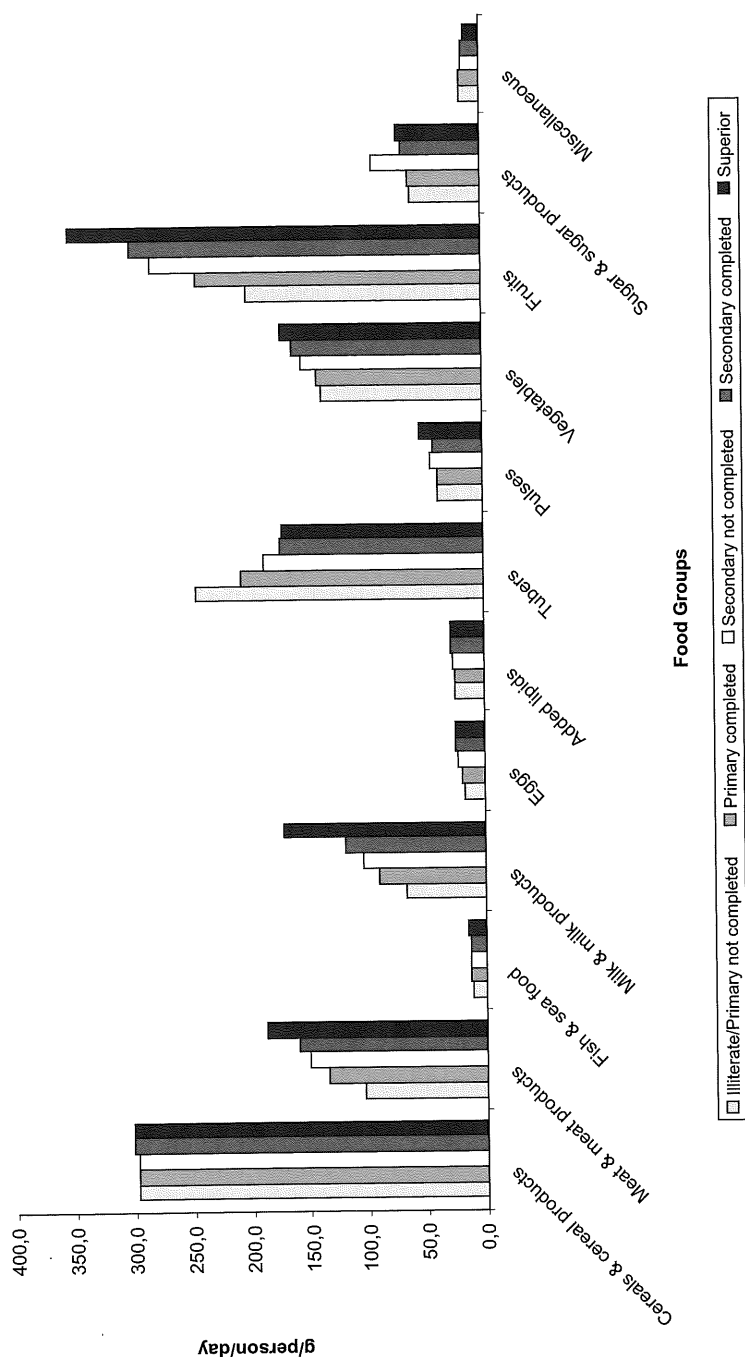


Fig. 2. — Food availability in Bolivian households according to the educational achievement of the household's head.

consumption pattern. The coexistence of overnutrition- and undernutrition-related problems in the same population is also a fact of concern, since it has been previously associated with the clustering of unhealthy eating and lifestyle patterns (DOAK *et al.* 2002). Therefore, the alarming prevalence of overweight in females should bring the attention to the danger of developing an epidemic of obesity and other chronic diseases (BIANCHINI *et al.* 2002, BJORNTORP 1998) that impair the quality of life (KOLOTKIN *et al.* 2001) and may reduce life expectancy (GOTTLIEB 2003). Based on these findings, it would be in the Bolivian population's best interest to implement policies and programmes aiming at the revalorization of traditional foods and the prevention of obesity (BLAIR & NICHAMAN 2002).

Disparities in food availability have been observed. Regional disparities were not as striking as the differences between the wealthier and the poorer Bolivians. The most economically disadvantaged people are, nevertheless, much more efficient in the use of their income (MAXWELL & FRANKENBERGER 2003). They will therefore prefer the cheaper sources of energy to the detriment of fruits and vegetables. However, the wealthier people and regions (the Low Lands) are more likely to show the characteristics of the nutritional transition (PEREZ-CUETO & KOLSTEREN 2004).

Of concern is the compromise of quality of the diet in favour of energy-dense and filling foods that was observed amongst the less wealthy households purchasing mainly tubers and cereals, to the detriment of fruits and vegetables. These findings support the need to enhance interventions aiming at the increase of food security, in terms also of quality, in the poorer groups of the population (MAXWELL & FRANKENBERGER 2003).

This study also provides evidence supporting the new approach to nutritional surveillance: finding and exploiting cheaper sources of data and focusing on the emerging overnutrition-related health concerns (BEGHIN *et al.* 2002). Even more, it also provides support for the use of alternative methodologies for the estimation of food availability at more disaggregated levels, in order to identify disparities within the country (BYRD-BREDBENNER *et al.* 2000, TRICHOPOULOU *et al.* 1999, TRICHOPOULOU 2001).

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## REFERENCES

- BARCELO, A., DAROCA, M.C., RIBERA, R., DUARTE, E., ZAPATA, A. & VOHRA, M. 2001. Diabetes in Bolivia. — *Rev. Panam. Salud Publica*, **10**: 318-323.
- BEGHIN, I., MAIRE, B., KOLSTEREN, P.W. & DELPEUCH, F. 2002. La surveillance nutritionnelle: 25 ans après. — *Cahiers Santé*, **12**: 112-116.
- BERNSTEIN, M.S., COSTANZA, M.C. & MORABIA, A. 2004. Association of physical activity intensity levels with overweight and obesity in a population-based sample of adults. — *Prev. Med.*, **38**: 94-104.
- BIANCHINI, F., KAKS, R. & VAINIO, H. 2002. Overweight, obesity, and cancer risk. — *Lancet Oncol.*, **3**: 565-574.
- BJORNTORP, P. 1998. Obesity: a chronic disease with alarming prevalence and consequences. — *J. Intern. Med.*, **244**: 267-269.
- BLAIR, S.N. & NICHAMAN, M.Z. 2002. The public health problem of increasing prevalence rates of obesity and what should be done about it. — *Mayo Clin. Proc.*, **77**: 109-113.
- BYRD-BREDBENNER, C., LAGIOU, P. & TRICHOPOULOU, A. 2000. A comparison of household food availability in 11 countries. — *Journal of Human Nutrition and Dietetics*, **13**: 197-204.
- COLE, T. J., BELLIZZI, M.C., FLEGAL, K.M. & DIETZ, W.H. 2000. Establishing a standard definition for child overweight and obesity worldwide: international survey. — *BMJ*, **320**: 1240-1243.
- DIETZ, W.H. 2004. Overweight in childhood and adolescence. — *N. Engl. J. Med.*, **350** (9):855-857.
- Director-General WHO 2002. Global strategy for the prevention and control of non-communicable diseases. — *In*: Report of the WHO (Geneva, March 22nd 2002), **A53** (14): 6 pp.
- DOAK, C., ADAIR, L., BENTLEY, M., FENGYING, Z. & POPKIN, B. 2002. The underweight/overweight household: an exploration of household sociodemographic and dietary factors in China. — *Public Health Nutr.*, **5**: 215-221.
- FREEDMAN, D.S., DIETZ, W.H., SRINIVASAN, S.R. & BERENSON, G.S. 1999. The relation of overweight to cardiovascular risk factors among children and adolescents: the Bogalusa Heart Study. — *Pediatr.*, **103**: 1175-1182.
- GORTMAKER, S.L., MUST, A., PERRIN, J.M., SOBOL, A.M. & DIETZ, W.H. 1993. Social and economic consequences of overweight in adolescence and young adulthood. — *N. Engl. J. Med.*, **329** (14): 1008-1012.
- GOTTLIEB, S. 2003. Obesity in young blacks is linked to a 20-year reduction in life span. — *BMJ*, **326**.
- JAMES, W.P., NELSON, M., RALPH, A. & LEATHER, S. 1997. Socioeconomic determinants of health. The contribution of nutrition to inequalities in health. — *BMJ*, **314**: 1545-1549.
- JEFFREYS, M., MCCARRON, P., GUNNELL, D., MCEWEN, J. & SMITH, G.D. 2003. Body mass index in early and mid-adulthood, and subsequent mortality: a historical cohort study. — *Int. J. Obes. Relat. Metab. Disord.*, **27** (11):1391-1397.
- KOLOTKIN, R.L., METER, K., WILLIAMS, G.R. 2001. Quality of life and obesity. — *Obes. Rev.*, **2**: 219-229.
- LAGIOU, P. & TRICHOPOULOU, A. 2001. The DAFNE initiative: the methodology for assessing dietary patterns across Europe using household budget survey data. — *Public Health Nutrition*, **4**: 1135-1141.

- LIBERATOS, P., LINK, B.G. & KELSEY, J.L. 1988. The measurement of social class in epidemiology. — *Epidemiol. Rev.*, **10**: 87-121.
- MAIRE, B., BEGHIN, I., DELPEUCH, F., KOLSTEREN, P.W. & REMAUT, A.M. 2001. Nutritional surveillance: a sustainable operational approach. — Antwerp, Institute of Tropical Medicine, 69 pp.
- MARTORELL, R., KHAN, L.K., HUGHES, M.L. & GRUMMER-STRAWN, L.M. 1998. Obesity in Latin American women and children. — *J. Nutr.*, **128**: 1464-1473.
- MAXWELL, S. & FRANKENBERGER, T.R. 2003. Household food security: concepts, indicators, measurements. A technical review. — New York, Rome, UNICEF, IFAD, 274 pp.
- MURRAY, C.J. & LOPEZ, A.D. 1997. Mortality by cause for eight regions of the world: Global Burden of Disease Study. — *Lancet*, **349**: 1269-1276.
- MUST, A., JACQUES, P. F., DALLAL, G. E., BAJEMA, C. J. & DIETZ, W. H. 1992. Long-term morbidity and mortality of overweight adolescents. A follow-up of the Harvard Growth Study of 1922 to 1935. — *N. Engl. J. Med.*, **327** (19):1350-1355.
- OREN, A., VOS, L. E., UITERWAAL, C.S., GORISSEN, W. H., GROBBEE, D. E. & BOTS, M. L. 2003. Change in body mass index from adolescence to young adulthood and increased carotid intima-media thickness at 28 years of age: the Atherosclerosis Risk in Young Adults study. — *Int. J. Obes. Relat. Metab. Disord.*, **27** (11):1383-1390.
- PEREZ-CUETO, F. J. 2003. Utilización de las encuestas MECOVI para la estimación de la disponibilidad de alimentos en los hogares bolivianos. INE. La Paz. — *Revista de Estudios Económicos y Sociales*, **3**: 47-78.
- PEREZ-CUETO, F. J. & KOLSTEREN, P.W. 2004. Changes in the nutritional status of Bolivian women 1994-1998: demographic and social predictors. — *Eur. J. Clin. Nutr.*, **58**: 660-666.
- PEREZ-CUETO, A., ALMANZA, M. & KOLSTEREN, P.W. 2004. Female gender and wealth are associated to overweight among adolescents in La Paz, Bolivia. — *Eur. J. Clin. Nutr.* (Advance Online Publication), 11 August 2004.
- RAMAN, R.P. 2002. Obesity and health risks. — *J. Am. Coll. Nutr.*, **21** (2):134S-139S.
- SOBAL, J. 1994. Social and economic consequences of overweight in adolescence. — *N. Engl. J. Med.*, **330** (9): 647.
- SOLOMON, C.G. & MANSON, J.E. 1997. Obesity and mortality: a review of the epidemiologic data. — *Am. J. Clin. Nutr.*, **66**: 1044S-1050S.
- THOMPSON, D. & WOLF, A.M. 2001. The medical-care cost burden of obesity. — *Obes. Rev.*, **2**: 189-197.
- TRICHOPOULOU, A. 2001. The DAFNE databank as a simple tool for nutrition policy. DATA Food NETworking. — *Public Health Nutrition*, **4**: 1187-1198.
- TRICHOPOULOU, A., LAGIOU, P., NELSON, M., REMAUT, A.M., KELLEHER, C., LEONHAUSER, I., MOREIRAS, O., SCHMITT, A., SEKULA, W., TRYGG, K. & ZAJKAS, G. 1999. Food disparities in 10 European countries: Their detection using household budget survey data. The DATA Food NETworking (DAFNE). — *Initiative. Nutrition Today*, **34**: 129-139.
- TRICHOPOULOU, A., NASKA, A. & COSTACOU, T. 2002. Disparities in food habits across Europe. — *Proc. Nutr. Soc.*, **61**: 553-558.
- WHO Expert Committee 1995. Physical status: the use and interpretation of anthropometry. — In: Report of the WHO (Geneva, 1995), **854**: 453 pp.