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# DIETARY PATTERNS AND NON-COMMUNICABLE DISEASES IN SELECTED LATIN AMERICAN COUNTRIES

María Eugenia Bonilla-Chacín, Luis T. Marcano Vázquez, Ricardo Sierra, Úrsula Aldana

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## Health, Nutrition, and Population (HNP) Discussion Paper

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# Health, Nutrition and Population (HNP) Discussion Paper

## Dietary Patterns and Noncommunicable Diseases in Selected Latin American Countries

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Paper prepared as background for a regional study on Promoting Healthy Living in Latin America and the Caribbean: Governance for Multisectoral Activities to Prevent Health Risk Factors and for a sub-regional study on Promoting Health Living in Central America. This work was financed by the World Bank and the Spanish Fund for Latin America and the Caribbean (SFLAC).

**Abstract**: To raise awareness among policymakers and health practitioners about unhealthy diets, this document examines dietary patterns in selected Latin American countries using household surveys. The analysis shows that a large percentage of households in the countries examined have inadequate diets. Not only are calorie intakes higher than recommended to maintain a healthy weight, but the diets are also rich in fats, particularly saturated fats, sugars and sodium, and poor in fruits and vegetables. These unhealthy diets are present in both rural and urban areas and in households at different income levels. These dietary patterns are likely to increase the risks for developing non-communicable diseases such as cardiovascular diseases, certain types of cancer, and diabetes mellitus. These diseases are increasingly representing the main causes of death and disability in Latin America, and thus there is an urgent need to increase efforts to promote healthy diets. There are cost-effective interventions that have proven to improve diets, particularly to reduce sodium and trans fat intake, and there are promising examples in the region of the implementation of some of these cost-effective interventions. In addition, given the harmful effects of these dietary patterns, it is important to monitor the prevalence of unhealthy diets across different population groups as well as the intermediate risks factors linked to these diets, such as overweight and obesity, high blood pressure, and high fasting glucose in the blood. This would require better information than what is currently available and information that is comparable across time.

**Keywords**: unhealthy diets, calories, macronutrients, noncommunicable diseases, Latin America.

**Disclaimer:** The findings, interpretations, and conclusions expressed in the paper are entirely those of the authors, and do not represent the views of the World Bank, its Executive Directors, or the countries they represent.

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# DIETARY PATTERNS IN SELECTED LATIN AMERICAN COUNTRIES AND NON-COMMUNICABLE DISEASES

## Introduction

1. **The purpose of this document is to raise awareness among policymakers and practitioners about unhealthy dietary patterns in Latin America; patterns that increase the risk of developing non-communicable diseases (NCDs)**. The objective of the paper is to analyze, using household surveys, the dietary patterns in selected Latin American countries; how they vary across income level, location of residence, and across time. Specifically, the study analyzes the following aspects: (i) levels and sources of calorie intake; (ii) fat, sugar, and dietary fiber intake; and (iii) sodium intake. The paper concludes with a review of population-based policies to improve diets and prevent NCDs.

2. **Non-communicable diseases are the main cause of death and disability in Latin America; their contribution to the burden of disease has been increasing fast**. Cardiovascular diseases, in particular, are the main cause of death in the countries considered in this study: Bolivia, Costa Rica, Ecuador, Guatemala, Honduras, Nicaragua and Panama.[1] In all these countries but Costa Rica, age-standardized cardiovascular disease death rates are higher than those in higher income OECD countries.[2] A similar pattern can be found for cancer, which represents the second main cause of death in most countries in the region. Diabetes is also an important cause of death and disability in the region.[3] NCDs tend to affect older population, but even if we look at main causes of years of life lost in the region, NCDs still remain among the first five main causes. For instance, following the Burden of Disease study of 2010[4], the main causes of years of life lost in central Latin America (Central America, Mexico, Colombia and Venezuela) are violence, followed by ischemic heart disease, road injuries, lower respiratory infections and diabetes mellitus. Among Andean countries, the main causes of years of life lost are: lower respiratory infections, road injuries, ischemic heart disease, preterm birth complications, and cerebrovascular disease. In contrast, in 1990 the main causes of years of life lost in central Latin America were: diarrheal diseases, lower respiratory infections, interpersonal violence, preterm birth, and ischemic heart disease; while in Andean countries the first five causes in that year were all communicable diseases or maternal and child conditions, including

[1] WHO, 2008 and 2011. Global Burden of Disease 2004 and 2008. Online database available at: http://www.who.int/healthinfo/global_burden_disease/estimates_country/en/index.html.
[2] Bonilla-Chacín, M. and Marcano Vásquez, L. 2012.
[3] WHO 2011.
[4] Lozano, R. et al 2012.

lower respiratory infections, diarrheal diseases, preterm birth complications, neonatal encephalopathy and tuberculosis.[5]

3. **A large share of NCDs can be prevented**. Cardiovascular diseases, cancers and diabetes mellitus share a number of biological risk factors: high blood pressure, high blood glucose, abnormal blood lipids, and overweight/obesity.[6] These are the result of common factors such as unhealthy diets, physical inactivity, tobacco use, and the harmful use of alcohol, all of which are amenable to public policy changes. In this paper, we are examining one of those modifiable risk factors: unhealthy diets.

4. **Diets rich in fat, salt and sugar and poor in fruits and vegetables generate important risks for the development of chronic diseases**. Diets rich in animal fats, such as meats, eggs, and dairy products increase the level of cholesterol in the blood and thus also increase the risk of cardiovascular diseases.[7] Eliminating saturated fats and trans-fats from foods and substituting them with monosaturated and polyunsaturated fats, not only decreases the risk of coronary heart disease but it might also reduce the risk of type 2 diabetes, which is associated with the consumption of saturated fats and trans-fats and inversely associated with polyunsaturated fats from vegetable sources.[8] Diets dense in sodium are associated with high blood pressure and coronary heart disease.[9] In addition, energy dense and micronutrient poor diets (such as diets high in fats and sugars or starches) promote weight gain and thus overweight and obesity. The latter are also important risks for developing cardiovascular diseases, diabetes, some cancers such as colon, breast and endometrial cancer, and musculoskeletal diseases like osteoarthritis.[10] In addition, sugars are the most important factor associated with the development of dental caries.[11]

## Literature Review

5. **The average daily calorie intake has been increasing over the last decades, particularly in high income countries**. Food supply data from the US shows that the average calorie intake increased by 12 percent or about 300 calories per capita per day between 1985 and 2000.[12] Also there has been an increase in portion sizes, an increase in energy density of foods consumed, and an increase in snacking and the share of foods eaten outside the home.[13]

[5] http://www.healthmetricsandevaluation.org/gbd/visualizations/gbd-2010-change-leading-causes-and-risks-between-1990-and-2010
[6] WHO 2005.
[7] http://www.cdc.gov/heartdisease/index.htm
[8] Hu FB et al 2002;288(20):2569-2578
[9] Brown IJ et al. 2009; 1-23.
[10] http://www.who.int/mediacentre/factsheets/fs311/en/
[11] WHO 2003.
[12] Putman et al 2002.
[13] Ledikwe et al 2005.

6. **Not only is average calorie intake increasing, but the sources of these calories have also been changing**. Diets across the world are changing from mainly plant-based to increasingly animal-based diets.[14] Countries at different income levels have reduced their consumption of fiber and complex carbohydrates and increased their consumption of fats and sugary foods, particularly sugar sweetened beverages.[15,16] There is evidence from the US showing that in the year 2000 the per capita food supply provided 65 grams of added fat, a 23 percent increase from the consumption in the early 1980s.[17] There is also evidence from all over the world of an increased supply in caloric sweeteners available for consumption; in the year 2000, there were about 74 more calories per capita of caloric sweetener consumed than in 1962, this is an increase of 32 percent.[18] There is also evidence from the US showing that between 1977 and 2001, Americans increased the portion of total energy obtained from soft drinks and fruit drinks, while decreasing the amount of milk consumption, for a net increase in total calories of about 278 calories.[19] Finally, there is evidence of an increase in the fat intake and sugar intake across countries of different income levels.[20]

7. Changes in the nutrition patterns in developed countries have been linked to the obesity epidemic in these countries, as well as the increase in other non-communicable conditions. A longitudinal analysis of developed countries that estimated the relative contribution of increased calorie intake and reduced physical activity to obesity concluded that the rising obesity is primarily the result of consuming more calories.[21]

8. The analysis in this paper covers only a few countries in Latin America and the Caribbean. Three studies carried out in Brazil[22], Bolivia[23] and Mexico[24] previously did a subset of the analysis presented in this paper using income and expenditure surveys. These three studies use adult equivalent measures, but only to estimate total calories and per groups of foods, not macronutrients, with the exception of a small set in the case of Brazil (carbohydrates, lipids and proteins).

[14] WHO 2003.
[15] Drewnowski 1997.
[16] Popkin 2006.
[17] Putman et al 2002.
[18] Popkin and Nielsen 2003.
[19] Nielsen and Popkin 2004.
[20] Kearney 2010.
[21] Bleich et al 2007.
[22] Moreira Claro el al 2010.
[23] Pérez Cueto 2003.
[24] Rivera et al 2002.

## Methodology

9. This paper uses Living Standard Measurement Surveys (LSMS), Income and Expenditures Surveys, and the nutritional database of the U.S. Department of Agriculture. Living Standards Surveys and Income and Expenditure Surveys provide information on food consumption at the household level, and information on quantity and cost of different food items consumed. The nutritional database of the USDA provides the food composition at product level.

10. There are three types of data that are commonly used to evaluate food availability and consumption patterns in the world.[25] The first type is data on food supply and utilization, which form the basis of food balance sheets. These data allow an assessment of food availability at an aggregate level, not of food actually consumed. In addition, these data would not allow any examination of the patterns of consumption or food availability across different socioeconomic groups. The second type is data from household income and expenditure surveys, which is used in this study. Although these data can only provide information at a household level, it allows evaluations of socioeconomic variations across population groups. Finally, the third are data from individual food consumption surveys. This is the most reliable source of data for this type of analysis; however, individual nutrition surveys are expensive and time consuming, and not many countries have conducted them. None of the countries included in this study have nationally representative individual nutrition surveys. Table 1 presents results using the three types of data for the early 1990s for Canada and a few European countries. As seen in the table, results using household budget surveys, although higher than those using individual food consumption surveys, are lower than those using food balance sheets.

**Table 1: Mean Intake of Energy and Macronutrients as Reflected in Food Balance Sheets (FBS), Household Budget Surveys (HBS), and Individual Surveys (IDS) – 1990-1992**

| | Canada | | | Poland | | | Spain | | |
|---|---|---|---|---|---|---|---|---|---|
| | **FBS** | **HBS** | **IDS** | **FBS** | **HBS** | **IDS** | **FBS** | **HBS** | **IDS** |
| Energy (kcal) | 3017 | 2115 | 2057 | 3348 | 2629 | 2093 | 3688 | 2634 | 2022 |
| Protein (g) | 94.8 | 81.3 | 87.2 | 102.5 | 71.6 | 68.2 | 105.0 | 93.5 | 90.7 |
| Carbohydrates (g) | 331.0 | 269.4 | 239.7 | 442.0 | 344.0 | 264.9 | 364.3 | 294.0 | 201.7 |
| Fat (g) | 128.4 | 84.6 | 80.4 | 114.7 | 106.9 | 83.3 | 181.2 | 121.0 | 84.1 |

Source: L. Serra-Majem et al 2003.

11. This study analyses two years of detailed nutrition information from Bolivia, Guatemala, Nicaragua and Panama, and one year for all other countries. In most countries, the years analyzed are close to each other; most of the information comes from the first half of the 2000s.

[25] Serra-Majem L et al 2003.

In the case of Nicaragua, although data from the first two years came from comparable surveys, the sample frame slightly changed between the two surveys[26], and thus the results are not fully comparable. In addition, the 2009 data might reflect the effects of the economic and financial crisis; thus its results need to be assessed with caution.

12. The surveys used for this study are different across countries and thus it is not possible to make reliable country comparisons; for instance, average calorie intake in Costa Rica seems to be lower than in Guatemala and Nicaragua, which are lower income countries (Table 3). The household survey used to examine dietary patterns in Costa Rica is an income and expenditure survey, which has a different design and instruments than those used in the other two countries, which were living conditions surveys. Nevertheless, it is possible to evaluate within country differences and observe general trends in dietary patterns in the region.

**Table 2: Types of Surveys Available Per Country**

| | **Baseline** | **Follow up** |
|---|---|---|
| Bolivia | Household Survey 2000 | Household Survey 2009 |
| Costa Rica | Income and Expenditures, 2004 | n/a |
| Ecuador | Living Standards, 2005-2006 | |
| Guatemala | Living Standards, 2000 | Living Standards, 2005/6 |
| Honduras | Living Standards, 2004 | n/a |
| Nicaragua | Living Standards, 2001 | Living Standards, 2005, 2009 |
| Panama | Living Standards, 2003 | Living Standards, 2008 |

Source?

13. To estimate the nutritional profile of households, the study identified and inputted the USDA codification of the nutritional database to the food items listed in the Living Standard and Income and Expenditure Surveys. Food items in the surveys were first matched with the USDA nutritional database. Most fruits, vegetables, beverages, and meats were matched at this stage. Products that were not matched were mainly local and traditional meals, some fruits or vegetables without translation into English, and unusual foods. Meals in the surveys with equivalent items in the USDA database were then identified. The list of Latino foods in the USDA database helped in matching several items in the surveys.[27]

[26] The 2005 survey included larger samples in areas already surveyed in 2001 and also sampled new towns that did not exist in the previous census (1995). The expansion of the sample was not neutral. The biggest expansion was carried out in those departments where poverty incidence was the highest, probably areas with difficult access, or where population was sparsely distributed.

[27] For example, the USDA database includes several types of *tamales* and bean soups, specific items like *arepas*, *pupusas*, *empanadas*, and typical Latino meals. Finally, meals without equivalences were broken down into their components and matched by the main ingredient. For example, "prepared turkey" (pavo preparado) was coded as the item "turkey, all classes, meat and skin, cooked, roasted" in the USDA database.

14. Once this matching was completed, the macro and micro nutrient components of each food were estimated. First, the amount of food was converted into grams using as reference the typical size of the product. Once the weight of products was obtained, nutritional consumption was assessed in terms of energy, carbohydrates, fats, and sodium. Energy was measured in calories and, carbohydrates, fats and sodium in grams. Finally, the food consumed was classified based on the food groups used in "My Plate", which is part of the communication strategy of the "Dietary Guidelines for Americans, 2010".[28] These groups are: grains, proteins (different types of meat), vegetables (divided into roots, vegetables, and vegetable proteins, such as beans and seeds), fruits, dairy products, and oils. The "added sugar category", which includes sweetened beverages, candies and other desserts, was added to the classification.

15. The nutrient equivalent (Ni) of the food item (i) was estimated as follows:

$$N_i = \frac{Q_i}{15} * \frac{p_i}{100} * \frac{f(N)_i^k}{100}$$

where

$Q_i$ = Quantity in grams of food item (i) bought or acquired by the household in last 15 days.

$p_i$= Percentage of edible portion, assumed to be 100.

$f(N)_i^k$= Conversion factor for the relevant nutrient or proximate (k) from nutritional database per 100 grams; (k) may be calories, carbohydrates, fat or sodium.

# Results

## Calorie Intake

16. **The mean calorie intake in most countries analyzed is similar to that of much richer countries.** Table 3 shows that most adults in the countries analyzed have an average daily calorie intake that is similar to the per capita intake of Canada, Poland and Spain during the early 1990s. More recent data from an individual nutrition survey from the US, the National Health and Nutrition Examination Survey 2007-2008, also shows similar levels of consumption: 2,504 calories for adult men and 1,771 calories for adult women.[29] All these countries have relatively large percentages of people overweight and obese. Nonetheless and as previously mentioned, these estimates are not fully comparable across countries, particularly not the ones from the US as they were carried out using an individual consumption survey.

[28] US Department of Agriculture and US Department of Health and Human Services 2010.
[29] Wright and Wan 2010.

**Table 3: Average Calorie Intake per Adult Equivalent in Selected Latin American Countries and Average Per Capita Intake in Higher Income Countries**

| Country and survey year | Average intake | [95% confidence intervals] | |
|---|---|---|---|
| Bolivia 2009 | 2,341 | 2,253 | 2,430 |
| Costa Rica 2004 | 1,908 | 1,904 | 1,911 |
| Ecuador 2006 | 1,955 | 1,915 | 1,994 |
| Guatemala 2006 | 2,594 | 2,590 | 2,598 |
| Honduras 2004 | 1,801 | 1,799 | 1,802 |
| Nicaragua 2009 | 2,185 | 2,183 | 2,187 |
| Panama 2008 | 2450 | 2411 | 2490 |
| Canada 1990-1992 | 2115 | | |
| Poland 1990-1992 | 2629 | | |
| Spain 1990-1992 | 2634 | | |

Source: Study analysis for Latin America and Serra-Majem et al 2003 for other countries.

17. **The average calorie intake in the region increases with socioeconomic levels**. The average (apparent) calorie consumption per adult equivalent[30] in all countries and all years assessed increases with consumption quintiles (Table 4). For instance, in Panama and Nicaragua, the calorie intake per adult equivalent in households in the richest quintile of the consumption distribution is almost three times higher than in households in the poorest quintile. This is not surprising given the existing levels of inequality in the region, and since the income elasticity of demand for food is positive, and tends to be relatively high in low and middle income countries. For instance, in 2005 a study estimated that the income elasticity for food, beverages and tobacco was higher than 0.7 in Ecuador and Bolivia (the two countries that are common in both studies); while the average income elasticity in the middle income countries considered was 0.657.[31]

18. **In three of the four countries with two years of data, these socioeconomic differences were reduced over time, Panama being the sole exception.** This decrease in inequality in the consumption of calories reflects the reduction in income inequality the region has been enjoying since the early 2000s. While in 2002 the average Gini coefficient in LAC was 0.57, it was 0.509 by 2009.[32]

[30] Adult equivalent is a measure of per capita consumption that takes into account the heterogeneity of household composition (see methodological annex for more details).
[31] Income elasticity in that study is measured as the total percentage increase in the consumption of food, beverage and tobacco if total expenditure in all categories increases by 1 percent.
[32] Cornia 2012.

**Table 4: Average per Adult Equivalent (seemingly) Calorie Intake in Selected Countries, by Urban and Rural Areas and by Consumption Quintiles**

| | | | | Consumption Quintiles | | | | |
|---|---|---|---|---|---|---|---|---|
| **Country and year** | **Total** | **Urban** | **Rural** | **Poorest** | **II** | **III** | **IV** | **Richest** |
| **Bolivia 2000** | 1744 | 1860 | 1542 | 1156 | 1558 | 1826 | 1993 | 2187 |
| **Bolivia 2009** | 2341 | 2303 | 2417 | 1583 | 2150 | 2393 | 2685 | 2898 |
| **Costa Rica 2004** | 1,908 | 1,900 | 1,920 | 1,289 | 1,664 | 1,889 | 2,197 | 2,479 |
| **Ecuador 2006** | 1,955 | 1,971 | 1,922 | 1,346 | 1,773 | 2,013 | 2,250 | 2,391 |
| **Guatemala 2000** | 2,442 | 3,208 | 1,853 | 1,885 | 2,125 | 2,406 | 2,770 | 3,023 |
| **Guatemala 2006** | 2,587 | 2,731 | 2,419 | 2,632 | 2,488 | 2,619 | 2,599 | 2,594 |
| **Honduras 2004** | 1,801 | 2,089 | 1,496 | 1,278 | 1,641 | 1,948 | 2,077 | 2,095 |
| **Nicaragua 2005** | 2,202 | 2,423 | 1,893 | 1,104 | 1,641 | 1,987 | 2,482 | 3,048 |
| **Nicaragua 2009** | 2,185 | 2,310 | 1,993 | 1,159 | 1,682 | 2,040 | 2,387 | 2,969 |
| **Panama 2003** | 1,938 | 1,987 | 1,850 | 1,046 | 1,494 | 1,789 | 2,150 | 2,487 |
| **Panama 2008** | 2450 | 2648 | 2052 | 1225 | 1738 | 1993 | 2561 | 3636 |

Note: Confidence intervals are in the Annex 2.

Source: Estimates from Income and Expenditure Survey for Costa Rica 2004 and Living Conditions Surveys for Guatemala 2011, Nicaragua 2009, and Panama 2008.

19. **In Bolivia, Guatemala and Panama the average calorie intake increased between the two years of available data, while in Nicaragua it slightly decreased**. The pattern in the former three countries is found in many countries in the world. Income per capita grew in all these countries in the periods considered, and this is not surprising. What is surprising is that in the cases of Guatemala and Panama, the two years are not far apart and that this increase, at least in the case of Panama, happened across all the consumption distribution, including richer households where calorie intake was already high. The calorie intake increase in Guatemala was mainly due to an increase in the calorie intake in rural areas. In contrast, calorie intake in urban areas decreased from a very large level in the first year. In Nicaragua, the pattern remained very similar, decreasing slightly, although this might be the results of the impact of the economic crisis of 2009.

20. **In all countries but Costa Rica, calorie intake is higher in urban areas than in rural areas**. However, for those countries where more than one year is available, changes in the rural/urban pattern can be observed. While in Panama the difference in calorie intake between rural and urban areas increases between the two surveys, in the other three countries, Bolivia, Guatemala and Nicaragua, it decreases. In Nicaragua, for instance, in 2009 the average calorie intake in urban areas decreased, while that of rural areas increased relative to 2005. While it is not clear why this is the case, it is possible that this change in the pattern of consumption between rural and urban areas in Nicaragua is associated with the global economic crisis of 2009, which could have affected the two areas differently. In Bolivia, between the two available surveys, calorie intake increased in all areas, but it increased more in rural areas, and in 2009 calorie consumption in cities is not statistically different from that in rural areas.

**Table 5: Calorie Needs by Gender, Age and Activity Levels – US Dietary Guidelines for Americans 2005**

| | | Activity Level | | |
|---|---|---|---|---|
| | | Sedentary | Moderately Active | Active |
| Gender | Age (years) | Calories | | |
| Child | .1-3 | 1,000 | 1,000-1,400 | 1,000-1,400 |
| Female | 4–8 | 1,200 | 1,400–1,600 | 1,400–1,800 |
| | 9–13 | 1,600 | 1,600–2,000 | 1,800–2,200 |
| | 14–18 | 1,800 | 2,000 | 2,400 |
| | 19–30 | 2,000 | 2,000–2,200 | 2,400 |
| | 31–50 | 1,800 | 2,000 | 2,200 |
| | 51+ | 1,600 | 1,800 | 2,000–2,200 |
| Male | 4–8 | 1,400 | 1,400–1,600 | 1,600–2,000 |
| | 9–13 | 1,800 | 1,800–2,200 | 2,000–2,600 |
| | 14–18 | 2,200 | 2,400–2,800 | 2,800–3,200 |
| | 19–30 | 2,400 | 2,600–2,800 | 3,000 |
| | 31–50 | 2,200 | 2,400–2,600 | 2,800–3,000 |
| | 51+ | 2,000 | 2,200–2,400 | 2,400–2,800 |

Source: US Department of Health and Human Services:
http://www.health.gov/dietaryguidelines/dga2005/healthieryou/html/chapter4.html#chap4table2

21. **In the selected countries, an important share of households have calorie intakes per adult equivalent that are higher than what would be needed to maintain a healthy weight, particularly among households in urban areas**. The needed calorie intake for an individual to maintain a healthy weight varies with gender, age, and level of physical activity. As this study is based on household information, the benchmark used for the upper most level is 3,000 calories per adult equivalent. Only active adult men would need calorie intakes as high as this threshold.[33] In all countries an important share of households has higher calorie intake than would be needed to maintain a healthy weight; in some cases as many as 20 to 30 percent of households have intakes per adult equivalent that are higher than 3,000 calories (Table 6). The problem seems to be greater in urban than in rural areas with the sole exception of Costa Rica. As calorie intake increases with income quintile, it is likely that the percentage of households with intake higher than 3,000 calories also increases with income.

[33] Table 5 has calorie recommendations from the US Dietary Guidelines of 2005.

**Table 6: Percentage of Households with Different Ranges of Calorie Intake Per Adult Equivalent in Different countries in Rural and Urban Areas**

| Country and year | Calorie Ranges | Total | Urban | Rural |
|---|---|---|---|---|
| Costa Rica 2004 | <2000 | 65.37% | 66.5% | 63.5% |
| | 2000-3000 | 15.4% | 14.9% | 16.3% |
| | >3000 | 19.21% | 18.6% | 20.2% |
| Guatemala 2006 | <2000 | 36.8% | 31.1% | 43.4% |
| | 2000-3000 | 31.3% | 32.8% | 29.6% |
| | >3000 | 31.9% | 36.1% | 27.0% |
| Honduras 2004 | <2000 | 58.5% | 47.9% | 69.8% |
| | 2000-3000 | 29.8% | 36.4% | 22.8% |
| | >3000 | 11.7% | 15.8% | 7.4% |
| Nicaragua 2009 | <2000 | 56.9% | 52.1% | 64.3% |
| | 2000-3000 | 25.7% | 28.0% | 22.1% |
| | >3000 | 17.4% | 19.9% | 13.6% |
| Panama 2008 | <2000 | 64.6% | 63.9% | 66.0% |
| | 2000-3000 | 22.1% | 23.7% | 19.0% |
| | >3000 | 13.3% | 12.5% | 15.0% |

Source: Estimates from Income and Expenditure Survey for Costa Rica 2004 and Living Conditions Surveys for Guatemala 2011, Nicaragua 2009 and Panama 2008.

22. Although this information is not enough to conclude whether this high calorie intake would result in a higher number of people overweight and obese, the limited evidence available seems to point in this direction. Overweight and obesity[34] are the result of imbalances between calorie intake and energy expenditure. The surveys used in this study do not provide information on physical activity and energy expenditure. Nevertheless, evidence from developed countries shows that the main variable explaining the increasing trend in obesity is an increase in energy intake.[35] With the exception of Bolivia, there is no reliable information on trends of people overweight and obese in the selected countries. Table 7 shows an increase in the percentage of obese women in Bolivia between 2003 and 2008; as can be seen in the table, this increase occurred in all socioeconomic groups. At the same time, between 2000 and 2009 calorie intake per adult equivalent in Bolivia increased across all income quintiles and in both rural and urban areas (Table 4).

[34] Body mass index (BMI) is the ration of a person's weight and height (BMI = ($kg/m^2$)) and it is a proxy of body fat. A person is considered overweight if her BMI >=25 and obese if her BMI>=30.
[35] Bleich et al 2007.

**Table 7: Obesity Among non-Pregnant Women (15-49 years) in Bolivia 2003 and 2008**

| | Poorest | II | III | IV | Richest | Total |
|---|---|---|---|---|---|---|
| **Bolivia 2003** | 5.9 | 12.2 | 16.4 | 19.1 | 17.5 | 15.1 |
| **Bolivia 2008** | 8.3 | 15.6 | 20.2 | 23.1 | 16.8 | 17.4 |

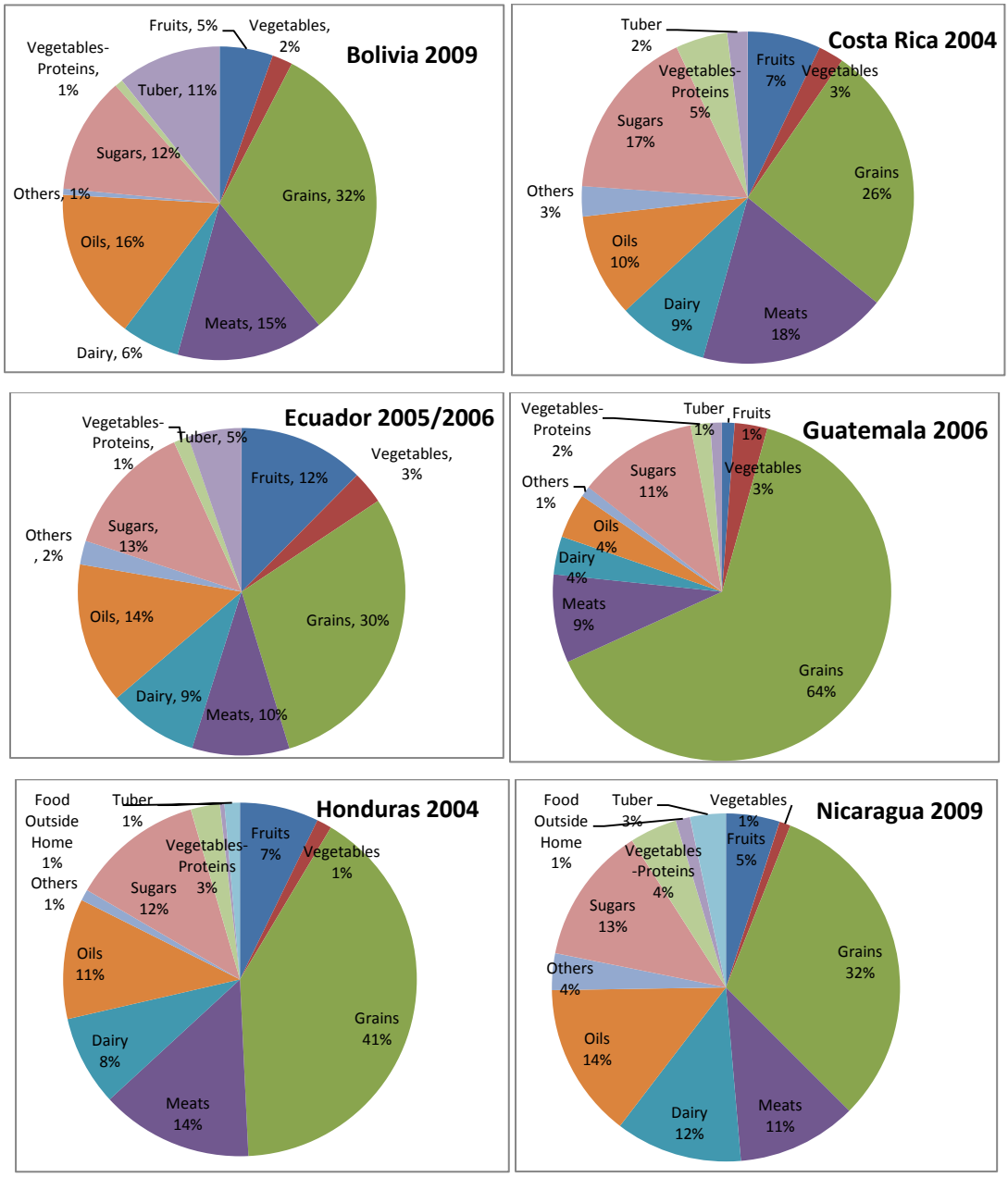
Source: DHS Surveys.

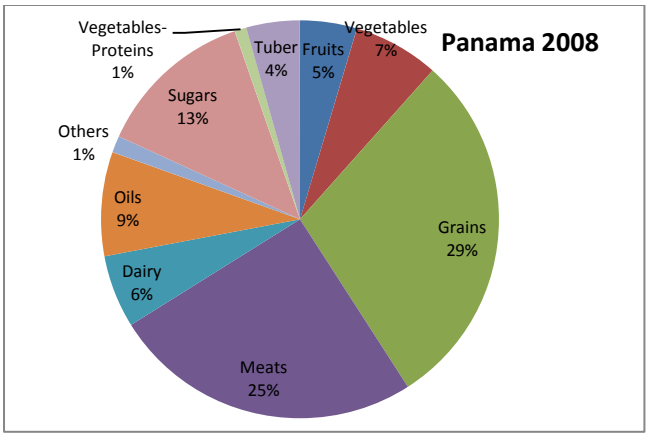
## Sources of Energy

23. To simplify the discussion on dietary patterns in the selected countries, this section uses "My Plate" food classification, modified to include tubers, added sugars and oils. This classification includes: vegetables; vegetable proteins, including seeds, beans and others; tubers; grains, including whole grains, refined grains, tortillas, bread, pasta, breakfast cereals, etc.; animal proteins (meats), including fish, chicken, eggs, beef, etc.; dairy, including milk, cheese, yogurt, ice cream, etc.; oils, including vegetable oils, margarine, and butter; and added sugars, including mainly sugar sweetened beverages, cakes, candies, and other desserts. A later section discusses dietary patterns in the sub-region in terms of macronutrients and a few micronutrients.

24. **We can identify three different patterns of energy sources in the sub-region; what differentiates the three patterns is how important grains and animal proteins are in the total household calorie intake.** The first pattern is that of Guatemala where two thirds of the total calorie intake comes from grains, mainly maize. The second pattern is that of the richest two countries, Costa Rica and Panama. These two countries have a large share of calories coming from meats and dairy as well as the largest share of calories from fruits and vegetables. Costa Rican households also have the highest share of calories from added sugars in the sub-region, while Panama has the highest share of calories from oils. Finally, the third pattern is that of Bolivia, Ecuador, Honduras, and Nicaragua where grains represent between a third and two fifths of total calorie intake and where all other sources of calories consumed are distributed somewhat evenly among the different types of food. In the latter countries, Ecuador has a relatively different pattern, as this is the country with the largest share of fruits and vegetables consumption in all the countries analyzed.

## Figure 1: Sources of Household Calorie Intake in Selected Countries






Source: Estimates from an Income and Expenditure Survey for Costa Rica 2004, Living Conditions Surveys for Ecuador 2005/2006, Guatemala 2011, Nicaragua 2009 and Panama 2008.
Note: The category grains include not only grains but also vegetable proteins, mainly beans and seeds.

25. **In Guatemala (Table 8), more than half of the entire calorie intake comes from grains in both years, although more in 2006 when grains and vegetable proteins represented more than 60 percent of the total calorie intake.** Between the two years, on average, grain consumption increased. While the share of grains and vegetable proteins in total calorie intake in 2000 is not very different in rural and urban areas, in 2006 this difference is large as grain consumption increased in rural areas and decreased in cities.

**Table 8: Average Calories Per Adult Equivalent Per Food Item – Guatemala 2000 and 2006**

| | Nation | | Urban | | Rural | |
|---|---|---|---|---|---|---|
| | **2000** | **2006** | **2000** | **2006** | **2000** | **2006** |
| Fruits | 31.5 | 34.4 | 51.2 | 44.0 | 16.4 | 23.3 |
| Vegetables | 116.9 | 86.5 | 161.2 | 103.0 | 83.0 | 67.5 |
| Grains | 1,340.6 | 1,621.9 | 1,891.1 | 1,664.9 | 918.2 | 1,572.2 |
| Proteins | 248.7 | 227.2 | 338.7 | 268.4 | 179.7 | 179.4 |
| Dairy | 74.6 | 100.9 | 102.2 | 119.9 | 53.4 | 78.9 |
| Oils | 138.1 | 114.6 | 163.8 | 132.1 | 118.3 | 94.2 |
| Others | 40.8 | 26.8 | 48.5 | 26.5 | 34.9 | 27.2 |
| Added Sugars | 358.2 | 293.0 | 362.2 | 290.2 | 355.2 | 296.3 |
| Vegetable Proteins | 43.3 | 46.3 | 39.5 | 43.9 | 46.2 | 49.1 |
| Tuber | 44.8 | 30.3 | 46.8 | 32.3 | 43.2 | 28.0 |

Source: Estimates using the Guatemala Living Conditions Surveys 2000 and 2006.

26. **In the two richest countries, Panama and Costa Rica, the consumption of animal proteins and dairy as a percentage of total calorie intake is higher than in the other countries.** In both countries, animal proteins and dairy contribute more than 25 percent of the total calorie intake (Figure 1). Both countries also have a large percentage of their calorie intake

coming from added sugars; Costa Rica is the country with the highest share of calorie intake from sugars, representing 17 percent of the total intake. These two countries also have a relatively high share of calorie intake from fruits and vegetables, representing more than 13 percent of the total intake.

**Table 9: Average Calories Per Adult Equivalent Per Food Item – Panama 2003 and 2008 and Costa Rica 2004**

| | Panama | | | | Costa Rica | |
|---|---|---|---|---|---|---|
| | Urban | | Rural | | Urban | Rural |
| | 2003 | 2008 | 2003 | 2008 | 2004 | 2004 |
| Fruits | 64.8 | 75.6 | 122.3 | 181.1 | 152.2 | 115.8 |
| Vegetables | 139.1 | 113.2 | 119.2 | 200.3 | 54.0 | 37.7 |
| Grains | 544.4 | 521.9 | 560.1 | 571.4 | 500.0 | 500.4 |
| Proteins | 548.1 | 545.1 | 427.8 | 421.9 | 394.8 | 303.9 |
| Dairy | 140.1 | 122.1 | 74.8 | 73.3 | 174.1 | 156.0 |
| Oils | 179.3 | 904.2 | 139.0 | 167.1 | 156.5 | 223.8 |
| Others | 26.5 | 24.1 | 28.0 | 28.2 | 54.9 | 59.4 |
| Added Sugars | 246.5 | 237.5 | 240.8 | 279.5 | 278.6 | 369.3 |
| Vegetables-Proteins | 18.6 | 35.2 | 20.0 | 21.8 | 80.3 | 112.3 |
| Tuber | 63.6 | 52.5 | 109.6 | 96.1 | 41.7 | 32.5 |

Source: Estimates from the Costa Rica Income and Expenditure Survey 2004 and the Panama Living Conditions Surveys 2003 and 2008.

27. **In Panama, there is a large difference in the pattern of calorie intake between urban and rural areas in the two years.** These differences are, in part, reflecting the large income differences between the two areas in the country. In contrast to the other countries analyzed, where urban areas have higher consumption of all food groups with only few exceptions, in Panama households in urban areas have higher consumption of proteins, dairy, and oils, while those in rural areas have higher consumption of vegetables and fruits. The largest difference is in the share of oils in the total calorie consumption, which in urban areas represents 35 percent of the total calorie intake, while in rural areas only 10 percent. There is little difference in the consumption pattern in rural areas in the two years examined, with the exception of oils.

28. **In Bolivia, Ecuador, Honduras and Nicaragua more than a third of total calorie intake comes from grains**; less than 8 percent from fruits and vegetables (with the exception of Ecuador, where fruits represent about 15 percent of the total intake); more than 20 percent from meats and dairy; about 12 percent from refined sugars; and more than 10 percent of calorie intake from oils. In the two Andean countries, the consumption of tubers is relatively high, particularly in Bolivia.

## Fruit and Vegetable Intake

29. **The consumption of fruits and vegetables can promote weight loss and reduce the risk of coronary heart disease, partly due to their high content of dietary fiber.** Based on this, the WHO/FAO recommended level of fruit and vegetable consumption is more than 400 grams per person per day.[36] The WHO and FAO recommendations excludes tubers, like potatoes, yucca and others from this classification and thus from the recommendation of 400 grams of fruits and vegetables per day.

30. **With the sole exception of Ecuador, the consumption of fruits and vegetables in the selected countries is lower than recommended to live a healthy life**. On average, the consumption of fruits and vegetables in all countries analyzed is lower than the WHO/FAO recommended threshold (Table 10). The exception is Ecuador, where daily average consumption of fruits alone is already more than 400 grams in households at the richer end of the consumption distribution.

**Table 10: Average Adult Equivalent (seemingly) Consumption in Grams of Fruits and Vegetables by Countries, Rural and Urban Areas, and Consumption Quintile**

| | | | | | Consumption Quintiles | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Country and year** | | **Total** | **Urban** | **Rural** | **Poorest** | **II** | **III** | **IV** | **Richest** |
| **Bolivia 2009** | **Fruits** | 216 | 232 | 185 | 94 | 182 | 227 | 277 | 298 |
| | **Vegetables** | 77 | 80 | 70 | 41 | 62 | 86 | 92 | 102 |
| | **Veg - Proteins** | 18 | 18 | 17 | 10 | 16 | 20 | 21 | 22 |
| | **Tubers** | 246 | 198 | 338 | 245 | 245 | 247 | 234 | 257 |
| **Costa Rica 2004** | **Fruits** | 143 | 167 | 104 | 67 | 80 | 142 | 176 | 247 |
| | **Vegetables** | 100 | 111 | 83 | 51 | 73 | 96 | 121 | 160 |
| | **Veg - Proteins** | 35 | 29 | 43 | 32 | 37 | 35 | 35 | 34 |
| **Ecuador 2005/06** | **Fruits** | 402 | 419 | 371 | 251 | 317 | 392 | 475 | 578 |
| | **Vegetables** | 94 | 104 | 75 | 47 | 74 | 97 | 117 | 138 |
| | **Veg - Proteins** | 34 | 33 | 36 | 21 | 30 | 36 | 41 | 42 |
| **Guatemala 2006** | **Fruits** | 127 | 154 | 96 | 84 | 90 | 113 | 147 | 202 |
| | **Vegetables** | 329 | 364 | 287 | 240 | 272 | 309 | 380 | 443 |
| | **Veg- Proteins** | 195 | 171 | 224 | 169 | 206 | 203 | 203 | 194 |
| **Honduras 2004** | **Fruits** | 176 | 257 | 91 | 59 | 106 | 173 | 237 | 314 |
| | **Vegetables** | 77 | 105 | 47 | 31 | 51 | 75 | 101 | 130 |
| | **Veg - Proteins** | 47 | 49 | 44 | 43 | 48 | 50 | 49 | 43 |
| **Nicaragua 2005** | **Fruits** | 195 | 194 | 196 | 126 | 136 | 167 | 193 | 290 |
| | **Vegetables** | 83 | 103 | 52 | 20 | 43 | 62 | 88 | 150 |

[36] WHO 2003.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Veg - Proteins** | 68 | 54 | 88 | 75 | 71 | 70 | 67 | 61 |
| **Panama 2008** | **Fruits** | 91 | 87 | 100 | 60 | 65 | 64 | 93 | 138 |
| | **Vegetables** | 207 | 180 | 261 | 287 | 140 | 150 | 190 | 262 |
| | **Veg - Proteins** | 53 | 60 | 39 | 21 | 34 | 36 | 42 | 100 |

Source: Estimates from the Income and Expenditure Survey of Costa Rica and Living Conditions Surveys of Guatemala, Honduras, Nicaragua, and Panama.

31. **With the sole exception of Panama, the total consumption of fruits and vegetables in all countries is higher in cities than in rural areas.** Only in the case of beans and other vegetables rich in proteins, is the consumption in rural areas higher than in urban centers. Finally, in the case of Bolivia, the average consumption of tubers was included as this is the country with the highest share of calories coming from tubers. The average consumption of fruits and vegetables in Bolivia is below the recommended thresholds; however, the average consumption of tubers is very high, almost as high as the consumption of all other vegetables and fruits combined.

## Macronutrient intake: Fats, Sugars, Dietary Fiber

32. **There is evidence from different parts of the world and particularly from high income countries of an increase in fat intake**.[37] There is also evidence that the consumption of fatty foods is not concentrated in high income households but thanks to the increased availability of relatively cheap vegetable oils, there is a high intake of fatty foods in households at different income levels. This increase in consumption of fatty foods is a worrisome trend due to the links between fats, particularly trans fats and saturated fats, and NCDs.

33. In the selected countries as we have seen before, **the higher income countries are more likely to have large consumption of animal proteins and animal fats**. But these are not the only sources of fatty foods in the region, vegetable oils and some processed foods are also important sources of trans fat, saturated, polyunsaturated and unsaturated fats. This study uses the Institute of Medicine 2006 Dietary Reference Intake thresholds for healthy fat consumption. The maximum recommended intake of fats for adults is about 111 grams per day. Table 11 presents the recommended ranges for different macro and micronutrients. The table is based on recommended energy levels of between 2,000 and 3,000 Kcal per adult per day. The thresholds for all other macronutrients are based on this Kcal range and in recommended levels of different micro and macronutrients for adults.

[37] Kearney 2010.

**Table 11: Institute of Medicine Dietary Guidelines**

| Name | IOM RANGES (grams) | |
|---|---|---|
| **Macronutrients** | **Min** | **Max** |
| Carbohydrate | 228 | 494 |
| Proteins | 39 | 204 |
| **Fats** | | |
| Fatty acids, total saturated | 5.0 | 19.0 |
| Fatty acids, total monounsaturated | 0.5 | 1.6 |
| Fatty acids, total polyunsaturated | 4.4 | 17.0 |
| Total lipid (fat) | 42.4 | 111.2 |
| **Fiber and sugars** | | |
| Fiber, total dietary | 30 | 38 |
| Sugars, total | 0 | 76 |
| **Minerals** | **(micrograms)** | |
| Sodium | 1300 | 2,300 |

Source: Institute of Medicine of the National Academies 2006.
Note: These ranges were created based on a range of calorie intake of 2000 to 3000 calories per adult per day.

34. **A large percentage of the households in the region have fat intakes which are higher than recommended for a healthy diet.** This large intake particularly affects the two countries with the highest income, Costa Rica and Panama. These two countries have more than 10 percent of households with total fat intake above the recommended level in both urban and rural areas. In Panama's urban areas, almost a fourth of households have total fat intake higher than the recommended level.

**Table 12: Percentage of Households with Total Fat Intake Higher than the IOM Recommended Level**

| Country and year | Total | Urban | Rural |
|---|---|---|---|
| Costa Rica 2004 | 14.13% | 13.3% | 15.5% |
| Guatemala 2006 | 4.8% | 6.3% | 3.1% |
| Honduras 2004 | 5.9% | 8.6% | 3.0% |
| Nicaragua 2009 | 6.7% | 7.5% | 6.2% |
| Panama 2008 | 18.5% | 19.6% | 16.4% |

Source: Estimates from the Income and Expenditure Survey of Costa Rica and Living Conditions Surveys of Guatemala, Honduras, Nicaragua and Panama.

35. **In the region, only Panama has on average higher total fat consumption than recommended.** On average, only households in the two highest income quintiles in Panama have total fat consumption higher than the recommended levels. Nicaragua and Panama have the largest income gradient with households in the richest end of the income distribution having fat intake that is about 2.3 and 7 times higher than households in the poorest end of the distribution. Households in urban areas are more likely to have higher fat intake than recommended.

**Table 13: Average Total Fat Consumption Per Adult Equivalent Across Rural and Urban Areas and Consumption Quintiles – (in grams)**

| | | | | Consumption Quintiles | | | | |
|---|---|---|---|---|---|---|---|---|
| **Country and year** | **Total** | **Urban** | **Rural** | **Poorest** | **II** | **III** | **IV** | **Richest** |
| **Bolivia 2009** | 76.4 | 79.2 | 70.8 | 43.8 | 66.2 | 78.8 | 93.1 | 100.1 |
| **Costa Rica 2004** | 58.3 | 57.9 | 59.0 | 38.2 | 50.1 | 55.8 | 68.8 | 78.1 |
| **Ecuador 2005/06** | 59.7 | 60.6 | 57.8 | 39.0 | 54.9 | 61.9 | 69.7 | 73.0 |
| **Guatemala 2006** | 51.1 | 56.1 | 45.2 | 49.5 | 45.9 | 52.3 | 52.8 | 54.8 |
| **Honduras 2004** | 52.4 | 63.1 | 41.2 | 31.2 | 44.4 | 58.2 | 64.5 | 65.0 |
| **Nicaragua 2009** | 60.2 | 62.6 | 56.4 | 32.7 | 48.7 | 58.9 | 66.8 | 77.2 |
| **Panama 2008** | 128.5 | 155.5 | 74.1 | 31.6 | 74.2 | 88.6 | 136.1 | 224.5 |

Source: Estimates from the Income and Expenditure Survey of Costa Rica and Living Conditions Surveys of Guatemala, Honduras, Nicaragua and Panama.

36. **The levels of saturated fats, associated with coronary heart disease and stroke, are higher than recommended in four of the seven countries analyzed**. The main sources of saturated fats are red meats, dairy products, coconut oil, and coconut milk. Not surprisingly, the country with the highest percentage of calories from dairy products and meats is also the country with the highest average intake of saturated fats: Panama, followed by Nicaragua and Honduras. Panama has, on average, a consumption that is about four times the recommended level.

37. **In contrast, diets in the region are poor in dietary fibers**. There is evidence that diets high in dietary fibers promote weight loss and can protect against coronary heart disease. The main sources of fiber are fruits, vegetables, and whole grains. In all countries analyzed, on average, adult dietary fiber consumption is much lower than recommended (Table 14); in some cases the intake is less than half of the recommended lower consumption threshold (Table 11).

**Table 14: Average Saturated Fat and Dietary Fiber Consumption Per Adult Equivalent– (in grams)**

| **Country and year** | **Saturated Fats** | **Dietary Fiber** |
|---|---|---|
| **Bolivia 2009** | 15.73 | 20.38 |
| **Costa Rica 2004** | 20.8 | 23.04 |
| **Ecuador 2005/06** | 13.83 | 22.40 |
| **Guatemala 2006** | 14.15 | 18.6 |
| **Honduras 2004** | 24.43 | 26 |
| **Nicaragua 2009** | 26.45 | 21.73 |
| **Panama 2008** | 52.7 | 13.66 |

Source: Estimates from the Income and Expenditure Survey of Costa Rica and Living Conditions Surveys of Guatemala, Honduras, Nicaragua and Panama.

38. **Latin American diets are high in sugars; all countries have adult sugar consumption that is higher than the recommended level**. Diets that are energy dense and poor in micronutrients, usually diets high in fats and added sugars such as sweetened beverages, tend to promote weight gain.[38] Moreover, sugars produce dental caries. Table 15 shows that, on average, all countries have sugar consumption that is higher than recommended (76 grams as per Table 11). This pattern is repeated across urban and rural areas and across income quintiles.

**Table 15: Average Total Sugar Consumption Per Adult Equivalent Across Rural and Urban Areas and Consumption Quintiles – (grams)**

| | | | | Consumption Quintiles | | | | |
|---|---|---|---|---|---|---|---|---|
| **Country and year** | **Total** | **Urban** | **Rural** | **Poorest** | **II** | **III** | **IV** | **Richest** |
| **Bolivia 2009** | 103.4 | 107.6 | 95.2 | 64.0 | 91.7 | 100.7 | 124.7 | 135.8 |
| **Costa Rica 2004** | 114.4 | 110.5 | 120.8 | 81.6 | 98.3 | 120.1 | 126.9 | 144.0 |
| **Ecuador 2005/06** | 116.6 | 118.7 | 112.4 | 79.8 | 102.8 | 118.9 | 134.3 | 147.1 |
| **Guatemala 2006** | 119.6 | 125.6 | 112.5 | 122.1 | 115.9 | 124 | 120.1 | 115.6 |
| **Honduras 2004** | 82 | 94.2 | 69.1 | 64.1 | 74.1 | 83.6 | 92.7 | 96.6 |
| **Nicaragua 2009** | 128 | 128.3 | 127.4 | 79.1 | 102.3 | 119 | 136.1 | 169 |
| **Panama 2008** | 96.9 | 90.2 | 110.4 | 84.4 | 81.2 | 90.7 | 95.9 | 116.7 |

Source: Estimates from the Income and Expenditure Survey of Costa Rica and Living Conditions Surveys of Guatemala, Honduras, Nicaragua, and Panama.

39. **Latin Americans consume a large share of calories from added sugar**. Table 15 shows all sugar consumption, including sugar present in fruits. However, if we only look at the share of total consumption coming from sugar-dense and micronutrient-poor foods such as sweetened beverages and sweets, the pattern remains. These foods increase the intake of calories and can contribute to obesity in the region. Calories from foods with added sugars (Figure 1) represent about 11-17 percent of total calorie intake, which is higher than the recommended WHO threshold of less than 10 percent of total energy intake.[39] In contrast to other sources of energy, the percentage of calories from sugary foods does not vary as much across countries or across income levels or location within countries. Costa Rica is the country in the region with the highest share of the household calorie intake from sugary foods: 17 percent. In all other countries refined sugars generate 11 percent or more of the total calorie intake.

## Sodium Intake – Levels

40. **Most surveys have information on the salt purchased by the household and the apparent consumption of food. However, it is not possible to separate the sodium added during preparation and at the time of consumption, from the sodium that is already part of the food prepared, thus there is a risk of double counting sodium intake**. For this reason,

[38] WHO 2003.
[39] WHO 2003.

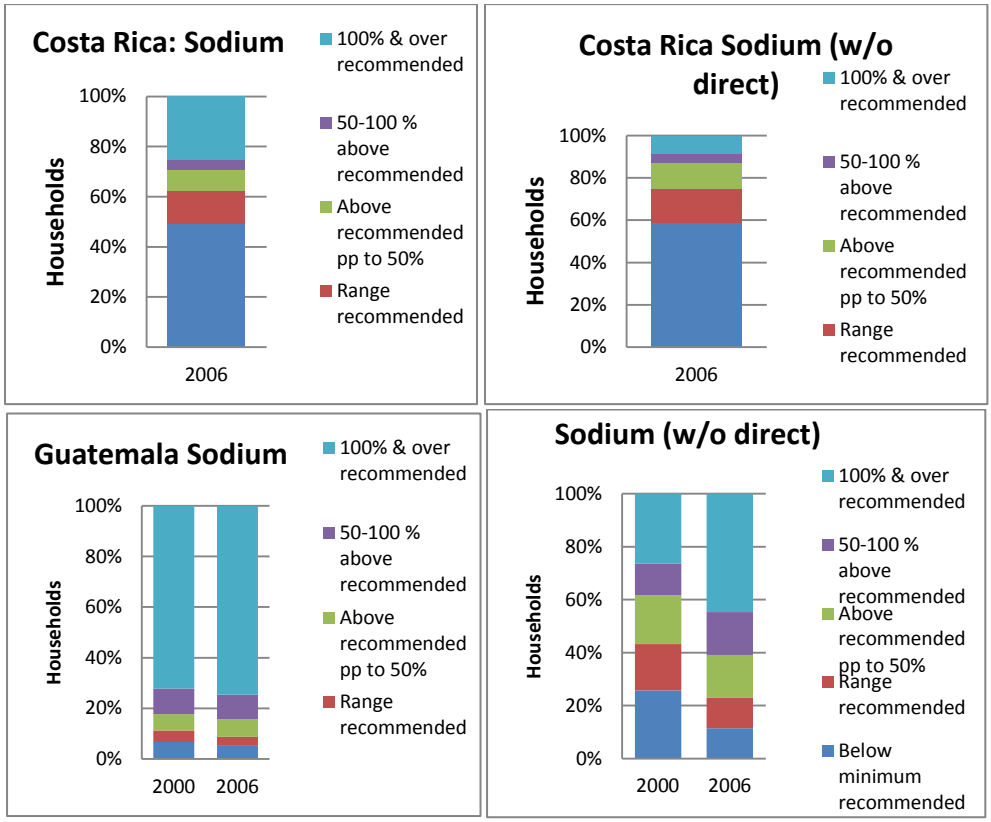
two separate calculations were made to estimate the sodium intake per adult equivalent in the household -- one that takes into account the sodium from salt purchased by the household and one that does not. This section presents both estimates but bases most of the analysis on the one that does not include the sodium from salt purchased.

41. **The WHO recommended levels of sodium intake are a maximum of 2 g a day;** while the recommendation in the current US dietary guidelines is 2.3 g among the general population and a maximum of 1.5 g a day for people 51 and older, or people of any age that are African American, have diabetes, high blood pressure or chronic kidney disease.[40] This analysis uses the more conservative threshold of 2.3 g a day per adult equivalent.

42. **A large percentage of households in the two countries shown have sodium intakes per adult equivalent that are much higher than 2.3 g a day** (Figure 2). The graphs to the right present the average sodium intake per adult equivalent without including the sodium from the salt bought separately. These graphs show that in the two countries a third or more of the households have sodium intakes that are much higher than the recommended thresholds. In the case of Guatemala, about 80 percent of households have sodium intakes higher than these recommended thresholds.

[40] US Department of Agriculture and US Department of Health and Human Services 2010.

**Figure 2: Estimated Consumption of Sodium Per Adult Equivalent Including and Excluding Salt Bought Separately by the Household**




Source: Estimates from the Income and Expenditure Survey of Costa Rica and Living Conditions Surveys of Guatemala.

## Discussion and Conclusions

43. **A large percentage of households in the countries analyzed have unhealthy diets that generate risks for developing NCDs.** Not only are calorie intakes higher than recommended to maintain a healthy weight, but the diets are also rich in fats, particularly saturated fats, sugars and sodium, and poor in fruits and vegetables. Energy dense diets that are not balanced by physical activity promote weight gain and thus overweight and obesity. These conditions increase the risk of several NCDs, including cardiovascular diseases, diabetes mellitus, and certain types of cancers. Diets rich in saturated fat can increase the risk of cardiovascular diseases; while sodium dense diets can increase blood pressure and the risk of coronary heart disease. In contrast, the consumption of fruits and vegetables can promote weight loss and reduce the risk of coronary heart disease.

44. **Although the data used precludes reliable comparisons across countries, it is clear that unhealthy diets affect households in all countries, at all income levels, and in both urban and rural areas**. However, high income households tend to consume more of most foods and thus tend to have a higher consumption of not only saturated fats and sugars, but also of

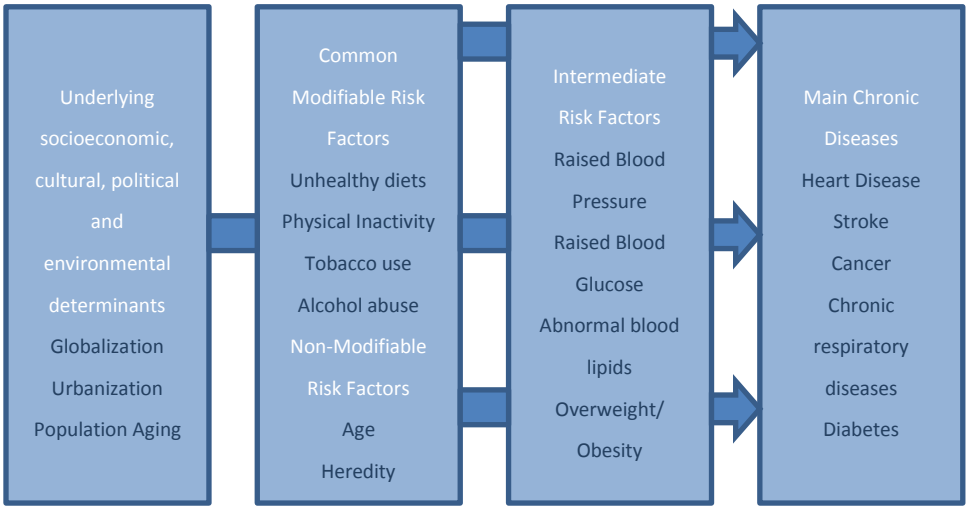
fruits and vegetables. In contrast, poorer households in all countries tend to have lower consumption of saturated fats, sugars, and fruits and vegetables. Only in the case of vegetable proteins, such as beans and seeds, is the intake higher in rural areas of most countries.

45. **With the data available, it is not possible to estimate the actual impact of these diets on the health of the population.** However, other sources of information can give us an indication of the possible impact. Unhealthy diets are not the only modifiable risk factor for the development of NCDs (Figure 3); physical inactivity, tobacco use and alcohol abuse also increase the risk for developing NCDs, partly since they increase the risk of developing intermediate risk factors such as high blood pressure, high blood glucose, and overweight and obesity.

46. **According to the Global Burden of Disease (BOD) Study[41], alcohol abuse is the main health risk factor for the population in central Latin America** (including Mexico, Colombia and Venezuela) and in the Andean countries. This is due to the disability adjusted life years lost, mainly as a consequence of alcohol related road traffic accidents and violence. The second risk factor for health in central Latin America is high BMI, followed by high levels of glucose in the blood. In the Andean countries, the second risk factor is high blood pressure, while the third is high BMI. Unhealthy diets contribute to the development of these intermediate risk factors. The BOD study also examined different features of the dietary patterns that represent risk factors for health. Diets low in fruits were ranked as the 7$^{th}$ and 10$^{th}$ risk factors for health in central Latin America and in the Andean countries respectively. Other aspects of the diets that were ranked among the first 15 risk factors for health in these countries were: diets high in sodium, diets low in nuts and seeds, iron deficiency, suboptimal breastfeeding, etc.

[41] Lim et al 2012.

**Figure 3: Determinants of Chronic Non-Communicable Diseases**




Source: WHO. 2005.

Note: The framework was modified to include alcohol abuse.

47. **Data from individual countries also show that in the capital cities of four of the countries analyzed, between two thirds and a half of all adults are overweight or obese** (Table 16). In Managua, as many as 73 percent of adult women are overweight or obese, while in Costa Rica about half are. Although capital cities are not representative of the countries, a large percentage of households in both urban and rural areas have calorie intakes that are higher than what is needed to maintain a healthy weight.

**Table 16: Prevalence (%) of Adults (20 years and older) Diagnosed and Newly Diagnosed (diagnosed during survey) with Diabetes Mellitus, Hypertension by Type, and Overweight and Obesity -2003-2006**

| | San José | Guatemala City | Tegucigalpa | Managua |
|---|---|---|---|---|
| **Diabetes Mellitus** | | | | |
| Known Diabetes | 6.3 | 4.3 | 2.5 | 5.3 |
| Newly Diagnosed | 2.5 | 2.9 | 2.9 | 4.5 |
| **Hypertension** | | | | |
| HTA stage 2 | 2.3 | 1.2 | 2.7 | 2.8 |
| HTA stage 1 | 7.7 | 5.1 | 8.3 | 7.5 |
| Pre hypertension | 26.7 | 26.6 | 25.1 | 33.2 |
| known HTA | 15.3 | 11.2 | 11.8 | 18.6 |
| **Overweight and Obesity (BMI>=30)** | | | | |
| Men | 64.3 | 65.7 | 51.5 | 60 |
| Women | 54.3 | 65.2 | 57.4 | 72.8 |

Note: HTA is Hypertension. Stage 1 corresponds to systolic blood pressure between 140-159 and Stage 2 >=160.
Source: Panamerican Health Organization 2010.

48. **Given the large percentage of people overweight and obese in the cities shown, the high prevalence of diabetes mellitus among adults is not surprising.** The prevalence of diabetes is as high as 10 percent among adults in Managua. To put these numbers in context, in the year 2010 the prevalence of diabetes among adults 20 years and older in the US was 11.3 percent.[42] The table also shows a large percentage of adults with high blood pressure. In Managua as many as a third of adults are hypertensive; in Honduras, the country with the lowest percentage, as many as 18 percent are. Sodium rich diets are not the only risk factor for hypertension. Tobacco use is also a risk factor affecting up to a quarter of adult men in the countries shown in the table.[43]

49. **Finally, in some of the countries analyzed, high prevalence of overweight and obesity coexist with high prevalence of chronic malnutrition.** These two conditions sometimes coexist in the same household and are often interrelated: low birth weight for instance is associated with increased rates of high blood pressure, heart disease, stroke and diabetes.[44] Among the four countries in the world with the highest percentage of households having both overweight mothers and stunted (chronically malnourished) children are Guatemala (13 percent of households), Bolivia (11 percent of households), and Nicaragua (almost 10 percent of households).[45]

50. **Given the harmful effects of these dietary patterns, it is important to monitor the prevalence of unhealthy diets and other risk factors for health across different population groups.** This would require more detailed data than the data that are currently available, and data that are comparable across time. The data used for this study gives a good estimate of household consumption of calories and some macronutrients, but it does not give such good estimates on sodium consumption, for instance. Also the data used does not allow any examination of the possible associations between these risk factors and intermediate risk factors such as BMI.

51. **It would also be important to understand the underlying determinants of these changing dietary patterns.** Although this was beyond the scope of this work, there is international evidence showing the importance of both urbanization and globalization in changing dietary patterns. Urbanization has been associated with higher caloric intake, more sweeteners, fats and oils and more animal protein from meats and dairy products.[46] These effects on diets are combined with lower energy expenditure in urban jobs compared with rural ones and less physical activity during leisure time. Another likely driver of dietary changes is globalization. Reductions in barriers to trade, the growth of transnational food companies,

[42] http://diabetes.niddk.nih.gov/dm/pubs/statistics/#fast
[43] WHO Global Health Observatory Data Repository Tobacco Control. Data from 2009.
[44] WHO 2005.
[45] Garret and Ruel 2003.
[46] Kearney 2010 and Thow et al 2009.

foreign direct investment and liberalization of media are thought to be some of the channels by which globalization affects healthy behaviors.[47] Income growth, urbanization, and lifestyle changes have been linked to increased consumption of fats and sweeteners[48,49] and higher BMIs. At the same time, the growth of Transnational Food Companies (TFCs) has increased the availability of processed and fast foods, which have been made more desirable to consumers thanks to the use of advertising and promotion. One of the most visible effects of the growing TFC presence and of the changing nature of the food industry and food behavior in Latin America has been the rapid replacement of local food stores with supermarkets. According to the WHO, supermarkets control 50 percent to 60 percent of the food retail sector in the region.[50] This dramatic effect of the dietary transition due to globalization is evident in Central America. A descriptive study on the effects of reductions in barriers to trade in the diets in Central America, concluded that trade liberalization in the sub-region has contributed to an increase in the availability of animal products and processed foods.[51] This increase in the availability of food, jointly with social and demographic changes, has facilitated a dietary change in the sub-region towards increased consumption of meat, dairy products, and processed foods.

52. **The dietary patterns in the countries analyzed show evidence of the urgent need to increase efforts to promote healthy diets.** Very few countries have been able to do this and no country has been able to reverse the obesity trend. Nevertheless, there are cost-effective interventions to promote healthy diets. Many require the intervention of several sectors, such as education, agriculture, finance, and not just health. The WHO Global Status Report on NCDs[52] lists the following three interventions to promote healthy diets as "Best Buys", as they are cost-effective, low costs, and can be implemented in low resource settings: the reduction of salt intake and salt content in foods, the replacement of trans-fats in foods with poly-unsaturated fat, and the promotion of public awareness about diet and physical activity.

53. **There are promising examples in LAC of policies to reduce sodium and trans fats.** One example is the program "Less Salt, More Life" of the Ministry of Health of Argentina. It includes agreements with the industry to reduce sodium in certain processed foods including meat products, baked goods and snacks, dairy products (cheeses), and soups, dressings, and canned foods, as well as a strategy to reduce sodium in artisanal breads. Also in Argentina, the Food Code was recently amended to regulate the maximum amount of trans-fats in processed foods.

[47] Thow and Hawkes 2009.
[48] Drewnowski and Popkin 1997.
[49] Popkin 2006.
[50] Hawkes 2007.
[51] Thow and Hawkes 2009.
[52] WHO 2011.

54. In addition, there is mounting international evidence of other programs/policies that have improved diets, increased physical activity and, in few cases, even reduced BMIs. Some low-cost and cost-effective examples of those programs and policies are included in the WHO Global Status report. They include:

a. **Promoting adequate breast-feeding and complementary feeding to avoid child malnutrition.** Evidence from observational studies points to a relationship between low birth weight and child malnutrition, and chronic diseases in adults; thus, it is important to reduce child malnutrition.

b. **Levying food taxes and applying subsidies to promote healthy diets.** Examples of these taxes/subsidies exist: Several states and cities in the United States apply taxes on sugar and sweetened beverages; although they tend to be small, some subdivisions are trying to increase them. Evidence indicates that soda taxes moderately reduce soft drink consumption in children and adolescents, but they are offset by increased consumption of other high-calorie drinks.[53] Evidence also shows that although current tax levels on sodas have little impact on overall consumption, some groups of children – those already overweight, in low-income households, and African American children- are more sensitive to these taxes, particularly when the sodas are not available at schools.[54] Larger effects on weight are expected from higher taxes because numerous studies find that changing the relative prices of food/beverages alters their consumption and, as the price of unhealthy food rises in relation to healthy food, the consumption of the latter increases.[55] There are other international examples of taxing unhealthy foods: Denmark introduced a saturated-fat tax in late 2011 and later on eliminated it; Hungary is proposing a new tax on foods with "too much" sugar, salt or fat, while increasing taxes on liquor and soft drinks, all to pay for state-financed health care.[56] Another international example of the effectiveness of fiscal measures on changes in dietary habits is the case of Poland and the elimination of large subsidies to butter and lard. In the early 1990s, the government removed these subsidies and as a result, the consumption of non-hydrogenated vegetable oils increased rapidly partly substituting the consumption of butter and lard. This change in diets brought about a decrease in coronary heart disease of about 28 percent in those years.[57] There are also examples of subsidies to healthy foods to promote their consumption: For example, Brazil's "Fome Zero" program subsidizes produce markets and state-sponsored low-cost restaurants.[58]

c. **Restricting the marketing of foods and beverages high in salt, fats and sugar, especially to children.** Worldwide, children respond to the marketing of food which is critical, since food promotion influences children's knowledge,

[53] Fletcher et al 2010.
[54] Sturm et al 2010.
[55] The Robert Wood Johnson Foundation 2009.
[56] Bittman 2011.
[57] Willet et al 2006.
[58] Idem.

preferences, purchasing, consumption, diet and weight-related health status.[59] Thus, from 2007-2008, the UK limited ads for foods high in fat, salt, and sugar.[60] Also, in 2010, the WHO developed a "Set of Recommendations for Marketing Food and Non-Alcoholic Beverages to Children, and in May 2011, PAHO organized a regional expert consultation in the Americas on these recommendations for the hemisphere.

55. **The WHO status report also lists other programs/policies with evidence of effectiveness but not much of cost-effectiveness in reducing overweight/obesity.** These programs include:

d. **School-based interventions to improve nutrition and increase physical activities.** There is increasing evidence on the effectiveness of school-level interventions to decrease obesity levels. The most effective are multi-faceted, including curriculum, policies and social/physical environments.[61] Evidence indicates that there needs to be both a change in behavior as well as one in the environment—particularly in the food available at the school and the physical activity regimen—for the interventions to be effective.[62] Some of the most successful have included compulsory physical activity classes. Thus, Mexico recently introduced a policy that prohibits the sale of foods and beverages with high caloric content and low nutritional value in the schools. Most countries in the region have school health programs or "Schools that Promote Health" (*Escuelas Promotoras de la Salud*) that could be the basis for school-based interventions aimed at preventing NCDs.

**e. Workplace programs for physical activity and healthy diets.** There are several experiences in developed countries on worksite interventions that have improved vegetable/fruit intake as well as fiber, fat and dairy intake, and total energy. Among them are point-of-purchase labeling in cafeterias and vending machines, modifying food service preparation to reduce sodium and fat, offering more fruits and vegetables, and expanding healthy food options.[63] There is also evidence of positive though small effects of programs aimed at increasing physical activity at the worksite. These programs tend to be comprehensive, and include individual counseling and group education, along with physical and environmental changes, such as on-site fitness facilities and accessible stairways.[64]

[59] Hastings and Cairns 2010.
[60] Idem.
[61] Kain et al. 2010.
[62] Kain et al 2010.
[63] Yancey et al 2007.
[64] Idem.

# Annex 1: Methodological Notes

## Introduction

1. This study uses the Living Standard Surveys and the Household Income and Expenditure Surveys of selected countries in Latin America. They are Bolivia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Nicaragua and Panama. Both groups of surveys provide information about food consumption at household level. Nonetheless the intended purpose of the surveys was to provide levels of expenditure at household level; these surveys also provide information on food quantity, in addition to cost. Thus, it is possible to estimate the nutritional composition of the household food consumption by using the adequate conversion table.

2. Assessments based on consumption patterns at household or individual levels are rare. The purpose of these methodological notes is to describe the sources used and the procedures carried out to estimate the nutritional profile and patterns of food consumption of households in selected countries.

## Sources

3. The sources of information used in this study are the Living Standard Surveys, the Income and Expenditures Surveys, and the nutritional database of the U.S. Department of Agriculture (USDA). The Living Standards surveys and the Income and Expenditure Surveys provide information on seemingly consumption of food at household level. The nutritional database of the USDA provides information about food composition at product level.

4. The Living Standard and Income and Expenditures surveys collect information on daily expenditure on food within a period of reference. More specifically, all surveys collect information on food expenditures in the last 15 days. However, sample sizes, list of items and the degree of details provided by the surveys varies greatly from country to country.

## Surveys

5. Table 1 shows the countries and the surveys utilized. This study analyses two years of detailed nutrition information from Bolivia, Guatemala, Nicaragua and Panama, and one year for all other countries. In most countries, the years analyzed are close to each other; most of the information comes from the first half of the 2000s. In the case of Nicaragua, although data from the first two years came from comparable surveys, the sample frame slightly changed between

the two surveys[65], and thus the results are not fully comparable. In addition, the 2009 data might reflect the effects of the economic and financial crisis; thus its results need to be assessed with caution.

**Table 1: Type of Surveys Available per Country**

| | Baseline | Follow up |
|---|---|---|
| Bolivia | Household Survey 2000 | Household Survey 2009 |
| Costa Rica | Income and Expenditures, 2004 | n/a |
| Ecuador | Living Standards, 2005-2006 | |
| Guatemala | Living Standards, 2000 | Living Standards, 2005/6 |
| Honduras | Living Standards, 2004 | n/a |
| Nicaragua | Living Standards, 2001 | Living Standards, 2005, 2009 |
| Panama | Living Standards, 2003 | Living Standards, 2008 |

## Sample Sizes

6. The surveys have sample sizes that vary from 3.7 thousand to 13.7 thousand households. Living Standard surveys tend to be larger than Income and Expenditures ones. However, the difference in the number of food items identified in the surveys varies greatly. Income and Expenditures surveys can identify more than seven hundred different food items while the average number of items identified in Living Standard Surveys is below one hundred.

**Table 2: Sample Size and Number of Food Items in Surveys**

| | Baseline | | Follow up | |
|---|---|---|---|---|
| | Households | Food Items | Households | Food Items |
| Costa Rica | 4,231 | 732 | n/a | n/a |
| El Salvador | 4,381 | 69 | n/a | n/a |
| Guatemala | 7,276 | 99 | 13,686 | 116 |
| Honduras | 3,746 | 612 | 8,175 | 135 |
| Nicaragua | 4,171 | 68 | 6,898 | 87 |
| Panama | 6,363 | 83 | 7,045 | 83 |

Provide data source by indicating which type of surveys.

## Nutritional Database

7. The other source of information used to estimate the nutritional consumption patterns is the USDA National Nutrient Database for Standard Reference. The database provides the composition of raw, processed and prepared foods. The database is used as the reference

[65] The 2005 survey included larger samples in areas already surveyed in 2001 and also sampled new towns that did not exist in the previous census (1995). The expansion of the sample was not neutral. The biggest expansion was carried out in those departments where poverty incidence was the highest, probably areas with difficult access, or where population was sparsely distributed.

conversion table. The database version used in this study is the release 23 (SR23) of 2010. "It contains data on 7,636 food items and up to 146 food components" (p 1).

8. Table 3 shows the typical information contained in the USDA nutritional database. It includes the amount of energy, the content of proximates or macronutrients, minerals, vitamins, alcohol and caffeine in foods per 100 grams. Additionally, "to be included in the database, a nutrient profile must have values for the proximate components and at least one other nutrient." (p 10) Thus, having the amount or weight of food, the USDA database allows the estimation of the nutritional composition of food consumption.

**Table 3: Sample of Information Contained in USDA Database (Per 100 g)**

| | | Rice bran, crude | | Rice, white, long-grain, parboiled, enriched, cooked | |
|---|---|---|---|---|---|
| | Units | Value | Std. Error | Value | Std. Error |
| **Proximates** | | | | | |
| Water | g | 6.1 | 1.1 | 70.4 | 2.0 |
| Energy | kcal | 316.0 | - | 123.0 | - |
| Energy | kJ | 1,322.0 | - | 513.0 | - |
| Protein | g | 13.4 | 0.5 | 2.9 | 0.3 |
| Total lipid (fat) | g | 20.9 | 1.6 | 0.4 | 0.1 |
| Ash | g | 10.0 | 0.7 | 0.3 | 0.0 |
| Carbohydrate, by difference | g | 49.7 | - | 26.1 | - |
| Fiber, total dietary | g | 21.0 | - | 0.9 | 0.5 |
| **Sugars, total** | g | 0.9 | - | 0.1 | - |
| Sucrose | g | 0.5 | - | 0.1 | 0.0 |
| Glucose (dextrose) | g | 0.2 | - | 0.0 | 0.0 |
| **Minerals** | | | | | |
| Calcium, Ca | mg | 57.0 | 6.1 | 19.0 | 1.3 |
| Iron, Fe | mg | 18.5 | 3.6 | 1.8 | 0.1 |
| Potassium, K | mg | 1,485.0 | 198.5 | 56.0 | - |
| **Sodium, Na** | mg | 5.0 | 1.2 | 2.0 | 0.2 |
| Zinc, Zn | mg | 6.0 | 0.9 | 0.4 | 0.0 |
| **Vitamins** | | | | | |
| Vitamin C, total ascorbic acid | mg | - | - | - | - |
| Vitamin B-6 | mg | 4.1 | 0.3 | 0.2 | - |
| Folic acid | mcg | - | - | 79.0 | - |
| Vitamin B-12 | mcg | - | - | - | - |
| Vitamin A, RAE | mcg_RAE | - | - | - | - |
| Vitamin E (alpha-tocopherol) | mg | 4.9 | - | 0.0 | - |
| Vitamin D | IU | - | - | - | - |
| Vitamin K (phylloquinone) | mcg | 1.9 | - | - | - |
| **Lipids** | | | | | |
| Fatty acids, total saturated | g | 4.2 | - | 0.1 | - |
| Fatty acids, total monounsaturated | g | 7.5 | - | 0.1 | - |
| Fatty acids, total polyunsaturated | g | 7.5 | - | 0.1 | - |
| Cholesterol | mg | - | - | - | - |
| | | | | | |
| Alcohol, ethyl | g | - | - | - | - |
| Caffeine | mg | - | - | - | - |

9. The USDA Nutritional Database includes the nutritional composition of foods typically found in the United States. For instance, since food may change significantly among countries, it is difficult to substantiate the applicability of the USDA database on Latin American countries.

However, there are grounds for the use of the USDA database. First, the list of raw products, fruits and vegetables in the USDA database is comprehensive. Finally, in terms of prepared food, due to the influence of the increased immigration into the US, especially from Central America, the last release of the USDA database was expanded to include traditional Latino food. The USDA states that "as part of an ongoing effort to expand the number of Latino food items in the database, profiles for a number of Latino cheeses, fruits, crackers, and restaurant items such as pupusas, arepas, buñuelos, and tamales, have been added" (p 2). The expansion of the USDA database facilitates the conversion of Latin American food into nutritional values.

## My Plate: The New Food Pyramid

10. In addition to the nutritional database of the USDA, this study uses the classification proposed by the USDA[66] in food groups. "My Plate" was unveiled in June 2011 and "it is part of a larger communications initiative based on 2010 Dietary Guidelines for Americans to help consumers make better food choices" (USDA, 2011). The purpose of "My plate" is to provide practical information about recommended portions of different types of food.

11. The methodology used by the USDA classifies food in five groups. These are: the Grains Group, the Vegetable Group, the Fruit Group, the Dairy Group and the Protein Foods Group. The five groups of food are shown as organized in a plate, a very familiar image in western societies. Also, the USDA lists the typical products found in every group of food.

12. "My Plate" recommends that, excluding milk and dairies, fruits and vegetables should occupy 50 percent of the plate, versus 50 percent of proteins and grains. However, "My Plate" does not establish numerical recommended values for any particular group of food. Though, it is clear that the groups of Vegetables and Grains are depicted as larger portions than fruits and proteins, there is not particular standardization associated to it.

13. Moreover, since the publication of My Plate, some institutions have proposed adjustment to the plate already. In particular, the Harvard Medical School[67] recommends a new distribution and a more detailed plate in which "Milk and dairy are not must-have foods", oils are an explicit part of the diet, and specific foods are recommended over others within every group. However, neither the USDA nor Harvard Medical School versions of the plate, establishes specific recommended values for every group of food.

14. Nonetheless the lack of specific consumption standards for groups of food, the products in the Living Standard and the Income and Expenditures surveys are classified following USDA methodology. Simple products are classified by the list of the USDA. Complex and prepared

[66] http://www.choosemyplate.gov/
[67] http://www.health.harvard.edu/blog/harvard-to-usda-check-out-the-healthy-eating-plate-201109143344

meals are classified as “others” unless it is clear that the meal contained a large proportion of a particular group of food. Also, the group of “others” includes salt, unidentified species, oils, and alcoholic beverages.

## Adult equivalent Ratios

15. Gender and age are the main factors for food intake requirements. Consequently, the consumption patterns should be approached at individual level. However, Living Standard and Income and Expenditure surveys collect food data at household level. In other words, food consumption is recorded in the household as one unit. This means that there is no way to know how much food is consumed by each individual within the household. However, there are some alternatives to deal with this problem.

16. The most basic solution is to evaluate consumption at household level using per capita values. However, this solution overlooks the heterogeneity of the households in terms of characteristics of their members. Consequently, it is important to adjust the values according to the characteristics of the household’s members (See Forsyth, 1960, Nelson, 1988 for more information).

17. The adult equivalent ratio utilized in this study is a simplified equivalence table derived from the averages by gender of the recommended daily calories intake presented in Table 4. It shows that the number of members in the households is adjusted according to its composition by age. The weight of adults 19 years old and over is one, while the weight of children 0 to 3 is 0.53, 53 percent of the weight of an adult. Also, since teenagers 15 to 18 years old require a greater caloric intake, their weight as member in the household is greater than one, 1.08.

**Table 4: Adult Equivalent Ratios (AER)**

| Life stage | Ratio |
|---|---|
| 0 to 3 | 0.53 |
| 4 to 6 | 0.73 |
| 7 to 10 | 0.83 |
| 11 to 14 | 0.91 |
| 15 to 18 | 1.08 |
| 19 & over | 1.00 |

Thus, the number of adults equivalent per household is defined as $Ae = \sum_1^n w_i$, where (w) is the weight or ratio of the member (i) according to age. Thus, per capita consumption adjusted by adult equivalent is $Cp_j = \frac{Cx_j}{Ae_j}$ where (cx) is the total consumption of the household (j).

## Procedures

18. The methodology used to estimate the nutritional profile of households identifies and inputs the USDA codification of the nutritional database to the food items listed in the Living

Standard and Income and Expenditure surveys. This procedure is carried out manually in three stages. The first stage included the identification and translation of food items of the Living Standard and Income and Expenditure surveys. In the second stage, translated items were looked up in the USDA nutritional database. Most fruits, vegetables, beverages, and meats were matched in this stage. Products that were not matched in the second stage were mainly local and traditional meals, some fruits or vegetables without translation and unusual foods. In the third stage meals were replaced by equivalent items in the USDA database. The list of Latino foods in the USDA database helped in matching several items in the surveys. For example, the USDA database includes several types of tamales and bean soups, specific items like arepas, pupusas, empanadas, and typical Latino meals. Finally, meals without equivalences were broken down into their components and matched by the main ingredient. For example, "prepared turkey" (pavo preparado) was coded as the item "turkey, all classes, meat and skin, cooked, roasted" in the USDA database.

19. The next step was the computation of the actual consumption of nutrients at household level. First, the amount of food was converted into grams. Products that were reported as units, slices, cans, bottles, boxes, packages, etc., were converted to grams using, as a reference, the typical presentation of the product. For example, common cereal boxes in Latin American countries weigh 250 grams, bread units weigh around 63 grams and milk jugs contain about one liter. Once the product weight was obtained, nutritional consumption was assessed in terms of energy, carbohydrates, fats, and sodium. Energy is measured in calories and, carbohydrates, fats and sodium in grams.

20. In the case of sodium, it is possible to identify two sources. The first source is salt bought by households, which is included in all surveys. The second source is the sodium consumed from prepared foods. As it is not possible to distinguish how much of the salt bought is used in food preparation, salt consumption within the household can be overestimated. Thus, sodium consumption is presented in two estimations. The first estimation is the amount of sodium from salt bought directly. The second estimation presents sodium intake resulting from food consumption only.

21. Thus, the nutrient equivalent (Ni) of the food item (i) could be given by the expression.

$$N_i = \frac{Q_i}{15} * \frac{p_i}{100} * \frac{f(N)_i^k}{100}$$

where

$Q_i$ = Quantity in grams of food item (i) bought or acquired by the household in last 15 days.

$p_i$= Percentage of edible portion, assumed to be 100

$f(N)_i^k$= Conversion factor for the relevant nutrient or proximate (k) from nutritional database per 100 grams. (k) may be calories, carbohydrates, fat or sodium.

## Treatment of Special Cases

22. Even though the list of products in the nutritional database is large, certain food items in the surveys cannot be matched with known foods. The list of special items, included in table 6, is made of mainly unidentified and rare foods. For example, "Zompopo" is a type of ant common in rural areas of Nicaragua, Guatemala, El Salvador and Chiapas.

**Table 5: Unclassified Food Items**

| Costa Rica | Guatemala | Honduras | Nicaragua | Panama |
|---|---|---|---|---|
| Chucheca | Zompopo y otros | Flor de izote | Alimentos | Alimentos |
| Caimito | insectos | Ruda | bebidas y tabaco | bebidas y tabaco |
| Cana de azúcar | | Salsoco | no desglosables | no desglosables |
| Carambola | Otros productos | Colorantes | | |
| Yuplon | alimenticios n.e.p. | | | |
| Arracache | | Alimentos | | |
| Cubaces | | bebidas y tabaco | | |
| Malanga | | no desglosables | | |
| Nampi | | | | |
| Vainica | | | | |
| Hojas de plátano | | | | |
| Bicarbonato | | | | |
| Colorantes | | | | |
| Polen | | | | |
| | | | | |
| Alimentos | | | | |
| bebidas y tabaco | | | | |
| no desglosables | | | | |

Source: Authors based on household surveys used

23. Table 5 also includes non-food items such as "Hojas de plátano" (Plantain leaves), which are in general, not edible, but are broadly used in food preparation throughout the region. The most complicated cases are those foods that cannot be identified. In these cases it is impossible to find an equivalent food in the nutritional database. This is a common problem found in the Income and Expenditure Surveys. We were not able to find good descriptions for 9 items in Costa Rica. Finally, all surveys included the option of food items not specified.

24. All the special cases referred to in this section, shown in table 5, were classified as missing values. In other words, the computations do not take into consideration this portion of the food reported by the households. However, the number of missing records in the database due to difficulties in food classification is small. For example, in Guatemala there were 16

missing records with Zompopo, out of more than two hundred thousand, in the survey of the year 2000. Costa Rica presented the worst case with a total of 3,275 records missing due to unclassified food items. Moreover, this represents just 3.5 percent of all food items reported by households.

# Annex 2: Results including Confidence Intervals

## Costa Rica

| | Averages and Confidence Intervals | | | Averages and Confidence Intervals | | | Averages and Confidence Intervals | | |
|---|---|---|---|---|---|---|---|---|---|
| | Nation | | | Urban Areas | | | Rural Areas | | |
| | Cases / Households | | 1,138,559 | Cases / Households | | 709,750 | Cases / Households | | 428,809 |
| **Proximates** | **2004** | **[95% CI]** | | **2004** | **[95% CI]** | | **2004** | **[95% CI]** | |
| Energy | 1,907.54 | 1,903.95 | 1,911.14 | 1,900.05 | 1,895.37 | 1,904.73 | 1,919.95 | 1,914.38 | 1,925.51 |
| Carbohydrate | 272.22 | 271.70 | 272.75 | 266.80 | 266.16 | 267.44 | 281.20 | 280.30 | 282.11 |
| Proteins | 64.79 | 64.59 | 64.98 | 68.22 | 67.94 | 68.50 | 59.10 | 58.91 | 59.30 |
| **Fats** | | | | | | | | | |
| Fatty acids, total saturated | 20.80 | 20.76 | 20.85 | 20.12 | 20.05 | 20.19 | 21.94 | 21.87 | 22.01 |
| Fatty acids, total monounsaturated | 22.24 | 22.19 | 22.30 | 22.11 | 22.04 | 22.19 | 22.46 | 22.38 | 22.53 |
| Fatty acids, total polyunsaturated | 15.28 | 15.25 | 15.32 | 15.67 | 15.62 | 15.72 | 14.64 | 14.58 | 14.70 |
| Cholesterol | 227.66 | 226.95 | 228.37 | 241.69 | 240.67 | 242.71 | 204.45 | 203.61 | 205.28 |
| Total lipid (fat) | 58.33 | 58.20 | 58.46 | 57.91 | 57.72 | 58.09 | 59.04 | 58.85 | 59.22 |
| **Fiber and sugars** | | | | | | | | | |
| Fiber, total dietary | 23.04 | 22.99 | 23.08 | 22.85 | 22.79 | 22.90 | 23.35 | 23.27 | 23.42 |
| Sugars, total | 114.37 | 114.09 | 114.66 | 110.49 | 110.14 | 110.84 | 120.81 | 120.31 | 121.31 |
| **Minerals** | | | | | | | | | |
| Sodium | 1,794.49 | 1,790.42 | 1,798.55 | 1,984.85 | 1,980.03 | 1,989.68 | 1,479.40 | 1,472.24 | 1,486.55 |
| Calcium, Ca | 524.24 | 523.20 | 525.29 | 574.98 | 573.55 | 576.41 | 440.26 | 438.85 | 441.67 |
| Iron, Fe | 11.65 | 11.63 | 11.67 | 12.32 | 12.29 | 12.36 | 10.54 | 10.51 | 10.57 |
| Magnesium, Mg | 317.57 | 316.95 | 318.19 | 311.85 | 311.09 | 312.62 | 327.03 | 325.98 | 328.08 |
| Phosphorus, P | 1,130.26 | 1,127.77 | 1,132.75 | 1,175.76 | 1,172.22 | 1,179.30 | 1,054.96 | 1,051.90 | 1,058.01 |
| Potassium, K | 2,612.13 | 2,606.79 | 2,617.47 | 2,707.15 | 2,700.25 | 2,714.05 | 2,454.86 | 2,446.48 | 2,463.24 |
| Zinc, Zn | 9.65 | 9.62 | 9.67 | 10.21 | 10.17 | 10.25 | 8.71 | 8.68 | 8.74 |
| **Vitamins** | | | | | | | | | |
| Folate | 372.52 | 371.52 | 373.52 | 394.75 | 393.34 | 396.15 | 335.73 | 334.45 | 337.01 |
| Vitamin A, RAE | 746.46 | 743.40 | 749.53 | 829.32 | 825.12 | 833.51 | 609.33 | 605.12 | 613.53 |
| Vitamin C, total ascorbic acid | 76.00 | 75.75 | 76.25 | 88.89 | 88.53 | 89.25 | 54.66 | 54.38 | 54.95 |
| Vitamin D | 2.90 | 2.89 | 2.91 | 3.36 | 3.35 | 3.37 | 2.14 | 2.13 | 2.15 |

# Guatemala

| | National | | | | | | Urban | | | | | | Rural | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Proximates** | **2,000** | **[95% CI]** | | **2,006** | **[95% CI]** | | **2,000** | **[95% CI]** | | **2,006** | **[95% CI]** | | **2,000** | **[95% CI]** | | **2,006** | **[95% CI]** | |
| Energy | 2,441.7 | 2,439.1 | 2,444.2 | 2,586.7 | 2,585.0 | 2,588.4 | 3,208.4 | 3,204.0 | 3,212.8 | 2,731.1 | 2,728.7 | 2,733.4 | 1,853.1 | 1,850.5 | 1,855.7 | 2,419.2 | 2,416.8 | 2,421.7 |
| Carbohydrate | 413.1 | 412.7 | 413.5 | 430.2 | 429.9 | 430.5 | 528.3 | 527.6 | 529.0 | 445.5 | 445.1 | 445.9 | 324.7 | 324.3 | 325.1 | 412.4 | 412.0 | 412.8 |
| Proteins | 75.3 | 75.2 | 75.4 | 81.1 | 81.1 | 81.2 | 103.1 | 103.0 | 103.3 | 87.9 | 87.8 | 87.9 | 53.9 | 53.8 | 54.0 | 73.3 | 73.2 | 73.4 |
| **Fats** | | | | | | | | | | | | | | | | | | |
| Fatty acids, total saturated | 15.0 | 14.9 | 15.0 | 14.2 | 14.1 | 14.2 | 19.9 | 19.8 | 19.9 | 16.1 | 16.0 | 16.1 | 11.2 | 11.2 | 11.2 | 11.9 | 11.9 | 12.0 |
| Fatty acids, total monounsaturated | 22.3 | 22.2 | 22.3 | 24.4 | 24.4 | 24.5 | 30.5 | 30.4 | 30.5 | 26.4 | 26.4 | 26.4 | 15.9 | 15.9 | 16.0 | 22.2 | 22.2 | 22.2 |
| Fatty acids, total polyunsaturated | 12.7 | 12.7 | 12.7 | 12.5 | 12.5 | 12.5 | 15.9 | 15.8 | 15.9 | 13.7 | 13.7 | 13.7 | 10.3 | 10.2 | 10.3 | 11.1 | 11.1 | 11.1 |
| Cholesterol | 163.5 | 163.1 | 164.0 | 150.4 | 150.3 | 150.6 | 232.8 | 231.9 | 233.8 | 174.4 | 174.2 | 174.6 | 110.3 | 110.1 | 110.6 | 122.7 | 122.5 | 122.9 |
| Total lipid (fat) | 49.9 | 49.9 | 50.0 | 51.1 | 51.0 | 51.1 | 66.2 | 66.1 | 66.3 | 56.1 | 56.1 | 56.2 | 37.4 | 37.3 | 37.5 | 45.2 | 45.1 | 45.2 |
| **Fiber and sugars** | | | | | | | | | | | | | | | | | | |
| Fiber, total dietary | 24.2 | 24.1 | 24.2 | 18.6 | 18.6 | 18.6 | 27.7 | 27.6 | 27.7 | 20.8 | 20.8 | 20.8 | 21.5 | 21.4 | 21.5 | 16.1 | 16.1 | 16.1 |
| Sugars, total | 147.5 | 147.3 | 147.6 | 119.6 | 119.5 | 119.7 | 159.2 | 159.0 | 159.5 | 125.6 | 125.5 | 125.8 | 138.5 | 138.3 | 138.7 | 112.5 | 112.4 | 112.6 |
| **Minerals** | | | | | | | | | | | | | | | | | | |
| Sodium | 3,581.1 | 3,576.6 | 3,585.5 | 8,492.5 | 8,485.2 | 8,499.8 | 5,093.6 | 5,085.5 | 5,101.7 | 7,997.8 | 7,988.8 | 8,006.8 | 2,420.1 | 2,416.2 | 2,423.9 | 9,066.4 | 9,054.6 | 9,078.1 |
| **Vitamins** | | | | | | | | | | | | | | | | | | |
| Folate | 389.7 | 389.2 | 390.2 | 313.0 | 312.6 | 313.3 | 520.7 | 519.9 | 521.5 | 387.7 | 387.2 | 388.1 | 289.2 | 288.7 | 289.7 | 226.3 | 226.0 | 226.6 |
| Vitamin A, RAE | 732.9 | 730.8 | 735.0 | 565.6 | 564.7 | 566.5 | 1,005.0 | 1,000.7 | 1,009.3 | 692.3 | 691.0 | 693.7 | 524.1 | 522.4 | 525.7 | 418.7 | 417.6 | 419.7 |
| Vitamin C, total ascorbic acid | 89.7 | 89.5 | 89.8 | 68.5 | 68.4 | 68.6 | 115.8 | 115.5 | 116.1 | 79.8 | 79.7 | 79.9 | 69.6 | 69.5 | 69.8 | 55.4 | 55.3 | 55.5 |
| Vitamin D | 2.0 | 2.0 | 2.0 | 1.9 | 1.9 | 1.9 | 2.9 | 2.9 | 2.9 | 2.3 | 2.3 | 2.3 | 1.4 | 1.3 | 1.4 | 1.4 | 1.4 | 1.4 |

# Honduras

| | National | | | Urban | | | Rural | | |
|---|---|---|---|---|---|---|---|---|---|
| **Proximates** | **2004** | **[95% CI]** | | **2004** | **[95% CI]** | | **2004** | **[95% CI]** | |
| Energy | 1,800.71 | 1,799.08 | 1,802.35 | 2,089.42 | 2,087.29 | 2,091.55 | 1,496.35 | 1,494.07 | 1,498.63 |
| Carbohydrate | 263.52 | 263.27 | 263.77 | 295.45 | 295.13 | 295.77 | 229.85 | 229.48 | 230.23 |
| Proteins | 57.86 | 57.80 | 57.93 | 73.16 | 73.06 | 73.25 | 41.74 | 41.65 | 41.82 |
| **Fats** | | | | | | | | | |
| Fatty acids, total saturated | 19.66 | 19.64 | 19.68 | 24.43 | 24.39 | 24.46 | 14.64 | 14.61 | 14.67 |
| Fatty acids, total monounsaturated | 21.09 | 21.07 | 21.11 | 25.25 | 25.22 | 25.28 | 16.70 | 16.67 | 16.73 |
| Fatty acids, total polyunsaturated | 11.72 | 11.71 | 11.73 | 13.45 | 13.44 | 13.47 | 9.89 | 9.87 | 9.90 |
| Cholesterol | 192.87 | 192.59 | 193.14 | 264.56 | 264.19 | 264.93 | 117.28 | 116.96 | 117.61 |
| Total lipid (fat) | 52.47 | 52.41 | 52.53 | 63.13 | 63.05 | 63.21 | 41.23 | 41.16 | 41.30 |
| **Fiber and sugars** | | | | | | | | | |
| Fiber, total dietary | 20.94 | 20.92 | 20.96 | 26.00 | 25.97 | 26.03 | 15.60 | 15.57 | 15.63 |
| Sugars, total | 82.01 | 81.93 | 82.09 | 94.23 | 94.11 | 94.34 | 69.13 | 69.04 | 69.23 |
| **Minerals** | | | | | | | | | |
| Sodium | 1,147.01 | 1,145.22 | 1,148.80 | 1,538.78 | 1,536.10 | 1,541.46 | 733.99 | 732.06 | 735.93 |
| Calcium, Ca | 338.92 | 338.48 | 339.36 | 461.11 | 460.50 | 461.72 | 210.11 | 209.64 | 210.57 |
| Iron, Fe | 11.35 | 11.34 | 11.36 | 13.42 | 13.40 | 13.43 | 9.17 | 9.16 | 9.19 |
| Magnesium, Mg | 274.12 | 273.83 | 274.41 | 343.87 | 343.49 | 344.26 | 200.59 | 200.22 | 200.96 |
| Phosphorus, P | 957.21 | 956.14 | 958.28 | 1,242.86 | 1,241.42 | 1,244.29 | 656.08 | 654.81 | 657.34 |
| Potassium, K | 2,019.94 | 2,017.60 | 2,022.29 | 2,606.30 | 2,603.03 | 2,609.57 | 1,401.79 | 1,399.10 | 1,404.49 |
| Zinc, Zn | 8.27 | 8.26 | 8.28 | 10.79 | 10.78 | 10.81 | 5.60 | 5.59 | 5.62 |
| **Vitamins** | | | | | | | | | |
| Folate | 388.38 | 387.91 | 388.86 | 430.34 | 429.74 | 430.93 | 344.16 | 343.42 | 344.89 |
| Vitamin A, RAE | 428.22 | 427.22 | 429.21 | 613.15 | 611.58 | 614.72 | 233.26 | 232.24 | 234.27 |
| Vitamin C, total ascorbic acid | 66.52 | 66.39 | 66.65 | 96.02 | 95.82 | 96.22 | 35.42 | 35.29 | 35.55 |
| Vitamin D | 1.61 | 1.61 | 1.61 | 2.20 | 2.20 | 2.21 | 0.99 | 0.98 | 0.99 |

# Nicaragua

| | Total | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Cases / Households** | | 964,691 | | | 987,852 | | | 1,207,087 |
| **Proximates** | **2001** | **[95% CI]** | | **2005** | **[95% CI]** | | **2009** | **[95% CI]** | |
| Energy | 2,557.27 | 2,553.87 | 2,560.67 | 2,201.99 | 2,199.69 | 2,204.29 | 2,184.72 | 2,182.81 | 2,186.63 |
| Carbohydrate | 378.51 | 378.00 | 379.02 | 336.31 | 335.95 | 336.66 | 334.13 | 333.82 | 334.45 |
| Proteins | 72.00 | 71.89 | 72.12 | 64.61 | 64.52 | 64.69 | 63.31 | 63.24 | 63.38 |
| **Fats** | | | | | | | | | |
| Fatty acids, total saturated | 32.46 | 32.40 | 32.51 | 26.76 | 26.72 | 26.79 | 26.45 | 26.42 | 26.47 |
| Fatty acids, total monounsaturated | 33.65 | 33.59 | 33.71 | 25.87 | 25.84 | 25.90 | 25.97 | 25.95 | 26.00 |
| Fatty acids, total polyunsaturated | 11.30 | 11.28 | 11.32 | 8.97 | 8.96 | 8.98 | 9.05 | 9.04 | 9.06 |
| Cholesterol | 196.37 | 195.97 | 196.76 | 163.51 | 163.23 | 163.78 | 165.59 | 165.37 | 165.81 |
| Total lipid (fat) | 77.41 | 77.27 | 77.54 | 61.60 | 61.53 | 61.67 | 61.47 | 61.41 | 61.53 |
| **Fiber and sugars** | | | | | | | | | |
| Fiber, total dietary | 25.58 | 25.53 | 25.63 | 21.77 | 21.73 | 21.80 | 21.73 | 21.70 | 21.76 |
| Sugars, total | 144.24 | 143.98 | 144.50 | 121.73 | 121.60 | 121.87 | 127.96 | 127.84 | 128.08 |
| **Minerals** | | | | | | | | | |
| Sodium | 2,934.20 | 2,925.57 | 2,942.84 | 2,690.59 | 2,683.79 | 2,697.38 | 2,616.90 | 2,613.40 | 2,620.40 |
| Calcium, Ca | 864.20 | 862.09 | 866.30 | 801.31 | 799.47 | 803.16 | 790.08 | 788.90 | 791.26 |
| Iron, Fe | 31.08 | 30.99 | 31.17 | 27.98 | 27.91 | 28.04 | 27.33 | 27.28 | 27.38 |
| Magnesium, Mg | 313.09 | 312.55 | 313.62 | 260.85 | 260.54 | 261.15 | 247.64 | 247.31 | 247.98 |
| Phosphorus, P | 1,137.64 | 1,135.63 | 1,139.64 | 999.70 | 998.11 | 1,001.30 | 974.98 | 973.74 | 976.22 |
| Potassium, K | 2,947.35 | 2,942.03 | 2,952.68 | 2,408.73 | 2,405.15 | 2,412.31 | 2,268.04 | 2,265.60 | 2,270.49 |
| Zinc, Zn | 9.11 | 9.09 | 9.13 | 7.31 | 7.30 | 7.32 | 7.45 | 7.44 | 7.46 |
| **Vitamins** | | | | | | | | | |
| Folate | 510.30 | 509.23 | 511.37 | 434.37 | 433.81 | 434.94 | 437.23 | 436.26 | 438.19 |
| Vitamin A, RAE | 3,989.39 | 3,973.23 | 4,005.54 | 3,193.73 | 3,185.76 | 3,201.70 | 2,852.11 | 2,843.95 | 2,860.27 |
| Vitamin C, total ascorbic acid | 115.30 | 114.92 | 115.68 | 114.56 | 114.30 | 114.83 | 118.18 | 117.94 | 118.42 |
| Vitamin D | 3.26 | 3.25 | 3.27 | 3.05 | 3.03 | 3.06 | 2.84 | 2.83 | 2.84 |

# Nicaragua Urban Areas

| **Cases / Households** | | 589,907 | | | 576,334 | | | 728,886 |
|---|---|---|---|---|---|---|---|---|
| **2001** | **[95% CI]** | | **2005** | **[95% CI]** | | **2009** | **[95% CI]** | |
| 2,714.70 | 2,710.38 | 2,719.02 | 2,422.82 | 2,419.61 | 2,426.04 | 2,310.39 | 2,307.86 | 2,312.92 |
| 394.73 | 394.08 | 395.39 | 367.19 | 366.69 | 367.69 | 349.94 | 349.52 | 350.36 |
| 78.64 | 78.48 | 78.80 | 73.45 | 73.32 | 73.57 | 68.55 | 68.45 | 68.65 |
| | | | | | | | | |
| 34.20 | 34.13 | 34.27 | 28.75 | 28.70 | 28.80 | 27.54 | 27.51 | 27.57 |
| 36.33 | 36.26 | 36.41 | 28.15 | 28.11 | 28.19 | 27.56 | 27.53 | 27.59 |
| 11.56 | 11.54 | 11.58 | 9.48 | 9.47 | 9.50 | 9.04 | 9.03 | 9.05 |
| 205.56 | 205.05 | 206.07 | 175.63 | 175.26 | 176.00 | 167.92 | 167.64 | 168.20 |
| 82.09 | 81.93 | 82.26 | 66.38 | 66.28 | 66.48 | 64.14 | 64.07 | 64.20 |
| | | | | | | | | |
| 24.95 | 24.88 | 25.01 | 21.11 | 21.06 | 21.17 | 19.94 | 19.91 | 19.97 |
| 150.06 | 149.68 | 150.43 | 125.86 | 125.67 | 126.06 | 128.30 | 128.14 | 128.45 |
| | | | | | | | | |
| 3,349.97 | 3,337.09 | 3,362.84 | 3,296.95 | 3,286.01 | 3,307.90 | 3,040.87 | 3,035.91 | 3,045.83 |
| 870.64 | 868.52 | 872.75 | 842.41 | 839.92 | 844.91 | 782.58 | 781.37 | 783.80 |
| 29.18 | 29.09 | 29.27 | 25.97 | 25.92 | 26.03 | 23.83 | 23.79 | 23.88 |
| 292.66 | 292.11 | 293.21 | 249.63 | 249.22 | 250.04 | 222.00 | 221.68 | 222.32 |
| 1,141.24 | 1,139.00 | 1,143.49 | 1,040.86 | 1,038.50 | 1,043.21 | 949.91 | 948.57 | 951.26 |
| 2,879.31 | 2,873.29 | 2,885.33 | 2,372.61 | 2,367.37 | 2,377.86 | 2,107.30 | 2,104.46 | 2,110.13 |
| 9.85 | 9.82 | 9.89 | 7.99 | 7.97 | 8.00 | 7.65 | 7.64 | 7.66 |
| | | | | | | | | |
| 518.58 | 517.51 | 519.66 | 471.24 | 470.42 | 472.07 | 441.48 | 440.56 | 442.40 |
| 4,961.78 | 4,938.15 | 4,985.41 | 4,005.74 | 3,993.65 | 4,017.83 | 3,438.01 | 3,425.46 | 3,450.56 |
| 134.32 | 133.86 | 134.77 | 131.87 | 131.51 | 132.23 | 125.69 | 125.38 | 126.00 |
| 2.99 | 2.98 | 3.00 | 3.06 | 3.03 | 3.08 | 2.52 | 2.52 | 2.53 |

## Nicaragua Rural Areas

| **Cases / Households** | | 374,784 | | | 411,519 | | | 478,201 |
|---|---|---|---|---|---|---|---|---|
| **2001** | **[95% CI]** | | **2005** | **[95% CI]** | | **2009** | **[95% CI]** | |
| 2,309.47 | 2,304.06 | 2,314.89 | 1,892.70 | 1,889.75 | 1,895.66 | 1,993.16 | 1,990.35 | 1,995.97 |
| 352.98 | 352.16 | 353.80 | 293.05 | 292.60 | 293.51 | 310.05 | 309.60 | 310.49 |
| 61.56 | 61.38 | 61.73 | 52.22 | 52.12 | 52.33 | 55.32 | 55.22 | 55.41 |
| | | | | | | | | |
| 29.71 | 29.61 | 29.80 | 23.97 | 23.93 | 24.02 | 24.78 | 24.74 | 24.82 |
| 29.43 | 29.34 | 29.52 | 22.67 | 22.63 | 22.71 | 23.55 | 23.52 | 23.59 |
| 10.89 | 10.85 | 10.93 | 8.26 | 8.24 | 8.27 | 9.07 | 9.05 | 9.08 |
| 181.89 | 181.27 | 182.50 | 146.53 | 146.12 | 146.94 | 162.03 | 161.68 | 162.38 |
| 70.03 | 69.81 | 70.24 | 54.90 | 54.81 | 55.00 | 57.40 | 57.31 | 57.50 |
| | | | | | | | | |
| 26.57 | 26.49 | 26.65 | 22.68 | 22.64 | 22.72 | 24.47 | 24.41 | 24.52 |
| 135.08 | 134.76 | 135.40 | 115.95 | 115.77 | 116.14 | 127.44 | 127.26 | 127.63 |
| | | | | | | | | |
| 2,279.80 | 2,271.06 | 2,288.54 | 1,841.36 | 1,836.98 | 1,845.75 | 1,970.67 | 1,966.77 | 1,974.57 |
| 854.06 | 849.79 | 858.34 | 743.75 | 741.03 | 746.46 | 801.51 | 799.19 | 803.82 |
| 34.07 | 33.90 | 34.24 | 30.78 | 30.65 | 30.90 | 32.65 | 32.55 | 32.76 |
| 345.24 | 344.17 | 346.30 | 276.56 | 276.11 | 277.01 | 286.73 | 286.05 | 287.40 |
| 1,131.96 | 1,128.18 | 1,135.73 | 942.07 | 940.14 | 944.01 | 1,013.18 | 1,010.82 | 1,015.53 |
| 3,054.45 | 3,044.56 | 3,064.35 | 2,459.31 | 2,454.84 | 2,463.78 | 2,513.05 | 2,508.74 | 2,517.37 |
| 7.94 | 7.92 | 7.97 | 6.35 | 6.34 | 6.37 | 7.14 | 7.12 | 7.16 |
| | | | | | | | | |
| 497.27 | 495.08 | 499.45 | 382.74 | 382.06 | 383.41 | 430.74 | 428.75 | 432.74 |
| 2,458.84 | 2,441.34 | 2,476.35 | 2,056.51 | 2,048.84 | 2,064.18 | 1,959.06 | 1,952.14 | 1,965.97 |
| 85.37 | 84.70 | 86.03 | 90.33 | 89.94 | 90.72 | 106.74 | 106.35 | 107.12 |
| 3.68 | 3.65 | 3.71 | 3.04 | 3.02 | 3.05 | 3.32 | 3.31 | 3.33 |

# Panama

| | Nation | | | | | | Urban Areas | | | | | | Rural Areas | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Cases / Households** | | 758,365 | | | 875,021 | **Cases / Households** | | 487,755 | | | 584,496 | **Cases / Households** | | 270,610 | | | 290,525 |
| **Proximates** | **2003** | **[95% CI]** | | **2008** | **[95% CI]** | | **2003** | **[95% CI]** | | **2008** | **[95% CI]** | | **2003** | **[95% CI]** | | **2008** | **[95% CI]** | |
| Energy | 1,937.85 | 1,934.76 | 1,940.94 | 2,450.35 | 2,410.54 | 2,490.15 | 1,986.51 | 1,982.71 | 1,990.31 | 2,648.48 | 2,589.22 | 2,707.74 | 1,850.14 | 1,844.86 | 1,855.42 | 2,051.73 | 2,039.11 | 2,064.34 |
| Carbohydrate | 244.55 | 244.15 | 244.94 | 245.38 | 244.43 | 246.34 | 241.12 | 240.66 | 241.58 | 227.41 | 226.74 | 228.07 | 250.72 | 249.99 | 251.44 | 281.55 | 279.02 | 284.08 |
| Proteins | 59.54 | 59.44 | 59.64 | 58.97 | 58.84 | 59.09 | 63.29 | 63.18 | 63.41 | 60.83 | 60.67 | 60.99 | 52.77 | 52.59 | 52.94 | 55.21 | 55.00 | 55.41 |
| **Fats** | | | | | | | | | | | | | | | | | | |
| Fatty acids, total saturated | 32.83 | 32.72 | 32.95 | 52.70 | 51.18 | 54.23 | 33.52 | 33.37 | 33.66 | 60.81 | 58.54 | 63.09 | 31.60 | 31.41 | 31.78 | 36.39 | 35.86 | 36.92 |
| Fatty acids, total monounsaturated | 30.12 | 30.06 | 30.17 | 52.64 | 50.88 | 54.41 | 32.62 | 32.55 | 32.69 | 65.15 | 62.51 | 67.79 | 25.61 | 25.51 | 25.70 | 27.49 | 27.35 | 27.62 |
| Fatty acids, total polyunsaturated | 10.83 | 10.81 | 10.84 | 23.12 | 22.17 | 24.07 | 11.86 | 11.84 | 11.89 | 29.53 | 28.12 | 30.95 | 8.96 | 8.93 | 8.99 | 10.22 | 10.16 | 10.28 |
| Cholesterol | 230.41 | 229.99 | 230.82 | 287.21 | 282.60 | 291.82 | 249.45 | 248.95 | 249.94 | 328.99 | 322.11 | 335.88 | 196.09 | 195.37 | 196.81 | 203.15 | 202.38 | 203.92 |
| Total lipid (fat) | 73.77 | 73.61 | 73.94 | 128.47 | 124.24 | 132.70 | 78.00 | 77.79 | 78.21 | 155.50 | 149.17 | 161.82 | 66.16 | 65.89 | 66.42 | 74.10 | 73.47 | 74.73 |
| **Fiber and sugars** | | | | | | | | | | | | | | | | | | |
| Fiber, total dietary | 13.79 | 13.75 | 13.83 | 13.66 | 13.55 | 13.77 | 13.23 | 13.18 | 13.28 | 11.74 | 11.67 | 11.82 | 14.78 | 14.71 | 14.85 | 17.51 | 17.20 | 17.82 |
| Sugars, total | 94.29 | 94.13 | 94.46 | 96.90 | 96.40 | 97.41 | 97.04 | 96.85 | 97.24 | 90.17 | 89.84 | 90.51 | 89.34 | 89.05 | 89.63 | 110.44 | 109.07 | 111.81 |
| **Minerals** | | | | | | | | | | | | | | | | | | |
| Sodium | 1,975.86 | 1,972.47 | 1,979.26 | 2,619.13 | 2,569.47 | 2,668.78 | 2,244.32 | 2,240.01 | 2,248.63 | 3,102.71 | 3,028.46 | 3,176.95 | 1,491.99 | 1,486.97 | 1,497.00 | 1,646.23 | 1,640.22 | 1,652.25 |
| Calcium, Ca | 544.53 | 543.63 | 545.43 | 493.11 | 491.87 | 494.34 | 606.69 | 605.53 | 607.85 | 530.56 | 528.85 | 532.27 | 432.49 | 431.17 | 433.81 | 417.75 | 416.38 | 419.13 |
| Iron, Fe | 13.27 | 13.24 | 13.30 | 12.10 | 12.06 | 12.13 | 13.96 | 13.91 | 14.00 | 12.26 | 12.21 | 12.30 | 12.03 | 11.99 | 12.07 | 11.77 | 11.71 | 11.83 |
| Potassium, K | 2,513.05 | 2,508.93 | 2,517.16 | 2,562.98 | 2,549.70 | 2,576.27 | 2,583.14 | 2,578.20 | 2,588.07 | 2,434.52 | 2,427.30 | 2,441.73 | 2,386.72 | 2,379.40 | 2,394.04 | 2,821.44 | 2,784.17 | 2,858.70 |
| Zinc, Zn | 6.02 | 6.01 | 6.03 | 6.03 | 6.01 | 6.05 | 6.23 | 6.21 | 6.24 | 6.09 | 6.06 | 6.11 | 5.65 | 5.64 | 5.67 | 5.91 | 5.88 | 5.94 |
| **Vitamins** | | | | | | | | | | | | | | | | | | |
| Folate | 301.33 | 300.70 | 301.95 | 300.16 | 299.03 | 301.29 | 305.13 | 304.32 | 305.95 | 292.13 | 290.84 | 293.41 | 294.46 | 293.50 | 295.43 | 316.32 | 314.12 | 318.52 |
| Vitamin A, RAE | 800.16 | 797.61 | 802.70 | 1,657.67 | 1,588.18 | 1,727.15 | 894.67 | 891.42 | 897.92 | 2,137.09 | 2,033.12 | 2,241.05 | 629.81 | 625.82 | 633.80 | 693.14 | 687.73 | 698.55 |
| Vitamin C, total ascorbic acid | 95.30 | 95.06 | 95.55 | 105.39 | 104.80 | 105.98 | 103.95 | 103.64 | 104.26 | 107.74 | 107.13 | 108.35 | 79.71 | 79.33 | 80.10 | 100.67 | 99.39 | 101.95 |
| Vitamin D | 2.89 | 2.88 | 2.89 | 2.91 | 2.91 | 2.92 | 3.32 | 3.31 | 3.33 | 3.23 | 3.22 | 3.23 | 2.10 | 2.09 | 2.11 | 2.28 | 2.27 | 2.29 |

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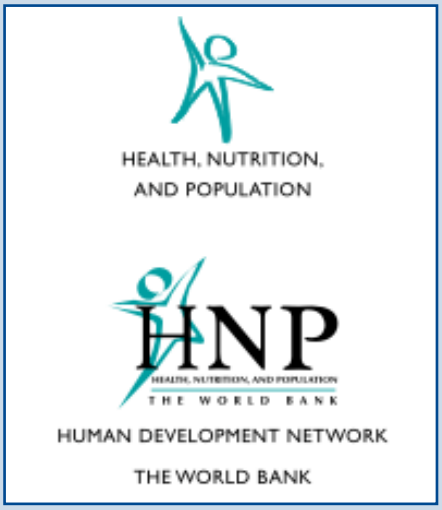


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