Towards the Measurement of Household Resilience to Food Insecurity: Applying a Model to Palestinian Household Data

Deriving Food Security Information from National Household Budget Surveys

Experiences, Achievements, Challenges

DERIVING FOOD SECURITY INFORMATION FROM NATIONAL HOUSEHOLD BUDGET SURVEYS

Experiences, Achievements, Challenges

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Acronyms

ARMM	Autonomous Region in Muslim Mindanao
ASEAN	Association of South East Asian Nations
CART	Classification and Regression Tree
CIS	Commonwealth of Independent States
CMSI	Centre of Medical Statistics and Information
COICOP	Classification of Individual Consumption by Purpose
CPI	Consumer Price Index
CSES	Cambodia Socio-Economic Survey
CV	Coefficient of Variation
DEC	Dietary Energy Consumption
DHS	Demographic and Health Survey
DS	Department of Statistics
EWS	Early Warning System
FANTA	Food and Nutrition Technical Assistance Project
FBS	Food Balance Sheet
FCT	Food Composition Table
FIES	Family Income and Expenditure Survey
FIVIMS	Food Insecurity and Vulnerability Information and Mapping Systems
FNRI	Food and Nutrition Research Institute
FSO	Food Security Observatory
FSSM	Food Security Statistics Module
GDI	Gender-related Development Index
GDP	Gross Domestic Product
HBS	Household Budget Survey
HDI	Human Development Index
HIES	Household Income and Expenditure Survey
HSP	FAO Household Survey Programme
ICAS	International Conference on Agriculture Statistics
IDC	International Demonstration Centre
IDRF	Cape Verde Household Income and Expenditure Survey (*Ínquérito Ás Despesase e Receitas Familiares)*
IFPRI	International Food Policy Research Institute
IHS	Integrated Household Survey
ILCS	Integrated Living Conditions Survey
ILO	International Labour Organization
INE	National Statistics Institute of Cape Verde (*Instituto Nacional de Estatistica*)
ISS	International Scientific Symposium
KIHBS	Kenya Integrated Household Budget Survey
KNBS	Kenya National Bureau of Statistics

Lao PDR	Lao People's Democratic Republic
LECS	Lao Expenditure and Consumption Survey
LFS	Labour Force Survey
LSIS	Lao Social Indicator Survey
MDER	Minimum Dietary Energy Requirement
MDG	Millennium Development Goals
MICS	Multi-Indicator Cluster Survey
MTDP	Medium-Term Development Plan
NBS	National Bureau of Statistics of the Republic of Moldova
NCDC	National Centre for Disease Control
NDC	National Demonstration Centre
NGO	Non-Governmental Organization
NHS	National Household Survey
NNS	National Nutrition Survey
NS	Nutrition Survey
NSC	National Statistics Centre
NSO	National Statistics Office
NSS	National Statistical Service of Armenia
OPT	Occupied Palestinian Territories
PA	Palestinian Authority
PCBS	Palestine Central Bureau of Statistics
PECS	Palestinian Expenditure and Consumption Survey
PIP	Palestinian Emergency and Public Investment Program
PPS	Probability Proportional to Size
PPPS	Palestinian Public Perception Survey
RAP	FAO Regional Office for Asia and the Pacific
SCS	State Committee of Statistics
SD1	Standard deviation of energy consumption due to income
SD2	Standard deviation of energy acquisition due to income
SEM	Structural Equation Model
SESP	Socio-Economic Stabilization Plan
UNDP	United Nations Development Programme
UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
UNRWA	United Nations Relief and Works Agency for Palestine Refugees in the Near East
UNU	United Nations University
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
UXO	Unexploded Ordinances
WBGS	West Bank and Gaza Strip
WFP	World Food Programme
WFS	World Food Summit
WHO	World Health Organization

Figures

Foreword

In the 1996 World Food Summit and later in 2000 in the Millennium Declaration, countries committed themselves to decreasing by half the number and the proportion of people suffering from hunger by 2015. Hungry people are defined as not having physical, social and economic access to sufficient, safe and nutritious food for meeting their dietary energy needs and food preferences for an active and healthy life.

FAO was given the mandate to monitor hunger reduction efforts by providing estimates on people with food deprivation (hunger) in terms of proportion and numbers. The bench-mark period for both World Food Summit and Development Goals targets is 1990-92. The State of Food Insecurity in the World published by FAO in 2006, indicates that more than 820 million people in the developing world were undernourished in 2001-03.

FAO has been monitoring food deprivation at country, regional and global levels using food consumption data as estimated by food balance sheets based on country data. Several national statistics offices have assessed food insecurity at national and sub-national levels using food consumption and income (or total expenditure as proxy) data collected in national household surveys. National statistics offices have analyzed household survey data using the Food Security Statistic Module (FSSM) developed by the Statistics Division. The FSSM is a set of procedures implemented by national statistics offices in countries to produce a suite of standard indicators on food security at national and sub-national levels that are consistent and comparable over time and among countries.

This document is a compilation of papers authored by national officers with the collaboration of FAO professionals involved in food security using food security statistics from 11 countries in Asia, Africa and Eastern Europe. The document also includes papers reporting on methodological issues related to the estimation of food deprivation in countries in terms of experiences and achievements. It points out challenges for future work in using food consumption and other pertinent data collected in national household surveys to assess the situation of food insecurity.

The aim of this document is to facilitate a better understanding of food security indicators in terms of their production and use for food policy analysis as well as their limitations. It highlights issues for further development to improve information on food security so that food policy measures can be better informed and monitored over time and be adjusted accordingly. Improving food data collection will allow practitioners and stakeholders on food security to better target food deprived people with more effective actions against hunger.

I wish to thank all authors from national statistical offices and institutions involved in food security, for sharing their experiences. I am also grateful to national teams of participant countries and FAO colleagues involved in the EC-FAO Food Security Information for Action Programme, in particularly the Household Survey Programme in the Statistics Division, Food Insecurity and Vulnerability Information and Mapping Systems (FIVIMS) in the Agricultural Development Economics Division, the Gender, Equity and Rural Employment Division which are part of the Economic and Social Development Department. Finally, I express my gratitude to the European Union for the financial support to participant countries and to the EC-FAO Food Security Information for Action Programme.

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Preface

The International Scientific Symposium (ISS) on Measurement and Assessment of Food Deprivation and Undernutrition, held in FAO in 2002, brought together scientists dealing with methods and their applications for measuring hunger. The aim of the ISS was to enhance FAO's mandate of measuring and monitoring progress towards World Food Summit and Millennium Development Goals targets on halving the number and the proportion of hungry people by the year 2015.

After the ISS several methodological proposals have been made for measuring hunger. In 2006 Kakwani and Son proposed for the 2001 global estimates, to use as a measure of hunger, the proportion of people not having enough income to meet basic food needs, using as cut-off point, in the income distribution, the cost of average energy requirements priced in 1993 PPP dollars with no indication of nutrient quality of food consumed[1]. This methodology has been applied by countries using national food poverty lines and it is known as extreme poverty or as food poverty.

In 2007 Smith and Subandoro[2] proposed a non-parametric approach for estimating the percentage of people that are food energy deficient using household survey data. Energy deficiency occurs when individuals consume less than the average energy requirement for light physical activity. The percentage of food energy deficient people for a given energy consumption level has been over-estimated, compared to FAO estimate, because of two main reasons: first, the value of the cut-off point is higher than the FAO's cut-off point, reflecting average energy needs for average body size of people compared to minimum acceptable body size used by FAO (light physical activity level is common to both approaches); and second, the implicit higher inequality measure in food consumption due to sources of variation other than income and biological factors.

FAO uses a parametric approach for global estimates of the prevalence of food deprivation using national food production and trade data to prepare national food balances. After the ISS, FAO extended the use of this approach to household survey data. The three parameters are: the mean and the variance of energy consumption under the assumption of a lognormal distribution and the cut-off point as described in the previous paragraph. The variance is derived taking into consideration only the income and biological factors, ignoring other factors usually related to sampling design and measurement errors.

The food security statistics, in particular the prevalence of food deprivation at national and sub-national levels, presented in the various papers of this document are based on the FAO approach, using household survey data on private food consumption. Food consumption from household survey data refers to food consumed by household members while food consumption in national food account data refers to food consumed by people in public establishments (hospitals, hotels, prisons, military compounds, etc.) and by household members (private consumption); hence the prevalence of food deprivation differs due to different target populations.

The idea of compiling various papers on food security statistics in one document aims to share country experience in recent years using the FAO approach to available data on food consumption collected in national household surveys. These papers

[1] New Global Poverty Counts, UNDP - International Poverty Centre Working Paper #29, Brasilia, Brazil, 2006.

[2] Measuring Food Security Using Household Expenditure Surveys: Food Security in Practice, IFPRI, Washington DC, USA, 2007

have been disseminated in international conferences such as the Fourth International Conference in Agriculture Statistics (ICAS-4) held in Beijing, China, 22-24 October 2007 and the 20th Session of the African Commission on Agricultural Statistics (AFCAS-20) in Algiers, Algeria, 10 - 13 December 2007.

The introductory paper in Part 1 summarizes the efforts and lessons learned from experiences in participating countries to improve food security statistics. Part 2 deals with food security estimates performed at national and sub-national levels in four countries. The papers of Cambodia and the Philippines are examples of food security statistics with gender analysis, while the Lao PDR and Mozambique papers are examples of sub-national analysis. Part 3 addresses measurement approaches of food acquisition and food consumption for the purpose of estimating food security statistics. The examples of Armenia, Cape Verde and Kenya depict detailed effects of how food data are collected on estimates of food security statistics in different settings. Part 4 reviews the policy implications of food security statistics on agriculture in Palestine and food security statistics trends in Moldova. Part 5 shows examples of enhanced analyses using panel data on food consumption in Tajikistan while linking child nutritional status with food security statistics in Georgia. Part 6 proposes methodological approaches for improving food security statistics for policy analysis; the first paper discusses household resilience to food insecurity using Palestinian data, while the last paper describes the linkage between critical food poverty and food deprivation. Finally, Part 7 provides a glossary of selected terminology related to food security statistics.

Part 1.

Improving food security information from country experiences

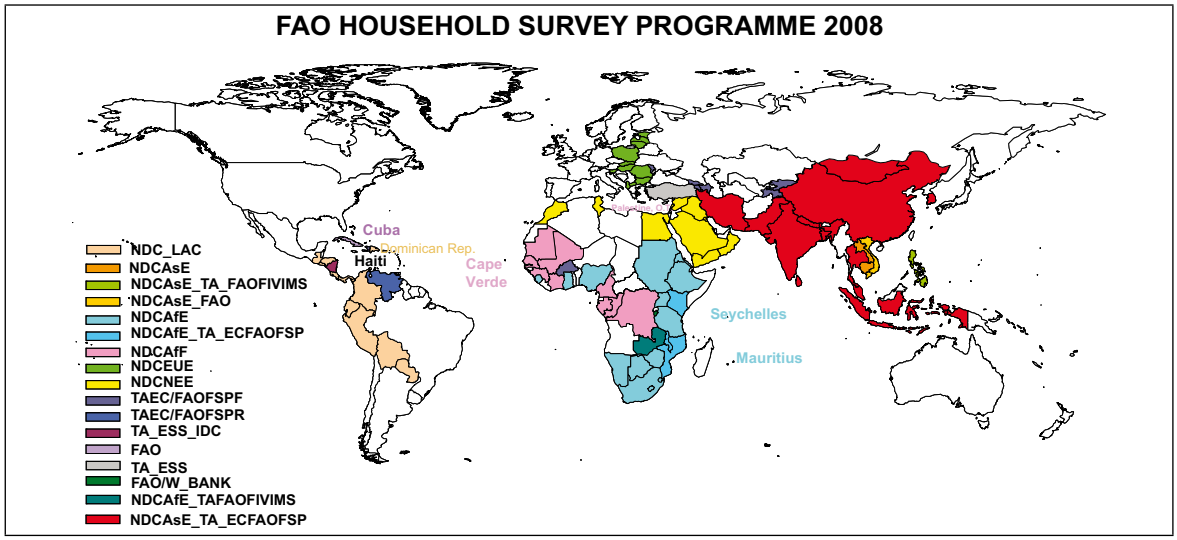
Deriving food security statistics from national household surveys: experiences, achievements and challenges

Ricardo Sibrian[3]

ABSTRACT

The FAO Household Survey Programme (HSP), which started in the mid-1980s, has helped many countries to improve the capacity of their national statistics offices (NSOs) concerning the derivation of food security statistics from national household survey (NHS) food consumption data. In 1994, HSP published the *Compendium on Food Consumption* and the *Sixth World Food Survey* as inputs for the World Food Summit (WFS) held in 1996. Since then, HSP has provided technical assistance to countries through regional seminars and workshops on how NSOs can estimate food security statistics from NHS data. Six regional workshops, in Asia (Bangkok 2002), English-speaking Africa (Accra 2003), Eastern Europe (Sinaia 2004), the Near East (Cairo 2005), French-speaking Africa (Bamako 2007) and Spanish-speaking Latin America and the Caribbean (San José, Costa Rica 2008) have covered 79 countries. Country representatives from NSOs and national institutions involved in food security have implemented the FAO methodology for estimating food deprivation (hunger) at national and sub-national levels. Participants from 12 country projects and four countries participating at the recently launched International Demonstration Centre (IDC) on Food Security and Consumption Statistics at FAO Headquarters have prepared technical reports on food insecurity assessments based on NHS data. This paper discusses the results, main issues and challenges for future development arising from these experiences to improve the statistical capacity of NSOs to produce food security statistics at national and sub-national levels, and of national food security units to perform food security analyses for national and international stakeholders.

Keywords: food security statistics, household surveys, food deprivation



[3] Senior statistician, FAO Statistics Division, Rome.

BACKGROUND

Within the framework of its Household Survey Programme (HSP), FAO has implemented three major activities to support countries in strengthening their statistical capacity to analyse the food consumption data collected in national household surveys (NHS) conducted by national statistics offices (NSO). These activities are: 1) regional workshops, known as national demonstration centres (NDCs) on food consumption and security statistics from NHS, implemented in support of the Food Insecurity and Vulnerability Information and Mapping Systems (FIVIMS) initiative; 2) the FAO Headquarters International Demonstration Centre (IDC) on Food Consumption and Security Statistics from NHS, for training country technical teams on food security in support of country projects financed by sources as the European Community (EC)-FAO and the World Bank; and 3) technical assistance for on-the-job training projects at the country level. Since 2002, HSP has covered 85 countries: 68 countries through the NDCs; four through IDC, which was launched in November 2006; and the remaining 13 countries through technical assistance within the framework of country projects, such as the EC-FAO Food Security Programme. Three IDC countries have been supported by EC projects and one by its own financial resources.

OBJECTIVE

The main objective of this paper is to discuss how experiences and achievements can help to overcome challenges in the search for ways to improve food security statistics and information that support committed national decision-making platforms in the fight against food deprivation and poverty.

EXPERIENCES

National demonstration centres

The NDCs on food security and consumption statistics from NHS were initially designed to review and discuss what could be done with the available NHS data collected on food consumption (in quantities and monetary values), income, non-food consumption and other household and member characteristics. The first NDCs were seminars rather than workshops, and few participant countries were able to produce food security statistics at the time.

Since 2002, the NDCs have been designed to work with NHS data to produce food security statistics. The NDC in Asia involved officers from the NSO only. This experience made it clear that deriving food security statistics is a rewarding challenge from a data processing and statistical analysis viewpoint. It was also clear, however, that users from various national sectors and the international community were unable to interpret food security statistics and were unaware of the possibility of producing them from already collected data. The NDC in Asia underlined the importance of collecting, processing and reviewing inconsistencies of data on food quantities consumed and the corresponding monetary values. It also made evident the importance of collecting food consumed data in standard measurement units, such as kilograms and grams for solid food items, and litres and millilitres for liquid and semi-solid food items. Several participating countries have improved their NHS as a result of this NDC.

The 2003 NDC with English-speaking African countries, in Accra, involved an officer from the NSO and one from national institution in charge of food security for each participating country. Producers and users of food security statistics interacted in the review of questionnaire design, data processing, statistical estimation and analysis, interpretation of the statistics produced, and presentation of findings.

The NDCs conducted in 2004 in Romania with Eastern Europe countries, in 2005 in Egypt with Near East countries, in 2007 in Mali with French-speaking

African countries and in 2008 in Costa Rica with Spanish-speaking countries in Latin America and the Caribbean involved the corresponding two national officers from each participating country. These NDCs have enabled software improvement to take place, speeding up productivity and ease of use of FAO's Food Security Statistics Module (FSSM), which is a set of statistical programs.

Technical assistance to on-the-job training projects

Simultaneous to implementation of the NDCs, technical assistance to on-the-job training of data processing and statistical analysis was provided by the FAO Statistics Division in countries participating in projects to improve food security information for supporting decision-makers on food security policies and actions. In 2002, four countries from the Commonwealth of Independent States (CIS) were supported by the EC within the framework of the EC-FAO Food Security Programme. In 2004 and 2005, four countries in Africa and Asia were supported by FIVIMS and World Bank projects. In 2006 and 2007, 13 countries from the CIS, Asia, Africa and the Caribbean were supported by the EC within the framework of the EC-FAO Food Security Programme. All countries have prepared national technical summary reports entitled *Food insecurity assessment based on food consumption statistics derived from the NHS*, using their most recently conducted national surveys. Most of these countries participated in the Side Event on Food Security Statistics and Information for Targeting Poor and Hungry Populations at Sub-national Levels, at the Fourth International Conference on Agriculture Statistics (ICAS-4) held in 2007, Beijing, and supported by FAO in the framework of the EC-FAO Food Security Information for Action Programme.

The International Demonstration Centre

The IDC on Food Security and Consumption Statistics from NHS was launched in November 2006 in response to country requests. IDC is located at FAO Headquarters and provides country participants with the opportunity to perform data processing, statistical analysis, report writing and dissemination of food security statistics. During the one-month training period, officers from each country's NSO, nutrition office and food security institution, work together as a team to produce a draft summary report to be presented to national and international stakeholders at a national seminar.

METHODOLOGICAL ISSUES

The training activities in more than 80 countries implemented through NDCs, IDC and direct technical assistance have provided outputs that merit close review. The methodological issues derived from these experiences are discussed in this section.

Scope, purpose and sample size of the NHS

The main purpose of conducting an NHS is to assess poverty, in order to provide inputs for national accounts and the elaboration of consumer price indices (CPIs), both total and food. Although most NHS collect food consumption data in quantity and monetary values, only a few countries process data on food consumption in quantities, limiting the estimation of statistics to those related to food monetary value. National counterparts in food data analysis have realized that many NHS require additional work for the estimation of food security statistics, in particular for estimating the prevalence of food deprivation. Modifications are required to NHS, diary designs and, in some cases, data collection procedures, to add value to ongoing NHS by including food security statistics as an extra purpose. In 2003, the International Conference of Labour Statisticians at the International Labour Organization (ILO) included food security as a purpose of household surveys of food consumption data. The sample sizes of most NHS are too small to yield reliable food security statistics at sub-national levels to match administrative criteria. Larger

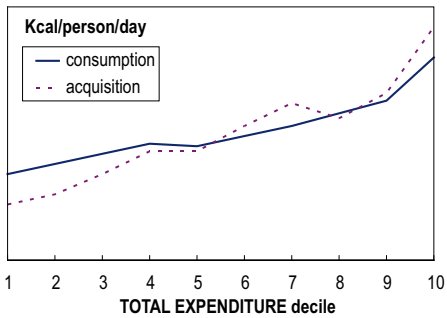
sample sizes may be needed to obtain food security statistics at such sub-national levels as provinces and to obtain identifiers and underlying factors of food insecurity.

Food data as acquisition versus as consumption

Most current questionnaires capture food data using the acquisition approach, that is, food acquired during the household reference period, regardless of when it was consumed. The effect of using acquisition data on food security statistic estimates is to flatten the distribution of food within the population, as illustrated in Figures 1.1 to 1.3 (Martirosova, 2007; Kvinikadze, Pantsulaia and Sibrian, 2007; Pereira, Troubat and Sibrian 2007).

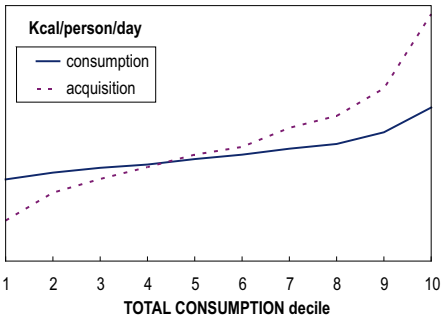
FIGURES 1.1 TO 1.3.
Dietary energy from food data collected using acquisition and consumption approaches

FIGURE 1.1.
Armenia



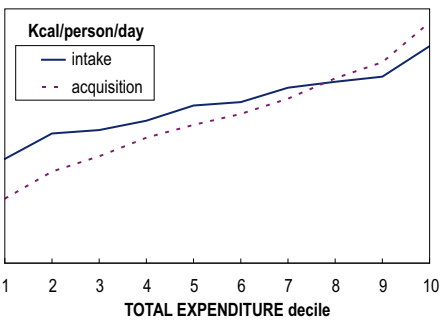
Source: ILCS 2004, Armenia.

FIGURE 1.2.
Georgia



Source: HHS 2000/2001, Georgia.

FIGURE 1.3.
Cape Verde



Source: IDRF 2001/2002, Cape Verde.

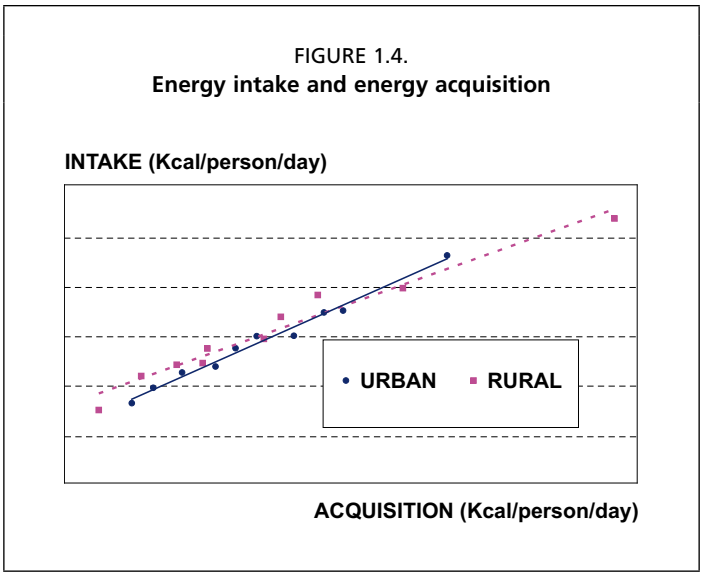
In all three cases, the use of food acquisition data led to underestimation of food consumption or intake in households of low income levels (proxy total expenditure or total consumption) and overestimation of high income levels in households; hence, food deprivation was overestimated in low-income population groups, and underestimated in high-income population groups. The pattern of under or overestimation differed among countries.

Estimating food consumption from food acquisition

In Georgia, the NHS for 2001/2002 provided inputs for estimating consumption from acquisition in the Integrated Household Survey (IHS) for 2005.

In Cape Verde, intake and acquisition in a sub-sample of households allowed the estimation of intake from acquisition for the complete sample of households in the 2001/2002 Household Expenditure and Income Survey (IDRF - *Ínquérito Ás Despesase e Receitas Familiares*). Figure 1.4 illustrates the relationship between intake and acquisition in the sub-sampled households, for both urban and rural populations.

FIGURE 1.4.
Energy intake and energy acquisition



Data on food given away

The majority of diaries and questionnaires do not capture transfers of food (in-kind) to other households or people as payments, and only a small number record food received as payments. The sharing of prepared food with visitors or workers is usually not recorded. As a result, the food data recorded in high-income households are overestimates, and in low-income households are underestimates. High-income households hire workers from low-income households. High-income households tend to be food givers, while low-income households tend to be food receivers. The effect of this over and underestimation of dietary energy consumption (DEC) is to produce an apparent distribution of food that is more unequal than it really is, particularly in rural populations (Kachaka, Mtembezeka and Chilimbila, 2007).

Data on food from own production

A significant proportion of households in rural areas produce food for own consumption. Most NHS questionnaires capture food consumption from own production, but few capture the quantities of a household's total production that it consumes itself during the reference period. This results in several NHS for Africa overestimating food consumption from own production in rural areas. As a consequence, food consumption is overestimated.

Data on food for non-consumption

Data on food acquired for purposes other than consumption should be clearly separated from data on food for consumption by household members. Food for re-sale may also be consumed, and if the portion of food for re-sale that a household consumes itself is not recorded, food consumption will be underestimated. Conversely, if all food for re-sale is recorded as consumption, then food consumption will be overestimated. Households' food industries may also be a source of household food consumption; if the portion of food produced that is consumed by the household is not recorded, food consumption will be underestimated; if all the food items used in the household food industry are recorded as consumption, food consumption will be overestimated. This situation is more frequently observed in urban households.

Data on food wastage

A significant proportion of the food acquired may be wasted during preparation as non-recycled leftovers and as leftovers on serving plates; this is highlighted in a study from Ankara, Turkey (Peckan *et al.*, 2005). The share of food wastage varies by food item and season. Food wastage also varies with households' income level and the amount of food they acquire and consume, as found in a study based on reported food intake and food consumption data in the Philippines (Sibrian, Komorowska and Mernies 2005). Food that is consumed away from home may also be wasted. Few NHS collect data on food wastage, which can range from negligible levels to more than 25 percent in terms of dietary energy. Food leftovers that are recycled for future meals or for feeding animals are not considered as food wastage. The consequence of not removing food wastage is thus overestimation of food consumed.

Data on food for animal feeding

Few NHS questionnaires include a section on food for human consumption that is also used to feed animals in or near the household. In urban households, pets (cats and dogs) benefit from food prepared for household members; in rural households, animals for production (pigs, hens, etc.) and pets share the food prepared for family members. An important amount of food can be devoted to this purpose. The share of food, prepared, raw or left over, for animal feeding is not considered as food consumption, but as food for non-consumption. In many cases, food leftovers for animal feeding are not food wastage.

Data on food sources

Food sources vary. The most important in the context of livelihoods are purchases for home preparation and food eaten away from home in urban areas, and own production and purchases in rural areas. In some countries, other sources include institutional food aid, such as for maternal and child care, food aid and school feeding. Few NHS record food received as payment, given by relatives and others, or gathered from fields or through hunting. Very few NHS also record food given away as payments or gifts. Most NHS use the classification of individual consumption by purpose (COICOP) coding system, which includes non-alcoholic and alcoholic consumption and food eaten away from home as food consumption. Tobacco consumption is considered non-food consumption.

Data on food description

Most NHS describe food items very briefly. In some, food items are grouped, which can lead to misinterpretation of food item descriptions when matching with food composition tables (FCTs). Mismatching of food items is a source of bias in energy and nutrient value estimations. The NHS lists of food items are often too short, and

are rarely very long. In many countries, non-standard measurement units (bundles, packs, cups, heaps, plates, cans, bags, boxes, etc.) vary significantly in weight or volume among food products and regions. This practice poses a serious threat to the use of food quantities for estimating nutrient consumption. Additional information on food items improves their identification in FCTs. For example, the specification of cooked or raw, with/without bones or skin, dry/semi-dry/non-dehydrated, fresh/canned, lean/fatty, sweetened/unsweetened, homogenized/non-homogenized and with/without non-edible portions has allowed better nutrient consumption estimates to be made. In NHS, non-standard measurement units are standardized using food samples and units from different local markets. Some NHS have prepared conversion tables for this purpose. These state average typical units of, for example, 125 grams for tomatoes and 50 grams for eggs. In most NHS, exogenous density factors are used to convert volumetric measurements of liquid or semi-liquid food items to their equivalent gram weights.

Data on food prices for own production/business consumption

When household food expenditure is not available because of own production of food items on farms, in household food industries or from re-sale businesses, a detailed description of the food items consumed allows estimation of the monetary value of food consumed, by matching food items consumed with local market prices collected during the survey period, at the community level, which is the lowest administrative unit of sampled households. These data are useful for consistency checking of food prices at both household and local-market levels. Food item prices collected from the local market are also useful when adjusting for price seasonal variations over the NHS period.

Income and total consumption expenditure aggregates

Using the FAO methodology, food security statistics require income or proxy total consumption expenditure data for estimating food consumption and inequality in access to food owing to income level. Income is generally difficult to aggregate, and proxy total consumption expenditure is useful for ranking households on a per capita income level basis to estimate the inequality of food consumption owing to income within a population. In low-income households, a large share of total consumption is devoted to food. The quality of the estimates of income, total consumption expenditure and food expenditure (the monetary value of food consumed) is also important for estimating the prevalence of critical food poverty. In NHS, total consumption expenditure is used more frequently than income for estimating the prevalence of both food deprivation and critical food poverty.

Gender analysis

Gender analysis studies of food insecurity have been prepared from NHS. Food security statistics, such as the prevalence of food deprivation and of critical food poverty, DEC, income, food expenditure, and dietary energy cost have been differentiated between female and male-headed households in urban and rural populations in Georgia, Cambodia and the Philippines.

COMPLEMENTARY DATA

Sex and age population structure

The minimum dietary energy requirement (MDER), which is needed for deriving the prevalence of food deprivation and of critical food poverty at sub-national level, are estimated in most NHS using the sampled age and sex population structures of the corresponding sub-national population groups.

Attained heights by sex and age

Few NHS collect height data contemporaneously with food consumption data. Some NHS are conducted independently from anthropometric surveys, but during the same year. In both situations, MDER is estimated using updated height data. When no updated height data are available, previous survey data are used; when these are not available, heights from a similar country are used.

Minimum dietary energy requirement

The amount of energy required by an individual varies by sex, age, body weight for attained height and physical activity level. MDER is the average minimum energy requirement, corresponding to the minimum normative weight for height for a given age and sex for sedentary physical activity levels. The estimation of MDER is based on data of attained heights by age and sex in the sampled population, at national level or from other height data, and the age and sex population structure of the sampled population or at national level.

The minimum levels of DEC are derived from the FAO/World Health Organization (WHO)/United Nations University (UNU) 2001 Expert Consultation on Energy Requirements, published in 2004, for different sex and age groups, for minimum acceptable body weight for attained height to maintain weight and growth while performing minimum acceptable light physical activity and to maintain a healthy life.

The cost of MDER

The cost of MDER is valued at energy-yielding nutrient cost (proteins, fats and carbohydrates). The costs of protein, fat and carbohydrates are based on the food consumed by households in the lowest income quintile, which is assumed to be within the reach of the entire population. MDER is nutritionally balanced when proteins, fats and carbohydrates contribute 12.5, 22.5 and 65 percent, respectively, as recommended by experts (WHO, 2003). In many countries, the cost of a balanced MDER for estimating the critical food poverty line is significantly higher than the cost of the current MDER based on food prices for the food consumption pattern of households in the lowest quintile; in countries with a near-to-balanced food consumption pattern, the balanced MDER is similar to the current MDER. In these countries, households in the lowest income quintile have access to food of proper nutritional quality.

Statistical frameworks

As FSSM uses the FAO methodology, the prevalence of food deprivation and critical food poverty are estimated based on the parametric approach. Other approaches are not taken into consideration because of their weaknesses; more details on this are discussed in Sibrian, Naiken and Mernies, 2007.

CHALLENGES

The major challenges for the near future concern improvement of NHS and national capacities to implement statistical procedures and analyse the food security statistics derived from food consumption data collected for the NHS and other surveys in a multi-sectoral manner, for better policies and interventions.

NHS improvement

Several countries have realized that NHS can include a section that estimates food acquisition as inputs to the elaboration of CPIs and national accounting system, and a section that estimates food consumption for the purpose of food security assessments. The changes required to existing questionnaires and diaries are

relatively small compared with the benefits of expanding the usefulness of NHS for food security, as recommended by the ILO International Conference of Labour Statisticians in 2003.

Few countries have sections on sub-sample nutrition surveys for estimating intake. Food intake measures what household members have actually eaten, using direct weights or recalling methods based on food models to estimate the quantities of food eaten. The nutrition survey module is similar to food consumption modules, but nutrition surveys can be complex and expensive because they involve calculating the ingredients in prepared food. The food consumption data collected in NHS consider the food items consumed as those acquired, taking into account food given away to other households or people and prepared food used for purposes other than consumption by the sampled household members. In this sense, food consumption lies somewhere between food acquisition and food intake. Nutrition surveys are usually undertaken on small samples of households and preclude the identification of food-insecure population groups; NHS usually collect food consumption data for more disaggregated levels, such as geographical regions and household characteristic criteria. Other developments linked to NHS improvements regard the input data for estimating MDERs, such as attained heights for given age and sex.

Statistical capacity improvement

The statistical capacity of NSOs varies from country to country. Many NSOs are specialized in collecting data, but leave statistical analysis to users. There have been good results achieved by multi-sectoral teams working on cross-cutting issues such as food security. Food security is an important national subject for economic (agriculture, trade, labour, industry, commerce, etc.) and social (health, education, housing, etc.) sectors. Support from research and academic institutions, and a productive international community interacting and coordinating policies and interventions are also important.

The producers of food security statistics and indicators (NSOs, nutrition offices and ministries of agriculture and of trade) interact with users in the task of monitoring food insecurity. NSOs face increasing demand from users, and hence require more support in building their statistical capacity.

Policy analysis and interventions with an impact on food security

Every stakeholder in food security has its own role in monitoring food security at national and sub-national levels. Many countries have already set up national multi-sectoral working groups on food security, but others still lack these, for various technical or political reasons.

CONCLUSION AND REMARKS

NHS are major sources of information for deriving food security statistics and indicators that can help in making decisions with a positive impact on food security.

NHS can incorporate food consumption and food acquisition, focusing data collecting procedures on household member characteristics.

NSOs can process and analyse food security statistics and indicators, jointly with users, for the purpose of assessing and monitoring food insecurity at national and sub-national levels.

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Part 2.

Deriving food security statistics at sub-national levels

Gender analysis on food security statistics by specific population group in the Philippines' FIES 2003

Emma Ala-Fabian, Federica Guarascio, John Curry and Ricardo Sibrian[4]

ABSTRACT

The 2003 Philippine Family Income and Expenditure Survey (FIES) provides information on family food consumption, family income and family living expenditure levels and patterns; determines sources of income and income distribution, levels of living and spending patterns, and the degree of inequality among families; provides benchmark information to update weights in the estimation of consumer price indices (CPIs); and provides inputs for estimation of the country's poverty threshold and incidence. FIES 2003 required families to report the monetary values of food consumed and the corresponding food quantities. National Statistics Office (NSO) conducts an FIES every three years.

This study used the data file of the 2003 FIES as input to run the statistical processes of the Food Security Statistics Module (FSSM) developed by FAO. The study used complementary data on height and the age-sex structure of the population to update estimates of the minimum dietary energy requirement (MDER) for some specific population groupings. These data enhance the accuracy of food security indicators at sub-national levels.

This paper presents some of these statistics at national and sub-national levels. In particular, a gender and regional analysis provides insight into food deprivation and critical food poverty.

Keywords: food security statistics, gender and regional analysis

BACKGROUND

Although many countries in the Asia-Pacific region have made great strides towards economic development, developing countries in the region still face considerable challenges to reduce poverty and food insecurity, improve human development, and meet Millennium Development Goal (MDG) and World Food Summit (WFS) targets. As a medium human-development country in the region, the Philippines ranked 84th out of 177 countries on the human development index (HDI) of 2005 (UNDP, 2006). The proportion of the Philippine population that is undernourished is estimated at 19 percent (FAO, 2006: Table 1). Gender equality issues also exist. In 2006, the Philippines was ranked 66th out of 136 countries on the gender-related development index (GDI)[5] (UNDP, 2006: Table 24).

Food production is one of the three pillars of food security. In the Philippines, food supplies for human consumption come mainly from agricultural production and trade. Tropical fruits, rice, maize, mushrooms and sugar cane are extremely significant in the Philippines. Coconut is widely grown in Mindanao regions, with Davao

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[5] GDI is a composite index that measures average achievement in the three basic dimensions captured in the HDI - a long and healthy life, knowledge, and a decent standard of living - adjusted to account for inequalities between men and women (UNDP, 2005).

reporting the highest share, at 17.2 percent of the country's total production in 2003. Coconut was reported as one of the principal trees in the Autonomous Region of Muslim Mindanao (ARMM), accounting for 7.9 percent of the country's production. In Western Visayas, 86.2 percent of the total area was planted with sugar cane. Data on livestock production showed chicken raising, hogs and goats as the primary activity in most farms in these regions, such as in Davao (with 5.4 million chickens), Western Visayas (with 480.1 thousand hogs) and Central Luzon (with 184.1 thousand goats). Fisheries accounted for 8.7 percent of total production, particularly commercial fishing in Calabarzon.

Recently, the gender dimension of agriculture's role in combating rural poverty and food insecurity has been receiving increased attention. Given the trends of increasing female headship and management of rural agricultural households, it is important to understand the gender dynamics of food security in developing countries in the Asia-Pacific region.

OBJECTIVE, DATA AND METHODS

This paper analyses the gender dynamics relating to food insecurity based on food security statistics derived from the 2003 Family Income and Expenditure Survey (FIES). The analysis provides inputs for planning geared towards gender equality, equity and female empowerment within a framework of national development.

The FIES was conducted by national Statistics Office (NSO) and collected food data at two interval points each related to a six-month period: first in July 2003 and then in January 2004. This study made use of the FIES 2003 food data items from the 42094 families who were interviewed during the two visits. These sample families are representative at national level and for the 17 administrative regions.

FSSM converted food consumption in quantities into dietary energy consumption (DEC), using energy conversion factors for energy-yielding macronutrients (proteins, fats and carbohydrates); these energy conversion factors were extracted from the Association of South East Asian Nations (ASEAN) food composition table (FCT). FSSM also estimated inequality in access to food in energy terms owing to income, that is, the coefficient of variation (CV) of DEC due to income at national and sub-national levels. Using age and sex population structures from the January 2004 Labour Force Survey (LFS) and data on heights collected in the 2003 National Nutrition Survey (NNS), FSSM estimated MDER for different population groups.[6]

The data from the Philippine FIES were grouped into 17 regions, but FSSM requires a grouping of only eight regions. Hence, the original 17 regions were recoded as eight regional groupings, as follows: 1) National Capital Region; 2) Luzon 1 (Ilocos and Central Luzon); 3) Luzon 2 (Cordillera Administrative Region and Cagayan Valley); 4) Luzon 3 (Calabarzon, Mimaropa and Bicol); 5) Visayas (Western Visayas, Central Visayas and Eastern Visayas); 6) Mindanao 1 (Zambaonga Peninsula and ARMM); 7) Mindanao 2 (Northern Mindanao and Caraga); and 8) Mindanao 3 (Davao and Soccskargen).

FOOD SECURITY STATISTICS RELATING TO GENDER

Age and sex structure of the population

Figures 2.1 and Figure 2.2 show the age and sex population structures, respectively, for male and female-headed families. At national level, in male-headed families, the proportion of males among all age groups was higher than that of females.

In female-headed families, the proportion of male family members was lower than that of females in the 15 to 19 years age group and in 30 and above age groups.

[6] FIES 2003 and the January 2004 LFS used the same sample families. LFS contains demographic characteristics of each family member, while FIES contains demographic characteristics of family heads only.

Male life expectancy and labour migration are key factors in analysing male presence in the population structure. Life expectancy for Philippine women is 72.5 years; for men it is 67.2 years. The presence of elder males and females is common in the Philippines because of close family ties, with families tending to stay together despite old age. Thus, a family will normally have a grandparent included as a dependent.

FIGURE 2.1.
Age and sex population structure in male-headed families

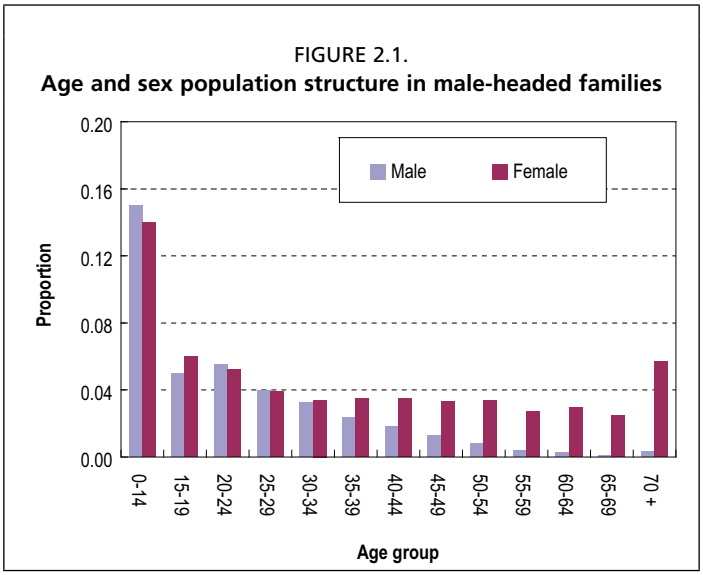


FIGURE 2.2.
Age and sex population structure in female-headed families

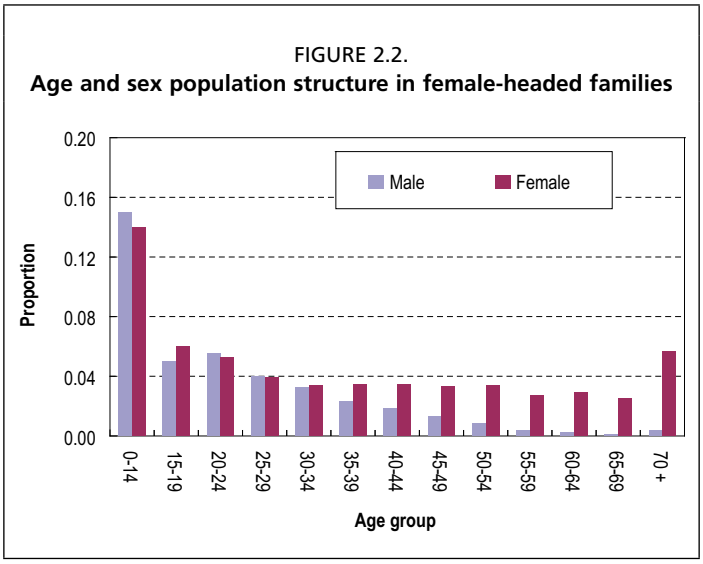
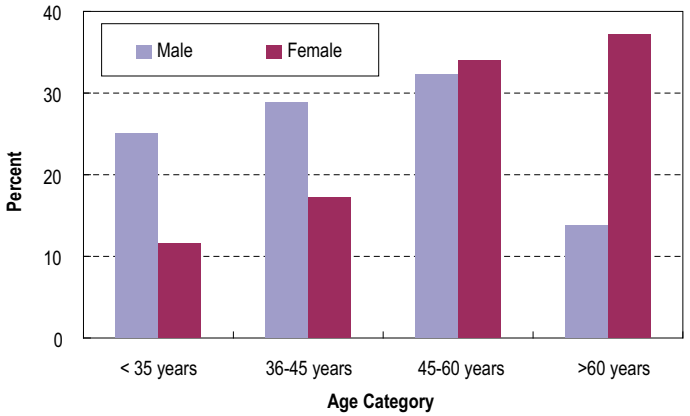


Figure 2.3 shows the percentages of male and female headed families for the total number of families, by age group of head.

Female family heads in the 60 and over age group comprised the largest share - at 37 percent - of female-headed families. This is in contrast to male family heads of the same age group, who accounted for only 14 percent of the total. Male family heads aged 45 to 60 years reported the largest share - at 32 percent - of male-headed families.

FIGURE 2.3.
Shares of male and female headed families as total number of families, by age group of head



Hunger and poverty

Food deprivation: Food deprivation, meaning failure to consume enough food to meet MDER, is linked to amounts of food consumed and the inequality in access to food mediated by income, within the population. In 2003, 38 percent of Philippine people were food-deprived (Figure 2.4).

At national level, food deprivation proportions were higher in male than in female- headed families, at 40 versus 27 percent. The prevalence was also higher for families headed by a male aged 35 to 44 years; with more than five family members; with the head working in agricultural activities; and with the head with no-schooling (no education grade).

FIGURE 2.4.
Prevalence of food deprivation in various population groups

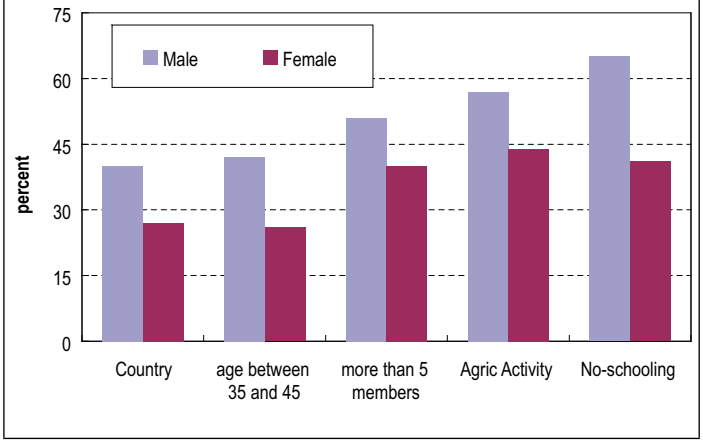
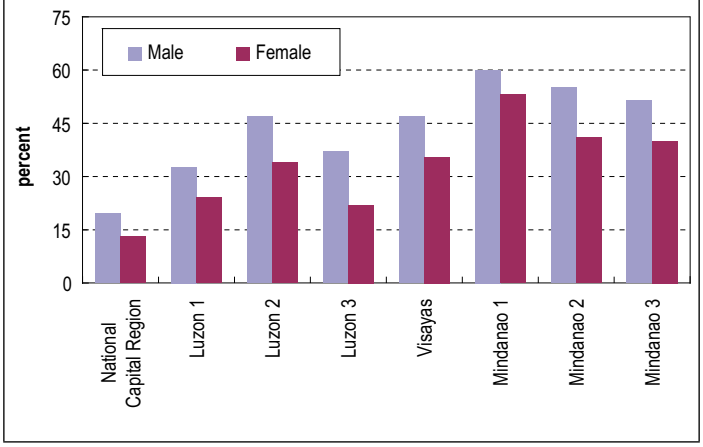


Figure 2.5 shows food deprivation at regional level. Food deprivation was high in all Mindanao regions, for both male and female-headed families, and ranged from 40 to 60 percent. Gender-wise, Luzon 3 reported the widest gap in food deprivation, with male-headed food deprivation 15 percent higher than female.

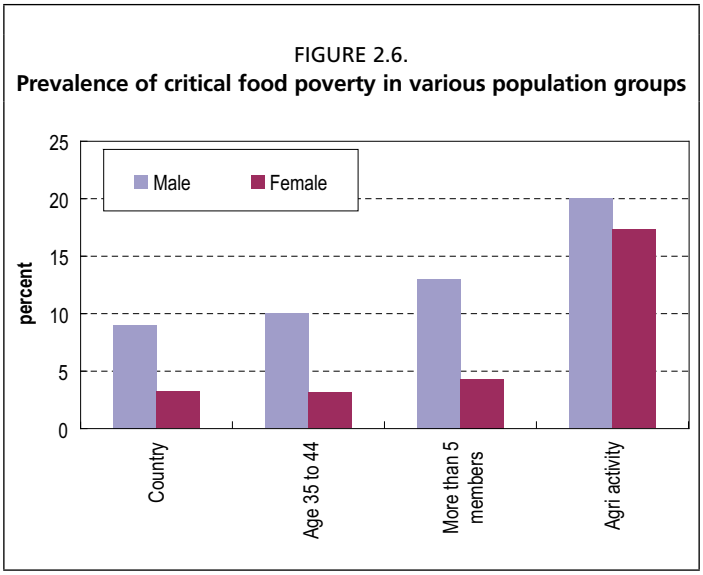
FIGURE 2.5.
Prevalence of food deprivation by region



Critical food poverty: The prevalence of critical food poverty refers to the proportion of the population whose income is lower than the cost of a food basket providing balanced MDER. Critical food poverty was higher in male than female-headed families, at nine compared with three percent. In particular, critical food poverty was higher in families headed by a young male, with more than five members, or with a family head working in agriculture activities or with no completed school (Figure 2.6).

The costs of the balanced-MDER were 12.43 and 11.86 pesos/1000 kcal, respectively, for female and male-headed families. Although female-headed families reported higher food costs, male-headed families still have higher food deprivation (Figure 2.4). The food deprivation gap between male and female headed families was 13 percent.

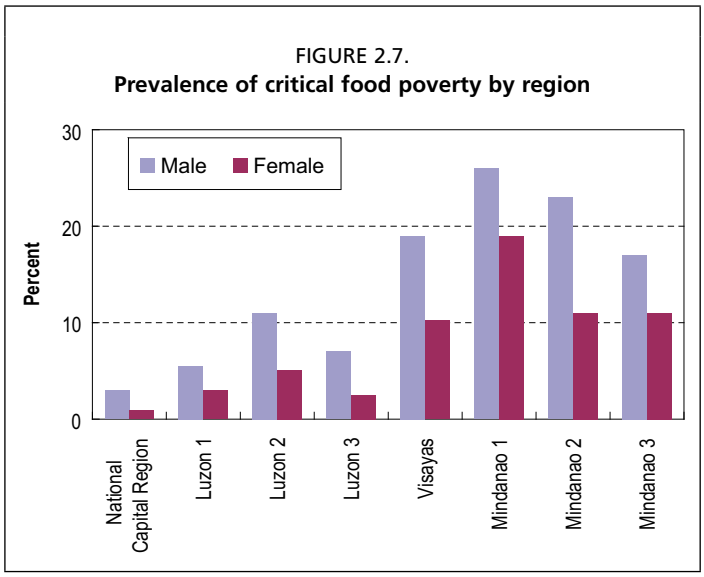
FIGURE 2.6.
Prevalence of critical food poverty in various population groups



Critical food poverty by age of family head showed that families headed by a young male were more critically food-poor than those headed by a young female. At national level, male-headed families were more critically food-poor than female-headed families.

Critical food poverty was higher for male than female-headed families in all regions (Figure 2.7). The highest critical food poverty was reported in Mindanao 1 (Zambaoanga Peninsula and ARMM).

FIGURE 2.7.
Prevalence of critical food poverty by region

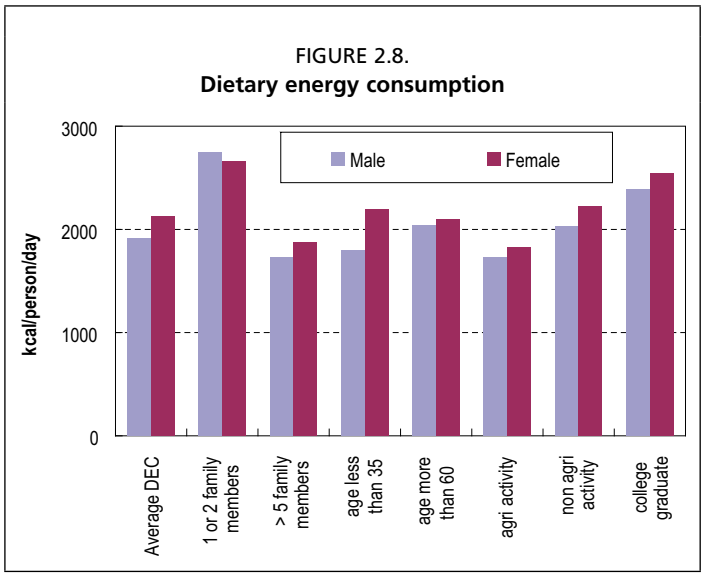


Food consumption and expenditures

Dietary energy consumption: Female-headed families consumed more food than male-headed ones (Figure 2.8). In particular, female-headed families had higher DEC than male-headed families of large size,[7] working in non-agricultural activities or with the highest level of education. In male-headed families, it could be expected that small families consume more food owing to the sex composition as compared with female-headed families.

The analysis of food consumed by age of family head revealed that families headed by a female of less than 35 years consumed more food than families headed by a male in the same age group. Female-headed families spent more on food and had higher dietary energy prices than male-headed families.

FIGURE 2.8.
Dietary energy consumption



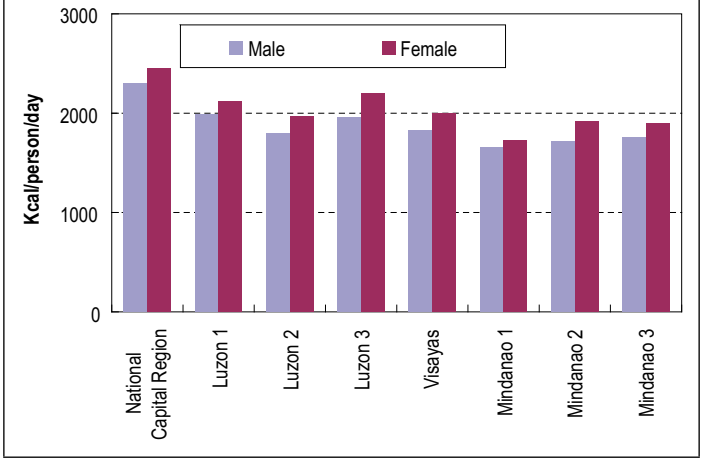
The higher prevalence of food deprivation among male-headed families was therefore mainly linked to low food consumption. Analysis of food consumed, by

[7] The average number of members in small families headed by a female was 1.7, while for families headed by a male it was 1.9. This explains the higher DEC for female-headed families with one or two family members.

economic activity of family head, revealed that both female and male-headed families working in agricultural sectors had lower food consumption than families working in non-agricultural sectors.

At regional level, male-headed families consumed less food in all regions (Figure 2.9). Food consumption was particularly low in Mindanao regions, where food deprivation rates were critically high.

FIGURE 2.9.
Dietary energy consumption by region



Share of food consumption by food source: Figures 2.10 and 2.11 show that both female and male-headed families purchased a high proportion of the food they consumed. However, families headed by a male unskilled worker had higher consumption of purchased food[8] than female-headed families.

Families headed by a young and low-educated female whose economic activity was non-agricultural consumed slightly more food from purchases than male-headed families. Food consumption from other sources (including own production) was slightly higher for male-headed families, particularly when the family head was a farmer or fisherman, probably because these categories produce the food they consume.

FIGURE 2.10.
Shares of DEC from purchases

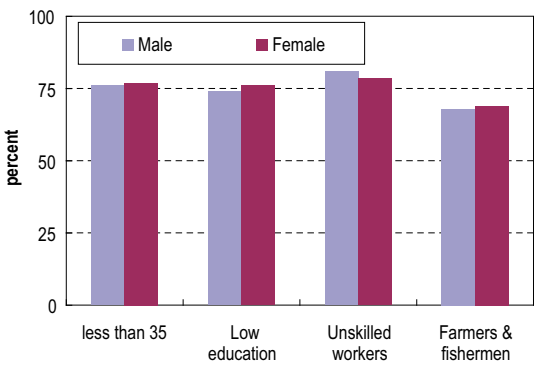
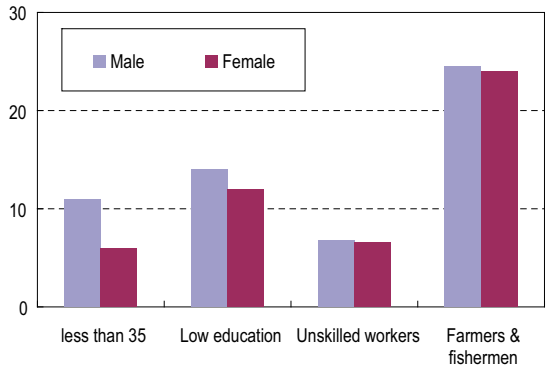


FIGURE 2.11.
Shares of DEC from other sources, including own production



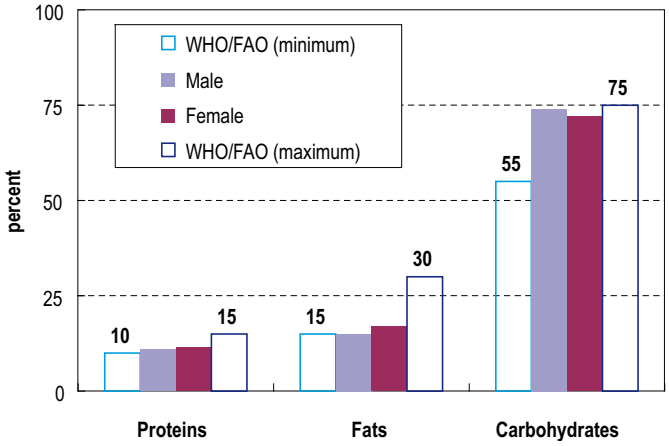
[8] A data limitation in this report was that food from own production could not be estimated separately, as it was recorded as purchases (*Food insecurity assessment based on food consumption statistics derived from the 2003 Philippines family income and expenditure survey. Summary preliminary report*).

The analysis of female and male-headed families' food consumption by food source for different population categories showed a common pattern: the most vulnerable groups purchase a higher share of the food they consume, so are the most affected by price variations. In addition, for both types of families, a large share of the food consumed was received as gifts from other sources.

Diet diversity: The quality of diet was the same for female and male-headed families. It was balanced in energy from proteins and carbohydrates (in both cases within the recommended ranges, 10-15 and 55-75 percent, respectively). Percentage share of energy from fats in the diet was within the recommended range in female-headed families (15-30 percent), but not in male-headed families (at less than 15 percent), as shown in Figure 2.12.

Rice and cereals are a significant source of dietary energy, and carbohydrate consumption provides 64 percent of total energy from food. Of total protein consumption, 12 percent was from fish.

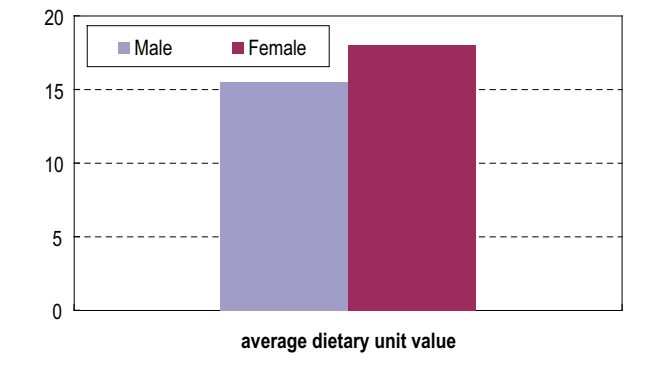
FIGURE 2.12.
Shares of DEC from proteins, fats and carbohydrates



Dietary unit energy cost: On average, female-headed families had higher dietary energy unit values than male-headed families (Figure 2.13).

The differences in MDER costs between female and male-headed families may reflect that female-headed families acquired nutritionally better food or more expensive food items.

FIGURE 2.13.
Average dietary unit cost (pesos/1 000 kcal)



Food may cost more because of acquisition mechanisms such as credit or frequent purchases of small quantities, which increase food costs. Poor families are most likely to ask for credit from suppliers for small quantities of food for consumption, so prices that are already high are made even higher through the use of credit.

Share of food in total consumption: Female-headed families spent on average a larger share of their total consumption on food than male-headed families. In particular, female-headed families spent more on food when the family was small, or when the family head was working in non-agricultural activities or had the highest level of education. However, analysis of total consumption of food by age of family head revealed that young female-headed families consumed more food than young male-headed families, but senior male-headed families consumed more than female-headed families in the same category. This indicates that families headed by a senior female had less money for buying goods other than food. However, among families with little money, those headed by a female were in a better position to buy any kind of goods, including food, than those headed by a male.

Inequality in access to food: The CV for food DEC was 29.4 percent for both female and male-headed families. This indicates equality in access to food between men and women.

CONCLUSION AND REMARKS

At national level, the data analysis showed a high food deprivation for male-headed compared with female-headed families. This was the case even when female and male-headed families had the same CV and MDER. This means that female-headed families acquire more food for consumption than male-headed families.

This pattern was confirmed by the findings on critical food poverty, for which male-headed families had rates three times higher than female-headed families. A lower income (or proxy total consumption expenditure) of 62.47 pesos/person/day in male-headed families, compared with 91.36 pesos/person/day in female-headed families, may explain the condition of male-headed families; male family heads may be the only source of income for larger families.

At regional level, it was observed that regions with high food deprivation and critical food poverty were rural regions where the main activity was agriculture. This was not the case in urban regions such as national Capital Region. It would be useful to analyse gender dynamics according to whether the region is urban or rural as this could provide important details for food insecurity analysis.

For female-headed families, food is a major investment, with women being more knowledgeable about this than men. However, male-headed families do not have the possibility of investing in either food or durable goods because they are more critically food-poor and food-deprived than female-headed families. This might be the result of gender inequalities in the roles and tasks related to food. Mechanisms such as micro-credit could improve financial status and increase community cohesion, with positive effects on reducing food deprivation and critical food poverty, especially in disadvantaged groups and areas where agriculture is the major activity.

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Sub-national estimates of food security statistics in Lao PDR's LECS III

Samaychanh Boupha[9]

ABSTRACT

The Lao Expenditure and Consumption Survey (LECS) is the largest and most important survey that national Statistics Centre (NSC) has undertaken. LECS III (for 2002/2003) was conducted over a period of 12 months from March 2002 to February 2003 as part of a regular five-year programme. Compared with previous surveys, LECS III contained some additional modules to improve food poverty monitoring, and collected data from a sample of 8100 households nationwide, with appropriate urban, rural and provincial coverage. Data on expenditure and consumption were collected for a whole month based on daily recording of all transactions in diaries. Food data were available for more than 150 food items, and included food expenditures for purchases and own production, as well as food consumed away from home. Household food consumption from own production was also collected, and quantities and monetary values estimated. The Food Security Statistics Module (FSSM) for comprehensive food consumption analysis was applied to LECS III food consumption data to derive statistics for analysis of the food situation in the country at national and sub-national levels.

This paper presents some of the statistics for national-level and different sub-national population groups.

Key words: food security indicators, sub-national

INTRODUCTION

The Lao People's Democratic Republic (Lao PDR) has a population of 5.6 million, of which 65 percent are concentrated along the Mekong River and in lowland areas. Lao PDR is one of the least developed countries in the East Asia region, with estimated yearly per capita income of US$606 in 2006. More than three-quarters of the people of Lao PDR live on less than US$2 a day, and the country's social indicators are among the most alarming in the region. Lao PDR is geographically situated in the centre of Indo-China, with 87 percent of its total land area being mountainous elevations over 500 m high, typically characterized by steep terrain and narrow river valleys with low agricultural potential, which slows down the country's overall economic performance.

Since launching the transition from central planning to a market economy almost two decades ago, Lao PDR has shown robust growth. Its annual per capita growth rate of 4.1 percent from 1988 to 2004 was 1.2 percentage points higher than the average for the group of low-income economies. A rise in per capita output of more than 80 percent came about via a shift in the composition of gross domestic product (GDP) from the primary to the secondary sector. Industrial growth averaged 11.9 percent from 1987 to 2004, compared with only 4.3 percent growth in agriculture. Over the same period, agriculture declined from 63 to 46 percent of GDP, while industry expanded from 11 to 27 percent. The relative decline of agricultural value-added brought a shift from on to off-farm work. The share of farmers among the employed labour force dropped from 82 percent in 1992/1993 to 67 percent in 2002/2003. This adjustment raised the living standards of families, as non-farm workers are about twice as productive as farm workers. The output share

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of rice declined from more than four-fifths in 1995 to just two-thirds in 2004. The contribution of rice would have fallen even more without steady increases in yields, which rose from 2.3 percent in 1990 to 3.3 in 2002/2003. While overall agricultural growth remained roughly constant, at six percent, expansion between 1997/1998 and 2002/2003 was more focused on crop production, which grew by 5.2 percent compared with only 2.5 percent from 1992/1993 to 1997/1998. The second five-year period saw sharp increases in the output of not only rice, but also vegetables, beans and sugar cane, leading to more diversified crop production.

The economic performance of Lao PDR was measured by the three Laos Expenditure and Consumption Surveys (LECS) conducted by National Statistics Centre (NSC) in 1992/1993, 1997/1998 and 2002/2003. Although the population expanded by one million people between 1992/1993 and 2002/2003, analysis of the results from the LECS shows an overall improvement in living standards. The absolute number of poor declined from about 2.0 million to 1.8 million. The impact of poverty reduction shifted during the late 1990s, from valleys to hilltops and from the poor to the very poor. Poverty is lower in cities than in villages, in localities with roads than in those without, and in non-priority districts than in priority districts. In particular, in the 47 priority districts, the poor in 2002/2003 were still more than double the non-poor. Exposure to food price variability has also decreased, as the share of food in total consumption declined from 64 percent in 1992/1993 to 61 percent in 1997/1998 and 55 percent in 2002/2003.

The three surveys together proved a very good tool for monitoring poverty, so the analysis of food consumption data derived from the surveys provides more key information on the overall situation of the country in terms of food security, at national level and for sub-national population groups. This exercise was conducted using the food consumption data from the 2002/2003 LECS III; some of the main results are presented in this paper.

LECS III

LECS III covers the whole of Lao PDR. The statistical unit is the household, and the survey covers economic transactions of households to estimate household income, consumption and production, as well as a number of social indicators. LECS III was undertaken from 1 March 2002 to 28 February 2003 (12 months). NSC conducts LECS every five years.

LECS is a multi-purpose survey designed with an emphasis on particular issues. The 1992/1993 LECS was combined with a large module of social indicators from the Lao Social Indicator Survey (LSIS). The 1997/1998 and 2002/2003 LECS focused on the economic activities of households. The objectives of LECS are to provide macro estimates for national accounts, the consumption structure (weighing system) for the consumer price index (CPI), estimates of labour force, and statistics on access to nutrition and income distribution.

The LECS sample design

The LECS III sample was made up of 8100 households from 540 villages - 15 households from each - enumerated over the 12 months of the survey. The sample was selected using the NSC village list as a sampling frame. A two-stage sampling scheme was used. In the first stage, a sample of villages was selected by probability proportional to size (PPS) sampling. The villages were first divided by province, then into urban and rural areas, and finally into rural villages with access to roads and those without. The sample of villages in each province was allocated a survey month randomly, so that each survey month had approximately the same number of sample villages. In the second stage, a systematic sample of 15 households was selected in each sample village.

Reliability of data

LECS is a sample survey, and as such is subject to sampling errors. Sampling errors in LECS III have been calculated for some important variables and are included in tables in the form of 95 percent confidence intervals ("margin of error"). All confidence intervals are in absolute figures. Data quality is also dependent on measurement, data entry and coding errors. Although efforts to detect data errors were made, there may still be some left, but they will not influence the results more than marginally. When judging quality, it must be kept in mind that the survey touches on concepts of household economy that are difficult to assess, not immediately clear, and therefore subject to different interpretations.

Questions in the village questionnaire are answered by village chiefs. His or her knowledge of the situation in the village may be more or less accurate, and can affect the results. For example, she/he may report data that tend to make the situation look better, such as by seeming to comply better with planning goals than is really the case or, worse, if he/she believes that this could benefit the village. The information in the household module is given by the households themselves, so it is up-to-date and mirrors the actual situation. The head count is based on information given by the village chief, and some data concerning households may not be up-to-date.

ANALYSIS OF FOOD SECURITY FROM LECS III

The estimated number of households in Lao PDR was 867000, and the average household size was 6.1, with a margin of error of ± 0.1.

Although the household size was significantly lower in LECS III compared with LECS II, its estimates seem to be more in line with those from the 1995 Census and the population head counts conducted in 2000 and 2003. Isolated households in northern regions were generally larger in size than urban households in the south.

TABLE 3.1
Average household size by type of area, 2002/2003

	Urban	Rural with access to road	Rural without access to road	Total
Lao PDR	5.8	6.0	6.6	6.1
North	5.8	6.0	7.0	6.2
Centre	5.8	6.1	6.4	6.0
South	5.6	6.0	6.1	5.9

Magnitude of food deprivation

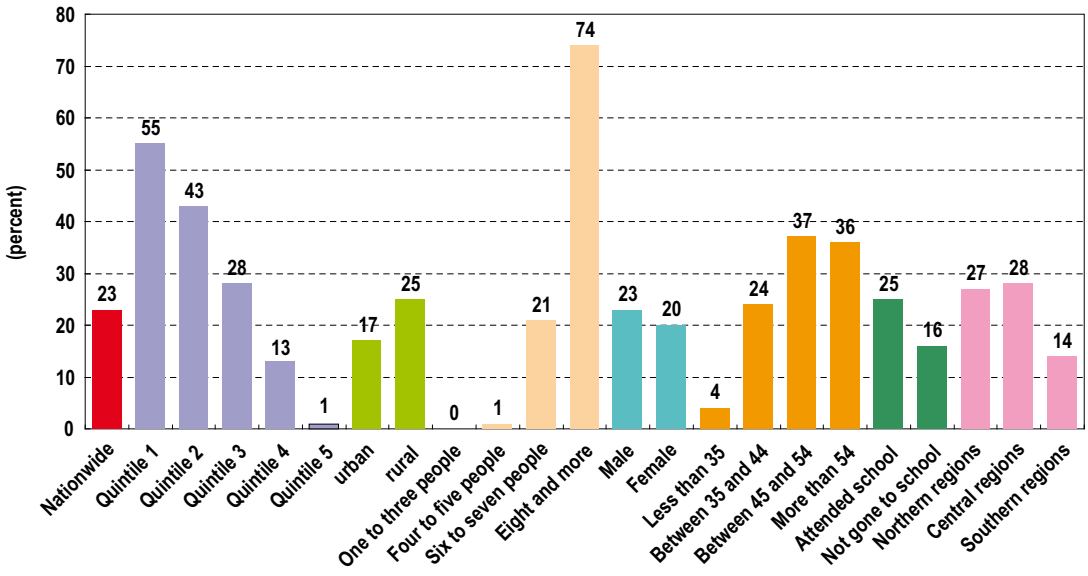
The prevalence of food deprivation,[10] as defined by Millennium Development Goal (MDG) indicator 1.9 on hunger reduction, was measured at national and sub-national levels. At national level, an average of almost one person out of four was food deprived in 2002/2003.

This high level of food deprivation did not reflect the overall situation of food insecurity at sub-national levels, as 17 percent of the population in urban areas was undernourished, compared with 25 percent in rural areas; 55 percent of the population with the lowest income was food insecure. The problem of access to food seems to intensify as the head of the household gets older or the size of the

[10] The prevalence of food deprivation depends mainly on three components:1) amount of dietary energy contained in food consumed; 2) inequality in access to food, mediated mainly by income; and 3) minimum dietary energy consumption (DEC) for a low acceptable body-weight for attained height and for performing sedentary physical activity, by age group and sex. The weighted overall minimum dietary energy requirement (MDER) of 1638 kcal per person per day was used as the cut-off point of the distribution function of DEC for estimating the prevalence of food deprivation.

household increases. One person out of two in households of six people and more was at risk of suffering from food deprivation.

FIGURE 3.1.
Food deprivation in Lao PDR



Depth of food deprivation

Nationwide, the average daily consumption for food-deprived people was about 1401 kcal. It would thus require an additional 237 kcal per day for the food-deprived population to reach the MDER of 1638 kcal needed to maintain a healthy life and perform a minimum level of physical activity; and an additional 452 kcal would be needed to reach the average DEC of 2090 kcal.

These deficits were at national level, but the intensity of food deprivation differed and widened within different groups of the population. For instance, the difference in average food consumption by food-deprived people in rural and urban areas was 102 kcal per person per day, but it would require an additional 866 kcal for the food-deprived population of urban areas to reach the average 2350 kcal DEC of urban areas, and less than 618 kcal for rural food-deprived people to reach the average 2000 kcal consumed in rural areas. Another interesting result is that rural areas' average DEC of 2000 kcal/person/day was equal to the average energy required, while the average DEC of urban areas, at 2350 kcal/person/day, was well above the average energy requirement of 2152 kcal.

Food consumption

A household in Lao PDR consumed goods and services with an average value of about 1.1 million kip per month. Half of this was devoted to food products, with a daily expenditure per person of about 2960 kip. The more vulnerable households in the lowest income group of the population spent on average less than a third as much on food than households in the highest income group. In terms of DEC, this represents a daily consumption of 2090 kcal per person. Food consumption patterns go in the opposite direction to food deprivation, and differed not only according to income level of the household but also area of residence, size of the household, region, and age or gender of the head of the household. The size and income level

were the two determinant variables with the greatest impact on the dietary energy of food consumed. Thus, a person from a low-income household of more than eight members consumed at least 500 kcal less than national average and about 2000 kcal less than a person from a household with fewer than three members.

As more than 75 percent of the population were engaged in subsistence farming, 45 percent of the monetary value of food consumed came from own production. Again this share varies widely among population sub-groups, and was higher for low-income households in rural areas or regions in the North (at more than 60 percent) than for households in urban areas and with high income, which purchased more than 73 percent of the food they consumed. In terms of dietary energy, the pattern was the same, but the magnitude was exacerbated. At national level, 61 percent of dietary energy came from own production. This reflected the fact that on average own-produced food was high-energy food of low cost. An important feature was that 75 percent of the monetary value of the food acquired by households in the lowest income group came from their own production, and this share increased to 84 percent when looking at food consumption in dietary energy terms. These results have two implications: 1) the lowest income group of the population is highly dependent on own production, and any change in this may have a major impact on food security; and 2) the nutrient consumption pattern is unbalanced, with more than 75 percent of energy coming from carbohydrates and less than 15 percent from fats. In contrast, 62 percent of the DEC of the highest income group came from purchases, nine percent from food consumed away from home and 28 percent from own production.

Diet composition

Providing 73 percent of the total calories consumed in Lao PDR, carbohydrates represented the largest energy source in the diet, followed by protein and, to a lesser extent, fats. Consumption of fats was too low, and should be much higher to meet the WHO/FAO guidelines for a balanced diet; consumption of rice contributed more than 75 percent of total consumption of cereals, which is higher than the guidelines because there are other products providing carbohydrates.

In general, people from urban areas consumed more carbohydrates and fats than people in rural areas. However, when looking at the contribution of each group of food products to total DEC, it appears that cereals and meat products together contributed 88 percent (75 and 13 percent, respectively) of the DEC of households in rural areas, while this share fell to 74 percent in urban areas (65 and eight percent, respectively). Meat contributed only eight percent of the diet of urban households; prepared food and food away from home represented 11 percent. The contributions of other foods were the same in the two areas.

The pattern of diet composition differs widely among regions. Households from southern regions consumed about 400 kcal/person/day more than households in northern regions, with a higher share of proteins (19 versus 14 percent) and a lower share of carbohydrates (69 versus 74 percent). This higher share of proteins in southern regions can be explained by the fact that most livestock is raised in this part of the country, so 53 percent of the total protein consumed was from animal products (meat, fish, eggs and dairy) in rural areas, while 56 percent was from vegetable products in urban areas.

Inequality in income and food consumption

The Gini coefficient, the coefficient of variation (CV) and the dispersion ratios are among the various indicators used to measure inequality of income or of access to food.

Inequality in access to food refers to data in both DEC and monetary value. Inequality in access to food, as given by the CV, was quite high, with almost no

significant differences between urban and rural areas, even though food deprivation in these areas differed widely (at 17 versus 25 percent). Among the young population, inequality in access to food was lower and DEC higher than in households with older heads. This can be attributed to the fact that 55 percent of the food acquired by households whose head was more than 54 years of age was purchased, while 57 percent of the food consumed by young households was from own production; hence these households are less vulnerable to market price fluctuations than those with older heads. Inequality in access to food in monetary terms was higher than that in dietary energy terms, as it took food price effects into account.

In Lao PDR, total expenditure was used as a proxy for income. Income inequality was higher than food consumption inequality because the range of variation of incomes among households was higher than that for food consumption. Households were constrained by biological requirements, and variations due to income were linked to demand elasticity only. At national level, the income of the last quintile was more than five times that of the first quintile, but at sub-national levels, the trends were different, as income disparities within urban households were much higher than those within rural households.

The analysis of inequality in terms of CV or Gini coefficient gives the same pattern. Based on LECS III, the Gini coefficient of income was 37.4, which corroborates the general findings according to which the Gini of income in Lao PDR was about 35 percent.[11]

Demand elasticity with respect to income is also a good indicator of inequality in access to food, as it measures the variations in food demand due to changes in income. Changes in food demand are more significant when the income of low-income households increases than when that of high-income households increases. This is mainly owing to the greater value of the Engel ratio (share of food in total consumption) of poor households compared with rich ones. In Lao PDR, a one percent increase in income leads to a 2.4 percent increase in food expenditure for households with low income, while it has a marginal impact of 0.4 percent on the food expenditures of households with high income.

CONCLUSIONS

On average, a household in Lao PDR consumes goods and services of a value of 1.1 million kip per month. Food products make up more than half of total consumption. The consumption pattern changes with changing income and relative prices. With an increase in income, people spend less on food compared with non-food items and, as a result, food consumption as a share of total consumption decreases.

Food in 2002/2003 made up 55 percent of overall consumption, compared with 61 percent in 1997/1998 and 64 percent in 1992/1993. Housing was a larger part of total consumption, at 13 percent compared with seven percent in 1992/1993 and 1997/1998; to some extent this reflects an effect of the different measurement methods of imputed rent used. There are statistically significant increases in the shares of consumption for education, personal care and "others". There are also significant decreases in the shares of consumption of own-produced food, household utensils, household operations and recreation. The share of transport costs increased from seven to 11 percent in 1992/1993 and 1997/1998, respectively, to 12 percent in 2002/2003; the change between 1997/1998 and 2002/2003 was not significant, however. Other changes were not significant. There was also a shift from own production consumption to consumption from purchases. The share of food from own production was 53 percent in 2002/2003, compared with 56 and 59 percent in 1997/1998 and 1992/1993, respectively.

[11] UNDP's 2006 human development report gives 34.6 percent as the Gini coefficient of Lao PDR, based on the 2002 survey.

At national level, 23 percent of the population was suffering from food deprivation. The situation being more dramatic in the northern and central regions than in the south, and in low-income households whose energy consumption (87 percent) depended on the food they produced. On average, daily consumption per person was 2100 kcal, with an important share attributed to the consumption of carbohydrates, mainly rice.

LECS III was designed mainly to provide estimates of national totals for national accounts. Consequently, as a data source for food security analysis it has some shortcomings:

- The survey measures expenditures on food and consumption of own-produced food. The consumption of own-produced food relates to day-to-day consumption over the survey month. The expenditures relate to day-to-day food purchases, which are not necessarily consumed that day or even that month. If a household buys a sack of rice to be consumed over the following two months, the expenditure on rice will be high during the first month and zero during the second. Depending on whether the household is surveyed during the first or second month, it will either have high rice expenditure or no rice expenditure at all. So, when considering the way expenditures are measured, measurement errors will occur if expenditures are treated as consumption.
- Each household is surveyed for one month, and the sample of households is evenly spread over a 12-month period. This means that there will be apparent changes in consumption among households, which are really due to seasonal variation. This seasonal variation obscures the real inter-household variation that is meant to be measured.
- It is not possible to present reliable estimates for smaller geographical areas and socio-economic groups. The LECS sample is fairly large in terms of households, but the effects of clustering make the effective sample size substantially less than 8000 households, making it difficult to break down the results into smaller "mode-of-living" groups.

The following are some recommendations for improving data quality for food security statistics:

- The number of units of quantity measurement should be reduced and limited to the standard kilogram, gram and litre. Standard units, including local units, should be converted directly into grams or millilitres during the data entry process. Either unit values at the local market level should be used to convert specific local units of measurement into grams, or investigations could be conducted in local markets to obtain the exact gram equivalent of local units.
- The ASEAN food composition table was supplemented by the FAO and United States Department of Agriculture (USDA) tables to build the food composition table for Lao PDR. Additional work to revise this table for future use should be carried out, in consultancy with experts from the health and nutrition service.
- Food items should be specified more exactly than the broad categories currently used, such as beef, other meat, hunted or trapped animals, and cultivated fish. This would make it easier to find corresponding nutrient values, as the broad food commodity groups have a major impact on the nutrient values of the food items they refer to.
- With additional information on heights of the population, minimum energy requirements at national sub-national levels could derive better indicators for food deprivation and critical food poverty.
- Better estimates could be obtained if questionnaires were designed to account for food stocks from own consumption.

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Food insecurity indicators derived from the 2002/03 Mozambican Household Survey*

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ABSTRACT

At national level, 29 percent of the Mozambican population was food deprived in 2002-2003, consuming less than the minimum energy requirements, based on the Mozambican Household Survey data using the FAO methodology for measuring the prevalence of undernourishment. At sub-national levels, the highest prevalence of food deprivation occurred in Maputo Province and Gaza, with around 55 percent of the total population being food deprived; the lowest prevalence was found in the Sofala and the Manica provinces, at around 26 percent. The urban population showed higher prevalence of food deprivation (52 percent) than the rural population (23 percent). The main factors determining food deprivation were low income, large household size, female-headed households and household heads working in the industry and services sectors. The levels of food deprivation for those population groups are higher than that at national level. On average, each Mozambican had a daily food consumption of around 1990 kcal of which 70 percent was from carbohydrates, 19 percent from fats and 11 percent from proteins. This paper analyses the food insecurity situation in Mozambique using the food consumption data of the 2002-03 Mozambican integrated household income and expenditure survey (Inquérito aos Agregados Familiares - IAF).

Key words: food deprivation, sub-national

INTRODUCTION

Various indicators on food deprivation and poverty together with a large range of food security statistics were derived at national and sub-national levels. This food security information is very useful in defining the profile of food insecure populations and their location for more focused policy interventions in the fight against hunger. However, these statistics should be used with caution given the limitations (see section II) of the available food data in the IAF 2002/03, whose primary objectives were other than the food security analysis. Some recommendations are also provided to enhance the collection of food consumption data in future household surveys and to establish more reliable, consistent and comparable food security indicators useful for policy formulation on issues related to food security and poverty alleviation.

THE SURVEY

The 2002/03 IAF was conducted by national Institute of Statistics of Mozambique between July 2002 and June, 2003. The survey was designed to produce estimates on household expenditure, income and social characteristics of households at national, provincial and residential area (rural and urban) levels.

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Sampling design: The sample was built based on the 1997 population census. Households were selected in three stages: sample primary units, enumeration areas and households. The sample size was 8727 households, of which 4020 were in urban areas and 4707 in rural areas. A total of 8700 households responded to the survey representing a 99.7 percent response rate.

Survey design: The survey used four questionnaires:

- **the community questionnaire** (Questionario Comunitario), which recorded general characteristics of rural communities and market prices for selected products;
- **the general household characteristics questionnaire** (Caracteristicas Gerais do Agregado Familiar)
- **the daily household expenses questionnaire** (Despesas Diarias), which recorded seven days of household purchases, household consumption of own production, and gifts in kind received by the household; and
- **the monthly household expenses and income questionnaire** (Despesas e Receitas), which recorded the inventory of durable goods owned by the household, number and value of durable goods purchased in the last 12 months, education expenditure in the last 12 months, household purchases in the last 30 days, income and revenue in the last 30 days by household member and transfers received and paid in the last 30 days by household member.

Period of data collection: Household data was collected through three visits. On the first visit, the enumerator collected data from the general household characteristics questionnaire and part of the daily household expenses questionnaire. On the second visit (three days after the first), the daily household expenses and the monthly and annual household expenses were collected. On the third visit, (three days after the second), the income and the daily household expenses of the last three days were collected.

Limitations of the survey food consumption data:

- As the objective of the survey was for different purposes, the collected data referred to food acquisition instead of food consumption which will affect the overall results.
- Some excessively high and low values of food quantities were reported, particularly those food items coming from own production, which probably referred to quantity produced instead of consumed. These quantity values had to be re-estimated using their corresponding reported monetary value and the food items average dietary unit value at regional level.
- Mozambique does not have a food composition table and the nutrients values were obtained from the Portuguese and Africa reference food composition tables. In spite of having a very precise list of food items, the IAF 2002/03 contains a few broad groups of food items for which it was difficult to find precise corresponding nutrient values
- Finally, total expenditures were used as a proxy of income as no reliable data were available for this variable. The use of this series as a proxy of income distribution may affect overall results on food and critical food poverty.

MAIN FINDINGS

Magnitude of food deprivation

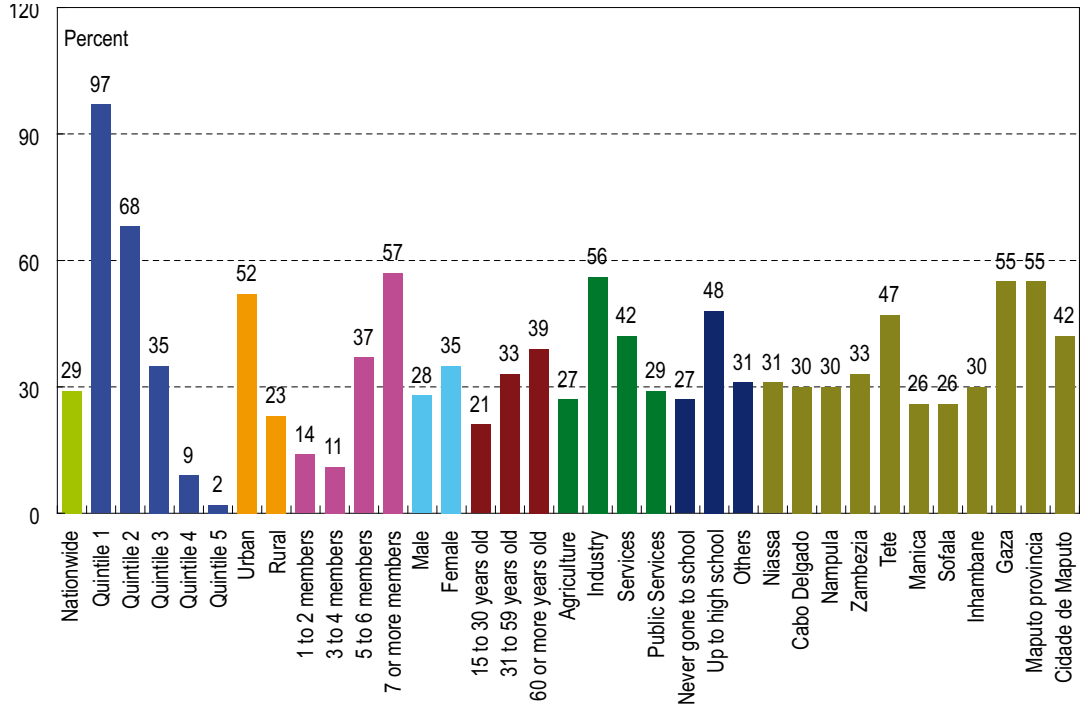
Methodology of measuring food deprivation

The FAO's measure of the prevalence of undernourishment is an indicator of food deprivation and is based on the distribution of household food consumption, expressed in terms of dietary energy. It compares dietary energy consumption (DEC) with energy requirements and is the proportion of population consuming below a minimum energy requirement level (MDER). Thus the prevalence of food deprivation depends on three components: the amount of dietary energy consumed (DEC); the inequality in access to food mediated mainly by the income measure known as coefficient of variation (CV) and the minimum dietary energy requirement (MDER) which refers to the lowest acceptable weight-for-height and light activity level of adults using the age-sex structure of the population.

The magnitude of hunger as measured by the prevalence of food deprivation showed that in 2002/03, about 29 percent of the total population in Mozambique was undernourished. Levels of food deprivation were not the same for sub-national population groups (urban and rural areas as well as provinces) as shown in Figure 4.1.

High levels of food deprivation were observed among people of the lowest income quintile, among households comprising more than seven members, and among households with heads who were more than 30 years old. In addition, Gaza and Maputo provinces had the highest prevalence of food deprivation (55 percent). Figure 4.1 also shows that food deprivation was higher in female headed households, and in urban areas (52 percent) rather than rural areas (23 percent).

FIGURE 4.1.
Proportion of food deprivation in total population

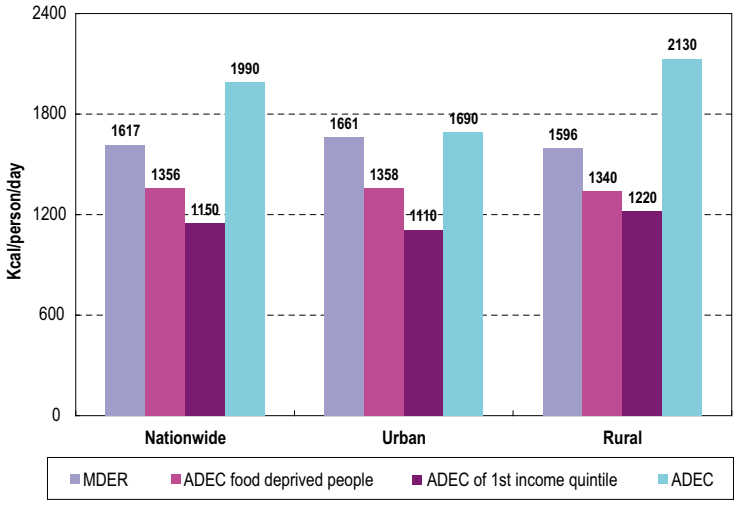


Depth of hunger

At national level, the average Mozambican had a daily energy consumption of 1990 Kcal while those of the food-deprived population, an average of 1356 kcal. Thus, the depth of hunger at national level, which measures the gap of the consumption of the food deprived population to the minimum energy requirement (MDER) of 1617 Kcal was 261 Kcal (Figure 4.2).

In rural areas, the average dietary energy consumed was significantly higher than in urban areas, (2130 versus 1690 Kcal). However, the average dietary energy consumption differed marginally, 1340 kcal for rural areas as against 1358 kcal for urban areas. The depth of hunger was higher in urban areas (303 Kcal with respect to urban MDER of 1661 Kcal) than in rural areas (2567 Kcal with respect to rural MDER of 1596 Kcal). However, both depths of hunger were considered high. Of great concern is the high energy gap in all groups of households in the lowest income quintile, with averages of energy consumption falling short of their respective MDER - for example, at national level by 467 Kcal, in urban areas by 551 Kcal and in rural areas by 376 Kcal. These energy shortages of households in the lowest income quintile were even higher than the depth of hunger at national level as well as in urban and rural areas. Energy consumption in the lowest income households in urban areas was lower than in the lowest income households in rural areas.

FIGURE 4.2.
Depth and intensity of hunger in urban and rural areas of Mozambique



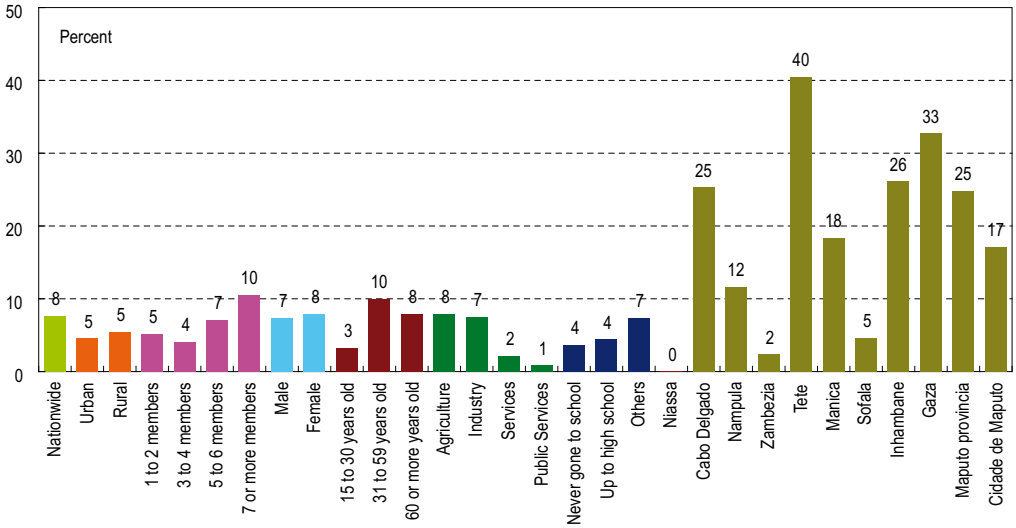
Critical food poverty

The prevalence of Critical Food Poverty (CFP) is the proportion of the population whose daily income is lower than the cost of a macronutrient-balanced food basket equivalent to the minimum dietary energy requirement (MDER). The MDER cost is valued using macro-nutrient unit costs from food consumed by households in the first income quintile. The macronutrient-balanced food basket provides 12.5, 22.5 and 65 percent energy from proteins, fats and carbohydrates respectively.

Nationwide the critical prevalence of food hunger was 7.7 percent. With respect to urban and rural areas it was 4.6 percent and 5.4 percent respectively (Figure 4.3).

The levels of Critical food poverty showed much variations among the sub-national level population groupings. The provinces of Niassa, Zambézia and Sofala had lower critical food poverty than national average. In terms of household characteristics, the lowest critical food poverty level was observed in households with three to four members, households with young heads of the age group 15 to 30 years and with the household head engaged in public services.

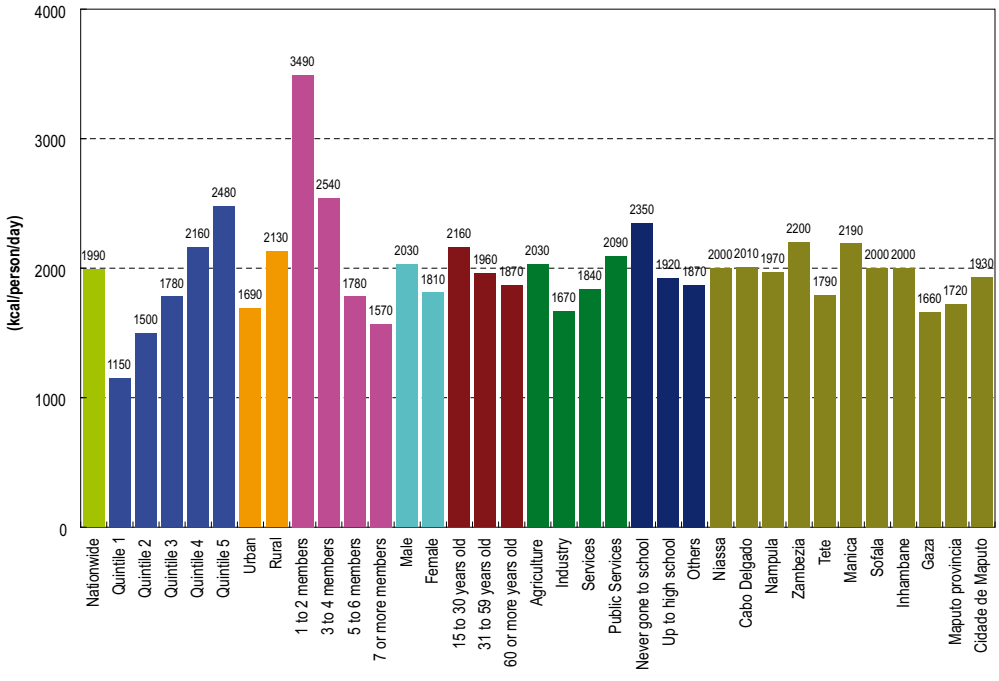
FIGURE 4.3.
Prevalence of critical food poverty



Food consumption and expenditures

Dietary Energy Consumption: The average dietary energy consumption (DEC) in Mozambique was of 1990 kcal/person/day in 2002-03. The DEC levels increased with income, but showed different patterns among the different population groupings. Hence, the daily average of 1150 kcal/person/day consumed by low-income population groups contrasted with the 2480 kcal/person/day consumed on average by households with high income. In households with one or two members, the average DEC was 3490 kcal/person/day against households with seven or more members, with an average of 1570 kcal/person/day (Figure 4.4).

FIGURE 4.4.
Dietary energy consumption



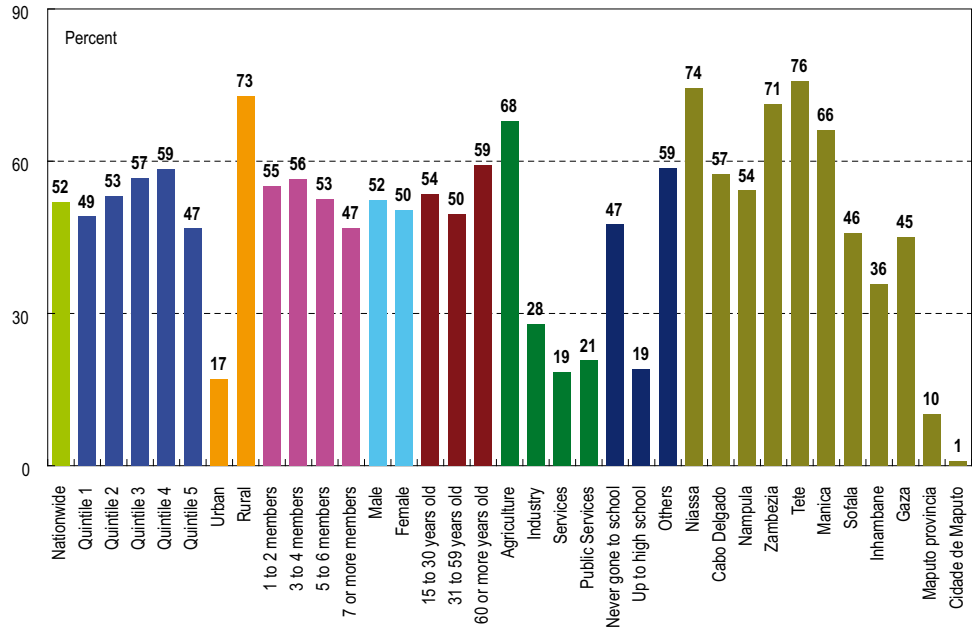
Dietary energy unit value: It costs on average 2.70 Mts (Mozambican Metrical) to acquire 1000 kcal at national level. But the dietary energy unit value (which does not include the cost of fuel energy needed to bring the food from as purchased state to that of ready to eat) differed according to the sub-national population groups. The value for 1000 kcal was 2.6 Mts for low-income groups but somewhat higher (3.00 Mts) for the highest income group.

The same difference was observed between urban and rural areas, where the cost of 1000 kcal in urban areas was about 61 percent higher than that in rural areas. Finally, the highest dietary energy unit value found was for Maputo City, where 1000 kcal cost on average 3.9 Mts, which represented a 44 percent higher cost than national average.

On average, 54 percent of total consumption was devoted to acquiring food. It was observed that the share of food expenditures as a percentage of total consumption expenditure decreases with higher income, which is in line with Engel's law on economic theory that the proportion of income spent on food decreases as income increases, other factors remaining constant. The population group with lowest income level (first decile) spent 81 percent of total consumption on food consumption; this decreased to 43 percent for the population group in the highest income level (tenth decile).

***Share of food consumption by food* source**: Most of the food consumed at national level was from own production (52 percent), while the food acquired from purchases was 45 percent. Food consumption away from home such as in restaurants, bars, etc and obtained free constituted the remaining three percent. However, the share of food consumption varied according to regions and sub-national groups. For example, rural households tended to consume more food from their own production (73 percent), compared to urban households (17 percent). In urban areas, purchases were the most important, with a share of 81 percent of total food value. There was also a notable difference from provinces in terms of share of food sources. In Maputo province and Maputo city the most important source of food was purchases, representing 86 percent and 98 percent of total food expenditure respectively (Figure 4.5).

FIGURE 4.5.
Share of food from own production to total food value



Dietary diversity

About 70.1 percent of the DEC of an average Mozambican consisted of carbohydrates, followed by fat with a contribution of 19.3 percent, and then protein at 10.6 percent. This consumption pattern follows the norms recommended by FAO/WHO for a balanced diet consisting of 10-15 percent of proteins, 15-30 percent of fat and finally 55-75 percent of carbohydrates (Figure 4.6). When looking at the contribution of each food commodity group to the total DEC, it appeared that cereals and their products provided 49 percent of the total dietary energy, followed by 17 percent from roots and tubers and their products, and 12 percent from oil crops (Figure 4.7). Meat and fish had a very low contribution (slightly more than three percent) to total energy consumption.

FIGURE 4.6.
Share of total calories of nutrients in total calories

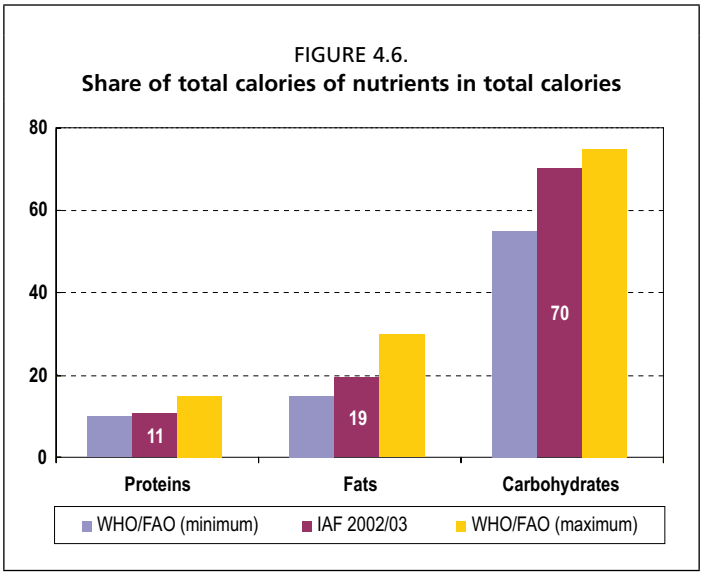
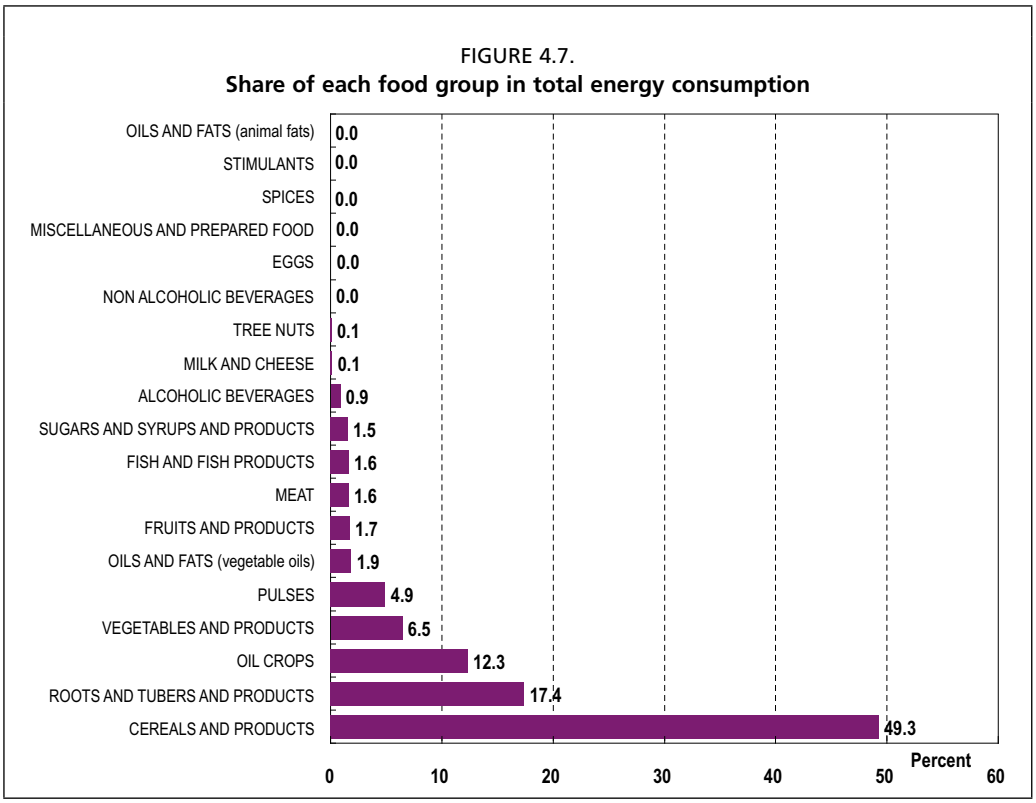


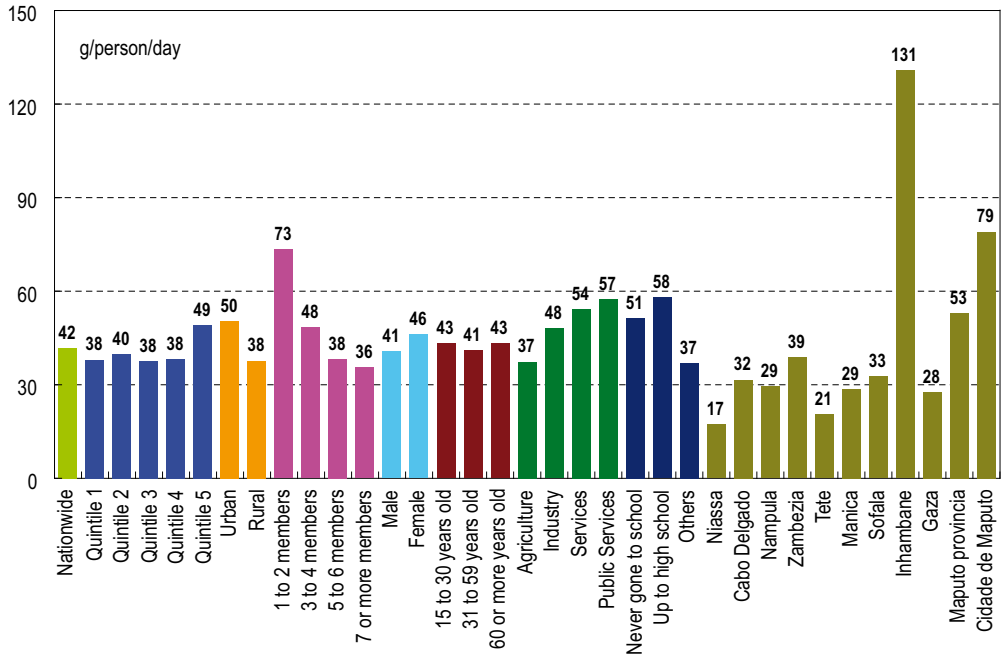
FIGURE 4.7.
Share of each food group in total energy consumption



On average, each Mozambiquan was consuming 341 grams/day of carbohydrates, 52 grams/day of proteins and 42 grams/day of fat, with larger amounts found among small size households and of the highest income quintile.

The cereals group was the most important food group in term of share of proteins (44 percent) and share of carbohydrates (59 percent) to total consumption. The data show that more than half of carbohydrates consumed come from cereals and their products, followed by roots and tubers and their products (23 percent) and vegetable products (almost seven percent).

FIGURE 4.8.
Consumption of fat at sub-national level



On average, consumption of proteins per person was low, at only 52 g/day. High consumption of fats was found in the Inhambane province (131 g/person/day) and Maputo City (79 g/person/day), while national average consumption was about 42g/person/day (Figure 4.8).

Urban areas reported higher consumption of fats than rural areas. Consumption of fat is mainly from oil crops (62 percent of total fat consumed), followed by cereals and their products (13 percent) and oils and fats (vegetables oils) at 11 percent.

RECOMMENDATIONS

The following are some recommendations that can be made to improve the quality of estimates on food security:

- More reliable estimates could be obtained with the review of the IAF questionnaires so as to collect the household food outlay in terms of food stocks (from own consumption and purchases) food consumption, and food given away. In addition, more consistent income data have to be catered for in the questionnaire design.
- The country should complete and update the food composition table.
- Height data, used in the estimation of minimum energy requirement, should be also collected in the survey

- National Institute of Statistics should continue to coordinate with other organizations involved in food security and agricultural data collection and key users of food security statistics, at all steps of survey implementation, including analysis, in order to improve the quality and analysis of data.

Finally, this exercise can serve as an incentive for African countries to develop agricultural and food security statistics based on national surveys, in order to better monitor the achievement of the Millennium Development Goals; and FAO, in partnership with other agencies, should support the countries in this challenge.

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Gender analysis of food security statistics by specific population group in Cambodia's CSES 2003/2005

Pich Pothy, Guarascio Francesca, John Curry and Ricardo Sibrian[13]

ABSTRACT

The 2003/2005 Cambodia Socio-Economic Survey (CSES 2004) provides information on household production and final consumption for national accounts, and on social and economic conditions of households for policy studies on poverty and for updating the consumer price index (CPI). National Institute of Statistics of Cambodia conducts the CSES every five years. CSES 2004 also collected data on household consumption based on acquired food, using two different data collection methodologies: recall questions similar to previous surveys, and a monthly diary for recording all economic transactions of households. Applying the FAO Food Security Statistics Module (FSSM) to the CSES 2004 food consumption data allowed the derivation of food consumption statistics for analysis of the food situation in the country, at national and sub-national levels. The study also used complementary data on the height of individuals and the age and sex structure of the population, to update estimates of the minimum dietary energy requirement (MDER) for some specific population groupings. These data enhanced the accuracy of the food security indicators at sub-national levels.

This paper presents some of these statistics at national and sub-national levels. disaggregated by sex of head of household. In particular, a gender and regional analysis provides insights on food deprivation and critical food poverty.

Key words: food security indicators, gender analysis

BACKGROUND

Poverty (income deprivation) and hunger (food deprivation) are two important aspects of food insecurity in Cambodia. Poverty is related to the economic problem of securing access to a minimum income to obtain an acceptable standard of nutrition, thereby affecting one of the three pillars of food security: economic access to available food and nutritional security. Both poverty and hunger are two consequences of economic dynamics that, along with other factors, affect the poor.

In 2004 in Cambodia, more than one-third of the population (36 percent) of 15 million inhabitants was classified as poor. Rural people represented 90 percent of the poor. Recent economic transformations, driven by cheaper goods, have triggered competition for foreign markets, thereby decreasing gains for locals and consequently causing national food insecurity, particularly for high-risk groups such as households where women are the sole income earners.

In their role of food producers, care givers and income generators, women are subject to unfavourable conditions and face additional burdens that make them one

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of the most vulnerable and food-insecure groups. This can be especially true when they are household heads. In Cambodia, one-third of households are headed by women (35 percent).

Moreover, the unpaid burden of caring for people with disability falls disproportionately on women, in both economic and psychological terms. Traditionally, caring for sick relatives is the duty of the head of the household, who is often an older woman. This responsibility for care of the sick is particularly relevant when considering disabilities from landmines and unexploded ordinances (UXOs), which are one of the legacies from the civil war. Between four and six million mines were laid - one for every two Cambodians - and landmines and UXOs kill and injure 1000 people every year (SCW, 2006). People (mainly children) who survive the explosions are forced to accept that they are no longer self-sufficient and must adapt themselves to being marginalized members of the community. As these accidents happen in peace time, it is very hard for the disabled or the head of the household to obtain financial support. However, the Government of Cambodia has taken action for poverty reduction and food security by developing the Cambodian Millennium Development Goals (MDGs) in 2003. These added a ninth goal regarding UXOs to the eight global MDGs.

Cambodia has achieved progress in gender equality through women's movements, in particular the steps taken concerning property rights since the 1980s, when private land replaced communal property and the majority of properties were registered in the name of the husband only. Women's movements with strong advocacy campaigns have expanded, and about three-quarters of women who are landowners can now sell without the need to obtain permission from men. In addition, two-thirds (68 percent) of Cambodian women are owners or co-owners of their dwellings, a similar proportion (64 percent) own some land, and about half are owners or co-owners of livestock.

Rice production in Cambodia represents the basic food supply, occupying 90 percent of total cultivated area. Poultry raising and fishing also comprise significant parts of food production; the Cambodian Department of Animal Health Production's 2003 poultry census reported that the Plain Penn area contributed 41 percent and the Tonle Sap area 37 percent. Fish and other aquatic animal consumption accounted for 30 kg per person per year (Baran, 2005).

OBJECTIVE, DATA AND METHODS

Women are fundamental in achieving food security, given their role as food producers, care givers and income generators. However, women's contribution to food security has been under-documented in food insecurity statistics owing to the lack of analysis concerning gender. This paper attempts to fill this gap through analysis of food security statistics derived from the 2003/2005 Cambodian Socio-Economic Survey (CSES 2004). This analysis is expected to provide inputs for planning geared towards gender equality, equity and female empowerment within a framework of national development in Cambodia, and to serve as a model for similar analyses elsewhere.

CSES 2004 collected data on household consumption using two different data collection methodologies: traditional recall questions, and a monthly diary for all household economic transactions. The FAO Food Security Statistics Module (FSSM) was applied to the CSES 2004 food consumption data and yielded food consumption statistics for analysis of the food situation in the country at national and sub-national levels. For the analysis, this study used the food security statistics for sub-national groups, particularly household groups, by gender of household head, area of residence (urban and rural) and region.

FSSM converted food consumption into quantities of dietary energy consumption (DEC) using energy conversion factors for energy-yielding macronutrients (proteins, fats and carbohydrates); these energy conversion factors were extracted from the

Association of South East Asian Nations (ASEAN) food composition table. FSSM also estimated inequality in access to food in energy terms due to income, that is, the coefficient of variation (CV) of DEC due to income at national and sub-national levels. Using sampled age and sex population structures and heights collected in the Demographic and Health Survey (DHS 2005-2006), FSSM estimated the minimum dietary energy requirement (MDER) for different population groups.

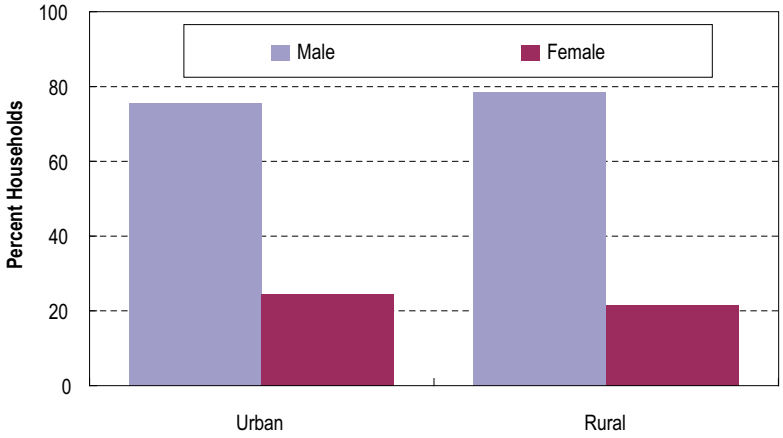
FOOD SECURITY STATISTICS RELATING TO GENDER

Proportions, age and sex structure of population from household surveys

Figure 5.1 shows the proportions of male and female-headed households in the sample, in urban and rural areas.

In both areas, the proportions of female and male-headed households were very similar. The higher proportion of female-headed households in urban areas was probably due to the work-related migration of single females working in the garment sector.

FIGURE 5.1.
Proportion of sample households for urban and rural areas by sex of household head



Maltoni notes that young, unmarried women are most likely to migrate to work in the apparel, sex or tourism industries, or as domestic servants (Maltoni, 2007: 5). The higher proportion of male-headed households in rural areas was probably due to male employment in agricultural activities, including fishing activities (30 versus 22 percent). Male-headed households were also more prominent among those with seven or more people (50 versus 32 percent).

Figures 5.2, 5.3, 5.4 and 5.5 show the age-sex structure, that is, the proportional contribution of males and females in various age categories to total household population for female and male-headed households in urban and rural areas. For all four household types, about half of the household population was made up of males and females aged 19 years or younger. In female-headed households, particularly those in rural areas, the proportion of males in the household began to decrease in the 20 to 34 years of age category, and decreased markedly through the middle-age categories and beyond. In male-headed households, the proportional contributions of males and females remained virtually at parity, even though there were fewer individuals in this category itself. Such patterns are perhaps due to the decline in fertility from 1995, and to internal migration patterns, as 35 percent of Cambodians have been classified as migrants (Maltoni, 2007: 4).

FIGURE 5.2.
Age-sex structure in urban female-headed households

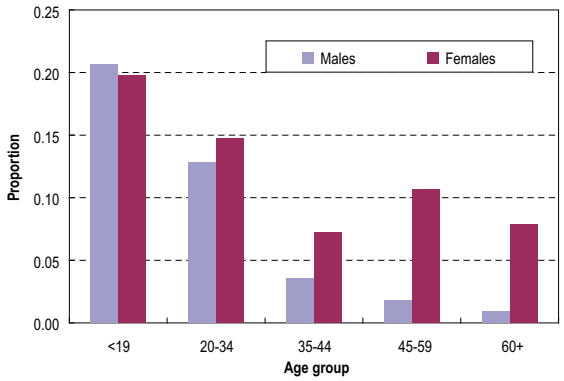


FIGURE 5.3.
Age-sex structure in rural female-headed households

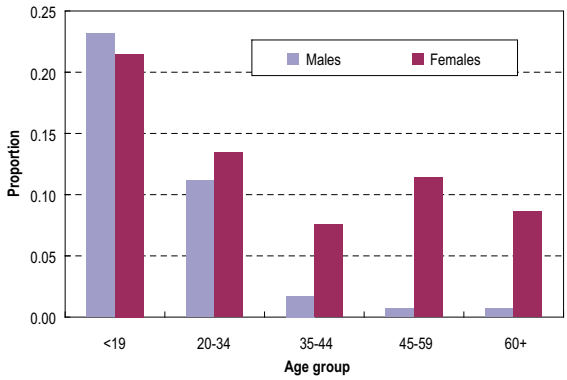


FIGURE 5.4.
Age-sex structure in urban male-headed households

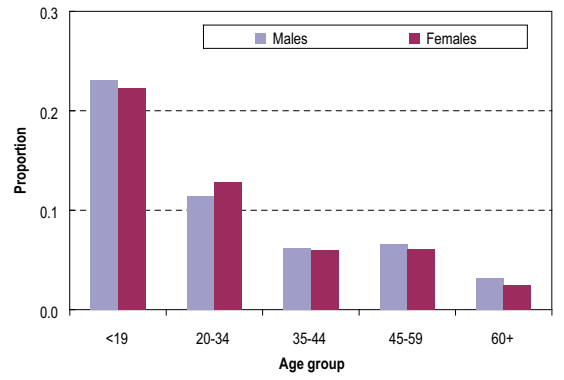
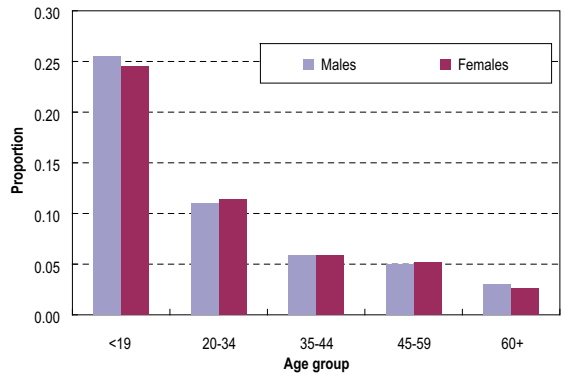


FIGURE 5.5.
Age-sex structure in rural male-headed households



At national level, the age-adjusted adult mortality rate was 520 and 310 per thousand people for males and females, respectively, aged 15 to 49 years. This illustrates the reasons for such a low proportion of males in Cambodia, particularly in female-headed households. The return of refugees may have determined the lower proportion of males with respect to females in female-headed households. Among the 41000 refugees returning to Cambodia since 1992, mainly from Thailand, the majority of families were headed by women.

FIGURE 5.6.
Age-sex structure of male-headed households with more than six people

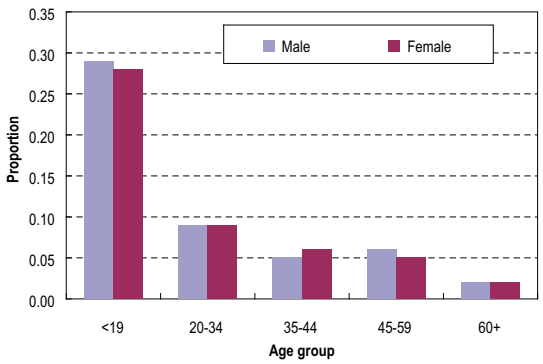
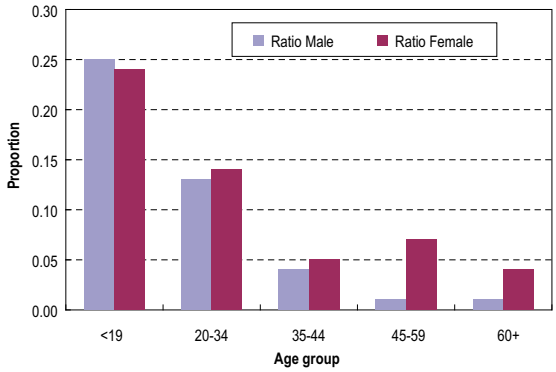


FIGURE 5.7.
Age-sex structure of female-headed households with more than six people



At national level, the proportions of males and females in male-headed households with more than six people were similar, except for those aged less than 19 years. In female-headed households, the proportion of females was higher than that of males in all age groups, except for those aged less than 19 years (Figures 5.6 and 5.7). Although the proportion of young people was higher in male-headed households, female-headed households with more than six people were more likely to face difficulties because they were maintained by one adult instead of two. This illustrates the higher vulnerability of female-headed households with more than six members to food deprivation and critical food poverty.

Hunger and poverty

Food deprivation: Food deprivation, defined here as not consuming enough food to meet MDER, is linked to the amounts of food consumed and to inequality in access to food as mediated by income within the population.

As shown in Figure 5.8, food deprivation percentages were slightly higher in female than male-headed households at national level (28 versus 22 percent), in urban areas (29 versus 22 percent) and in rural areas (29 versus 23 percent). Food deprivation percentages were considerably higher in female than male-headed households in the 35 to 45 years age group (32 versus 22 percent) and in households with seven people and more (50 versus 32 percent).

FIGURE 5.8.
Prevalence of food deprivation in various population groups

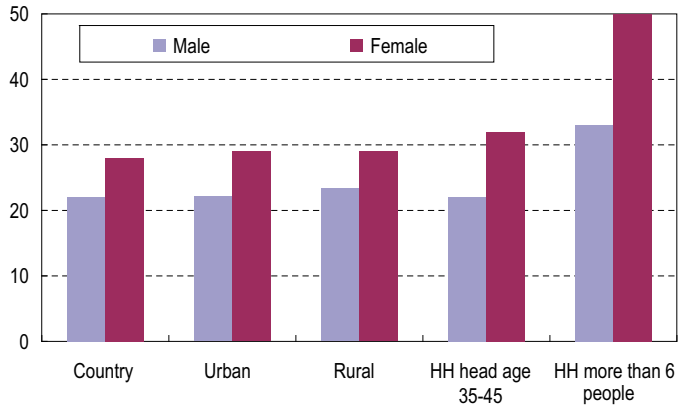
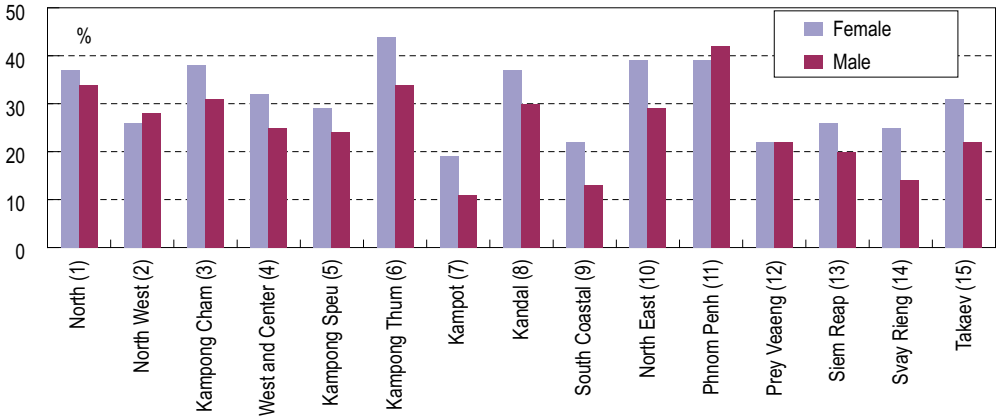


FIGURE 5.9.
Prevalence of food deprivation by household head gender and province



North (1): Banteay Mean Chey and Oudor Mean Chey.
North West (2): Bat Dambang and Krong Pailin.
West and Center (4): Kampong Chhnang and Pousat.
South Coastal (9): Kaoh Kong, Krong Preah Sihanouk and Krong Kaeb.
North East (10): Kratie, Mondul Kiri, Preah Vihear, Rattanak Kiri and Stueng Traeng.

At provincial level[14] (Figure 5.9), proportions of food deprivation were higher for female-headed than male-headed households in North, North East, West/Center and South Coastal areas and for Kampong Thum, Kampong Cham, Svay Rieng and Kampot provinces, while male-headed households were proportionally more food-deprived in the Phnom Penh province.

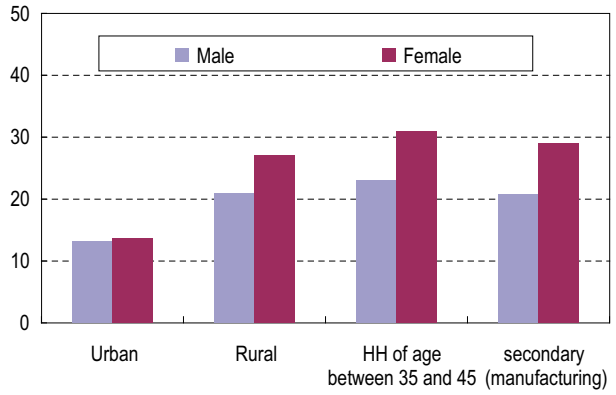
Critical food poverty: The prevalence of critical food poverty refers to the proportion of the population whose income is lower than the cost of a food basket providing balanced MDER. MDER was higher in female than male-headed households at national level (1732 versus 1713 kcal/person/day), in urban areas (1766 versus 1756 kcal/person/day) and in rural areas (1725 versus 1705 kcal/person/day). The cost

[14] Lack of data urged the grouping of some provinces into broader areas (see legend for Figure 4.9). Provinces were grouped in the same area only if contiguous.

of the balanced MDER was 559[15] riel for females and 500 riel for males at national level; it was 685 and 535 riel in urban and rural areas, respectively, for female-headed households, and 641 and 483 riel in urban and rural areas, respectively, for male-headed households, at macronutrient prices for households in the first quintile of income. The differences in MDER costs were linked to the different macronutrient unit values in the various household groups, particularly in urban population groups with higher food costs.

As shown in Figure 5.10, the prevalence of critical food poverty in both urban and rural areas was marginally higher in female than male-headed households. In particular, rural female-headed households were more critically food-poor than male-headed households, 27 versus 21 percent. The prevalence of critical food poverty was high in households with heads aged between 35 and 45 years, and higher in female than male-headed households (31 versus 23 percent).

FIGURE 5.10.
Prevalence of critical food poverty in various population groups

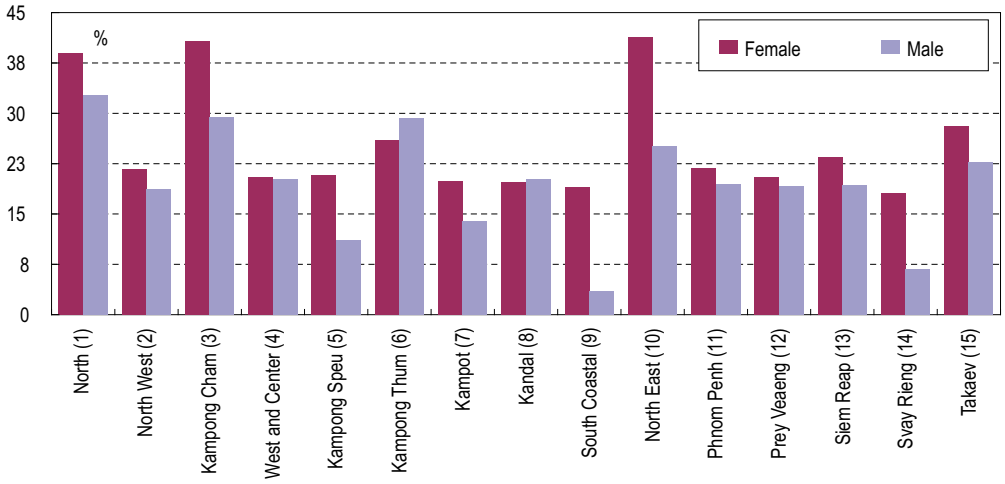


Critical food poverty by economic activity shows that, of all other economic sectors, 29 percent of the population of female-headed households working in manufacturing sectors were critically food poor, compared with 21 percent in male-headed households at national level. Rural women constituted 46 percent of unpaid workers at national level.

At provincial level, critical food poverty was higher for female than male-headed households in Kampong Cham, a province with 95 percent rural population. In North and North-East areas, which are mainly rural, and in South Coastal areas, 41 percent of female-headed households were critically food poor and 30 percent of male-headed households.

[15] Average inter-bank exchange rates for 2004 were US$1.00 = 40 to 62 riel (source: FX History at www.oanda.com/convert/fxhistory).

FIGURE 5.11.
Prevalence of critical food poverty by household head gender and province



North (1): Banteay Mean Chey and Oudor Mean Chey.
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North East (10): Kratie, Mondul Kiri, Preah Vihear, Rattanak Kiri and Stueng Traeng.

Critical food poverty was higher for male than female-headed households in Kampong Thum province (Figure 5.11).

Food consumption and expenditure

Dietary energy consumption: In both urban and rural areas, male-headed households consumed on average more food energy than female-headed households, 2340 versus 2200 kcal/person/day) in urban areas and 2320 versus 2270 kcal/person/day in rural areas (Figure 5.12). Nevertheless, female-headed households spent more on food (Figure 5.13), and their dietary energy prices were higher than those of male-headed households.

FIGURE 5.12.
Dietary energy consumption

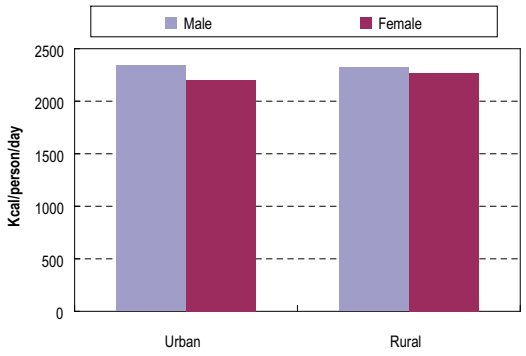
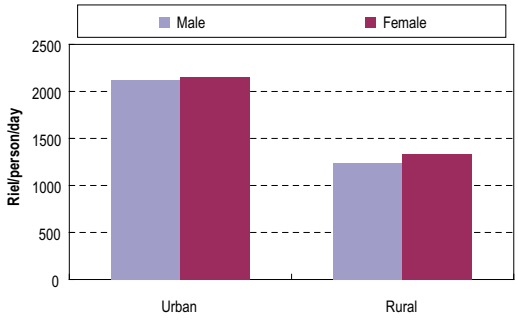


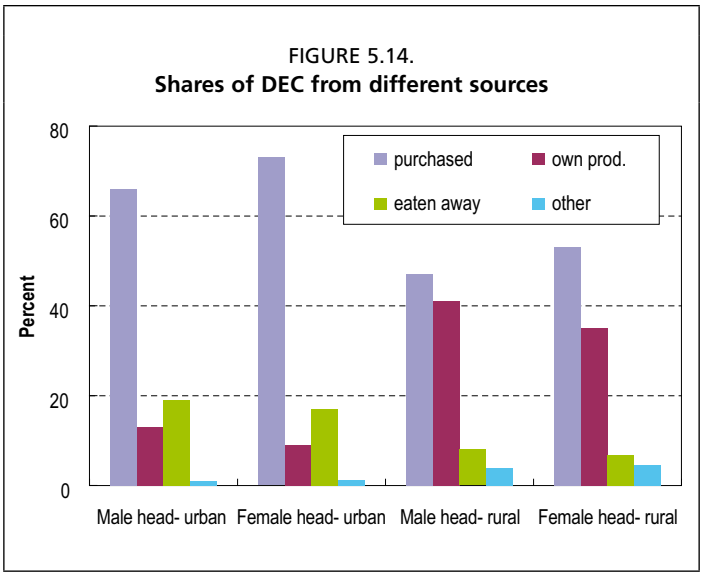
FIGURE 5.13.
Monetary values of food consumed



In both urban and rural areas, average food consumption in monetary value was higher for female than male-headed households. In rural areas, the monetary value of food consumption in a female-headed household was 1330 riel/person/day, while in a male-headed household it was 1242 riel/person/day. In urban areas, on average, the monetary value of food consumption in a female-headed household was 2156 riel/person/day, while in a male-headed household it was 2121 riel/person/day. Consequently, female-headed households had less money for meeting other needs, thus making life harder for them.

Shares of food consumption by food source: Figure 5.14 shows that in urban and rural areas, for both male and female-headed households, the share of DEC from purchases was the highest. The share from purchases was higher in female than male-headed households, while the opposite occurred for the share from own production, which was higher in male than female-headed households. The share of food eaten away from home to total DEC was slightly higher in male than female-headed households.

FIGURE 5.14.
Shares of DEC from different sources

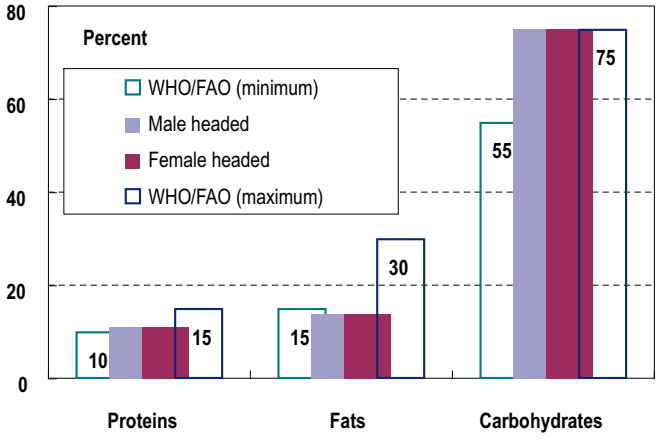


The share of DEC from purchases was higher in female than male-headed households, in urban areas by 73 versus 66 percent, and in rural areas by 53 versus 47 percent. The share of food DEC from own production was higher for male than female-headed households, in rural areas (42 versus 35 percent) and in urban areas (12 versus ten percent).

Diet diversity: As in the CSES 2004 in its preliminary report (issued in 2007), the dietary quality was the same for female and male-headed households at national level.

It was poor in fats, which accounted for less than the recommended minimum level of 15 percent, and excessive in carbohydrates, at more than the recommended maximum level of 75 percent. The share of energy from proteins was very close to the minimum level recommended. Rice was a significant source of dietary energy, and consumption of carbohydrates provided three-quarters (75 percent) of total energy from food. Almost one-quarter (24 percent) of total protein consumption was from fish.

FIGURE 5.15.
Shares of DEC from proteins, fats and carbohydrates



Dietary unit energy cost: In both urban and rural areas, female-headed households had a higher average dietary energy unit value than male-headed households. In both areas, female-headed households spent more on food than male-headed households. In urban areas, female-headed households spent 940 riel to acquire 1000 kcal, while male-headed households spent 908 riel. In rural areas, female-headed households spent 586 riel to acquire 1000 kcal, while male-headed households spent 536 riel. Food may cost more because of acquisition mechanisms such as credit or frequent acquisition of small quantities of food, which cause prices to increase. Poor households are most likely to ask suppliers for credit to obtain small quantities of food for consumption, so that high prices are made even higher by the use of credit.

Share of food in total consumption: At national level, female-headed households in the first and last quintile income groups spent a large share of their total consumption expenditure on food. This indicates that female-headed households had less money for buying goods other than food.

Inequality in access to food: The CV of DEC indicates that in both rural and urban areas inequality in access to food was higher in female than male-headed households.

CONCLUSION AND REMARKS

This paper has presented the results of an analysis of household food consumption statistics from CSES 2004 using a gender perspective. Although the preliminary food security analysis revealed considerable urban-rural differences and gender differences concerning several measures, the gender aspects of these within urban and rural areas have been made more apparent through the present analysis.

Food deprivation rates have been shown to be higher in female-headed households than in their male-headed counterparts, in both urban and rural areas. The gap between male and female prevalence rates is also considerable for households whose head is aged 30 to 45 years, and in households with more than six members. This gap was observed in the North, North-East, West/Center and South Coastal regions, particularly in the provinces of Kampong Thum, Kampong Cham, Svay and Rieng. The overall gender pattern of food deprivation rates was quite varied according to regions or provinces, reflecting the complexity of gender differences in the dataset. Similar patterns were observed for critical food poverty. Female-headed households

in both urban and rural areas consumed fewer kilocalories of food energy and paid more compared with male-headed households; large urban-rural differentials in the monetary value of food consumed for both types of household reflect the higher prices paid for food in urban areas. One of the many interesting findings of the analysis is that female-headed households in rural areas are highly reliant on food purchases to obtain their DEC, despite their low per person incomes.

The analysis reported here has assisted food policy formulators to identify more complex patterns of food insecurity, based on gender considerations, than conventional food insecurity analysis permits, and serves to illustrate the value of utilizing a gender perspective in the analysis of household food consumption. In order to explain these patterns, and be able to identify the appropriate solutions to reduce such situations of food insecurity, a more in-depth investigation of both secondary and primary sources of information is required.

One limitation of this study is that the dataset used to perform a quantitative analysis did not support a qualitative analysis in terms of providing explanations of the patterns.

- Three recommendations can be made:
- Ethnographic/qualitative studies should be undertaken to analyse and compare the social structure of consumption and food access for the household groups analysed. An ethnographic study would resolve the gaps that emerge from quantitative analysis.
- Having identified the vulnerabilities of both male and female-headed households to different dimensions of food insecurity, thus policy support measures, particularly regarding income generation and livelihood support activities for rural women, should be considered.
- Given the value-added to the preliminary food insecurity assessment in Cambodia, similar analyses employing food insecurity patterns based on household food consumption statistics and using a gender perspective should be encouraged for other countries.

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Part 3.

Consumption versus acquisition approaches for deriving food security statistics

Food data collected using acquisition and consumption approaches with daily diaries in Armenia's ILCS 2004

Diana Martirosova[16]

ABSTRACT

National Statistical Service (NSS) of Armenia collected food data in the 2004 Integrated Living Conditions Survey (ILCS 2004), based on two distinct approaches: food acquisition and food consumption. Daily diaries were used to collect both the quantity and the monetary value of each food item acquired for consumption or consumed from acquisition from various food sources, recorded in separate sections of the diaries. Food acquisition consisted of all daily purchases and other daily food items acquired from non-purchased sources, such as own production in the case of perishable food, own stock, which may be piled up from production or purchases, and received free or as aid. Food consumption consisted of all food items actually used for daily consumption by the household and obtained from sources such as purchases, own stock from production or purchases, received free or as aid. The two datasets were processed and analysed separately using the FAO Food Security Statistics Module (FSSM) for deriving the same set of food security indicators at national and sub-national levels.

This paper discusses the derivation of food security statistics using the acquisition and consumption approaches, and analyses the impact of any observed differences in the two approaches on the assessment and monitoring of food deprivation at national and sub-national levels.

Keywords: food acquisition, food consumption, undernourishment, food deprivation, critical food poverty

BACKGROUND

Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. Food insecurity exists when people do not have adequate physical, social or economic access to food as defined above. Armenia's national household Integrated Living Conditions Survey (ILCS) represents an important source of data on private household consumption expenditure for assessing food insecurity at national level and for sub-national population groups.

The United Nations Statistics Division manuals on conducting household surveys indicate that food can be collected using both acquisition and consumption approaches. Food acquisition refers to food acquired by households during the household reference period, regardless of when it was actually consumed, while food consumption refers to food consumed by households during the household reference period, regardless of when it was actually acquired. International Labour Organization (ILO) resolutions on household income and expenditure surveys at the Seventeenth International Conference of Labour Statisticians in Geneva 2003 indicated the use of household surveys for the purpose of assessing food insecurity.

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National Statistical Service (NSS) of Armenia has collected food data using food acquisition and food consumption approaches since ILCS 1996. Food consumption data are useful for assessing the food security situation in the country, and food acquisition data provide inputs to national account system, among other uses.

OBJECTIVES

The main objective of this paper is to discuss any observed differences between the food security statistics derived from acquisition and those derived from consumption data. The reason for doing so is that most household surveys worldwide collect food data using the acquisition approach, on the understanding that households not acquiring food during the household reference period would be counterbalanced at national level by households reporting food acquisition, regardless of when the food is actually consumed. Many criticisms of the acquisition approach as a method of food insecurity assessment are related to the fact that high-income households have more chance of acquiring bulk amounts of food for consumption for longer periods than low-income households. Hence, it is important to understand the behaviour of food security statistics based both on food acquisition and food consumption.

METHODS AND DATA

ILCS 2004 collected food data from the separate sections of the diaries, using the food acquisition approach, requesting food purchases during the household reference period, and the consumption approach, requesting food consumption data during the same reference period. ILCS 2004 data collection took place in the period from 1 April 2004 to 31 March 2005 (shifted year). The survey was conducted with monthly rotation of households and settlements.

Armenia's NSS has developed two survey tools: a questionnaire and a diary. The questionnaire is completed by an interviewer during visits to a surveyed household within a month. During face-to-face interviews with the head of the household or another adult member, the interviewer collects information on composition and housing conditions of the household, level of education, health status and employment status of household members, landownership, availability and utilization of cattle and agricultural equipment, and other information.

The diary is completed every day for a month by the household key informant, who records all expenses on food, non-food products and services, with detailed descriptions of what was bought, such as the name of the product, its quantity, cost and place of purchase. In addition, the key informant records the consumption of products that were bought and/or received and utilized from own farms, as well as products that were received from other households. At the end of the month, information on rarely used food products is also recorded. The records in the dairy are verified by the interviewer during his/her visits to the household within the same month. The sections in the diary are: 1) food products purchased during the day; 2) food consumed at home during the day; 3) food consumed outside; 4) non-food products purchased and services received; 5) all other non-food products and services received free of charge; 6) household income and revenues; 7) food that is usually consumed daily in small quantities; and 8) real estate, durable goods and ritual services.

ILCS provides a wealth of information on the welfare of households and individuals and on annual changes in the situation of poverty. A consumption aggregate is used to approximate well-being in Armenia. It is assumed that consumption is better declared and is less sensitive to short-term fluctuations than income, especially in transition countries. The consumption aggregate is estimated based on ILCS. It comprises the following components: the value of food and non-food consumption, including consumption from home production, aid received from humanitarian organizations and other sources; and the rental value of durable goods.

Food consumption includes food consumed at home and outside the household (in restaurants, etc.). Food consumed may be from purchases or from non-purchases (in-kind food consumption), as well as own food production from own farm or home garden, food received as gifts and food transfers (in-kind as food) and humanitarian food aid.

ILCS provides information on household purchases of 195 food items and on household food consumption during the 30 days of the household reference period. The ILCS reference period is annual. In order to express food consumption in monetary values, the estimated prices of purchased items are used. The information collected on household food purchases includes the value, quantity, unit of measurement and location of purchase. Using the value and (standardized) quantities, unit values for all items at the household level are estimated.

Total country expenditures on food are obtained by summing household expenditures for all households in the sample. Household expenditures on all food items are calculated using the value of every food item purchased for each household (including imputed consumption in kind, i.e., food consumption that is not purchased, received as gifts and humanitarian aid). The average cost of one calorie in Armenia is calculated by dividing total country expenditure on food by total country calorie consumption.

FOOD SECURITY STATISTICS FROM ILCS 2004

Food security statistics using the acquisition and consumption approaches at national and sub-national levels regarded dietary energy value, monetary value and energy unit value, inequality in access to food due to income, share of food in total consumption, food deprivation, and critical food poverty. These estimates were derived from food data provided by households and recorded in separate sections to facilitate the necessary calculations using the acquisition and consumption approaches.

Dietary energy

The estimates of dietary energy using food data based on acquisition or consumption at the country level were the same in quantity, at 2020 kcal/person/day. However, households in the two lowest income quintiles registered less energy from acquired than consumed food quantities. The contrary - more energy from acquired than consumed food - was observed in households of the two highest income quintiles (Figure 6.1). The differences were higher in low-income than high-income households, and sampling weights balanced both estimates at the country level.

FIGURE 6.1.
Energy (kcal/person/day) by income

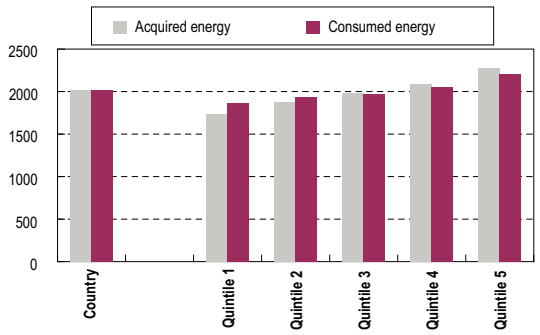
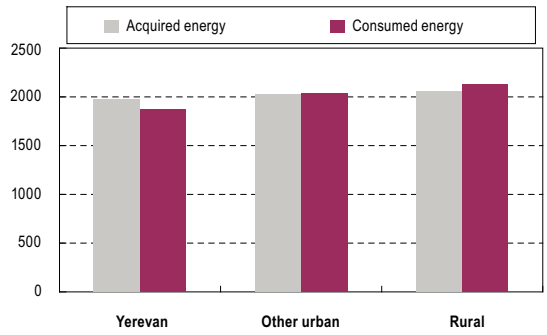


FIGURE 6.2.
Energy (kcal/person/day) by area



Households in rural areas registered less energy from acquired than consumed food, while households in Yerevan registered more energy from acquired than consumed food (Figure 6.2).

Households in the South and Central-North regions registered less energy from acquired than consumed food quantities, while those in the North region registered more acquired energy than consumed energy (Figure 6.3). These results compensate estimates among regions and national-level estimates of dietary energy using both consumption and acquisition.

Large size households, with older, unemployed or less educated heads registered less energy using the acquisition approach than from the estimates derived using the consumption approach (Figure 6.4).

No difference was observed between acquisition and consumption estimates of energy according to gender of household head.

FIGURE 6.3.
Energy (kcal/person/day) by region

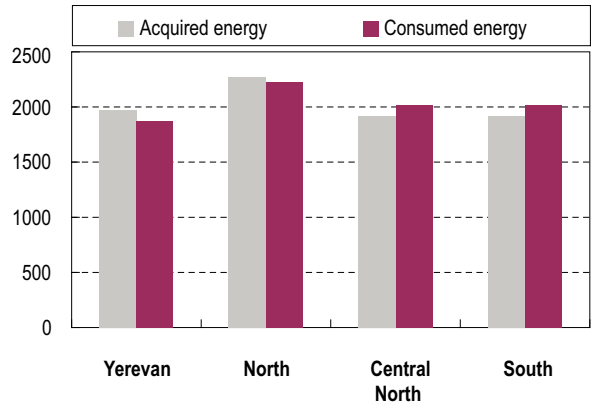
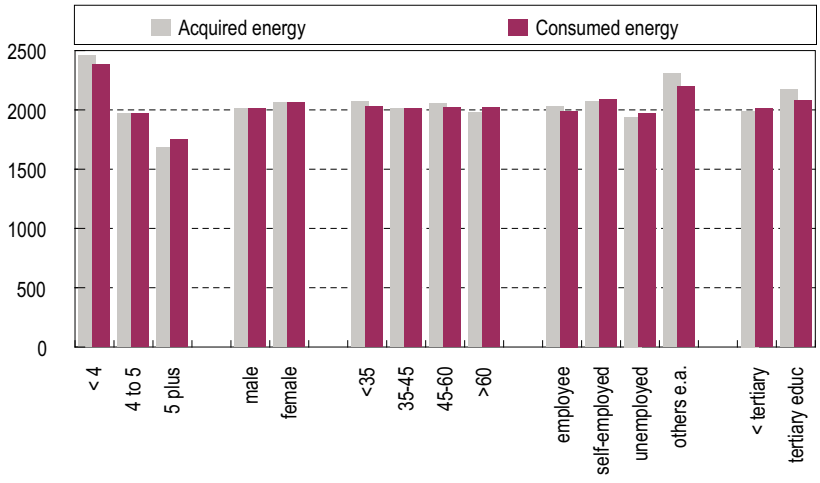


FIGURE 6.4.
Energy (kcal/person/day) by population group



In Armenia, the use of energy acquired rather than energy consumed would result in overestimation of food deprivation in low-income groups, rural areas and South and Central-North regions, among others, while underestimation would result in high-income groups, such as in Yerevan.

Monetary value of food and energy unit value

At country level, the monetary value of food was lower using the acquisition than the consumption approach (Figure 6.5).

FIGURE 6.5.
Country and regional monetary values of food (drams/person/day)

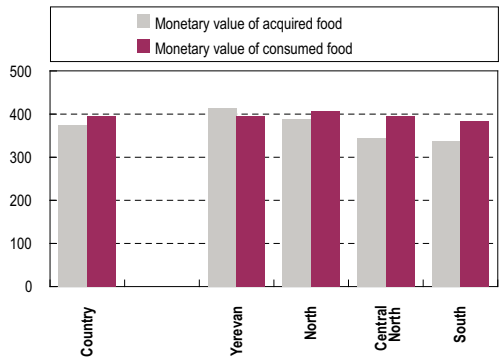
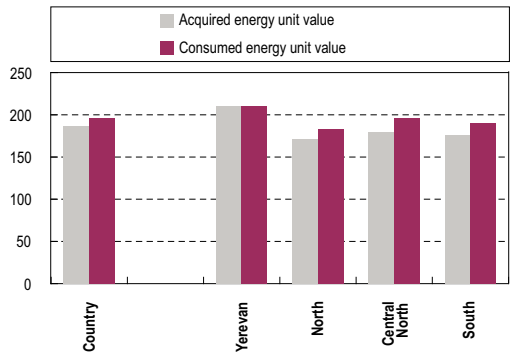


FIGURE 6.6.
Energy unit values (drams/1 000 kcal) at country level and by region



Consequently, the acquired energy unit value (drams/1000 kcal) was lower than the consumed energy unit value, because the amounts of energy (kcal/person/day) were similar in both acquisition and consumption approaches (Figure 6.6).

This difference was mainly due to households in Yerevan reporting higher unit monetary values from acquisition than from consumption (Figure 6.5), even when consumption unit values were priced from purchases in other regions.

Households at the highest income level reported higher acquired than consumed monetary food values, while the opposite was observed in the other income levels (Figure 6.7). Energy unit value as food acquisition was lower than as food consumption for all income levels, with the difference increasing in low income levels (Figure 6.8).

FIGURE 6.7.
Monetary values of food (drams/person/day) by income level

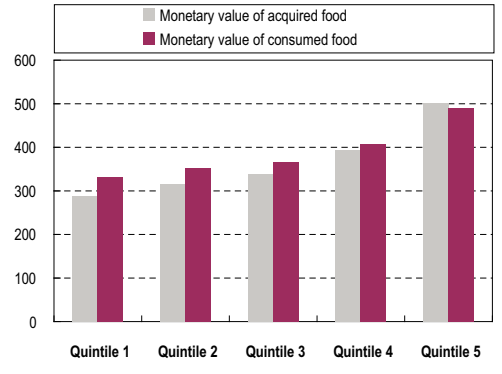
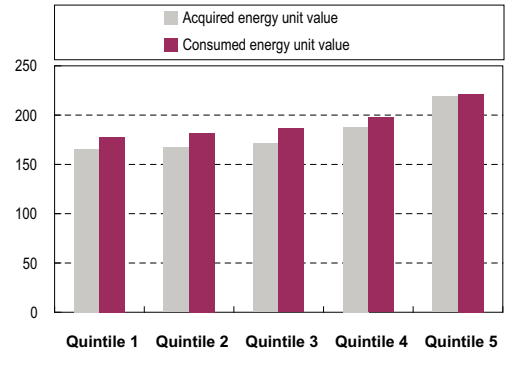


FIGURE 6.8.
Energy unit values by income level (drams/1 000 kcal)



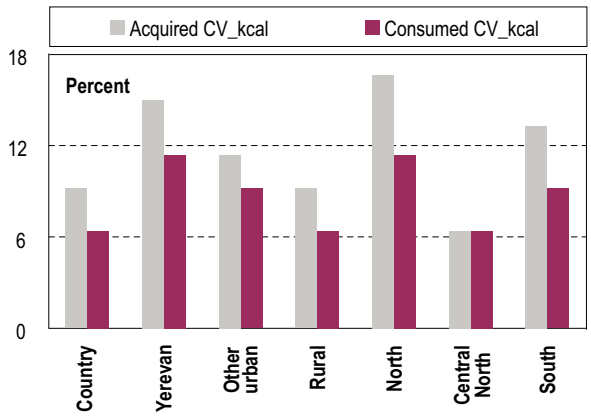
In assessing critical food poverty, if higher energy unit values from consumption data were used, then the critical food poverty line (cost of MDER) would increase compared with that based on acquisition data.

Inequality in access to food due to income

The inequality in access to food measured as the coefficient of variation (CV) of energy due to income based on food acquisition was higher than that based on food consumption, at country level and for all population sub-groups, except in Central-North region, where the two approaches yielded the same value (Figure 6.9).

With the exception of Central-North region, the consequence of higher inequality in access to food in all population groups would be a higher estimate for the prevalence of food deprivation. This would be true if food acquisition data were used, keeping the other parameters fixed in all these population groups.

FIGURE 6.9.
CVs of energy due to income at national level, by area and by region



Share of food in total consumption

The shares of food monetary value to total consumption expenditure (Engel ratios) were higher using data on food consumption than on food acquisition data, except in Yerevan. The country results reflected the same pattern of difference as in the regions. The Yerevan overestimate was small. Urban and rural populations showed similar patterns to national level (Figure 6.10). Engel ratios were higher using data on consumption in all quintiles, except the highest (Figure 6.11). Given that the purpose of the food insecurity assessment is to achieve estimates of food deprivation, it is clear that using food data based on acquisition would yield underestimates of Engel ratios.

FIGURE 6.10.
Shares of food in total consumption expenditure at national level, by area and by region

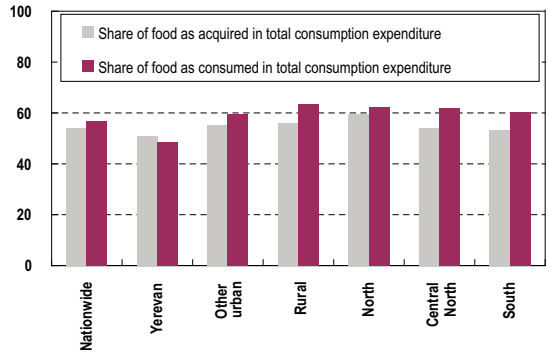
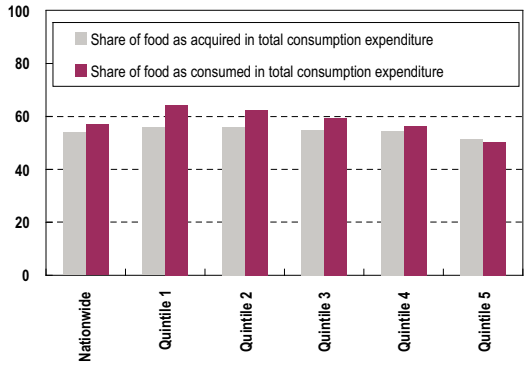


FIGURE 6.11.
Shares of food in total consumption expenditure by income



These findings are based on food monetary values; if the food insecurity analyses were instead based on the Engel ratios and food monetary values from food data on acquisition, the results would underestimate the importance of income devoted to food in low-income households.

Food deprivation

Given that the different estimates of access to food due to income, in both the acquisition and the consumption approaches, reported the same energy quantity, the prevalence of food deprivation (using acquisition) would be higher at country level (Figure 6.12). However, in the North region, a lower acquired than consumed energy quantity would yield higher food deprivation, as the inequality in access to food would be the same.

FIGURE 6.12.
Prevalence of food deprivation at national level, by area and by region

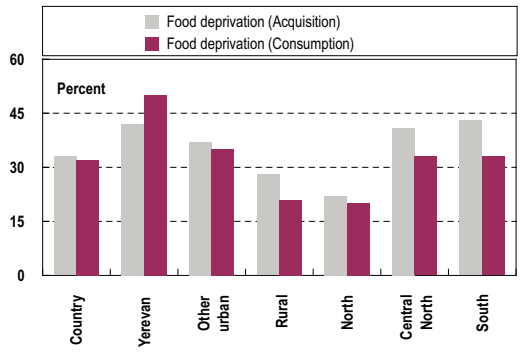
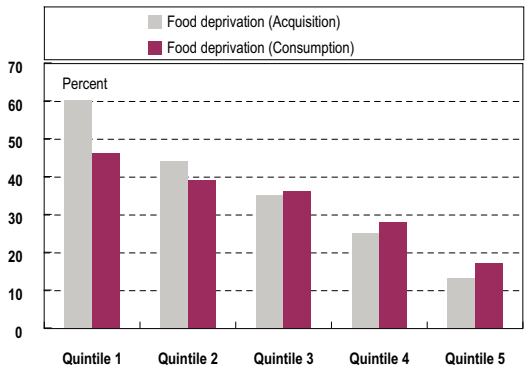


FIGURE 6.13.
Prevalence of food deprivation by income level



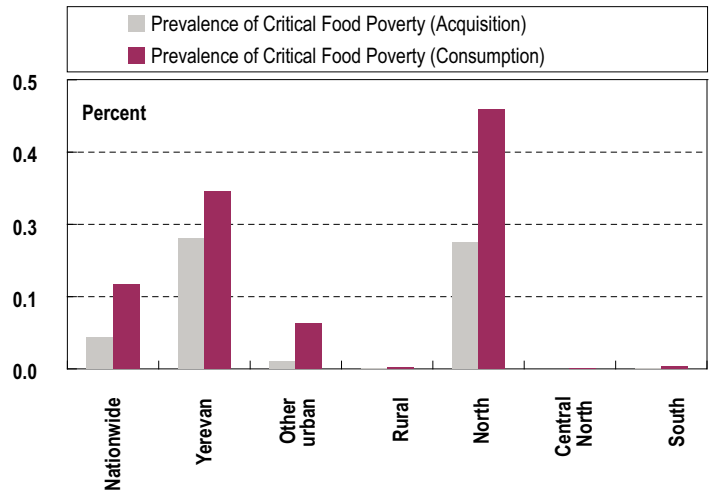
It is important to note that the results on food deprivation show an opposite trend compared with the Engel ratios, particularly in low-income households, that is, the acquisition approach would underestimate the Engel ratio and overestimate the prevalence of food deprivation. A similar pattern was observed for all household income levels.

As inequality in access to food due to income within a quintile is null, prevalence of food deprivation results only from differences in energy quantities. Therefore, for the first two quintiles, food deprivation would be higher using acquisition than using consumption, as food acquired was lower than food consumed for these two quintiles. The reverse is observed for the three highest income quintiles (Figure 6.13).

Critical food poverty

Even though critical food poverty was very low in Armenia (Figure 6.14), the fact that the acquired energy unit value was lower than the consumed energy unit value means that the food acquisition approach would yield a lower critical poverty line, resulting in a lower prevalence of critical food poverty than when using the food consumption approach.

FIGURE 6.14.
Prevalence of critical food poverty at national level, by area and by region



CONCLUSION AND REMARKS

For the purpose of food insecurity assessment, it is important to consider collecting food data using the consumption approach.

For the purpose of national accounts, it is important to consider using the acquisition approach.

If food acquisition had been used instead of food consumption, even if the energy quantities were the same at country level, food deprivation at national level would have been slightly overestimated, at 33 versus 32 percent; however the over and underestimation for sub-national population groups would have been higher. For non-geographical population groups, food deprivation derived using the acquisition approach would yield overestimates in low-income groups and underestimates in high-income groups, for example.

The increase in food deprivation resulting from using acquisition rather than consumption would be due to an overestimation of the CV of energy due to income, of nine versus six percent.

The decrease in critical food poverty is driven by the lower energy unit value obtained from using acquisition rather than from using consumption. At sub-national levels, the overestimation would be of even greater magnitude in geographical population groups.

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Food data collected using acquisition and consumption approaches with a seven-day recall method in Kenya's KIHBS 2005/2006

Josiah Kaara and Seevalingum Ramasawmy[17]

ABSTRACT

The Kenya National Bureau of Statistics (KNBS) collected food data in the 2005/2006 Kenya Integrated Household Budget Survey (KIHBS 2005/06) based on two distinct approaches: food acquisition and food consumption. A seven-day recall questionnaire collected the monetary and quantity values of food purchases during a seven-day period. The questionnaire also collected the quantities of consumed food obtained from purchases, own production, own purchased stocks, received free, etc. Food details were available for 154 food items, including those consumed away from home. The two sets of data were processed and analysed separately using the Food Security Statistics Module (FSSM) to derive the same set of food security indicators at national and sub-national levels.

This paper discusses the derivation of food security statistics using the acquisition and consumption approaches and analyses the impact of any observed differences in the two approaches on the assessment and monitoring of food deprivation at national and sub-national levels.

Keywords: food acquisition, food consumption, undernourishment, food deprivation, critical food poverty

BACKGROUND

The Kenyan economy enjoys relatively advanced agricultural and industrial sectors and substantial foreign exchange earnings from agricultural exports and tourism. After decades of low economic growth, Kenya has seen economic recovery since 2003, registering about 6.1 percent growth in gross domestic project (GDP) in 2006. In monetary value, the main agricultural products are tea, coffee, sugar cane, horticultural products, maize, wheat, rice, sisal, pineapples, pyrethrum, dairy products, meat and meat products, hides and skins, which represent 16 percent of national GDP. The majority of Kenya's land is arid or semi-arid and is home to pastoral and nomadic people living on the margins of subsistence. The country lacks robust food production and is vulnerable to unstable rain patterns, which greatly affected food production in 2005/2006. Subsistence farming is very high in rural Kenya, and probably the primary source of livelihood for about 70 percent of women in rural areas. Although the poorest of the poor are found in sparsely populated arid zones, mainly in the north of the country, more than 80 percent of rural poor people live in higher-potential areas around Lake Victoria and in Mount Kenya region.

More than half of the country's estimated 36 million people live in rural areas where there are high proportions of poor people with low standards of living and

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limited access to social services. Almost 75 percent of the Kenyan labour force is in the agriculture sector. Poverty remains an enormous challenge for Kenya, and progress towards hunger reduction is a major policy issue and a government priority.

OBJECTIVES, METHODS AND DATA

KIHBS 2005/2006 collected household food acquisition and consumption data, which allowed the derivation of food security statistics at national and sub-national levels using the FAO FSSM methodological approach. This analysis compares these two sets of estimates of food security indicators and evaluates the best possible use of them for the assessment and monitoring of food deprivation in Kenya.

KIHBS 2005/2006 is one of the most comprehensive budget surveys ever conducted in Kenya. Its sample design is based on the sampling frame from the 1999 Population and Housing Census. KIHBS selected survey clusters from a pool of 540 urban and 1240 rural clusters, and took place over a 12-month period on a sample of 13430 households. The randomizing of visits to selected clusters within each district throughout the year permitted the capture of seasonal effects on food consumption estimates.

The ten households selected in each cluster were each visited only once during the year. The aim of the survey instruments was to capture the total annual consumption, expenditure and income of each household, by combining the factual observation of food consumption (and some other frequent expenses) using two-week diaries, and the purchases of other items by recall, with reference periods ranging from three to 12 months. At the beginning of the survey, recall permitted the capture of food consumption over the previous seven days. It was intended that the combination of both methodologies would provide the necessary empirical basis for their comparison, and provide the basis for the formulation of simplified survey instruments for poverty monitoring in the future.

The survey collected food details according to the food acquisition and consumption approaches in section I of the main KIHBS questionnaire for the previous seven days. Food acquisition consisted of all daily purchases and other daily food items acquired from non-purchased sources, such as own production, own stock from production or purchases, received free or as aid. Food consumption consisted of all food items actually consumed daily in households, from acquisitions recorded as purchases own stock from production or purchases, received free or as aid, etc. FSSM processed and analysed the two sets of data separately to derive one set of food security indicators at national and sub-national levels.

FOOD SECURITY STATISTICS FROM KIHBS 2005/2006

The food security statistics obtained by the acquisition and consumption approaches at national and sub-national levels were: dietary energy value and relative food sources, monetary expenses, dietary energy unit value, inequality in access to food due to income, food deprivation, critical food poverty, and diet diversity.

Dietary energy

At national level, average daily dietary energy acquired per person was about 12 percent higher than that consumed. All population groupings showed higher acquired than consumed dietary energy (Figures 7.1 and 7.2).

Acquired energy in the lowest income group was ten percent lower than consumed energy. The highest-income population acquired 17 percent more energy than it consumed. The highest levels of acquired and consumed dietary energy were among populations in Nairobi and other urban areas and in Central and Eastern regions. The differences between acquired and consumed energy ranged from nine to 15 percent.

FIGURE 7.1.
Dietary energy by income level

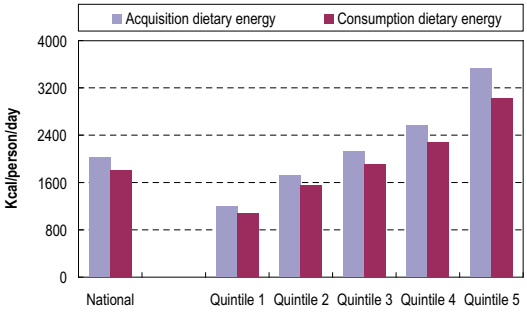
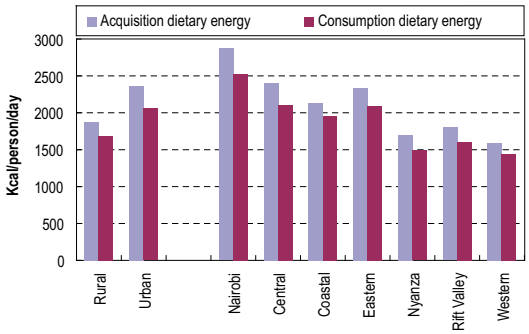


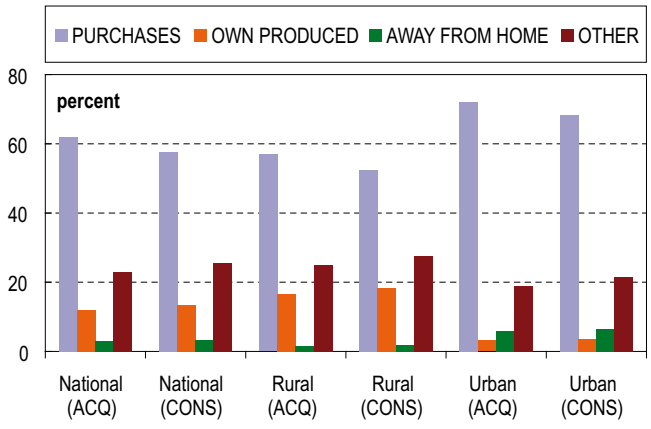
FIGURE 7.2.
Dietary energy by region



The difference between acquired and consumed energy lies in the purchases of food items (Figure 7.3). The higher acquired than consumed energy may reflect the energy acquired for stock or to give away to other people. The questionnaire did not collect information that differentiated between these issues. Purchase was the main dietary energy source, representing about 62 percent of total acquired dietary energy and 58 percent of that consumed at national level. Energy purchases under the acquisition approach were always higher than those under the consumption approach, at national and sub-national levels, but the differences varied in magnitude. The share of own production dietary energy was higher in consumed than acquired dietary energy, however.

The other sources of dietary energy showed the same pattern, mainly from own food stock or received free. Away-from-home food was significant in urban areas only. The share of away-from-home food was highest in Nairobi, owing to the availability of a large number of restaurants, street vendors, snack shops and food courts. The population of the lowest income quintile had the highest dietary energy from other sources, probably food aid or received as payment at workplaces.

FIGURE 7.3.
Shares of energy from food sources

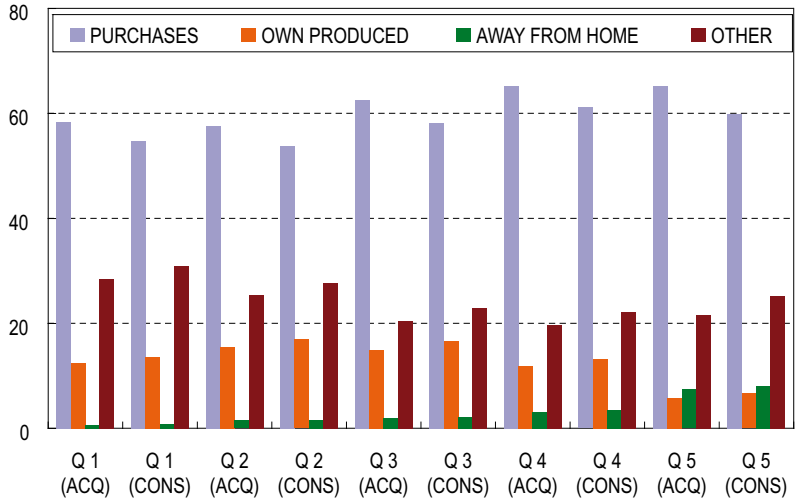


Away-from-home dietary energy had the same percentage contribution to both acquired and consumed energy, and had high levels for income quintiles four and five. Away-from-home energy was insignificant for the two lowest income groups.

Figure 7.4 gives the comparative contributions of the four sources of dietary energy, by income level, for both approaches.

Purchases acquired were always higher than those consumed at all income levels. The highest income level also had the highest share of purchased dietary energy.

FIGURE 7.4.
Sources of dietary energy by income level



Away-from-home dietary energy was usually available only among the populations of the fourth and fifth income quintiles. Purchased acquisition of away-from-home food was similar to consumption. The two other food sources - own production and other sources - had higher shares of consumed than acquired dietary energy. Their levels were more significant among the populations of the three lowest income groups.

Monetary expenses and unit values of dietary energy

The average daily per person food expense at national level was 45.23 Kenyan shillings (Kshs) using acquisition, compared with Kshs 41.73 using consumption (Figure 7.5).

Households in the highest income quintile had the highest monetary expenditure for both acquisition (Kshs 114.71) and consumption (Kshs 104.33). The high-income population group usually bought more expensive food and in bulk, either for food stock or to give to other people such as workers or guests. On average, this group's food expenditure was more than six times that of the lowest-income population, in both the acquisition and the consumption approaches.

The dietary energy unit value gives a different picture (Figure 7.6). The dietary unit value from consumption was higher than that from acquisition at national level and at all income levels.

Dietary energy unit value increased with increasing level of income, with the highest-income population groups paying more than twice what the low-income population paid, in both consumption and acquisition. High-income groups paid six percent more for consumed energy.

FIGURE 7.5.
Food expenses (Kshs/person/day) by income level

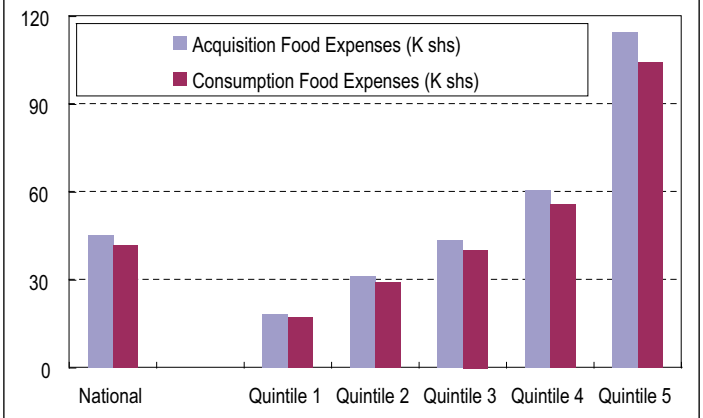
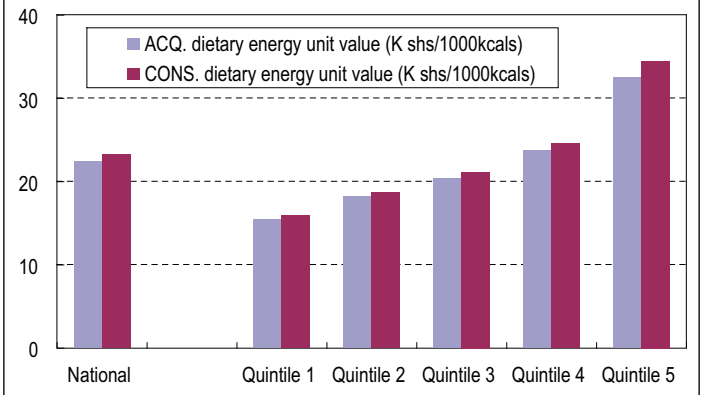


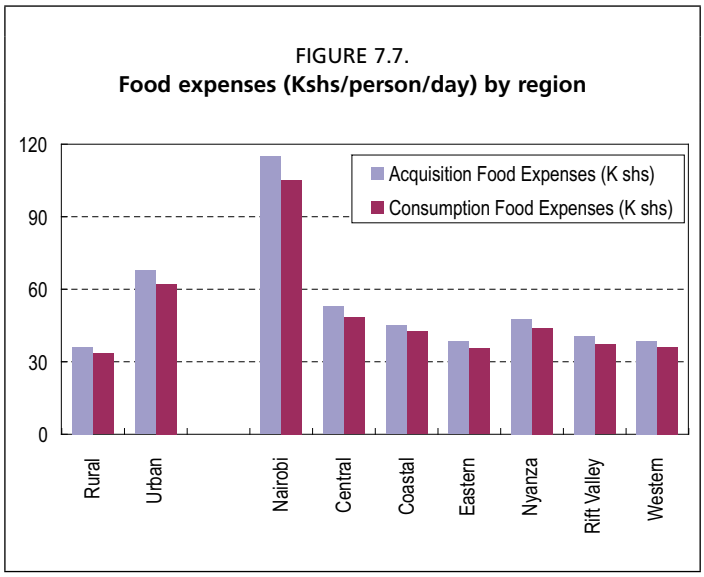
FIGURE 7.6.
Dietary energy unit values (kshs/1 000 kcal) by income level



Food expenses were by far the highest, using both acquisition and consumption, in Nairobi and, to a lesser extent, in other urban areas (Figure 7.7). Rural areas and the Eastern region had the lowest food expenses, at less than Kshs 40/person/day.

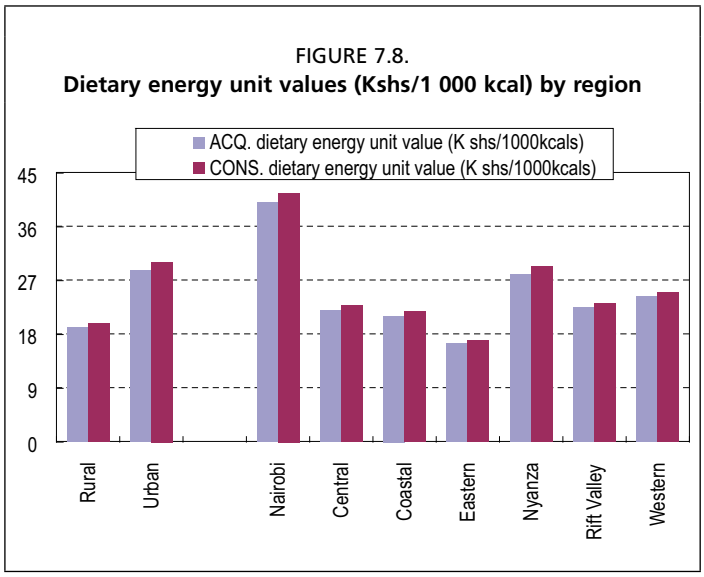
The food expenditure of Nairobi's population was almost three times that of the population in rural areas. This could be owing to the high dietary energy unit value in Nairobi (Figure 7.8) and the low income level of the rural population.

FIGURE 7.7.
Food expenses (Kshs/person/day) by region



The dietary energy unit value of consumption was higher than that of acquisition for all areas and regions (Figure 7.8).

FIGURE 7.8.
Dietary energy unit values (Kshs/1 000 kcal) by region



Nairobi and other urban areas showed high dietary energy values, as did rural areas and the Nyanza region. The Eastern region had the lowest dietary energy unit values, indicating that food prices were low in that region because it is a food producing region. The observed higher unit value of consumed compared with acquired dietary energy was probably due to the estimation procedures used to value all consumed food quantities.

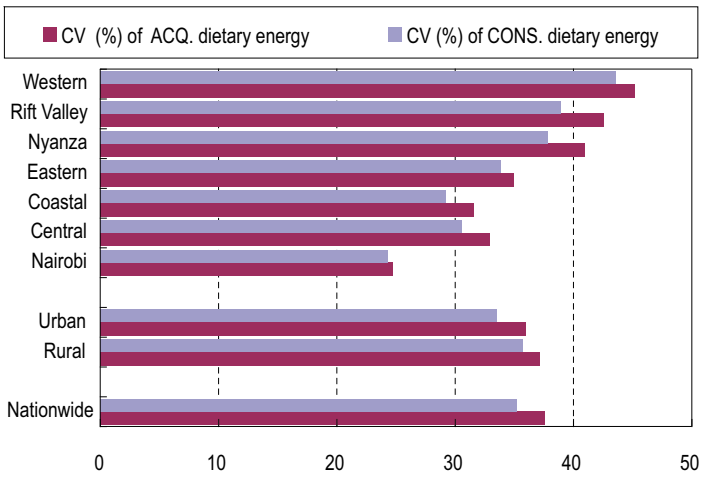
KIHBS 2005/2006 collected monetary values of purchased food quantities only. All consumed quantities were valued using available purchased unit food prices at levels other than the household, sometimes using regional and national prices. Energy unit values would increase the critical food poverty line (the cost of the minimum dietary energy requirement - MDER) when assessing critical food poverty using acquisition or consumption, as described in the section on critical food poverty.

Inequality in access to food due to income

Inequality in access to food as measured by the coefficient of variation (CV) of energy due to income was higher at country level and for all population groupings under the acquisition approach (Figure 7.9). Inequality in Kenya remains high, with CVs of 37.5 and 35.2 percent using the acquisition and consumption approaches, respectively, except in Nairobi. Nairobi had the lowest inequality in access to food due to income, at 24.7 and 24.3 percent using acquisition and consumption, respectively. The Western region registered the highest corresponding CVs at 45.2 and 43.6 percent.

These inflated CVs reflect the effect of under-reporting of food consumed by low-income households and over-reporting by high-income households, which give away prepared food in rural regions. The questionnaire did not record food given to non-household members such as workers and visitors in high-income households; neither did it record food received by household members as payment in the case of workers, and it probably under-reported food eaten away from home as non-purchased food.

FIGURE 7.9.
CVs of dietary energy due to income



The higher inequality in access to food, by an average of about three percentage points, using the acquisition approach would marginally overestimate the prevalence of food deprivation for all the population groups.

Food deprivation

At national level, the prevalence of undernourishment was 51 percent, based on consumption data, and 41 percent based on acquisition data. Figure 7.10 shows the variations among income levels and Figure 7.11 those among areas and regions.

FIGURE 7.10.
Food deprivation by income level

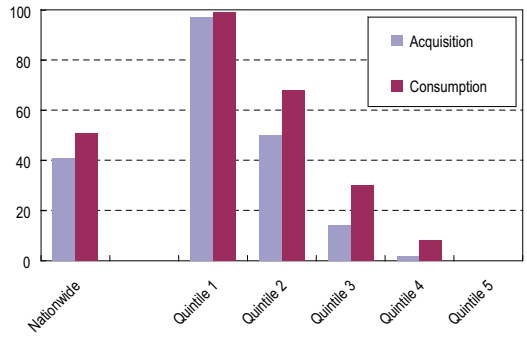
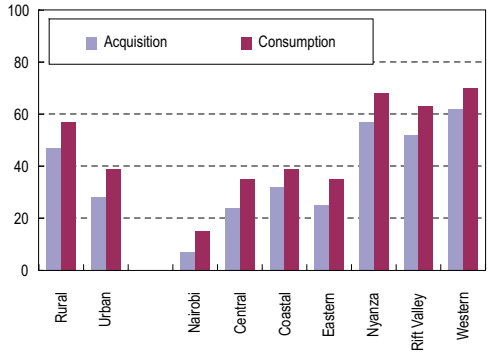


FIGURE 7.11.
Food deprivation by area and region



It is well-known that prevalence of food deprivation is higher with higher levels of inequality in access to food and is lower with higher levels of dietary energy. In this study it was found that despite the higher inequality in access to food, food deprivation was lower and this is because the dietary energy estimates using food acquisition dominated over the effect of higher inequality in access to food. On the other hand, the lower inequality in access to food and dietary energy estimates using food consumption yielded a higher prevalence of food deprivation, and this is because, the effect of lower dietary energy dominated over the effect of lower inequality in access to food. Consequently the magnitude of food deprivation would be under-estimated if food acquisition were used.

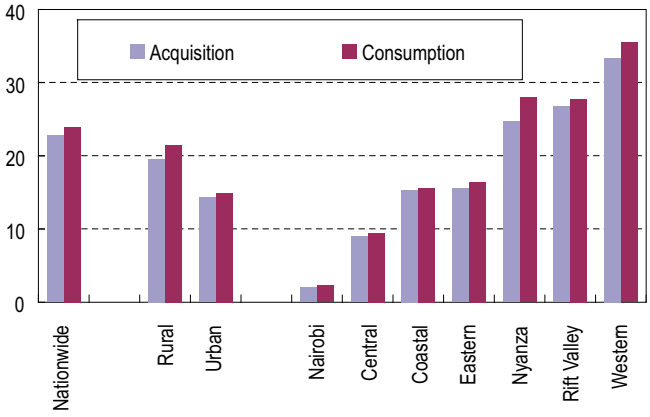
The differences in the two sets of food deprivation estimates differed by region owing to the magnitude of inequalities. Food deprivation estimates using acquired food data would be underestimated owing to lower inequality estimates.

Critical food poverty

Critical food poverty is the lack of income to acquire a balanced MDER. Figure 7.12 gives the prevalence of critical poverty at national and sub-national levels.

Critical food poverty estimates using acquired dietary unit values were marginally lower for all population groupings than those based on consumed dietary unit values. Nairobi and the Coastal region had the lowest differences, and the highest was in Nyanza. High consumed dietary energy unit values probably led to overestimation of critical food poverty, given that consumed monetary values were derived from purchased unit prices.

FIGURE 7.12.
Critical food poverty at sub-national levels



Diet diversity

The diet diversity using acquired and consumed dietary energy for national and sub-national levels showed that Kenyans consumed a relatively nutrient-balanced diet, as the shares of proteins, fats and carbohydrates in total consumption were within the WHO norms. Differences between the estimates derived from the two approaches were not significant at national level (Figure 7.13).

FIGURE 7.13.
Shares of energy from macronutrients at national level

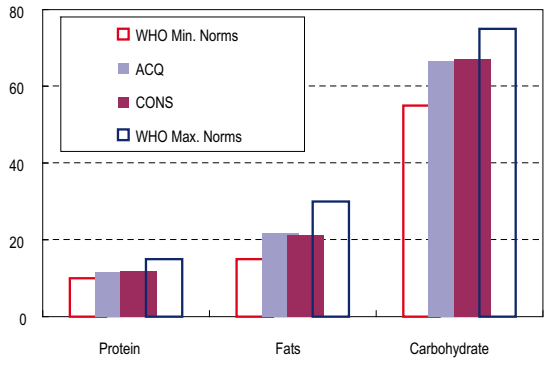
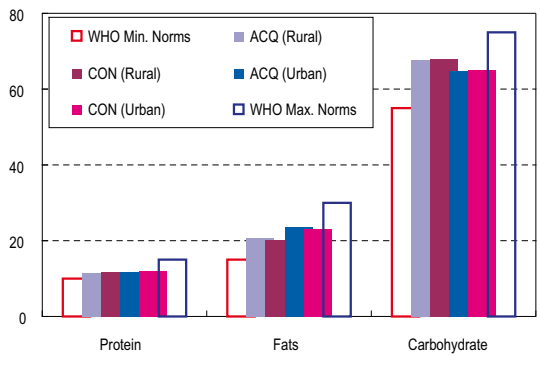


FIGURE 7.14.
Shares of energy from macronutrients by area



The two approaches showed some differences between rural and urban populations for fats and carbohydrates (Figure 7.14). Fats were lower using consumption data than using acquisition, in both rural and urban areas. However, carbohydrates consumed were higher than those acquired in both areas. Cereals and cereal products was the main food group, contributing about 48 and 50 percent, respectively, of consumed and acquired energy. Figure 7.15 compares the shares of the main food item groups, which contributed about 80 percent of dietary energy as estimated by the acquisition and consumption approaches. Consumption recorded higher energy shares than acquisition for sugar and pulses. Acquisition energy data for milk and cheese food items were higher than those for consumption. For protein consumption (Figure 7.16), cereals were the major contributor using both acquisition

and consumption, but the latter gave them a lower share. This could be owing to the perennial nature of these food items. The protein shares of pulses, milk and cheese and meat products were higher from consumption than acquisition.

FIGURE 7.15.
Shares of food groups in energy

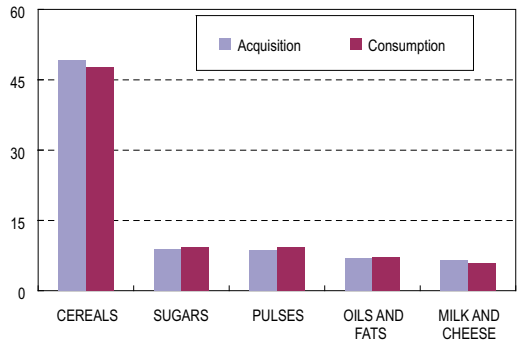
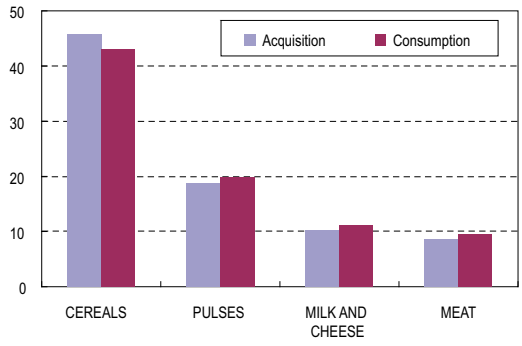


FIGURE 7.16.
Shares of food groups in protein



CONCLUSION AND REMARKS

Analysis of the acquisition and consumption food data of KIHBS 2005/2006 revealed some advantages in the use of consumption data instead of acquisition data for the assessment of food security at national and sub-national levels:

- Food consumption data provide better measures, on average, of food security statistics. Food consumption dietary energy estimates are more consistent and can easily approximate dietary energy intake, which is usually appropriate for assessing undernourishment.
- The measures of access to food, particularly regarding food dietary energy, derived from consumption data are more consistent.
- Food acquisition may be used more for policy and planning purposes than for assessing food deprivation.

The main recommendation is to collect monetary values of all food quantities, particularly those related to consumption, at household or local level. There are large differentials in both quantity units of measurement and prices, which have an impact on food security estimates. The NHS questionnaires can easily collect data using both acquisition and consumption, complemented with additional data on household food consumption received and given away.

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Food data collected using acquisition and intake approaches in Cape Verde's IDRF 2001/2002

Clodomir Pereira, Nathalie Troubat and Ricardo Sibrian[18]

ABSTRACT

National Statistics Institute (*Instituto Nacional de Estatistica* - INE) of Cape Verde conducted the Household Expenditure and Income Survey (*Ínquérito Ás Despesase e Receitas Familiares* - IDRF) 2001/2002 at national level. IDRF collected food consumption data from a sample of 4550 households on a monthly basis for a period of 12 months (October 2001 to October 2002), to account for seasonal variations, with a two-week household reference period. IDRF 2001/2002 provided detailed information of food acquired from purchases, own production, away-from-home consumption and other sources for 478 food products, in both quantity and monetary values, using diaries. Data on food consumed away from home were collected using individual questionnaires. IDRF 2001/2002 collected food intake data from a sub-sample of 2075 households using a specially designed questionnaire for a one-week household reference period. The questionnaire collected quantity data on intake; the corresponding monetary values were based on the unit values of food items from the main IDRF. The FAO Food Security Statistics Module (FSSM) estimated acquisition and intake food data to derive food security statistics at national level and sub-national levels.

This paper presents comparative results of the food security statistics derived from food acquisition and intake data, and further analysis of food security statistics at sub-national level based on intake data.

Keywords: food acquisition, food intake, undernourishment, food deprivation, critical food poverty

BACKGROUND

The United Nations Statistics Division manuals on conducting household surveys indicate that food data can be collected by using both acquisition (economic consumption) and intake (nutritional consumption) approaches. Food acquisition refers to food acquisition by households during the household reference period, regardless of when food consumption actually occurred. Food intake refers to food consumption by households during the household reference period, regardless of when food acquisition actually occurred. While acquisition data are useful for deriving inputs to national account system relating to food, intake data are useful for deriving food security indicators.

The Seventeenth International Conference of Labour Statisticians in Geneva 2003 issued resolutions on the use of household income and expenditure surveys for the purpose of assessing food insecurity.

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OBJECTIVES, METHODS AND DATA

The main objective of this paper is to discuss differences between acquisition-based and intake-based food security statistics. The reason for such a discussion is that most household surveys worldwide collect food acquisition data, but very few collect intake or consumption data. Many critics of acquisition data feel that they lack empirical evidence from household surveys that collect food and income or total expenditure data.

The Cape Verde Survey of Household Expenditure and Income (IDRF) 2001/2002 provides a unique opportunity to estimate food security statistics derived from food data based on acquisition and intake. National Institute of Statistics (INE) of Cape Verde collected food data in IDRF 2001/2002 based on two distinct approaches: food acquisition, and food intake from a sub-sample of households. Daily diaries collected both the quantity and the monetary value of each food item acquired for human consumption in all sampled households, while food intake refers to quantity values taken from a subset of sampled households.

Food acquisition, which is consumption from the economic point of view, consisted of all the food purchases and other food items acquired from non-purchased sources, such as own production, own stock from production or purchases, and received free or as aid, during a two-week household reference period. Food intake, which is consumption from the nutritional point of view, consisted of all the food items actually used for consumption by the household and obtained from such sources as purchases, own stock from production or purchases, and received free or as aid during a one-week household reference period in a sub-sample of households.

IDRF 2001/2002 collected food data from October 2001 to October 2002. The survey rotated sampled households on a monthly basis. INE developed several questionnaires for collecting household food intake and acquisition data on at-home consumption and away-from-home consumption by household members. Interviewers completed the questionnaires during visits to surveyed households during a two-week period.

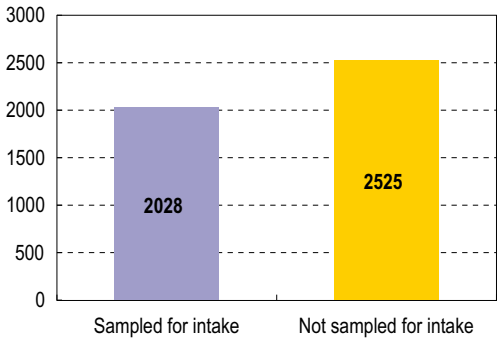
Every day, the household key informant recorded all expenses on food, non-food products and services, with details such as the name of the product, its quantity, cost and the place of purchase. The interviewer verified the records in the diary during his/her visits to the household during the same month, using sections on purchasing food products for food consumption at home during the day, food consumption outside, purchasing of non-food products and services, all other free-of-charge non-food products and services, and household total expenditure.

The datasets on intake and acquisition were processed using the FAO Food Security Statistics Module (FSSM), and analysed separately. FSSM was implemented across all the sample households using estimated intakes, based on estimated urban-rural differentials derived from a study on intake and acquisition from the sub-sampled households.

STUDY OF INTAKE VERSUS ACQUISITION

Intake and acquisition of food were measured in a sub-sample of IDRF2001/2002. Figure 8.1 shows the number of sampled households in each group. The first group measured intake for one week and acquisition for two weeks, and the second group measured only acquisition for two weeks. There were fewer households in the first group because of non-responses. It seems that there was selection bias in sampling households for the collection of intake data.

FIGURE 8.1.
Numbers of sampled households



IDRF provides a wealth of information on the welfare of households and individuals and on annual changes to the poverty situation. A total expenditure aggregate approximated well-being in Cape Verde. The households selected for intake and acquisition data collection had lower total expenditure than non-selected households (Figure 8.2). It is important to note that the expenditure inequality was lower among selected than non-selected households and that selected households had more members than non-selected households.

Figure 8.3 shows how the dietary energy level in households sampled was lower for acquisition than for intake by almost 200 kcal/person/day. Acquired energy in non-sampled households was higher than in sampled households, by more than 250 kcal/person/day; this difference may be linked to the higher total expenditure as shown in Figure 8.2. Probably, if all households sampled in IDRF 2001/2002 had had their intakes measured, their dietary energy would have been higher.

FIGURE 8.2.
Total expenditures

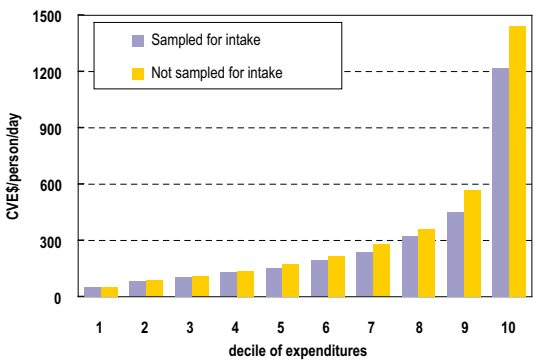


FIGURE 8.3.
Dietary energy

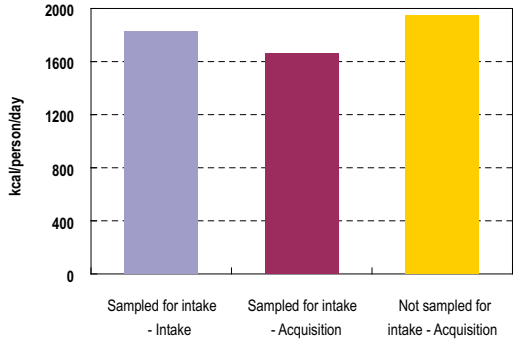
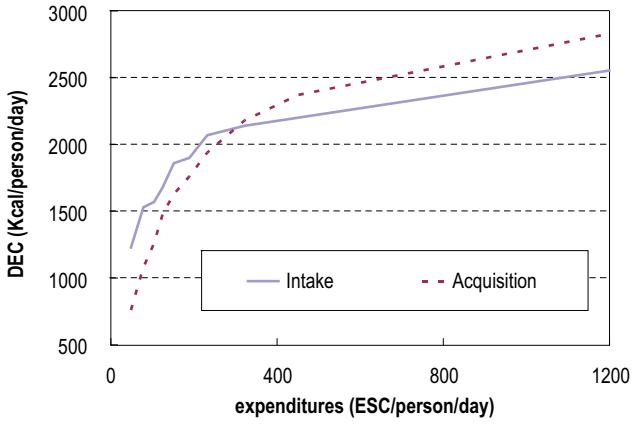


Figure 8.4 shows estimates of dietary energy using food data based on acquisition and intake by level of total expenditure in sub-sampled households. The acquired dietary energy per person per day was lower than the intake in low-income households and higher in high-income households. As income increased, the gap between acquisition and intake widened, reflecting households' growing ability to acquire more food and store it. Food acquisition recorded in household surveys may

be consumed (intake) during or after the household reference period, while food recorded as intake may be acquired during or before the reference period.

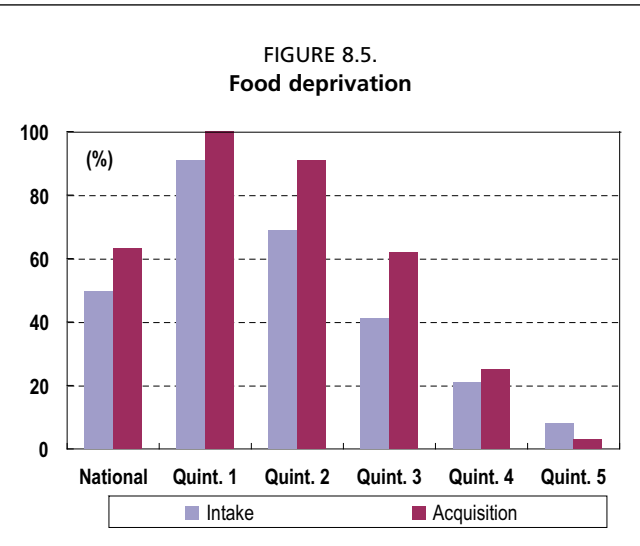
FIGURE 8.4.
Dietary energy from acquisition and intake data



For middle-income households, acquired food may be consumed (intake) after the acquisition period, and food intake may be acquired before the intake reference period, and recorded data on acquisition and intake may balance at national level. For the lowest-income households, the two may not balance, owing to lower economic capacity to acquire food in quantities to allow consumption beyond the household reference period or to a lack of facilities for preserving perishable fresh food such as meat, fish and dairy products acquired and consumed on a daily basis; hence, acquisition data underestimate intake.

On the other hand, households at the highest income level do not consume all the food acquired during the household reference period. They also acquire food for consumption by non-members, such as workers, visitors and neighbours, which is recorded as consumed by household members, resulting in overestimates of food intake. As shown in Figures 8.4 and 8.5, the implication of acquisition's underestimation of dietary energy in low-income groups is an overestimation of food deprivation for sub-sampled households.

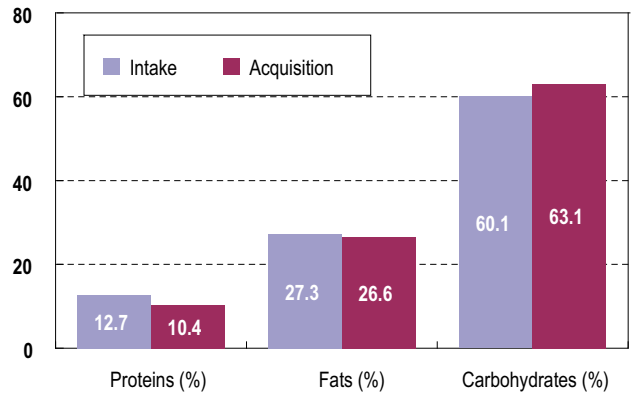
FIGURE 8.5.
Food deprivation



In terms of diet composition, as shown in Figure 8.6, dietary energy intake also showed a different pattern from that of acquired dietary energy.

Dietary energy intake was higher than acquired dietary energy for proteins and fats. The share of proteins from perishable food (fish, meat, dairy products and eggs) was higher for intake than for acquisition (33 versus 27 percent), the food consumed by lower-income households being more likely to be for immediate consumption owing to fewer facilities for buying and storing non-perishable food. It is also quite likely that these food products were acquired from higher-income households as payments in-kind.

FIGURE 8.6.
Diet composition



The acquired food cost expressed in terms of energy was higher in the sub-sample of households than in the non-sampled households, as illustrated in Figure 8.7.

This difference in cost of energy may be linked to the quality of food consumed and the acquisition strategy for coping with everyday food security in the sub-sampled households. Selected low-income households consumed fewer cereals and cereal products than non-sampled households (46 versus 49 percent) and acquired smaller quantities of more perishable food at higher energy unit cost. The quantity unit cost of food intake was higher than that for acquiring food in larger quantities that may have been consumed for longer periods, as may occur in high-income level households. The dietary energy unit value has an effect on critical poverty lines, which are used for estimating critical food poverty (Figure 8.7).

FIGURE 8.7.
Dietary energy unit values (ECV/1000 kcal)

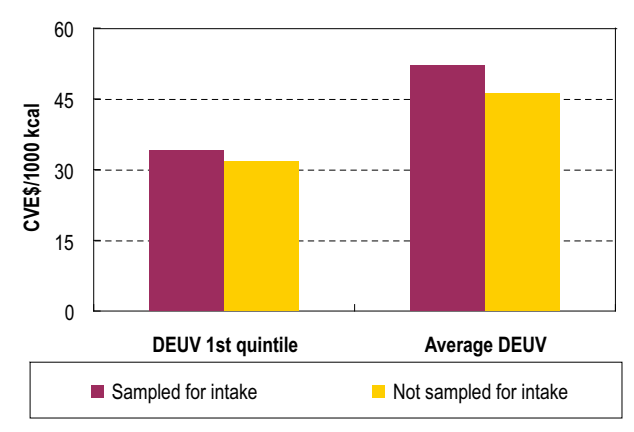
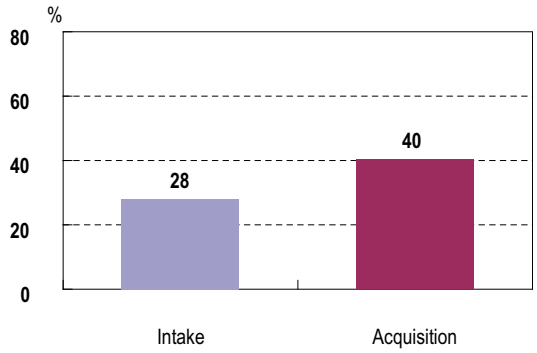


Figure 8.8 depicts the coefficients of variation (CVs) of dietary energy consumption (DEC), showing that dietary energy intake was more equally distributed among households than acquired dietary energy. A more equal distribution of dietary energy intake and a higher level of dietary energy imply a lower level of food deprivation (Figure 8.5).

The energy intake refers to a one-week period, which may pose a comparability problem with the two-week period for acquisition.

FIGURE 8.8.
CVs of DEC



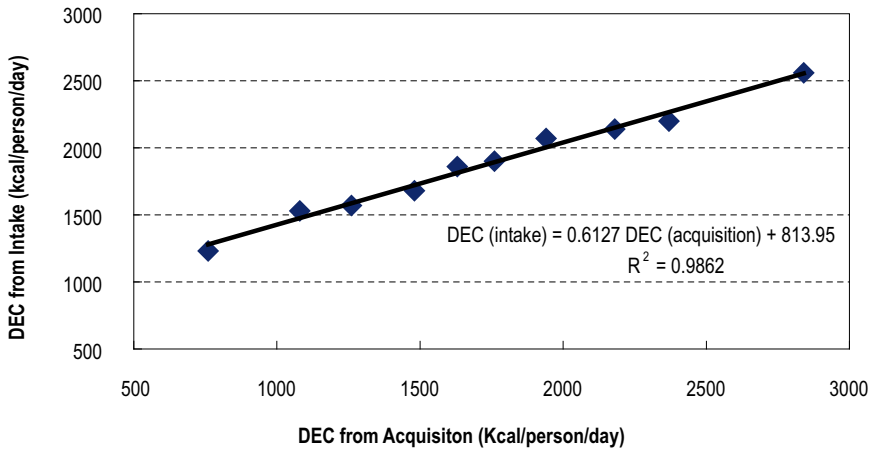
Other studies have reported similar findings on under and overestimation from acquisition compared with intake or consumption data at low and high income levels (Martirosova, 2007; Kvinikadze, Pantsulaia and Sibrian, 2007).

FOOD SECURITY STATISTICS FROM IDRF 2001/2002

As discussed, dietary energy from acquisition tends to be underestimated for low-income groups and overestimated for high-income groups. If sampling selection had not been biased (see Figure 8.7), then food intake data combined with information on household income could have had been used to assess food security in Cape Verde.

The analysis of food security at national and sub-national levels using food data from IDRF 2001/2002 was based on data on food intake, using data on food acquisition from the full sample. Figure 8.9 shows the relationship between dietary energy intake and acquisition at national level.

FIGURE 8.9.
Food intake as a linear function of food acquisition

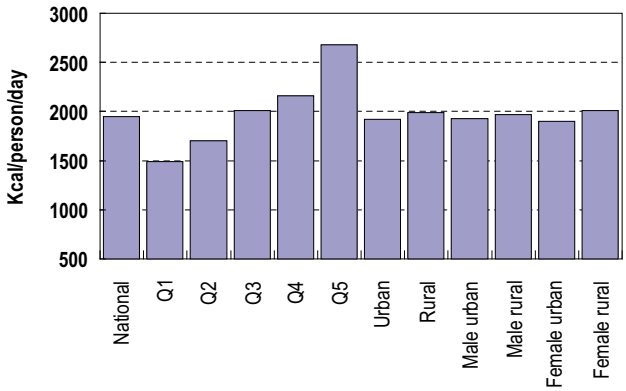


The results described in the following section are on food security statistics based on food intake, estimated from acquisition in all households using equations developed in the acquisition and intake study in sub-sampled households for urban and rural areas.

DIETARY ENERGY CONSUMPTION

According to IDRF 2001/2002, a person from Cape Verde consumed about 1950 kcal per day. Dietary energy intake differed by income level (Figure 8.10). Smaller differences were observed in favour of rural compared with urban households. Female-headed households in urban areas showed a lower level of dietary energy intake than those in rural areas.

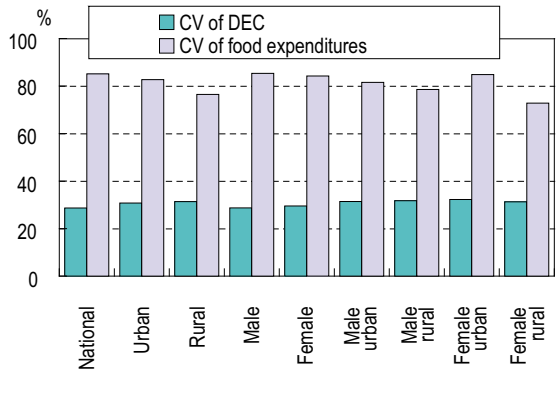
FIGURE 8.10.
Dietary energy at national and sub-national levels



Inequality in access to food due to income

Figure 8.11 illustrates access to food based on the CVs of DEC and food expenditures. Inequalities in access to food due to income as measured by the CV of DEC were quite high at national level (29 percent), but access to food was almost the same in all population groups at sub-national levels. Conversely, food expenditures were not equally distributed among sub-national groups.

FIGURE 8.11.
Coefficients of variation



In general, inequalities in food expenditure were lower among rural than urban households, and at their lowest among rural female-headed households. Dietary energy was more equally distributed in urban than rural areas, in male than in female-headed households and between male and female-headed households in urban and rural areas.

Food deprivation

Figure 8.12 shows levels of food deprivation at national and sub-national levels. Food deprivation was quite high at national level (41 percent). At sub-national levels, a higher level of food deprivation was observed in urban than rural areas (46 versus 38 percent).

Food deprivation differed at sub-national levels even when dietary energy intake and access to food inequalities were similar, owing to higher minimum dietary energy requirement (MDER) in urban than rural areas and in male than female-headed households in urban areas (Figure 8.13).

The different MDER levels result from the different age and sex structures of population groups. Female-headed households yielded lower MDERs in rural and urban areas, probably linked to the absence of adult males.

FIGURE 8.12.
Food deprivation at national and sub-national levels

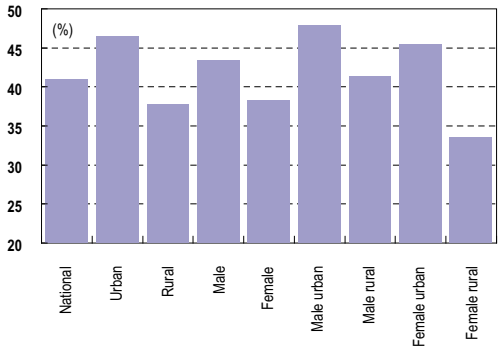
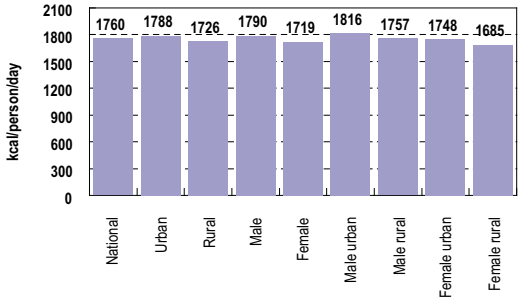


FIGURE 8.13.
MDERs at national and sub-national levels



CONCLUSION AND REMARKS

For food insecurity assessment purposes it is important to consider the collection of food data using both, the consumption or intake approach. In household surveys of large sample size it would be useful to measure intake in a sub-sample of households, in order to measure the relationships between intake and acquisition in urban and rural populations owing to the different dynamics of stocking food for human consumption.

It is important to consider the acquisition approach for the purposes of national accounts.

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Part 4.

Using food security statistics for policy analysis

Monitoring food insecurity based on Moldova's HBS 2003 and 2006

Oleg Cara and Ala Negruta[19]

ABSTRACT

Food security statistics are of interest to policy-makers, economists, nutritionists, food programme planners and others, in helping them identify and locate food-insecure people. In addition, they are useful for evaluating the effectiveness of intervention programmes using trend analysis. Moldova's National Bureau of Statistics (NBS) has a well-established Household Budget Survey (HBS) Programme that collects household expenditure, including on food, from a sample of 6000 households over a 12-month period. The food data are collected using diaries based on a monthly period. NBS used the FAO Food Security Statistics Module (FSSM) to derive food security statistics at national and sub-national levels from HBS 2003 and 2006.

This paper presents comparative results of the analysis of HBS 2003 and 2006 at national and sub-national levels, including some functional population groups for monitoring purposes. The results also provide elements for policy-makers to analyse the evolution of the food insecurity situation in Moldova over the three-year period. It also provides useful information for assessing and evaluating the implementation of food policies during the period.

Keywords: food consumption data, food security statistics, dietary energy consumption, food deprivation, critical food poverty, coefficient of variation

BACKGROUND

Improvement of the population's food security is one of the basic objectives specified in a range of national development programmes in Moldova. Food access and reduction of food deprivation are major concerns of the international community, as mentioned in the Millennium Development Goals (MDG) and the World Food Summit (WFS), which aim to reduce the undernourished population by half by 2015.

To improve the information framework for monitoring the food security situation and progress, thus providing decision-makers with more reliable and relevant information, national Bureau of Statistics of the Republic of Moldova (NBS) has started to compile food security statistical indicators. Compilation of these indicators is at national and sub-national levels, depending on the main socio-economic characteristics of households and the residence area. This activity follows the FAO methodology as recommended in the manual *Measuring hunger at sub-national level* (Sibrián, Ramasawmy and Mernies, 2007) and using the Food Security Statistics Module (FSSM) software.

OBJECTIVES, METHODS AND DATA

This paper contains a trend analysis of food security in Moldova from 2003 to 2006, at national and sub-national levels, based on the food consumption data collected from the 2003 and 2006 Household Budget Surveys (HBS) of Moldova. The paper also discusses and summarizes results on food deprivation, critical food poverty, food consumption in dietary and monetary values, food cost (dietary energy unit value), inequality in access to food and diet composition.

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FSSM estimated the relevant food security statistics from the two sets of food consumption data from HBS. HBS is a yearly continuous survey conducted by NBS. It has the purpose of observing, from a multilateral perspective, the living standards of the population with respect to income, expenditure and living conditions. The survey covers all the people in about 6000 households selected using a two-stage sampling design over national territory, apart from the left bank of river Dnester and the municipality of Bender. It does not cover people living in institutional units such as prisons, asylums for elderly people and orphanages. The interviewers record data with two instruments: interviews and self-recording. The main household questionnaire is completed during the interview, while the diary of daily records is kept through self-recording in combination with interview. Data collection on food expenditure follows the classification of individual consumption by purpose (COICOP) approach. The household reference period for recording data in the main household questionnaire and diary is the calendar month, apart from data on:

- food product expenditures in the 2006 survey were recorded during a two-week period only, while during a one-month period in previous surveys;
- some types of income and expenditures, especially those of a seasonal nature (expenditure and income from individual agricultural activities; and expenditure on home maintenance, such as central heating, gas and the procurement of coal and wood), which in the 2006 survey were registered for the current month and the last 12 months.

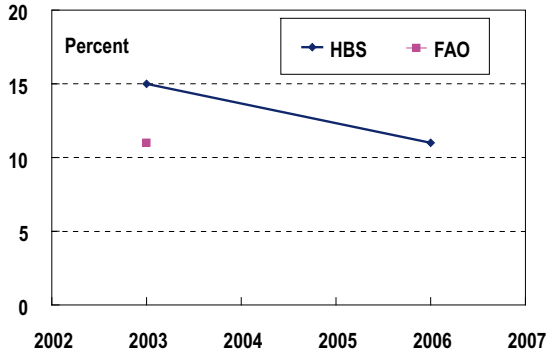
MONITORING PROGRESS IN FOOD SECURITY

Food deprivation

The prevalence of food deprivation (undernourishment) refers to the proportion of the population whose food dietary energy consumption is below the minimum dietary energy requirement (MDER).

This decreased from 15 percent in 2003 to 11 percent in 2006 according to HBS data (Figure 9.1). FAO estimated the prevalence of undernourishment (food deprivation) at 11 percent for the 2002-04 period, using food balance sheet (FBS) data. The 2003 and 2006 HBS estimates of food deprivation yielded an average annual decrease of about one percent, indicating that Moldova will probably meet the MDG indicator 1.9 target by 2015.

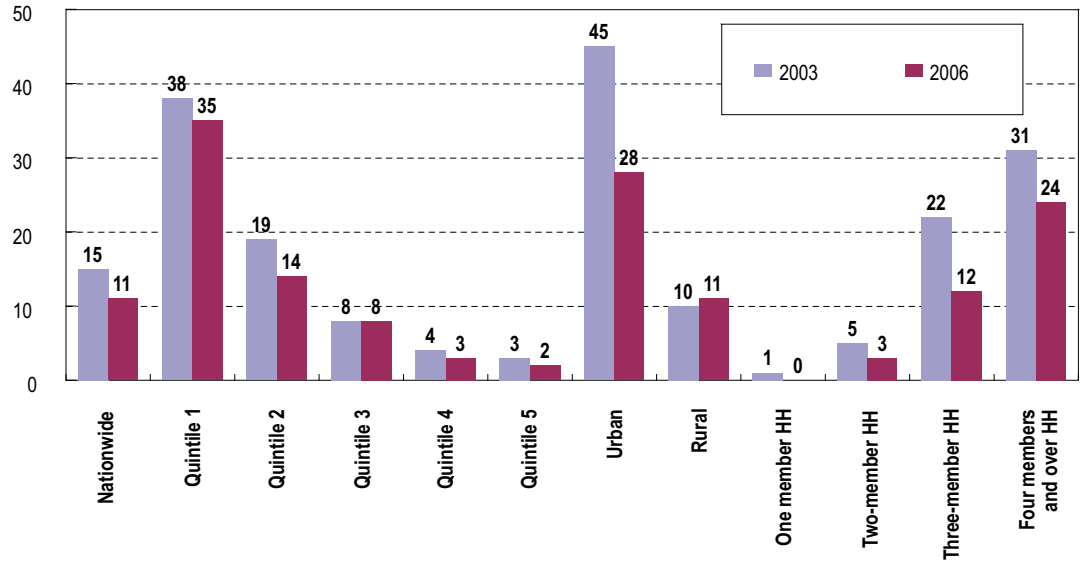
FIGURE 9.1.
Prevalence of food deprivation



NBS used FSSM programs to compute additional estimates of prevalence of undernourishment in different population groupings, based on geographical, demographic and socio-economic factors collected in HBS. Figure 9.2 gives the HBS-estimated levels of food deprivation at national and sub-national levels.

Food deprivation decreased in almost all population groupings from 2003 to 2006, except in rural regions, which registered a marginal increase of one percentage point. The urban population, which had the highest proportion of food-deprived population in 2003, registered a significant fall, to reach 28 percent in 2006. In 2003, the level of food deprivation among the low-income population was less than the 45 percent of urban areas. The fall of food deprivation among the low-income population was not sufficient to keep it below the 2006 urban level.

FIGURE 9.2.
Prevalence of food deprivation at national and sub-national levels

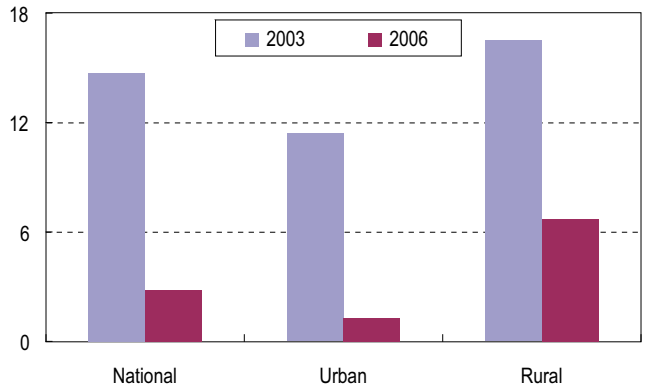


Critical food poverty

Figure 9.3 shows the prevalence of critical food poverty, that is, the proportion of the population living on less than the cost of a balanced diet equivalent to MDER in 2003 and 2006.

Critical food poverty decreased significantly from 15 percent in 2003 to less than three percent in 2006. The decreasing trends at national and sub-national levels were due to increases in income, which compensated for food price increases in the range of 50 to 75 percent from 2003 to 2006. The rural population still had a high level of critical food poverty, at seven percent, owing to the low level of income of this population.

FIGURE 9.3.
Prevalence of critical food poverty at national and sub-national levels

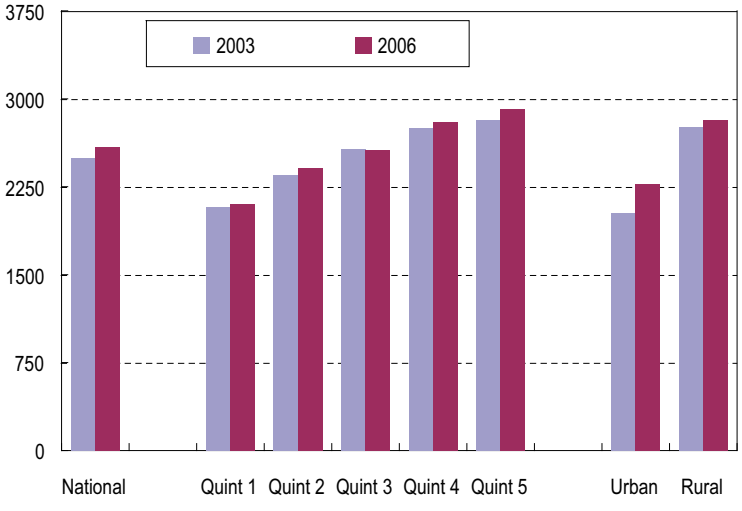


Dietary energy consumption

In 2006, the average daily dietary energy consumption (DEC) at national level was 2590 kcal per person, registering a 100 kcal increase over 2003's DEC of 2490 kcal (Figure 9.4).

DEC increases with income level and the highest income group had a daily per person consumption of more than 2900 kcal in 2006. Rural consumption was greater than that in urban areas. DEC increased in almost all population groupings. The highest increase was in urban areas, probably owing to the high levels of income among this population. The population of the lowest quintile experienced a marginal increase of one percent in their DEC during the three-year period.

FIGURE 9.4.
DEC (kcal/person/day) at national and sub-national levels



Food expenses and dietary energy unit value

From 2003 to 2006, there was a 76 percent increase in national food consumption expenditure, resulting in a 70 percent increase in the dietary energy unit value (Figures 9.5 and 9.6). These increases were the result of the combined effects of higher incomes and higher food prices during the three-year period. Wages went up by about 60 and 85 percent in the manufacturing and non-agricultural sectors, respectively, from 2003 to 2006, while the food price index rose by about 40 percent (Laborsta Web site). Again, the urban population registered the highest increases in food consumption expenses and hence paid higher prices for their DEC in 2006. It should be noted that the urban population obtained most of their food from purchases, compared with the rural population, which relied to a large extent on own-produced food, usually available at relatively low prices. For the lowest-income population, food consumption expenditure went up by about 60 percent and energy unit value by 55 percent.

FIGURE 9.5.
Food consumption expenses (lei)

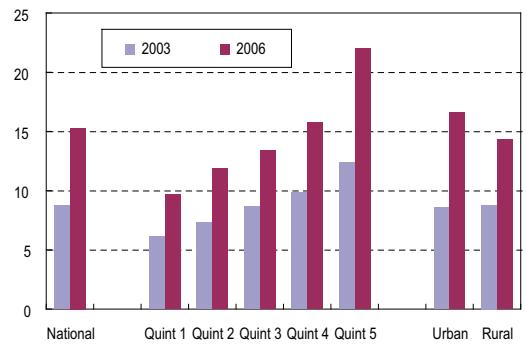
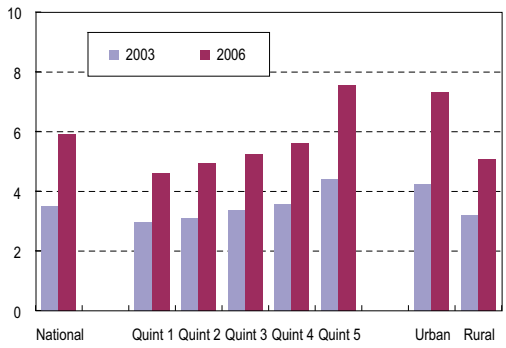


FIGURE 9.6.
Dietary energy unit values (lei per 1000kcal)

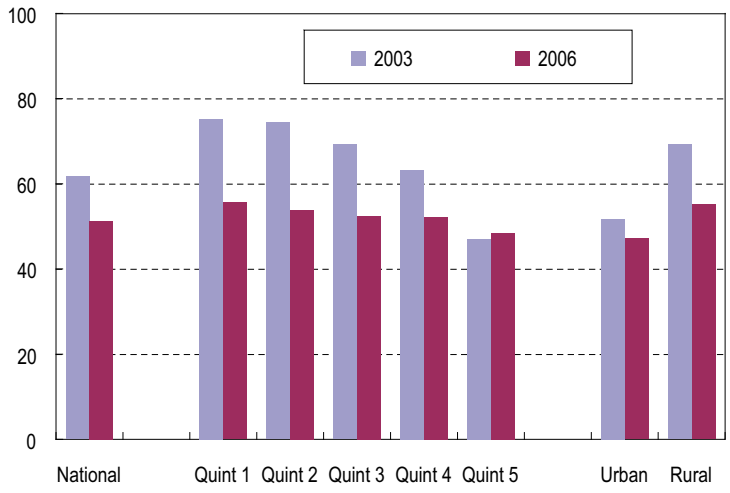


Food ratio

Expenditure on food products as a share of total consumption expenditure (the food ratio) decreased from 61 percent in 2003 to 51 percent in 2006 (Figure 9.7).

The overall decrease of ten percentage points was due to falls of 26 and 20 percent in the food ratios of low-income and rural households, respectively. The food ratio is expected to decrease with higher income (Engel's law), and this was the case for all population groupings, apart from the highest-income households. The main sources of food consumption of the population, expressed both in monetary and DEC values, were purchases, at 56 and 51 percent, respectively, in 2006 (Figures 9.8 and 9.9).

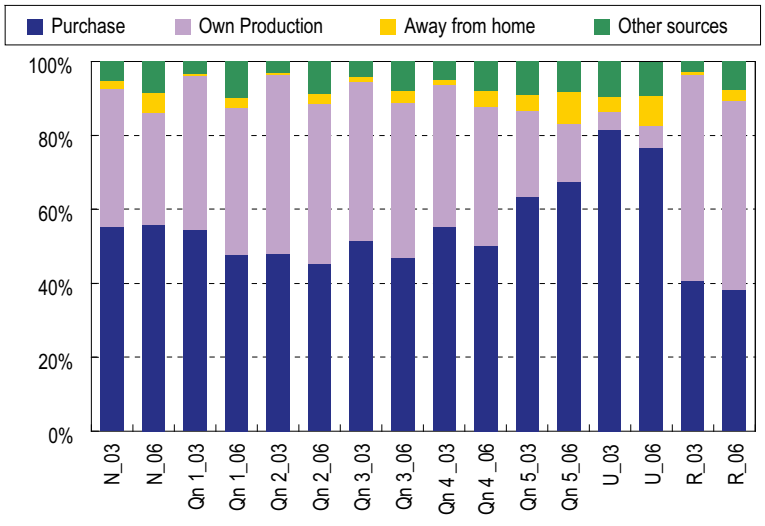
FIGURE 9.7.
Shares of food consumption to total consumption expenditure at national and sub-national levels



The corresponding 2003 values were 55 and 65 percent for monetary and dietary values, respectively. The share of purchased food in total food expenses decreased marginally in most population groups, except for the highest-income population, which registered a four-point increase.

There was a decrease of seven percentage points in the contribution of own-produced food to total food expenses at national level. This decrease was compensated for mainly by increases food from other sources, such as food from relatives, friends and food aid. From 2003 to 2006, there was a tendency for higher consumption of food away from home, due to the availability of more outside catering service facilities, such as restaurants, snack shops and food courts.

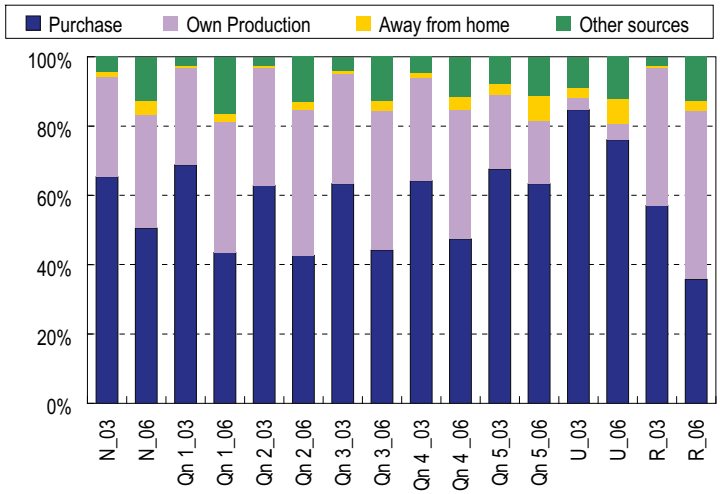
FIGURE 9.8.
Share of food expenditure by food sources at national and sub-national levels



The shifting of food sources showed a completely different pattern, as illustrated in Figure 9.9. Substantial decreases in the contribution of purchased food were counterbalanced by increases in the other three food sources.

An overall fall of 15 percentage points in the contribution share of purchased dietary energy was noted at national level, counterbalanced by increases of eight points for other food sources, four points for own-produced food and three points for away-from-home food. It is important to note the increasing importance of food from other sources, such as food from relatives, food aid received as wages or even taken from stock. The population of the highest-income group registered marginal falls of DEC from both purchased and own-produced food, but a significant increase in away-from-home DEC.

FIGURE 9.9.
Share of DEC by food sources at national and sub-national levels



In 2006, the population of rural areas obtained 49 percent of its DEC from own production, while in urban areas this indicator constituted only five percent. This fact underlines an increasingly high dependency on consumption from agricultural activities for the rural population, while for the urban population it indicates a high dependency on income, because urban consumption was mainly from purchases (76 percent) and food eaten away home (7 percent). The 2003 values were 85 and three percent, respectively.

Inequality in food consumption

Inequality in access to food, as measured by the coefficient of variation (CV) of food consumption due to income, is shown in dietary energy and monetary values in Figures 9.10 and 9.11, respectively.

FIGURE 9.10.
CVs of DEC

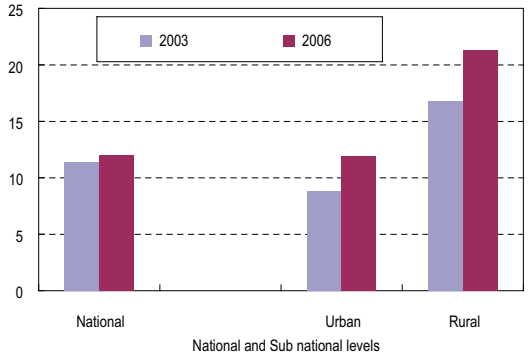
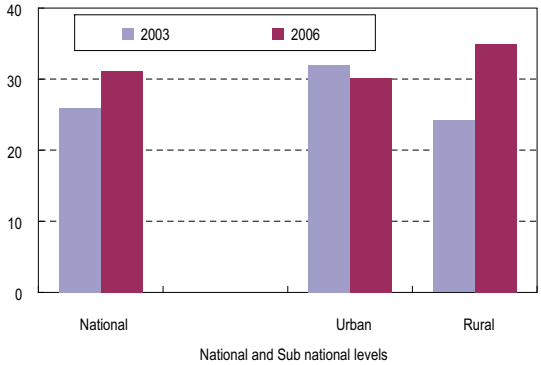


FIGURE 9.11.
CVs of food expenditure

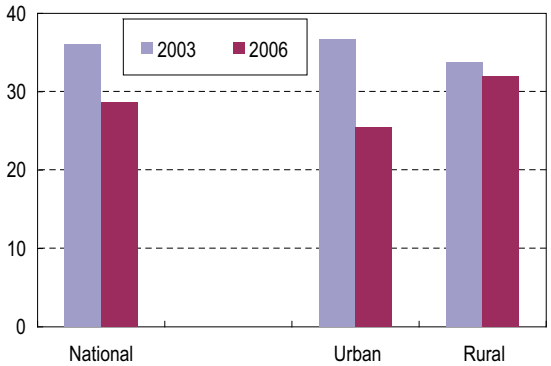


There was a slight increase in the CV of DEC at national level. Increases in sub-national population groups were more significant, particularly for urban and rural populations. The rural population had higher inequality in dietary energy than the urban population, in both reference periods. This indicates that rural income was more unequal and lower than that of the urban population. Inequality went up by more than 21 percent for the rural population; better income policies or better remunerated jobs are thus needed to reduce this inequality.

From 2003 to 2006, inequality in food monetary values registered high increases at national level and in rural areas, but a slight decrease in urban regions. The urban population registered a fall of about two percentage points, probably owing to improved distribution of income resulting from the increase in income from 2003 to 2006. The high increase of more than ten percentage points in rural areas could be due to high food prices, which include transportation and other handling costs. It should be noted that the CV for food monetary value is higher than that of dietary energy, as the former also captures the variability of food prices.

It is useful to analyse the evolution of income inequality that has occurred since the general increase in income in Moldova, as confirmed by the almost doubling of daily per person income between 2003 and 2006. Total consumption also almost doubled, resulting in a 75 percent increase in food consumption. The Gini coefficients at national and sub-national levels estimated from the two HBS are illustrated in Figure 9.12.

FIGURE 9.12.
Gini coefficients of income



The increase in the level of income has reduced the income inequality of almost all population groupings. At national level, a significant decrease from 36 to 29 percent was registered over the 2003-06 period. The decrease was more pronounced among urban populations, while a marginal decrease of less than two percent was noted in rural areas. An increase of about 95 percent in the daily per person income was noted in both urban and rural regions, but rural income levels were still lower than urban ones in 2006, by about 40 percent.

Diet diversity

In 2006, the average contributions to dietary energy were 17 percent from proteins, 26 percent from fats and 67 percent from carbohydrates. Compared with World Health Organization (WHO) recommendations, this is a balanced diet because it falls within the normative ranges from ten to 15 percent from proteins, 15 to 30 percent from fats and 55 to 75 percent from carbohydrates.

FIGURE 9.13.
Shares of energy from proteins, fats and carbohydrates and WHO recommendations

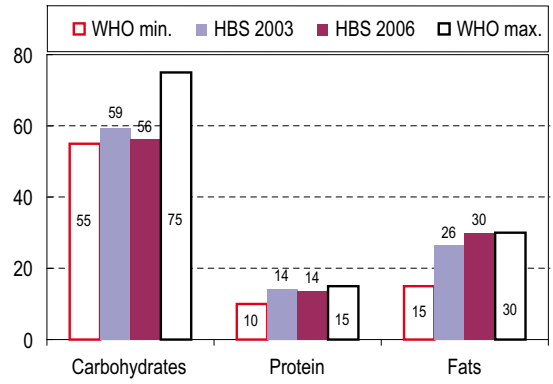


Figure 9.13 compares national shares of nutrients in energy with the WHO guidelines. The diet, which was reasonably balanced in terms of all three macronutrients, had seen an increase in the share of fats towards the maximum of 30 percent, while carbohydrates fell marginally to close to the minimum of 55 percent. These figures are still within acceptable WHO norms.

The share of proteins has remained at a high 14 percent. Analysis of DEC by food item groups showed high consumption of carbohydrates (cereals) and oil products, including both vegetable and animal fats. Cereal consumption fell from 48 percent in 2003 to 44 percent in 2006, while the consumption of oils and fats increased slightly (Figure 9.14).

Consumption of such food products as sugar, potatoes, pulses and vegetables decreased from 2003 to 2006, compensated for by higher consumption of meat, milk and cheese, fruits, fish, eggs and food consumption outside the home. Consumption of alcoholic beverages also went up. This pattern of consumption was more or less balanced, as the population had access to a large range of food products.

FIGURE 9.14.
Share of dietary energy consumption by food groups

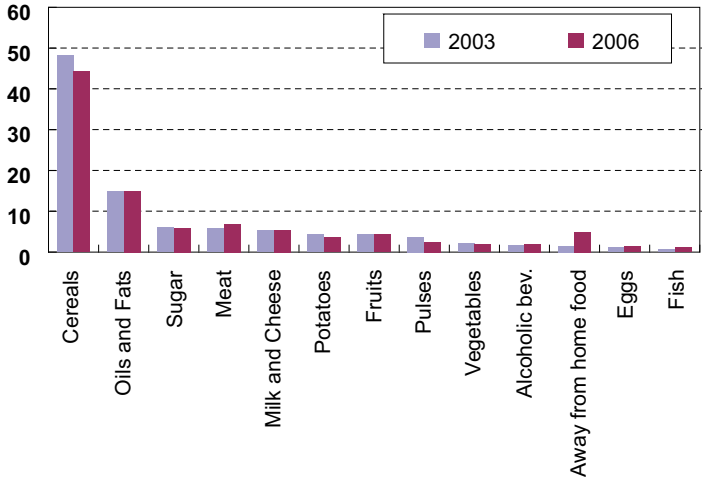
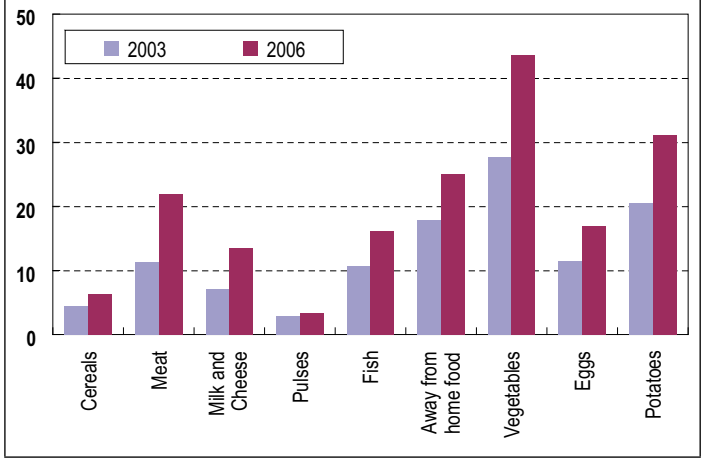


Figure 9.15 compares the protein unit values of food products that contributed more than 95 percent of the Moldovan protein intake. Pulses and cereals were the least expensive protein foods available in markets, while vegetables were the most expensive, owing mainly to their low protein content. From 2003 to 2006, the protein unit values of the main high-protein food items all went up in the range of 16 to 90 percent. Meat and milk and cheese had unit protein price increases of about 90 percent. The protein unit prices of high-value protein food, such as vegetables and potatoes, went up by more than 50 percent.

FIGURE 9.15.
Protein unit values (lei/100 g) for major food groups



CONCLUSIONS AND REMARKS

The food security statistics derived from the data collected in HBS are an important source of information on food deprivation and other food security indicators in Moldova. They also provide the information framework for monitoring the food security situation and progress, as well as providing society and decision-makers with reliable, relevant information for carrying out more effectively targeted activities.

FSSM software, designed by FAO and implemented by NBS, is a very efficient tool for elaborating and analysing food security indicators. However, during the elaboration of food security indicators and analysis, the following limitations were encountered:

- The accuracy of some HBS food consumption data was not sufficient. Because the survey tool was not designed specifically for estimation of the population's food consumption, especially food quantity values, it is thus necessary to take into account the possibly less accurate primary information provided by households, concerning:
  - consumption of food products for which the period of acquisition and use exceeds the two-week survey period, which could cause the under or overestimation of food consumption;
  - stocks, especially of food products purchased in large quantities;
  - estimation of food consumption from own production valued using local-market prices.
- Some food products were collected in broad groups of items and their nutrient values had to be estimated.
- Moldova lacks an official food composition table, including micronutrients such as vitamins and iron.

As the quality of food security indicators depends on the information collected by HBS, it is important to improve the accuracy of primary data in the next HBS. NBS looks forward to further support from FAO for the improvement and extension of food security analysis, including the use of updated versions of FSSM.

When comparing the results of 2006 with those of 2003, it is necessary to take into account some comparison limitations resulting from the fact that HBS 2006 was conducted on a new sample of households. There were also some methodological changes and a new questionnaire was introduced, focusing on the improvement of data quality.

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Using food security statistics for policy analysis and actions with long-term impact on hunger eradication based on Palestine's PECS 2005

Ala Joma[20]

ABSTRACT

The Palestine Central Bureau of Statistics (PCBS) conducted the Palestinian Expenditure and Consumption Survey (PECS) in 2005. PECS 2005 used the acquisition approach to collect household food expenditure and consumption data on a monthly basis, using daily diaries over a twelve-month period between January 2005 and January 2006. The survey sample consisted of 2152 responding households distributed in the West Bank (1427 households) and Gaza Strip (725 households). The Food Security Statistics Module (FSSM) permitted the derivation of national and sub-national estimates of food security statistics for assessing and monitoring the food situation in the West Bank and Gaza Strip (WBGS). Representatives from national and international institutions involved in food security discussed the results and some of the policy implications in the preliminary summary report *Food deprivation assessment in West Bank and Gaza Strip, based on food consumption statistics derived from the 2005 Palestinian Expenditure and Consumption Survey (PECS),* which was prepared by PCBS and the Ministry of Agriculture, with technical support from the FAO Statistics Division. This paper discusses the use of the food security statistics derived from PECS 2005 for policy analysis, particularly when applied to the agriculture sector in the effort to reduce hunger.

Keywords: food security statistics, policy implications, policy instruments

BACKGROUND

The West Bank and Gaza Strip (WBGS) are two geographically separate entities of what is known as the Occupied Palestinian Territories (OPT). WBGS survives in an exceptional situation because it is not a sovereign State and has only limited control over its natural resources - its land and water. More generally, the occupation has had a damaging impact on the ability of the Palestinian Authority (PA) to implement its policies country-wide, and even on its ability to raise revenues from its citizens to finance such implementation.

Unless the situation in WBGS improves, the likelihood of further escalation into a full-scale humanitarian crisis would increase. Since the second Intifada erupted in September 2000, the economic and social well-being of the four million indigenous Palestinians has continued to deteriorate. The local economy, both inside the Israel Defence Force closed areas and in surrounding rural areas, is severely affected, with agriculture suffocated and livelihoods destroyed. A major cause of this is that the functioning of markets is severely curtailed, and there has been deliberate destruction of property, orchards and irrigation systems. Social support networks are strained to

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breaking point, and exhausted coping strategies are being replaced by survival strategies that lead to structural poverty. The closures and movement restrictions on people and goods also seriously affect the provision of emergency, educational and social services.

Since October 2000, Palestine has steadily plunged into what some researchers have called "de-development". This is in sharp contrast to the situation on the eve of the second Intifada some six years after the establishment of PA, when levels of unemployment and poverty had declined for the fourth consecutive year. This promise of a prosperous future has been overturned owing to the Israeli response to the uprising, which has had a devastating impact on the whole Palestinian economic and social fabric. Economic decline and stagnation have led to a dramatic increase in poverty levels over the past seven years. Unemployment rose to a peak of 31.4 percent in 2002, and now about a quarter of the workforce is unemployed. The average wages of those employed fell by seven percent in the period 2001 to 2003.

With the protracted crisis that ensued after September 2000, all PA's national development plans and sectoral strategies became rapidly irrelevant in the new context. As the conflict intensified and closures assumed alarming proportions, a Palestinian Emergency and Public Investment Programme (PIP) for 2003/2004 was presented for donor financing in February 2003 in London. Ten months later, PA presented the Socio-Economic Stabilization Plan (SESP) for 2004/2005 to donors, in Rome. A key objective of these two plans was "to contribute to the basic humanitarian and social needs of a growing Palestinian population", which is reflected in cash and food assistance as well as employment generation programmes.

The Medium-Term Development Plan (MTDP) 2005 to 2007 followed SESP, with the latest draft dated February 2005. The overarching goals of MTDP are to address poverty in a sustainable way, reduce unemployment, and build social capital and functioning State institutions. PA is trying to attain these goals, but has not been in full control of the development process because of limits imposed by the occupation. Nevertheless, some aspects of development, such as institution and capacity building, are proceeding.

RATIONALE

There have been significant changes in the political and economic situation of WBGS recently, especially in 2006. The recent crisis triggered a revived interest from PA, humanitarian agencies and donors in food security analysis and programming. Improved information should contribute to a shared understanding of food security status and dynamics, leading to improved coordination among the broad range of actors working in the food security sector.

International summits such as the World Food Summit (WFS) and the Millennium Declaration have set targets to reduce hunger by 2015, in terms of both absolute numbers and proportion of the population below the minimum level of dietary energy consumption (DEC). There is a need for information to monitor these targets at national and sub-national levels.

In addition to these demands, other initiatives, such as the food security strategy, the poverty alleviation strategy and rural development strategies, have also increased the needs for food security statistics at national and sub-national levels to guide policy design, interventions, evaluation and monitoring.

OBJECTIVES, METHODS AND DATA

Food security statistics are useful to policy-makers (economists, nutritionists, food programme planners, food traders, etc.) in identifying and locating food-insecure people and evaluating the effectiveness of intervention programmes. These statistics, together with complementary information, help to foster an integrated approach to food and nutrition analyses, focusing on the prevention of undernourishment or starvation as fundamental food policy goals. This implies putting in place a set of

instruments and mechanisms that seek to: 1) overcome existing long-term nutritional deprivation in vulnerable population groups; and 2) identify short-term nutritional deprivation resulting from adverse political and natural events or sudden changes in people's capacity to acquire enough food.

Various methods are available for monitoring the nutritional status of both large categories and major sub-categories of the population. These include: 1) construction of a national food balance sheet to estimate the food available for human consumption in the country; 2) food consumption data collected through household expenditure and consumption surveys to estimate food deprivation and identify the profile of the population falling below minimum standards of food consumption; and 3) more specific investigations of vulnerable groups, to assess the degree, nature and intensity of their inability to acquire sufficient food.

Given the constraints involved in constructing a national food balance sheet, the analysis in this paper is based on the household expenditure, consumption and food data collected in the Palestinian Expenditure and Consumption Survey (PECS) 2005 by the Palestine Central Bureau of Statistics (PCBS). The FAO Food Security Statistics Module (FSSM) was implemented to derive national and sub-national estimates of food security statistics, for assessment and monitoring of the food situation in WBGS based on PECS 2005 data. The food security statistics discussed below allow policy-makers to assess, at national and sub-national levels, the nature and magnitude of food deprivation and critical food poverty, food and nutrient consumption levels (energy, proteins, fats and carbohydrates), access to food due to income, minimum dietary energy needs, and the contributions to total food consumption of different food sources. These estimates provide information for long-term forecasting of food demand and the monitoring and evaluation of the effects of programmes with food security policy implications.

The PECS 2005 sample consisted of 2152 responding households, distributed in the West Bank (1427 households) and the Gaza Strip (725 households). The acquisition approach was used to collect food data on a monthly basis, using daily diaries over a twelve-month period between January 2005 and January 2006. This approach is prone to wide margins of error, particularly owing to the PECS collection of acquisition rather than consumption data. In the context of the situation in WBGS, food acquisition as a proxy for food consumption may provide only an approximation of current conditions. However, the pursuit of accuracy must be weighed against the costs of obtaining additional information; the important task is to obtain orders of magnitude in terms of numbers of people, and to identify the geographical situation of food deficiency or vulnerable groups. The preliminary summary report, *Food deprivation assessment in West Bank and Gaza Strip based on food consumption statistics derived from the 2005 Palestinian Expenditure and Consumption Survey (PECS)*, prepared by PCBS and the Ministry of Agriculture, has been presented to and discussed among participants from national and international institutions involved in food security statistics in WBGS.

FOOD INSECURITY IN WBGS

The paper addresses food insecurity issues relating to: 1) access to food rather than food supply, that is, whether people have sufficient control over food and methods for supplementing their entitlements if food is deficient or absent; 2) access to food by all people, implying that an aggregate view is insufficient and that the situation of individuals in social groups at risk is of critical importance; and 3) a focus on availability of food and the ability to acquire food, corresponding to the distinction between food availability and food entitlement. These food security issues owe much to the shift away from thinking of food solely in terms of available food supply.

A complementary view of food insecurity is based on the risk that certain social groups may face starvation. Food insecurity is measured in terms of the probability

that a given population, for example, one defined by geographical location or income group, may experience inadequate access to food. This probability is the product of certain risks, such as closure and unemployment, that is, the probability of failing to earn enough. The task of food security policy is to reduce the level of these probabilities. Posing them in terms of risk makes it evident that stabilizing supply and reducing the incidence of poverty both have important roles to play.

A distinction between chronic[21] and transitory[22] food insecurity is also important, and provides a useful organizing scheme for discussing food policy instruments.

Food insecurity in Palestine in 2005 was indicated by a food deprivation level of 44 percent. This means that almost half the Palestinian population were consuming less than the minimum dietary energy requirement (MDER) of 1680 kcals per day (Palestine, 2007). Food deprivation was higher in rural areas and refugee camps than in urban areas, reflecting higher inequalities in access to food. The opposite was the case regarding income inequalities. The highest level of food deprivation (97 percent) was among the population of the lowest income group.

POLICY IMPLICATIONS

The food security situation, as summarized in the previous paragraph, provides inputs for understanding the nature of the food insecurity problem, and some intermediate and underlying causes. The nature and magnitude of food insecurity have policy implications for Palestine. Policies with an impact on food security concern the integration of actions affecting the supply, distribution and consumption of food in order to ensure continuity of access to enough food for all people in the country.

In this context, supply refers not just too domestic production, but also to the potential for supplementing food production with commercial imports or food aid. Distribution refers to the way food marketing channels work, and the effectiveness of its timing, place and form.

On the demand side, food policy is concerned with the adequacy of food consumption across all population groups in society. It is concerned with the aggregate and average nutritional status and the purchasing power of different groups of people regarding food, and includes policy instruments designed to improve the access to food of sections of the population that are vulnerable to inadequate levels of food consumption. Food policy is also concerned with the ability of the food marketing system to achieve efficiently the required spatial and temporal distribution of food, including inter-seasonal stabilization of volumes and prices. Stability of prices and supplies is a crucial integrating concept in food policy.

FOOD AVAILABILITY FOR HUMAN CONSUMPTION

On the supply side, food policy is concerned with food production, its rate of growth, food imports and food aid. Food production encompasses all those instruments that form agricultural policy: the inputs, outputs and technology of farm production, and instruments aiming to change the size and composition of food output. Food imports provide an alternative to domestic production for the achievement of a given level of total supply. The use made of imports for this purpose depends on both efficiency criteria (world prices versus domestic production costs) and macroeconomic feasibility (availability of foreign exchange). Food aid provides a third alternative source of food supplies.

Physical availability of food commodities is not considered a major problem in WBGS, although there have been sporadic losses of stable physical access to food as a consequence of the restrictive and arbitrary closure regime, mainly in the Gaza Strip. The destruction of infrastructure, mostly in the Gaza Strip, has put at risk other

[21] Chronic food insecurity refers to a continuously inadequate diet resulting from persistent inability to acquire enough food.

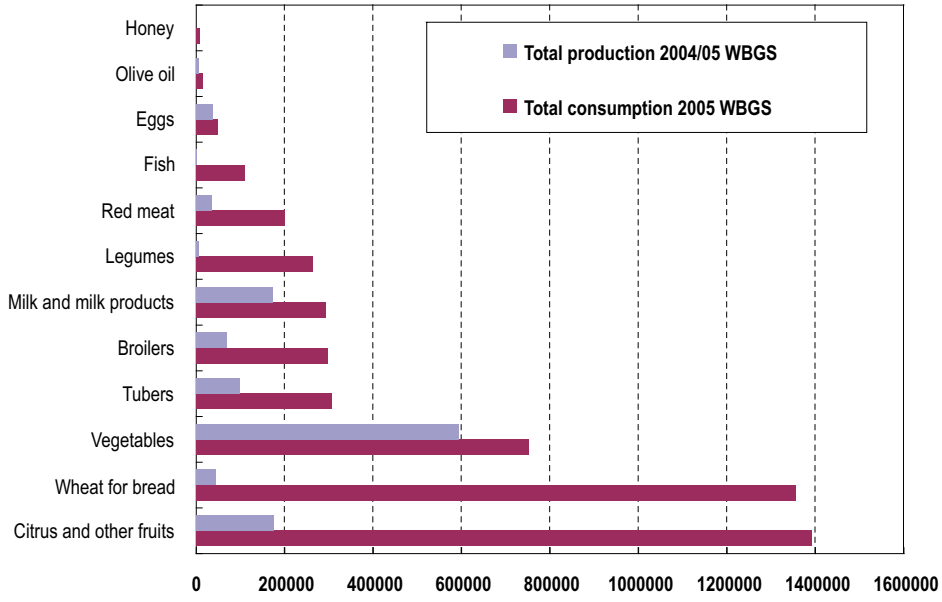
[22] Transitory food insecurity is defined as a temporary decline in a household's access to enough food.

essential components for food security, such as access to clean water, health care and productive assets. Productive capacity is permanently restricted by limitations on access to land and water, high costs and poor-quality sources of water, and limited access to and increased costs of fertilizers, livestock feed and other inputs.

Local production does not provide sufficient staple food commodities (such as cereals and pulses), and the food supply relies on imports and commercial channels. In addition, areas of high agricultural potential are affected by closures (e.g., Qalqilya, Tulkarm and Jordan Valley) and isolation from urban markets (e.g., Nablus). The gap between total consumption and total production shown in Figure 10.1 displays a structural deficit in stable food commodities that is not likely to change in the short term.[23] Except for the case of olive oil, where local production exceeded local consumption by 164 percent, local production covered from two to 83 percent of local consumption for the most important basic food groups (WFP and FAO, 2007).

WBGS is dependent on imports, the availability and price of which are controlled by Israel. Palestinian traders' access to agricultural products and foreign markets through Israeli ports of entry and exit are particularly affected by the unequal application of the 1994 Paris Protocol. Additional risks to Palestinian importers derive from the unpredictability of closure policies. For instance, the closure of Karni Crossing forced importers to pay significant demurrage fees for goods not released, and transaction costs have also increased, to accommodate the rising risk in shipping and documentation. These costs do not result in reduced availability of food, but are reflected in reduced economic access to food. In contrast, Israeli agricultural products enter the Palestinian market easily, which renders them very competitive in terms of price compared with local produce. WBGS exports vegetables to Israel which are about 20 percent of total imports from Israel. In addition, the international market provides some foods, such as cereals and pulses, at such low prices that Palestinian production is unable to compete (WFP and FAO, 2007).

FIGURE 10.1.
Local production in 2004/2005 compared with total local consumption in 2005 for selected food items/groups



Source: Data from PCBS and Palestinian Olive Oil Council.

[23] The average annual total consumption in the years 2004 and 2005 was calculated and used for comparison with total production in 2004.

Recently, food aid has become an ever-more prominent source of food. In 2005, the World Food Programme (WFP) and the United Nations Relief and Works Agency for Palestine Refugees in the Near East (UNRWA) distributed a total of 126066 tonnes of food aid. Food and non-food aid distributed through charities and non-governmental organizations (NGOs) as one-off assistance are difficult to capture. The significant amount of food aid distributed through conventional and non-conventional channels has enabled food-insecure Palestinians to cover their food needs, preventing negative repercussions on their nutritional status, as shown by the very slow - albeit steady - growth of chronic malnutrition (measured as stunting).

FOOD DISTRIBUTION AND ACCESSIBILITY

Agricultural and food market fragmentation in WBGS create a situation in which the food that is produced or imported is not evenly distributed. Fragmentation of food systems in the West Bank is caused by closures, checkpoints and the Barrier. This has resulted in a horizontal trisection, limiting the flow of commodities among northern, central and southern regions, and a vertical bisection, severing the agriculturally productive Jordan Valley from its markets. Many markets have closed or been relocated, increasing transaction costs and restricting the access of some population groups to the buying or selling of products. These areas are increasingly isolated "economic islands" on which increasingly distinct market catchment areas are based. Thus, while overall food availability at the macro level is balanced by imports, the availability of particular foods in particular areas at particular times may be uneven. In general, fluctuations in international prices, high fuel costs and increased transport costs have all exerted an upward pressure on prices.

At the same time, the inflow of Israeli products into Palestinian markets, the inaccessibility of other markets - including those in Israel, the West Bank or Gaza - for Palestinian traders, and the withholding of PA salaries and the economic recession since the beginning of 2006 have had a dampening effect on prices. The overall outcome has been a rise in prices, especially in the Gaza Strip.

Economic access to food continues to be the most significant food security concern in WBGS. Moderate food price increases in the face of drastic reductions in livelihoods, cash income and consumers' purchasing power have created a "market-induced shock" for vulnerable households. Traditionally strong social ties tend to preclude the possibility of acute household hunger, thus preventing an acute food crisis. Poor Palestinians receive various forms of assistance and services from a number of partners, enabling many of them to maintain sufficient access to necessary foods. However, declining food security in all areas of WBGS since the 2000 Intifada has been exacerbated by the more recent loss of income for PA employees and their dependents and the destruction or inaccessibility of productive assets and jobs for households affected by the Barrier and other occupation measures. To overcome the loss of income and the subsequent loss of economic access to food, Palestinians are using such coping mechanisms as assistance from friends and family, redistribution of limited resources among households, land cultivation and animal rearing, and financial loans (WFP and FAO, 2007).

CHALLENGES

The need to improve agriculture in WBGS has been underlined as a way of improving food availability for the Palestinian population. Closures, destruction of agricultural lands, lack of water, etc. hinder the already minimal food availability from own production (which accounts for less than four percent of food requirements) (Palestine, 2007). Significant domestic food production is limited to a few commodities - mainly olive oil, poultry products, milk/dairy, tubers and vegetables - of high nutritional value; most staple food commodities, such as

cereals, pulses and red meat, are imported. The focus on promoting domestic food production is based in part on the desire to avoid undue reliance on unstable and unpredictable world food markets, especially imports from Israel. Domestic food production is promoted by a range of policies, including those for land development, input, credit, research and irrigation. Growth of domestic food production mainly addresses the problem of total food availability, and has some impact on chronic food insecurity to the extent that the employment and income prospects of poor farmers and landless labourers are improved. It may also help overcome some types of transitory food insecurity; for example, irrigation reduces the seasonality of output for farmers. The production capacity of all high nutritional-value products, such as poultry, red meat and milk products, should be protected and expanded. This will help replace imports with local production and will also increase the income from exports, thus providing economic access to food that cannot be produced locally.

POLICY INSTRUMENTS

Instruments for tackling the lack of food entitlements take two forms: lowering the price of food to improve exchange entitlements (food subsides), or increasing command over food through employment creation, poverty alleviation, food-for-work programmes or cash transfers. These instruments can be general and applied to all food consumers, or targeted and directed to specific social groups in need.

The consensus on policy instruments to alter food entitlement is that targeted interventions are preferable to generalized interventions, and that self-regulated targeting is preferable to administered targeting. Targeting interventions are also preferred to generalized interventions because they avoid the creation of economy-wide price distortions.

In the present context, key features of food insecurity in WGBS, such as livelihood crisis and cash income decline, need to be addressed through a focus on economic access to food. The findings of the present analysis provide the foundation for adequate policy responses. Specific objectives and designed responses need to be developed in close interaction and coordination among relevant stakeholders on food security, both local and international. Responses include the following interventions.

Protection of livelihoods and mitigation of poverty

Protection of livelihoods and mitigation of poverty can take place through sustainable employment generation schemes, promotion of productive and income-generating activities, micro-enterprises and micro-finance, for example. Support to industries and the private sector requires close policy dialogue and commitment of different stakeholders to long-term processes.

Within this framework, agriculture/fisheries-based livelihoods need to be protected to maintain some strategic food production capacity for most rural families. Supporting this coping mechanism would contain the escalation of humanitarian needs and help protect entitlements to land and water resources, in particular through:

- strengthening of Palestinian produce, poultry, vegetables and olive oil, and support to poor farming households to maintain productive capacity in these vibrant sectors with a commercial perspective;
- investments in the diversification of food production patterns, aimed at enhancing: 1) local food security against the fragmentation of food systems; and 2) the source of locally procured food aid (e.g., from farmer to the poor, and complementary high-value food commodities for school feeding);
- technological improvements to increase agricultural productivity within the natural limits of land and water resources, focusing mainly on expanding income opportunities from agriculture by increasing the production and marketing of high-value crops that are also suitable for local consumption (WFP and FAO, 2007).

Job creation

The provision of temporary employment (income support) to the unemployed, and cash assistance to enhance households' capacity to cope with shocks and stresses, has a spin-off effect on local economies, especially when aimed at creating productive assets, such as land reclamation.

Job creation schemes can address several non-mutually exclusive requirements, such as:

- maintenance of urban infrastructure, including roads, water schemes and other civil infrastructure that prevent degradation and maintain the appearance and hygiene standards of towns and camps;
- investment in the productive asset base, particularly land and water conservation and management, which prevents degradation of the physical environment and augments Palestinians' entitlements and protection of their rights (WFP and FAO, 2007).

Food markets and trade

Food markets and trade need support to: 1) address traders' vulnerabilities in the areas of credit and supply chains; and 2) regulate food prices and affordability, to protect the purchasing power of the poor. As there is little experience of supporting traders and markets, interventions should be carefully studied in close collaboration with the private sector (WFP and FAO, 2007).

Food aid

The combined humanitarian aid efforts have undoubtedly saved lives, but they are not sustainable in the medium or long-term and they do not deal with the root causes of food insecurity. Humanitarian aid is often also poorly coordinated and based on the insufficient knowledge of those who most need food on the part of the responsible institutions. This has resulted in some deserving cases receiving nothing, while other families receive food from more than one source.

To alleviate poverty and sustain food security, a twin-track strategy is recommended: strengthening social safety nets to put food on the tables of those who need it most, and attacking the root causes of food insecurity with initiatives to enhance the productive capacity of the Palestinian economy, particularly agriculture and industry, by stimulating food production, increasing employment and reducing poverty. This brings to an end the current unfruitful debate about humanitarian aid versus development approaches to reduce poverty and food insecurity. The twin-track approach creates a virtuous circle as the use of locally produced food to improve food assistance to the needy, food availability and food accessibility, can result in rising incomes and additional improvements to food security. Targeting criteria need to be based on geographical location and level of impact of the crisis. Food aid should target urban as well as rural areas and refugee camps, as there is increasing evidence that a sector of the urban population cannot meet its food requirements.

Food aid interventions should include:

- productive assets creation (food for work) and protection of the livelihoods asset base (directed to socially impaired and poor households);
- support to education (school feeding) and vocational/literacy training (food for training);
- protection of food consumption/nutrition levels of very poor households;
- responses to acute food shortages, such as in situations of blockade and armed conflict, through contingency planning (WFP and FAO, 2007).

Social welfare/protection schemes

Various government organizations, such as the Ministry of Social Assistance, NGOs and other religious and secular stakeholders operate social welfare and protection schemes aimed at preventing the socially marginalized and poorest of the poor from falling into destitution and to offer young people opportunities for education and jobs. Such schemes include:

- direct income transfers (cash assistance, food aid);
- vocational training;
- promotion of income-generating activities.

Assistance should be determined on the basis of the difference between desired overall consumption and the actual level of access to essential needs, including food. The diverse eligibility and targeting criteria utilized by humanitarian actors and other agencies need to be reviewed in the light of social equity (Palestine, 2007; WFP and FAO, 2007).

Integration of policy instruments

Ideally, this involves the integration of both supply-side and demand-side instruments of food security, to form a coherent and integrated food security strategy. This rarely occurs in practice, however, because of the complexity of the different components of food and nutrition security. The Ministry of Agriculture usually handles domestic agricultural production, while nutrition is the responsibility of the Ministry of Health, and public employment schemes or food-for-work projects in the domain of the Ministry of Labour or Pubic Works. Coordinating the food security activities of all these agencies requires considerable effort, and is thus seldom achieved.

CONCLUSIONS

Although Palestine exhibits equilibrium in the aggregate supply and demand of food, for various reasons 44 percent of the population is unable to obtain adequate food for healthy survival. Inequalities in food distribution, due to differences in income among social groups, regions and households and within the household, remain food policy's main concern. Distinction between households and individuals is important for food policy, because individuals have special nutritional needs according to their age and sex, and these are not always easy to meet, even when the provision of basic calories is adequate at the household level.

An aggregate shortage of food is only one of several factors that can cause short or long-term inadequacy of food consumption. Food shortage affects entitlements primarily through an increase in the market prices of food. This diminishes the purchasing power of the 90 percent of the population that depends on market purchases of food for its survival. However, a number of adverse price changes, originating in events other than food shortage can also cause a fall in the exchange entitlement of food for different population groups. Examples of these are: 1) a rise in food prices caused by a devalued exchange rate; 2) a fall of trade for farmers; 3) a widening of the marketing margin between farm-gate sales prices and food retail prices; and 4) a rise in consumer prices that is not compensated by an equivalent rise in income.

In WBGS, where there is highly unequal income distribution, widespread unemployment or underemployment, and extensive poverty, there has been a high incidence of inadequate nutrition, even though at the aggregate level there is sufficient food to meet demand. By shifting the focus away from the aggregate economic level, it becomes possible to obtain a disaggregated view of the circumstances of social groups vulnerable to inadequate access to food. Such groups may be urban, rural or in refugee camps. The important factor is then people's command over food, which

varies according to the nature and strength of their food entitlements. Identifying vulnerable groups, their composition and location, can provide an understanding of the root causes of their problems, thereby facilitating the necessary responses through planning, programming and targeting of food-insecure groups.

Almost half of Palestinian households are food-insecure and highly dependent on assistance; solutions depend on tackling the root causes of their food insecurity, which are related to the political sphere. The ultimate long-term objective is to eliminate poverty via overall growth, paying adequate attention to the income distribution dimensions of alternative growth strategies. For example, one leading food security strategy sees the solution to the food entitlement problem as lying in employment-intensive development, especially in the small-farm sector, leading to patterns of rising demand for labour-intensive consumer goods, self-reinforcing growth of small-scale activities, and rising employment and incomes for previously vulnerable social groups.

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Part 5.

How to enhance analysis of food security statistics

Longitudinal analysis using panel data for assessing seasonal effects on the food security situation in Tajikistan's HBS 2005

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ABSTRACT

Household income and expenditure surveys (HIES) usually collect food data from households for only one period, which may be one or two weeks or one month. Most HIES extend the fieldwork over a period of one year to account for any seasonal effects on household expenditure, particularly food consumption. Survey estimates assume that seasonal effects are cancelled over large groups of households, but not at the level of the individual household. Thus, the inter-household variation estimated on the basis of such data would tend to include seasonal effects. The Tajikistan Household Budget Survey (HBS), on the other hand, has the particular characteristic of collecting expenditure and income data from the same households over a long period. The longitudinal survey design accounts for all variations, including seasonal effects, when analysed over the months of the yearly period. This paper presents some trend analysis of food security statistics derived from the 2005 Tajikistan Household Panel Monthly Food Consumption Data, collected from a sample of 925 households, and evaluates the impact of variability of the distribution of food consumption on food security statistics estimates.

Keywords: food consumption data, food security statistics, panel data, dietary energy consumption, food deprivation, critical food poverty, coefficient of variation.

BACKGROUND

Tajikistan is a landlocked country, which is sparsely inhabited and largely (90 percent) mountainous. Its total area is split into four regions (Oblasts) and one independent city, the capital Dushanbe. Only seven percent of the land area is arable; cotton and wheat are the main crops. Aluminium is the country's major resource, together with other limited mineral deposits such as silver, gold, uranium and tungsten. With abundant water resources, Tajikistan possesses many hydropower facilities, but these are not well distributed among its population. The civil war from 1992 to 1997 severely damaged the already weak economic infrastructure and caused a sharp decline in industrial and agricultural production.

Although Tajikistan has experienced steady economic growth since 1997, nearly two-thirds of the population continues to live in poverty. Economic growth reached 10.6 percent in 2004, but dropped to eight percent in 2005 and seven percent in 2006. Tajikistan's economic situation remains fragile owing to uneven implementation of structural reforms, weak governance, widespread unemployment and the external debt burden. Unemployment is officially estimated at 30 percent, but the real figure is likely to be much higher. Lack of alternative sources of livelihoods continues to exacerbate household food insecurity and results in underemployment in the

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agriculture sector. Large numbers of young men migrate seasonally or permanently for employment in other Commonwealth of Independent States (CIS) countries. There is high mobility of the working population to the Russian Federation, where more than 500000 Tajikistan people are currently working. In 2007, the total population of Tajikistan was about seven million; nearly 70 percent living in rural areas. Annual population growth is about two percent.

OBJECTIVES, METHODS AND DATA

This paper analyses the trends of food security statistics derived from the monthly and quarterly food consumption data of Tajikistan's 2005 Household Budget Survey (HBS 2005). It also evaluates the variation trends of inequality measures of dietary energy consumption (DEC) due to such factors as income and area of residence, and their effects on the measurement of food deprivation.

The Tajikistan State Committee of Statistics (SCS) conducts HBS based on the Soviet methodology of collecting household consumption expenditure from a fixed sample of households over time. A nationally representative sample of 925 households was selected from the 2000 population census data frame using multi-stage stratification. Rural and urban areas were accounted for, together with criteria for mountains, valleys, uplands, lowlands and national borders to the north and south. Households were selected at the last stage using the available administrative data regarding household composition. Detailed household expenditure including food and income data have been collected through daily records from the same 925 households since January 2000. Each household receives a monthly incentive equivalent to US$1 in local currency.

HBS 2005 collected consumption and expenditure data from 925 households over the year using eight types of questionnaire, which enabled the collection of complementary expenditure data on a daily, monthly and quarterly basis. Food data were recorded in detail: stock of each food item at the start of the month; daily purchases, own production and transfers (aid, gifts, etc.); and stock at the end of the month. Income was also collected by source on a daily and monthly basis. SCS used a detailed nutrient conversion table covering dietary energy, protein, fat and carbohydrate values to compute nutrient values.

The HBS 2005 monthly food consumption data, together with household income, were analysed using the statistical procedures of the FAO Food Security Statistics Module (FSSM). This paper compares the food security statistics estimates from two sets of data from the 925 households: the 12 sets of monthly food consumption data, and the quarterly aggregated data. Food consumption in terms of dietary energy and expenditure are examined, together with dietary energy unit value at national level, for each of the four main regions - Dushanbe, RPR, Sogd and Chatlon - and by income quintile. The measure of inequality in food assess is examined in great detail to evaluate the variations due to area of residence and income over the months of 2005. Measures of prevalence of hunger, food deprivation and critical food poverty are also discussed. Food expenditure as a share of total consumption and diet diversity are compared for the two sets of data.

FOOD SECURITY STATISTICS DERIVED USING THE LONGITUDINAL APPROACH

Dietary energy consumption

Average daily dietary energy consumption (DEC) was 2150 kcal in 2005. By region and income level, DEC showed wide fluctuations over the months of 2005, as illustrated in Figures 11.1 and 11.2. The population of Dushanbe and RPR regions had lower than national DEC levels in all months. These two regions had low food production because Dushanbe is the capital city and RPR is the region of aluminium ore, so both have to

rely on food imports from other regions or neighbouring countries. Sogd, the industrial region and Chatlon, the cotton and wheat growing region, had higher DEC than national level in almost all months. These two regions have good food availability because they contain the largest cultivation areas for such crops as potatoes, barley and melons.

FIGURE 11.1.
DEC trend by regions

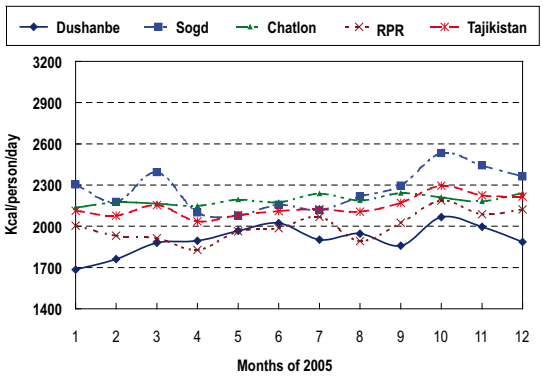
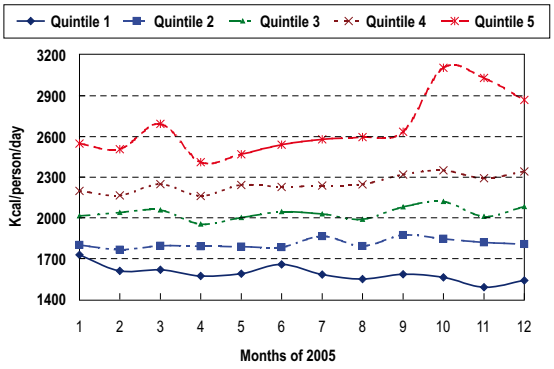


FIGURE 11.2.
DEC trend by income levels



Daily per person DEC according to income quintile showed gradual increases in the monthly totals from the lowest to the highest-income population group. The population of the three lowest quintiles had DEC below national minimum dietary energy requirement (MDER) of 1880 kcal/person/day in all months. Those of the two highest quintiles had DEC well above national average.

Fluctuations in the DEC of the four lowest income groups over the months were small, and more regular than those observed among regions. The highest-income group had more pronounced fluctuations, with peaks in March and October.

DEC varied more according to income level than to place of residence. DEC levels in the first four income quintiles did not differ greatly in magnitude. The average daily incomes per person ranged from 0.91 somoni for the lowest quintile to 1.91 somoni for the fourth; the highest quintile had a much higher average of 3.20 somoni. This high-income population group was present in all four regions, and may influence the observed regional fluctuations. The months of March and October 2005 registered high peaks in DEC, probably linked to national socio-cultural or religious events. More than 90 percent of Tajikistani people are Sunni Moslems and were probably fasting in October 2005, which was the month of Ramadan. It is well known that during this special religious month, food acquisition and consumption are high, in terms of both quality and quantity, particularly among high-income households. In addition, there is much sharing of food within the community, with a large part of food given away by some households and received by others. Data on such food transfers were not recorded, however, so the overall effect of this is not known.

Food expenditure

National average daily per person food expenditure fluctuated from month to month, with the lowest value (1.12 somoni) in February and the highest (1.68 somoni) in October, when there was a high level of overall consumption. Analysis by region showed that although the population of Dushanbe had relatively low DEC, its food expenditure was higher than national level, indicating that prices in the capital city were higher than in other parts of Tajikistan, probably owing to the high importation of food products from other regions or countries. The industrial region of Sogd also had a high level of food expenditure, ranging from 1.17 to 1.61 somoni, which was

slightly higher than the average in Dushanbe. The population of RPR had the lowest food expenditure (Figure 11.3).

Figure 11.4 shows the monthly trends of food expenditure by income level. Again, there are clear differences between the highest and the lowest income quintiles. Food expenditures for the three lowest income quintiles were lower than national level in all months. For most of the year, food expenditure in these quintiles remained almost constant, but there was an increase in October followed by a decrease in November and another increase in December, probably owing to end-of-year celebrations. The population of the highest income quintile had increasingly high food expenditures, with peaks in the three last months of 2005.

FIGURE 11.3.
Food expense trend by regions

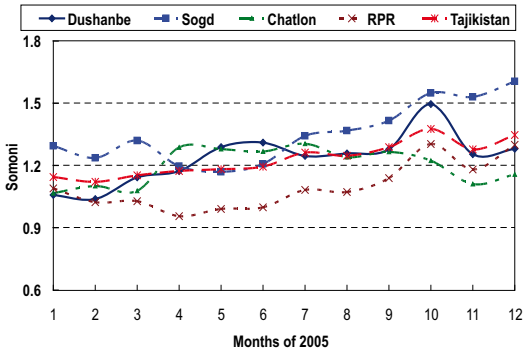
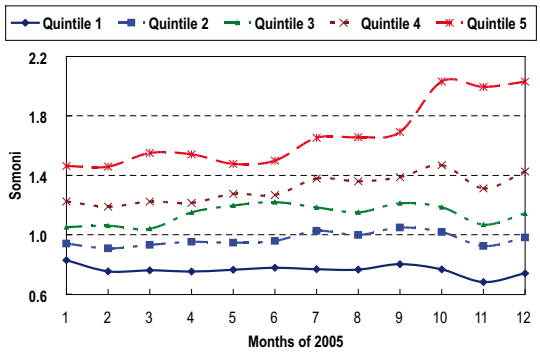


FIGURE 11.4
Food expense trend by income levels



Dietary unit value

National average dietary unit value was 0.57 somoni per 1000 kcal. This value varied from 0.55 somoni for the months of February and March, to 0.63 somoni in December. The population of Dushanbe had the highest dietary energy unit value over all months of 2005, paying abnormally high values in January (0.71 somoni) and October (0.75 somoni). Sogd also had a high overall dietary energy unit value, which increased slowly over the months of 2005 (Figure 11.5). It is surprising that the dietary unit value fell in all regions in November, before rising again in December. This could be due to a fall in food prices resulting from a surplus of food items on the market at the end of the religious month of October.

FIGURE 11.5.
Dietary energy unit value by regions

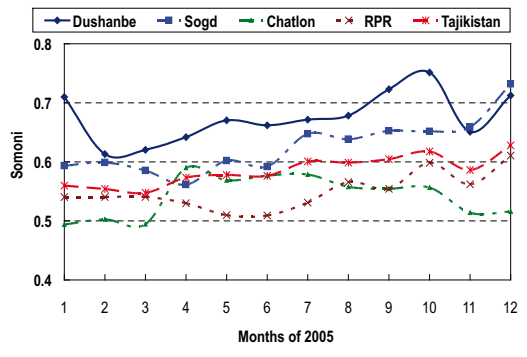
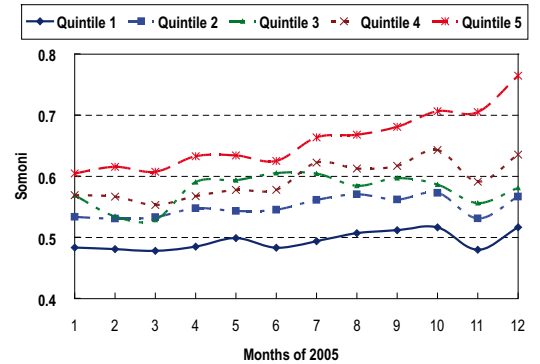


FIGURE 11.6.
Dietary energy unit value by income levels

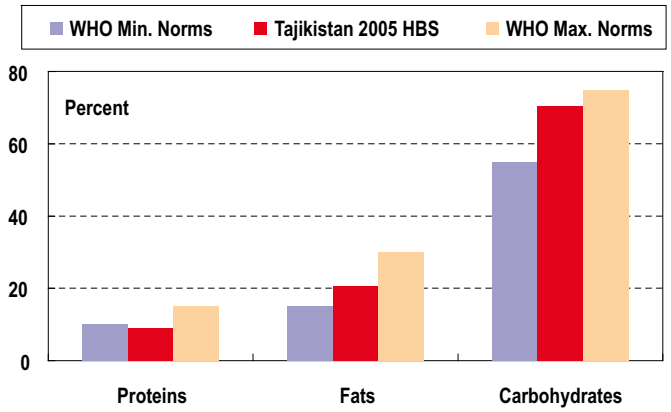


The dietary energy unit value by income quintile showed markedly increasing patterns over the months, again with a drop in November followed by an increase in December. The lowest quintile had an overall yearly dietary energy unit value of 0.49 somoni, compared with 0.66 somoni for the highest income quintile.

Diet diversity

The contributions of energy-yielding nutrients in total dietary energy showed that the consumed diet was deficient in proteins compared with World Health Organization (WHO) norms (Figure 11.7). The share of energy from proteins was about nine percent, which was less than the WHO minimum of ten percent. The share of energy from fats was within WHO norms, but the share of energy from carbohydrates (70 percent) was towards the WHO maximum of 75 percent. Consumption of protein food sources such as pulses, fish, meat or dairy products was very low.

FIGURE 11.7.
Share of energy from proteins, fats and carbohydrates in total energy and WHO guidelines



Regional analysis of the share of energy from proteins in total energy is given in Figure 11.8, which shows large and uneven variations among regions over the months of 2005. The population of Dushanbe were more protein-deficient (at less than nine percent in all months except July to September) than other regions, while the population of RPR had higher, but still deficient, protein consumption. In the two months of July and September there was increased protein consumption in all regions, probably due to the availability of protein-rich food products in the harvest seasons.

There were no clear differences in the levels of protein consumption among different income levels over the months (Figure 11.9); all income groups showed the same increasing patterns over the months of July and September, before dropping in October. This situation could be due to the scarcity of high-protein food products on the markets and the prohibitive prices of those that are available.

FIGURE 11.8.
Share of protein by regions

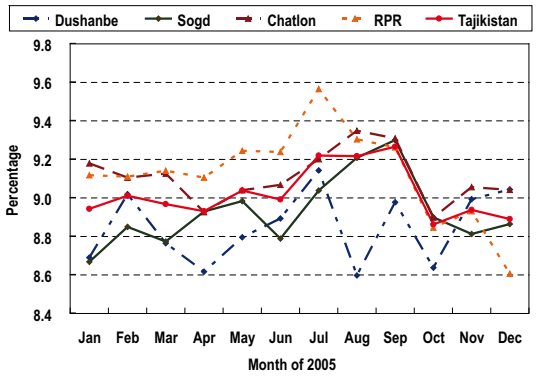
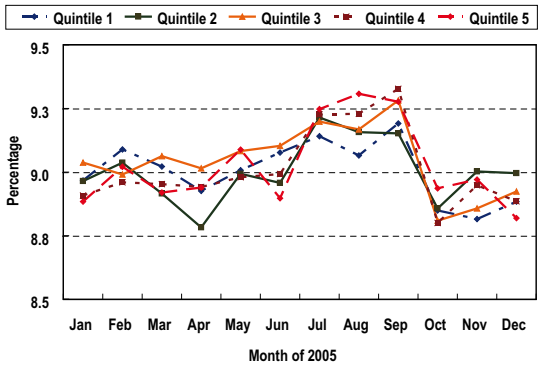


FIGURE 11.9.
Share of protein by income levels

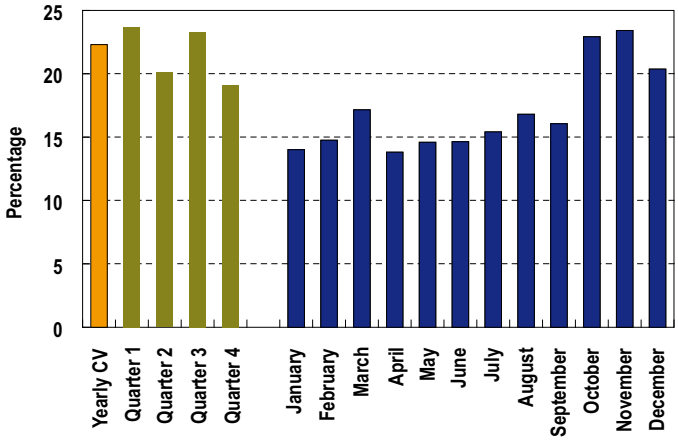


Inequality

The distribution of DEC is assumed to be log-normal and its variance is a function of the coefficient of variation (CV). The CV includes income and biological sources of variations of DEC and is a measure of access to food. The biological CV accounts for factors such as sex-age composition, body weight and physical activity of household members. It is estimated at 20 percent.

Figure 11.10 gives the inequality of food access due to income computed for groups of households classified according to income deciles. National CV of DEC over the year was 30 percent, which included 22 percent corresponding to the CV due to income. The CVs estimated for quarterly data differed marginally from the yearly CV. The estimated monthly CVs were lower than the yearly CV, except for in October and November.

FIGURE 11.10.
CVs of DEC due to income for 2005 and by quarter and month



A striking observation is that the monthly inequality measures of DEC due to income were usually (except for the last three months) less than the quarterly or yearly values, which are inflated by other variations owing to inter-household, seasonal (within the quarter) and other non-random factors.

These variations were analysed using the available 2005 longitudinal food data, with inter-household factors of area of residence and income level, using a linear

model of the log of DEC with repeated measures (months). The analysis of variance results are shown in Table 11.1. The variation estimates in the right-hand column have been converted to the original DEC scale for better understanding.

As shown in the top part of table 11.1, area of residence (rural or urban) and income levels (decile) were significant sources of inter-household variation with standard deviation of 2062 kcal/person/day. This variation does not reflect sources that are excluded in the model, random variation and undesirable variation due to sampling design and instrumental errors. The within-factors as sources of variation were significant in terms of time (months), in time within area of residence and in time within income levels.

TABLE 11.1
Analysis of variation of dietary energy consumption considering effects of area of residence, income levels and trend

Source of variation	F	Sig.	E(MS)	σ_i
Between Effects				
Area of residence	102.160	0.000	8.73	
Income	30.552	0.000	4.77	
Area of residence & Income	0.934	0.494	0.83	
Residual - Error (*between*)	0.000	0.000	0.86	2062
Within Effects				
Month	7.631	0.000	0.84	13
Month & Area	2.294	0.008	0.46	71
Month & Income	2.734	0.000	0.50	138
Month & Area & Income	1.116	0.204	0.32	448
Residual - Error (*within*)	0.000	0.000	0.30	608

Intra-household variation (standard deviation of 608 kcal/person/day) was smaller than inter-household variation, but a significant source of variation was seasonality. The possibility that inter-household variation estimates may be overestimated as a result of the sampling design should be taken into account. This study does not address this design effect on the variation among households.

In commonly used household survey design, where the reference period is one month or less and households are allocated over a one-year survey period, the sources of variation (month, month within area, month within income and error) are added to the survey estimates. By considering random allocation throughout the year, these surveys add variation to the inter-household CV and hence overestimate the prevalence of food deprivation.

Food deprivation

The longitudinal data of HBS 2005 were also analysed by comparing food deprivation over the four quarters to study food consumption distribution and any improvement in the level of undernourishment over the year. During 2005, four percent of the population moved out of the food-deprived category, owing to a two percent increase in the average daily DEC and a three percentage points decrease in the CV due to income, from 31 to 28 percent.

The MDER of 1880 kcal/person/day was the same for both quarters. Movements of population out of the food-deprived category were observed in both urban and rural areas, where the food-deprived decreased by two and six percent, respectively. Marginal increases in DEC were noted in both urban and rural areas, but rural areas also registered a significant five percentage point decrease in CV due to income. While there were significant improvements among the population of the three lowest income

quintiles, there were small setbacks for the population of the two highest quintiles, due mainly to a fall of about two percent in their DEC (Figures 11.11 and 11.12).

FIGURE 11.11.
Food deprivation by regions

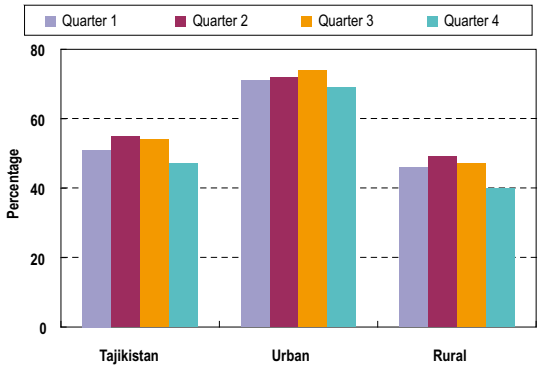
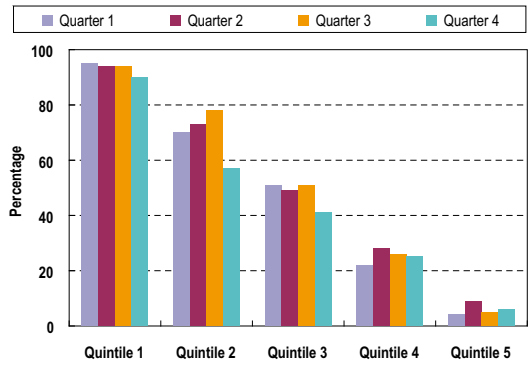
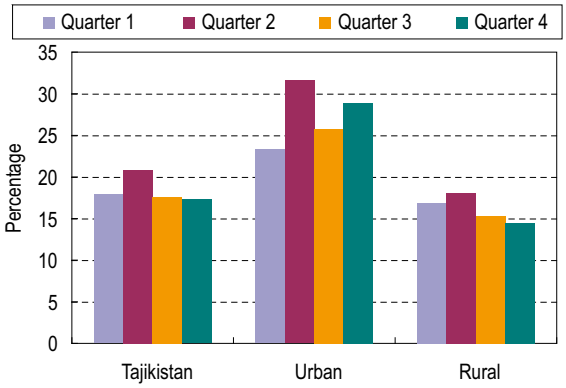


FIGURE 11.12.
Food deprivation by income levels



The prevalence of critical food poverty, which measures food income deprivation, showed a marginal fall of one percentage point at national level between the first and fourth quarters of 2005 (Figure 11.13).

FIGURE 11.13.
Critical food poverty by quarter at national and sub-national levels



The prevalence of critical food poverty fluctuated over the four quarters of the year, and was high in the second quarter at national and sub-national levels. It then fell in the following quarters. Critical food poverty was higher in urban than rural areas owing to the availability of food at lower prices in rural areas.

Intensity of food inadequacy

Figures 11.14 and 11.15 show the intensity of food poverty in relation to MDER over the four quarters of 2005, at national and sub-national levels and by income level, respectively. The figures show that urban areas with low DEC had higher food deficits than rural areas and national average.

The food deficit was less in the fourth quarter at national level and in both urban and rural areas. This was also true of the different income levels, owing to the higher DEC observed from October 2005. There was a general high food deficit during the third quarter in almost all the regional and economic population groupings, with the highest-income group witnessing a food deficit of about 150 kcal/person/day.

FIGURE 11.14.
Food deficit (kcal) to MDER by regions

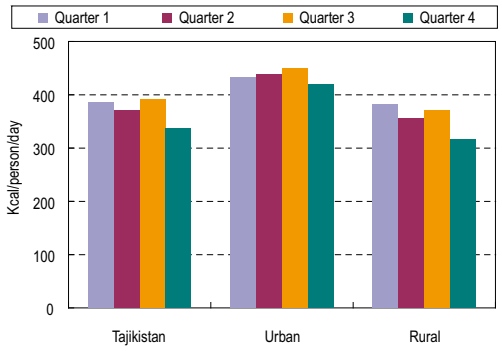
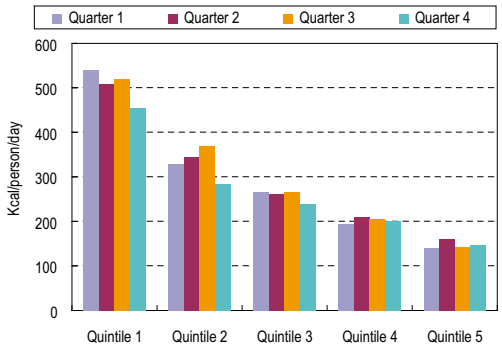


FIGURE 11.15.
Food deficit (kcal) to MDER by income levels



Food share

The share of food expenditure to total consumption expenditure estimated from annual household data at national level was 69 percent. This share at national level showed an erratic trend over the four quarters of 2005. From 68.4 percent in the first quarter, it increased to 69.6 percent in the second, fell to 65 percent in the third and rose again to 65.3 percent in the last. The same patterns occurred in urban and rural areas, but with higher magnitudes in rural than urban areas (Figure 11.16). However, the food share showed a decreasing trend with increasing income levels over the four quarters, with a high food share (80 percent) among the population of the lowest income group falling to about 50 percent for those of the highest income group. The second quarter registered the highest food share for most population groupings (Figure 11.17); this is a harvest period for some food crops.

FIGURE 11.16.
Food expenditure share by regions

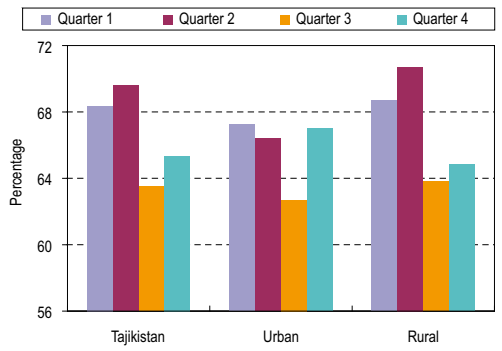
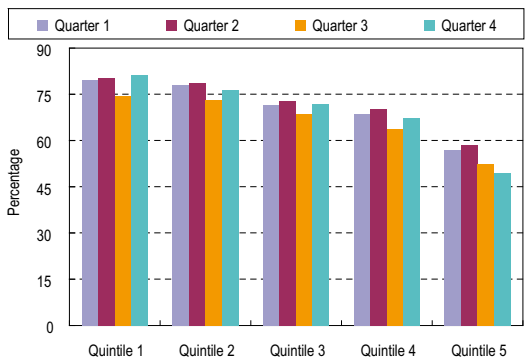


FIGURE 11.17.
Food expenditure share by income levels



Figures 11.18 and 11.19 illustrate the shares of DEC by food source at national and sub-national levels and by income level, respectively, for the four quarters of 2005. Purchases were almost the only source of DEC for the population of urban regions,

while own-produced food constituted a significant share of DEC, of about 40 percent, in most of the other population groupings. There was little variation in own production contribution among the quarters, apart from some high shares in the first and fourth quarters for the high-income groups, probably due to the harvesting season.

FIGURE 11.18.
Share of DEC by food sources and regions

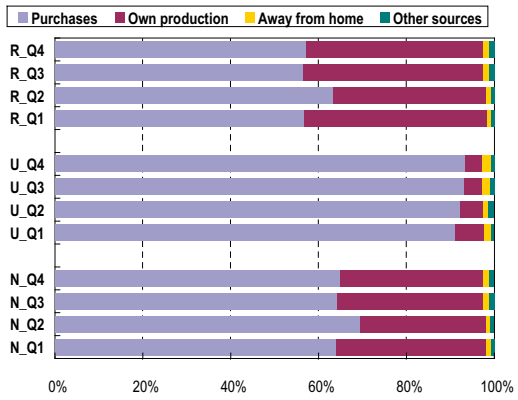
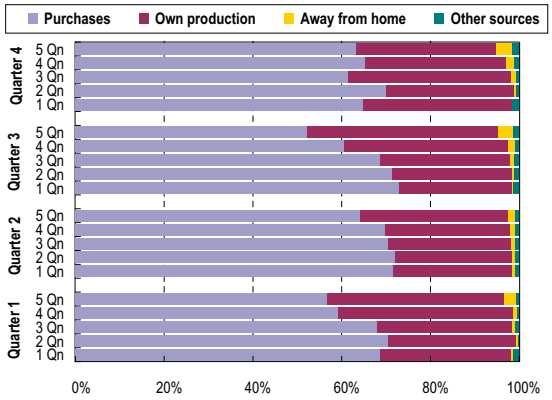


FIGURE 11.19.
Share of DEC by food sources and income levels



CONCLUSIONS

Analysis of the longitudinal food consumption data of Tajikistan's HBS 2005 provides some useful characteristics of food security statistics:

- Food deprivation differed by season and by income level.
- Food consumption was seasonal and was influenced by national socio-religious events.
- Food demand was high in high-income groups during specific periods.
- Dietary energy unit value differed among seasons and among income levels.
- Diet consumption of nutrients varied over the seasons.
- Food consumption from purchases did not vary over the seasons, while that from own production varied over the months.
- There was a seasonal affect on the diet consumption of nutrients.
- Food inequality or access measures were low when estimated with monthly data; the use of more aggregated data caused overestimations.
- The intensity of hunger differed by season and income level.
- The share of food in total expenditure varied with season and level of income.

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Deriving better estimates of food security statistics at sub-national levels by integrating Georgia's IHS and MICS data

George Kvinikadze, Grigol Pantsulaia and Ricardo Sibrian[25]

ABSTRACT

The Department of Statistics (DS) of Georgia has conducted a regular National Household Survey (NHS) since 1996. NHS started as an income and expenditure survey, until 2002, when it started to incorporate elements of the labour force survey to become the Integrated Household Survey (IHS). IHS data collection is spread over a period of one year. DS also collaborated with the Centre of Medical Statistics and Information (CMSI), national Centre of Disease Control (NCDC) and the United Nations Children's Fund (UNICEF) to conduct Multi-Indicator Cluster Surveys (MICS) in 2002 and 2005. MICS collected complementary data on child nutritional status for food security analysis.

The FAO Food Security Statistics Module (FSSM) applied to the IHS 2005 food consumption data enabled the derivation of food security statistics. These statistics enhanced the assessment of food insecurity in the country at national and sub-national levels, by providing information on the nutritional status of children. This additional and complementary information proved useful in differentiating the food security situations of different population groups. This paper discusses the results of the food security statistics derived from the food consumption data of IHS 2005, using complementary data from MICS on the nutritional status of children under five.

Keywords: food security statistics, food deprivation, child undernutrition, policy implications

BACKGROUND

In 2000, the Department of Statistics (DS) of Georgia, with financial and technical support from the EC-FAO Food Security Programme, established a Food Security Observatory (FSO), which provides users with information about the food security situation of the population. FSO has published 29 issues of the *Food Security Bulletin*, which covers all dimensions of food security (availability, access, utilization). The FAO Statistics Division developed the Food Security Statistics Module (FSSM) software to help national statistics organizations to optimize the analysis of existing data. The food consumption data collected in national household surveys (NHS) is useful for estimating the prevalence of undernourishment and a suite of food security indicators at national and sub-national levels. The software provides harmonized methodological procedures and recommendations on the compilation of food security statistics for comparability purposes at national, regional and global levels.

This paper uses results derived from the first application of FSSM software to the data of Georgia's Integrated Household Survey (IHS). In the future, FSO plans to use this software to derive the food security statistics it publishes in the *Food Security Bulletin*. The analysis incorporates results from the Multi-Indicator Cluster Survey (MICS).

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OBJECTIVES

The main objective of this study is to show how the integration of food security-related data from different sources can allow a more thorough analysis of the food security situation. In this case, the data in question are the food acquisition data from the 2005 round of the ongoing IHS and child undernutrition data from the MICS conducted in 2005. The prevalence of food deprivation and critical food poverty are compared and linked to the prevalence of undernutrition in children under five, measured by stunting.

METHODS AND DATA

The food acquisition data collected in IHS 2005 refer to a seven-day household reference period. Households used diaries to record all types of expenditure, as well as non-purchased commodities (own production, humanitarian aid, gifts from friends and kin) that entered the household during a particular week.

As food acquisition data do not reflect real food consumption, especially for the lowest and highest income groups, this study uses supplementary survey data from an NHS conducted in 2000/20001, which measured actual food consumption by households. The food acquisition and consumption data for 2000/2001 permitted the development of a function for estimating consumption from acquisition in IHS 2005. The ratio of standard deviation of energy consumption due to income (SD1), to standard deviation of energy acquisition due to income (SD2), permitted the estimation of the coefficient of variation (CV) of consumption due to income for the IHS 2005 data. The child undernutrition (stunting) data collected in MICS 2005 measured undernutrition of children under five years of age.

FOOD SECURITY STATISTICS FROM IHS 2005 AND MICS 2005

The three dimensions of income deprivation, food deprivation and child undernutrition link causes and effects in a causal-analytical framework. Income deprivation is a cause of lack of food; the latter is a cause of child undernutrition. Growth retardation (undernutrition) in children is the result of food deprivation and other immediate causes relating to child care, poor health and hostile environment. Food deprivation is the result of income deprivation and other immediate causes relating to lack of human capital, natural resources and assets. These links illustrate one of the causal paths of food insecurity. As these dimensions are structural in nature, their estimates from different surveys may be useful for making comparisons among population groups.

The food security statistics were derived from data collected in IHS 2005 and MICS 2005. At national and sub-national levels, these statistics relate to the prevalence of food deprivation as a measure of lack of food, the prevalence of critical food poverty as a measure of income deprivation, and the proportion of stunting in preschool-age children as a measure of undernutrition.

Links among income deprivation, food deprivation and child undernutrition in the total population

Population groups in Georgia have different conditions in all these dimensions, as shown in Figure 12.1 for national level, urban and rural populations, and regions.

Food deprivation: More than one in five Georgians suffered from food deprivation in 2005 (Figure 12.1), with food deprivation being higher in urban than in rural areas. At regional level, food deprivation ranged from 13 percent in Imereti and Kvemo to 61 percent in Kartli and Samtskhe-Javakheti. Although population groups differed in minimum dietary energy requirement (MDER) - owing to differences in weights for attained height, sex-age population structures and how food was distributed within each population - the main reason for different magnitudes of food deprivation was the amount of food consumed.

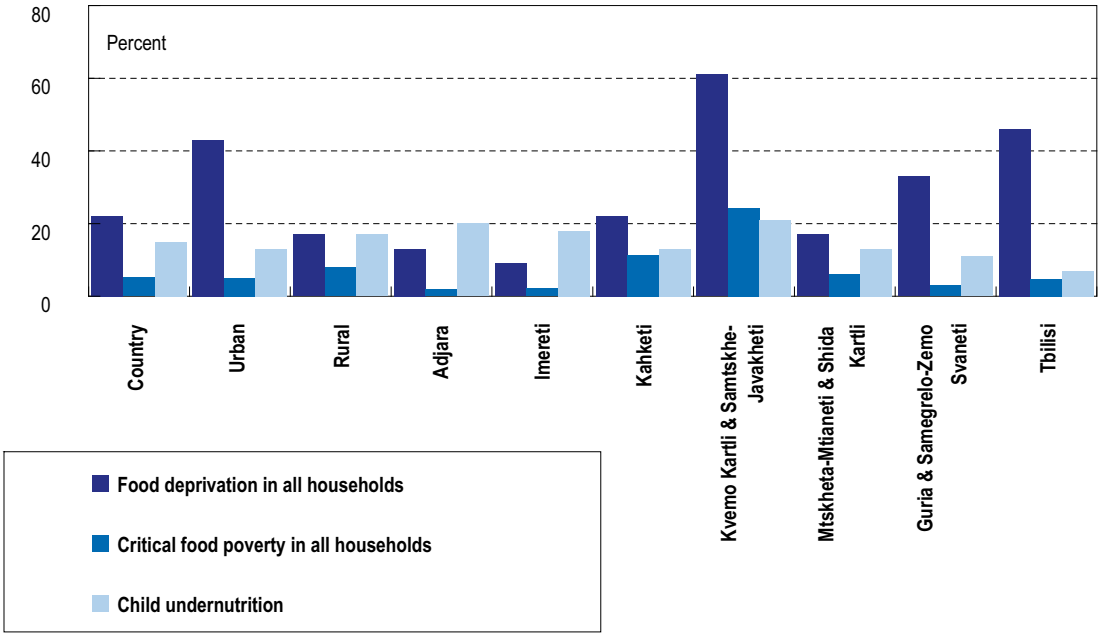
Income deprivation: One out of 20 Georgians suffered from critical food poverty (Figure 12.1), meaning their income was not enough to acquire food to meet the MDER used in estimating food deprivation. The prevalence of critical food poverty was slightly higher in rural than urban areas, while the reverse was true of food deprivation. At regional level, critical food poverty ranged from two percent in Imereti and Adjara to 24 percent in Kvemo Kartli and Samtskhe-Javakheti. Although the critical food poverty line differed among different population groups, a low income as measured by proxy total consumption expenditure was the main factor affecting critical food poverty for the same level of income inequality.

Growth retardation: One in seven children aged under five was stunted (Figure 12.1). The nutritional status of these children, as assessed by the prevalence of height retardation, indicates that stunting was higher in rural than urban areas. At regional level it ranged from about seven percent in Guria and Tbilisi to 21 percent in Kvemo Kartli and Samtskhe-Javakheti.

Summary: Food deprivation was higher in urban than rural areas, but critical food poverty and child undernutrition were higher in rural than urban areas. The levels of food deprivation and child stunting were similar in rural areas, while the level of food deprivation was three times that of child stunting in urban areas. At regional level, in Kvemo Kartli and Samtskhe-Javakheti all three hunger indicators were higher than national level, while other patterns occurred in other regions. In Tbilisi and Guria and Samegrelo-Zemo Svaneti, only food deprivation was higher than national level, but the causes for this may be different in the two regions, because Tbilisi relied mostly on food purchases, while in Guria and Samegrelo-Zemo Svaneti an important share of food was from own production.

In the other regions, compared with nationwide estimates, food deprivation was lower, but critical income deprivation was higher in Kakheti, and child stunting was higher in all regions except for Kakheti.

FIGURE 12.1.
Prevalence of food deprivation, critical food poverty and stunting in children under five at national level, by area and by region



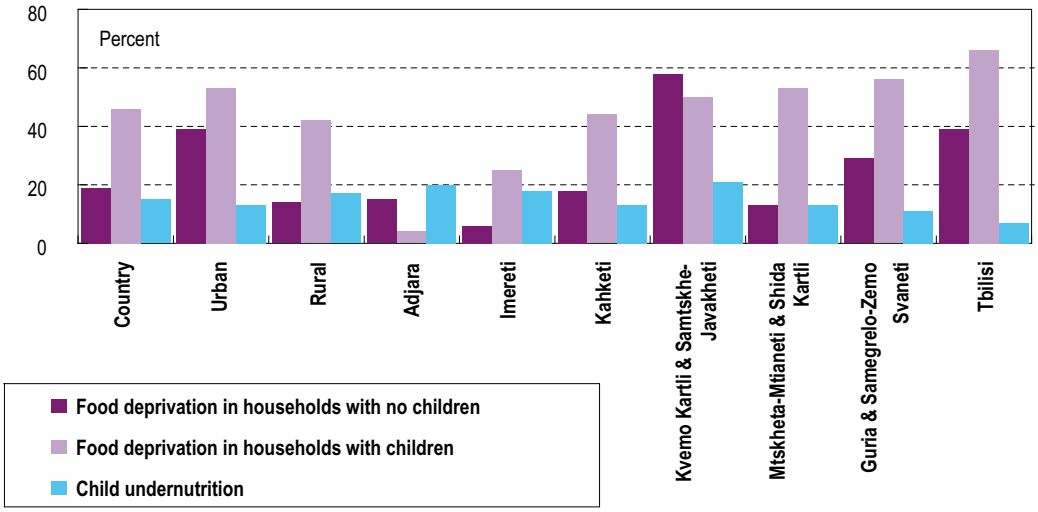
Links among income deprivation, food deprivation and child undernutrition in the population with young children

Household groups with young children aged less than five had different causal links than those of the general population of all households, as shown in Figure 12.2. Note that estimates of food deprivation and critical food poverty were different, but the prevalence of child stunting was based on the same households with children.

Food deprivation: The prevalence of food deprivation was higher in households with young children than in all households in general at national level and in urban and rural areas (Figure 12.2).

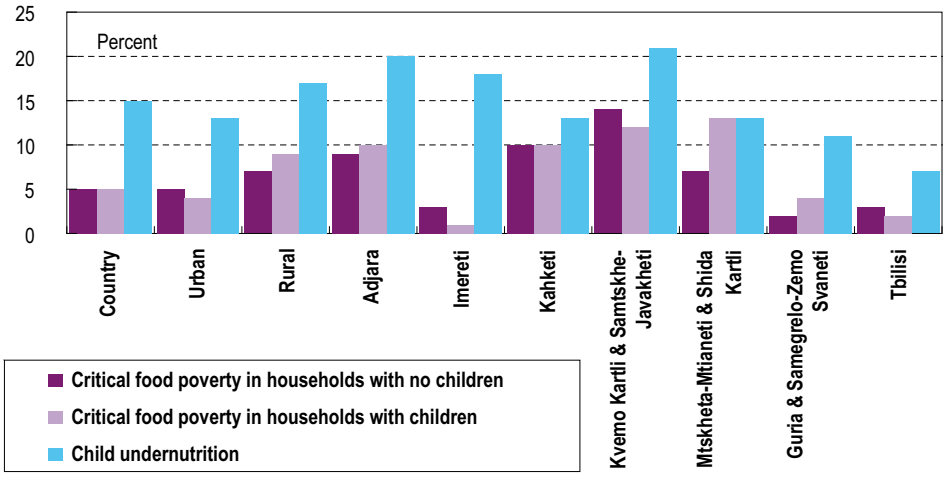
The difference in prevalence of food deprivation between households with and without young children was higher in rural than urban populations. In households with children, two-fifths of the population was food-deprived in all regions, except Adjara and Imereti. In Kvemo-Kartli and Samtskhe-Javakheti, food deprivation was very high in both households with and those without young children. Food deprivation in the total population was higher than child undernutrition, except in Adjara. This was the only region where households with young children had a larger average number of members and higher energy consumption than households without young children. In general, on a per person basis, households with young children had lower energy requirements and lower energy consumption than households without young children.

FIGURE 12.2.
Prevalence of food deprivation in households with and without young children at national level, by area and by region



Income deprivation: The prevalence of critical food poverty was similar in households with and without young children at national level, but in rural areas it was higher in households with young children than in those without, while the reverse occurred in urban areas (Figure 12.3).

FIGURE 12.3.
Prevalence of critical food poverty in households with and without young children at national level, by area and by region



Critical food poverty was higher in households with young children than in households without in Adjara, Mtskheta-Mtianeti and Shida Kartli, and Guria and Samegrelo-Zemo Svaneti; however the opposite occurred in Kvemo-Kartli and Samtskhe-Javakheti, and in Tbilisi. In Kahketi, critical food poverty was high in all households. In general, critical food poverty was lower than child undernutrition.

Policy implications: Table 12.1 summarizes the different patterns of the hunger indicators income deprivation, food deprivation and undernutrition for households with preschool-age children, at national level and for sub-national population groups.

The pattern of highest priority is number five. The differences among patterns result from the nature of policies and actions promoted in each population group. For example, in pattern number five (Kvemo-Kartli and Samtskhe-Javakheti), all sectors relating to income, food and health are responsible for taking action to decrease income deprivation, food deprivation and child undernutrition. In pattern six (Tbilisi), the actions called for relate more to food access for low-income groups, even if income deprivation was low.

TABLE 12.1
Hunger indicators in households with preschool-age children

Population group	Pattern	Income deprivation	Food deprivation	Under-nutrition
Country	1	Low	High	Moderate
Urban	1	Low	Very high	Moderate
Rural	1	Low	High	Moderate
Regions:				
Adjara	2	Moderate	Moderate	High
Imereti	3	Low	Moderate	Moderate
Kakheti	4	Moderate	High	Moderate
Kvemo-Kartli and Samtskhe-Javakheti	5	Moderate	Very high	High
Mtskheta-Mtianeti and Shida Kartli	4	Moderate	High	Moderate
Guria and Samegrelo-Zemo Svaneti	1	Low	Very high	Moderate
Tbilisi	6	Low	Very high	Low

Very high = 35 percent and more;
High = 20 to 34 percent;
Moderate = 10 to 19 percent;
Low = less than 10 percent.

An important point shown in this study is that hunger indicators may be interpreted differently depending on the study population being looked at. When the indicators on income and food deprivation refer to the total population, as is the standard procedure, the conclusions will be different from when they refer to the population of households with young children.

At national level, there was no difference in critical food poverty between households with and those without young children, but the prevalence of food deprivation in households with young children was almost twice that of households without. This difference in food deprivation occurred in rural populations, but the prevalence of critical food poverty in rural areas was lower in households with than in those without young children. Regarding differences among regions, the indicators of critical food poverty and food deprivation pointed in both directions.

Because of this variation, the food insecurity situation has different implications for policies and actions for the public and private sectors and civil society, depending on the sub-national population group (urban or rural) and region concerned.

The economic sector, including agriculture, commerce and infrastructure, responsible for food supply for human consumption requires policies that aim to increase the size of urban markets, particularly in Tbilisi. This would allow food of low energy cost, such as dairy products, which provide high-quality protein and are locally produced, processed and preserved, to be distributed to costumers in low-income households.

The productive sectors should also implement food production strategies that aim for high productivity, with low-cost transportation and distribution schemes. In population groups where child undernutrition is high, the health sector plays a key role in promoting and protecting health in young children.

CONCLUSIONS AND REMARKS

Analysis of the three indicators across the entire population is useful for demonstrating the relevance of the food insecurity problem at national level, while analysis across the population of households with young children is useful for the purpose of targeting food-insecure populations. The analysis should distinguish between these two contexts, however, to enable a better understanding of the food insecurity situation and to highlight the relevant policy implications that are needed to help to resolve the situation.

It is clear that the indicators on poverty and hunger, as measured by the prevalence of critical food poverty, food deprivation and stunting in children aged under five, depict different food insecurity situations in different population groups within a country.

In some population groups, these indicators illustrate that poverty and hunger may develop together, while in others, the main factor may be either critical food poverty or food deprivation. The nature of household livelihoods in the different population groups may explain these differences.

The different scenarios identified by the indicators on poverty and hunger provide inputs for tailored coordinated action in different geographical areas and sectors.

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Part 6.

Methodological issues on analysis of food security

Towards the measurement of household resilience to food insecurity: applying a model to Palestinian household data

Luca Alinovi, Erdgin Mane and Donato Romano[26]

ABSTRACT

Most of the current literature on food security focuses on the assessment of household vulnerability in food-insecure regions. The concept of vulnerability, by definition, is dynamic and forward-looking. However, almost all statistical methodologies applied until now have been static and unable to predict future events. The main reasons for this are both conceptual, such as the complexity (multidimensionality) of the concept of food security and the unpredictability of the many shocks that cause food insecurity, and empirical, such as the absence of longitudinal data over a sufficiently long period to enable the various sources of risk to express themselves, thereby not allowing the analysis of trends and risks.

For this reason, the concept of resilience has recently been introduced into food security literature. It aims to measure the capability of households to absorb the negative effects of unpredictable shocks or disasters, rather than predicting the occurrence of a crisis (as is the case in most vulnerability literature).

The definition of food system resilience directly affects the methodology adopted for its measurement. In the model described in this paper, household resilience is measured according to four building blocks: income and food access; assets; access to public services; and social safety nets. Stability and adaptive strategies are two additional dimensions that cut across these building blocks and account for households' capacity to respond and adapt to shocks.

In order to measure household resilience to food insecurity, an index was developed for each of these aspects, based on indicators from the Palestinian Public Perception Survey (PPSS). The process of building the indices involved the use of decision matrices and multivariate methods. The decision rules for building the indices were validated through classification and regression tree (CART) methodology to highlight the factors (indicators) that play a major role in qualifying the building blocks of household resilience. This information is crucial for policy-makers in general, and for food crisis response planning in particular.

INTRODUCTION

Most research in the field of food security has focused on developing and refining methods of analysis to predict the likelihood of a crisis more accurately. Such work has centred on the development of advanced early warning systems (EWS), using behavioural patterns in the economy to judge whether a crisis is about to happen, from the value change of selected indicators (Buchanan-Smith and Davies, 1995).

In the last decade, collaboration between the natural and social scientists concerned with the sustainability of jointly determined ecological-economic systems

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has brought about a potentially fruitful concept, well-known in ecological literature but new as applied to socio-economic systems: the concept of resilience (Adger, 2000). Broadly speaking, resilience is a measure of a system's ability to withstand stresses and shocks, that is, its ability to persist in an uncertain world.

More recently, some scholars and practioneers (Folke, Berkes and Colding, 1998; Folke *et al*., 2002) and some international organizations, such as FAO (Hemrich and Alinovi, 2004), have proposed applying this concept to food security issues. The idea implicit to this is that this concept could complement the EWS approach. Indeed, the EWS approach tries to predict crisis, while the resilience framework tries to assess the current state of health of a food system, and hence its ability to withstand shocks should they occur.

Although this statement appears to be sound and promising, many steps must be taken before the implications of adopting the resilience approach are clear and it can be operationalized. For instance, there is the need to clarify the meaning and scope of resilience as applied to the analysis and management of food systems. There are many questions to be addressed in pursuing this objective: What is the meaning of resilience as applied to food systems? What is the relationship between resilience and other concepts, such as vulnerability? How should resilience in a food system be measured? etc.

This paper addresses only the last question in the specific context of households. The choice of this level of analysis is justified on the grounds that it is at this level that most risk management and risk coping strategies are implemented, especially in the case of informal strategies, which are those that are most available to the poor (cf. World Bank, 2001). Therefore, the paper does not analyse other important measurement issues that pertain to different levels of analysis (e.g., how to measure food system resilience at the regional, national or global level). Another limitation of this study is that, while acknowledging the genuinely dynamic nature of the resilience concept, it does not have access to the basic information required to capture and quantify the volatility and vulnerability over time that poor households say is so important. In order to do this, it would be necessary to have panel datasets that are long enough to monitor the same households over time, to allow for the direct observation of how households deal with shocks. Moreover, measuring household resilience to food insecurity requires data on household assets (physical, human and social capital), in combination with data on formal safety nets, the functioning of markets and the economic policies that determine a household's opportunity set and the range of activities it can pursue to manage risk. Many of today's household surveys do not provide such information. Last but not least, information on movement in and out of food security is informative only after the facts have occurred. The challenge is to find indicators that can monitor households' resilience before crisis occurs.

The objective of this paper is therefore to design a methodology for measuring households' resilience to food insecurity, and to discuss and highlight the data needs for monitoring that can eventually be adopted when suitable datasets become available. For the time being, it tests the proposed methodology using the data from the 11th Palestinian Public Perception Survey (PPSS 2007).

This paper has the following layout: the next (second) section summarizes the concept of resilience and its relationship to other relevant concepts in food security literature (e.g., vulnerability, sustainability). The third section presents the proposed model, the methodological approaches adopted for measuring household resilience and the dataset used to test the proposed method. The fourth and fifth sections describe the model's application to the case of Palestine and discuss the main results of the study. The sixth section focuses on model validation through CART. The conclusions summarize the main findings and discuss implications for future research and the design of statistical surveys.

RESILIENCE AND ITS RELATION TO HOUSEHOLD FOOD SECURITY

"A system is a group of interacting components, operating together for a common purpose, capable of reacting as a whole to external stimuli: it is affected directly by its own outputs and has a specified boundary based on the inclusion of all significant feedback." (Spedding, 1988: 18). A household can be thought of as the system within which the most important decisions affecting food security are made (e.g., what income-generating activities to engage in, how to allocate food and non-food consumption among household members, and what strategies to implement *ex-ante* and *ex-post* to manage and cope with risks).

The consequence of acknowledging this is important in terms of both analytical content (what is the subject of the analysis?) and methodology (how should this be analysed?). This implies that it is necessary to consider a household as a *complex adaptive system*. It also implies that the stability of the household as a complex system depends less on the stability of its individual components, than on the household's ability to maintain its self-organization in the face of stress and shock, in other words its *resilience*.

The concept of resilience, originally proposed in ecological literature (Holling, 1973) has recently been proposed for exploring the relative persistence of different states of nature in complex dynamic systems such as the socio-economic (Levin *et al*. 1998). Put simply, resilience is a measure of stability in the face of shocks to the system. Vulnerability is the flip side of resilience: when a system loses resilience it becomes vulnerable to change that previously could be absorbed (Kasperson and Kasperson, 2005). In a resilient system, change has the potential to create opportunity for development, novelty and innovation. In a vulnerable system, even small changes may be devastating. As resilience declines it takes a progressively smaller external event to cause a catastrophe. A social-ecological system with low resilience may still maintain its functions and generate resources and services - that is, it may seem to be in good shape - until it is subjected to disturbances and stochastic events, when it may exceed a critical threshold and change to a less desirable state.

Levin *et al*. (1998) argue that resilience offers a helpful way of thinking about the evolution of social systems, partly because it provides a means of analysing, measuring and implementing the sustainability of such systems. This is largely because resilience shifts attention away from long-term equilibrium, towards the system's capacity to respond to short-term shocks and stresses in a constructive and creative way. Diversity does not support stability, but it does support resilience and system functioning (Holling, 1973; 1986), while rigid control mechanisms that seek stability tend to erode resilience and facilitate the breakdown of the system. In fact, the multidimensionality of the food security concept and the complexity of the conduit mechanism to food insecurity, qualify the household as a complex system facing largely unpredictable exogenous shocks. For this reason, the concept of resilience as applied to household food security seems to be very promising: it aims to measure the capability of households to absorb the negative effects of unpredictable shocks or disasters, rather than predicting the occurrence of a crisis (as in the case of most vulnerability literature).

THE CONCEPTUAL MODEL AND METHODOLOGY

The model

The conceptual framework shown in Figure 12.1 is the base for the resilience model. The idea is to estimate, at time T_0, every component separately and then generate a composite index of household resilience. Therefore, from T_0 to T_1, some shocks may occur. These shocks may be endogenous, if internally related to household capital, or exogenous, if externally related to household capital. The model assumes that the household has no control over exogenous shocks, but reacts to them by

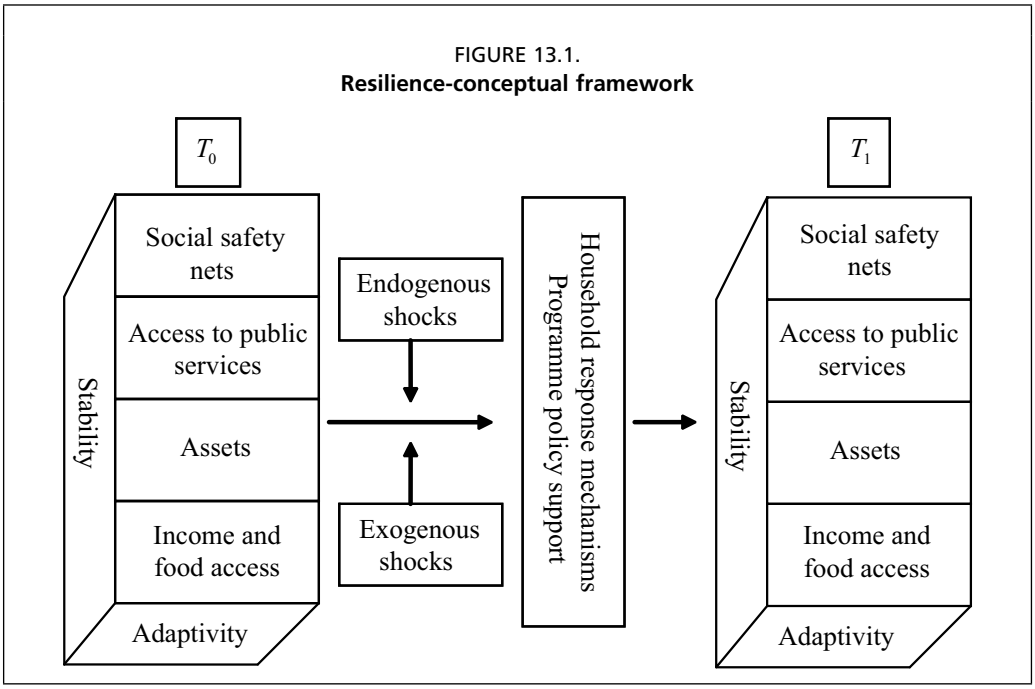
using available response mechanisms and through its absorption and adaptive capacities. Furthermore, a reaction to exogenous shocks (or systemic shocks) through policy support is undertaken by decision-makers other than the household (e.g., governments or international institutions), which might themselves be causes of external shocks. The different components of the resilience observed at time T_1 reflect how all these factors produce a change in the resilience of households.

The starting point in the methodological process is the 3D "parallelepiped" in Figure 12.1. In algebraic terms, the following equation estimates the resilience indicator for household *i*:

$$R_i = w_{IFA} IFA_i + w_{APS} APS_i + w_{SSN} SSN_i + w_S S_i + w_{AC} AC_i + w_A A_i + \varepsilon_i \qquad (1)$$

where: R = resilience; S = stability; SSN = social safety nets; APS = access to public services; A = assets; IFA = income and food access; AC = adaptive capacity; w_k = the weight for the k-th block in defining resilience; and ε_i = error term.

FIGURE 13.1.
Resilience-conceptual framework

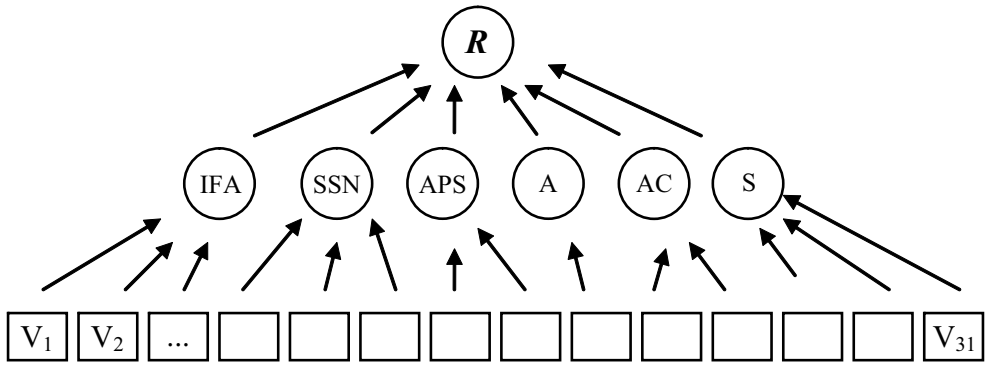


Resilience is a latent variable depending on the terms on the right hand side of Figure 13.1. Therefore, in order to estimate R there is need to estimate separately *IFA*, *S*, *SSN*, *APS*, *A* and *AC*, which are themselves latent variables. They are variables not directly observed in the survey, but it is possible to estimate them through multivariate techniques. For example, *IFA* is not just the income of the household, but also a series of estimated variables related to food consumption and expenditure and to households' perception of food access and dietary diversity, which are context and data-specific.

Methodological approaches

The model described in the previous section is an extension of multivariate regression models. In this case, it is a hierarchical model, where some of the variables are dependent on one side and independent from the other. Moreover, it also has to deal with unmeasured variables (latent). Figure 13.2 shows the path diagram of the model concerned.

FIGURE 13.2.
Path diagram of the household resilience model



In the causal models literature (Spirtes, Glymour and Scheines, 2000), the circles represent the latent variables and the boxes represent the observed variables. Most of the hierarchical or multi-level models studied in the literature deal with measured variables. In such cases, the regression properties are extended to the multi-level models. One of the innovations of this paper is its adoption of models for latent variables in complex survey data.

Considering the complexity of the model that is being dealt with, the following approaches can estimate household resilience.

Structural equation models (SEMs): These are the most appropriate tool for dealing with the kind of model described in the previous sub-section. Structural equation modelling combines factor analysis with regression. It is assumed that the set of measured variables is an imperfect measure of the underlying latent variable of interest. Structural equation modelling uses a factor analysis-type model to measure the latent variables via observed variables, simultaneously using a regression-type model for the relationship among the latent variables (Bollen, 1989). Generally, the estimation methods developed for SEMs are limited to the normally distributed observed variables, but in most cases (including in this paper), many variables are categorical or ordinal. Recent literature has proposed some attempts at broadening the SEM, but there are still difficulties regarding computational aspects (Muthén, 1984). It is also possible to use generalized latent variable models (Bartholomew and Knott, 1999; Skrondal and Rabe-Hesketh, 2004) to model different response types. A major concern in using SEM for measuring resilience is that the algorithms of SEM procedures are generally totally data-driven, while this paper includes some prior knowledge of the deterministic relations among measured variables. Therefore, Bayesian procedures could have been used for their flexibility, but owing to the quantity of variables to be used, the parameter identification problem requires careful consideration, in order to incorporate proper prior information. In the last decade, the use of Markov Chain Monte Carlo simulation methods (Arminger and Muthén, 1998; Lopes and West, 2003; Rowe, 2003; Mezzetti and Billari, 2005) has simplified the computational burden.

The multi-stage approach: This separately measures the latent variables through the observed variables. It involves the use of various sets of observed variables (represented as squares in Figure 12.2) to estimate the specific latent variables (circles in Figure 12.2). In other words, the circles in Figure 12.2 represent the common

pattern in the underlying measured variables. The methods used for generating these latent variables depend on the measurement scales of the observed variables. The typology of the variables under each latent variable may be different, and it is necessary to use different methods for different types of variables. The methods commonly used for this kind of analysis are:

- SEMs;
- factorial analysis;
- principal components analysis;
- cluster analysis;
- Lisrel methods.

These methods are usually combined with deterministic decision matrices, which are based on prior knowledge of the variables. An auxiliary tool for data mining purposes is the classification and regression tree (CART) methodology, which can also be used for testing the validity of the adopted model.

In this paper, the second strategy for measuring resilience was adopted, for the following reasons: 1) the variables available are not all normally distributed, which may require the use of different multivariate techniques; and 2) measuring the different components separately makes the model more flexible, permitting the inclusion of prior information and solving the parameter identification problem.

The dataset

The Palestinian Public Perception Survey (PPPS) data is an interagency effort aimed at understanding socio-economic conditions in the West Bank and Gaza Strip. The University of Geneva implemented the 11th PPPS with the collaboration of several agencies, including FAO for the food security component; responsibility for data collection lay with the Palestinian Central Bureau of Statistics. PPPS provides a very rich dataset, including key indicators relevant for defining and analysing household food security status and its dynamics.

The data are repeated cross-sections, but it is not possible to use the surveys carried out before 2007 owing to changes made in the food security section of the questionnaire, which make the last survey incompatible with previous ones. The sample size was 2087 households, and the sampling design was a two-stage stratified cluster. There was adjustment of the sampling weights (the reciprocal of selection probability) to compensate for non-response and to satisfy the population size estimates, particularly in the disaggregated analysis by region, sex and age groups.

The questionnaire had the following sections:

- the roster, with the household's demographic, occupational and educational status;
- security/mobility;
- labour market;
- economic situation (including the food security module);
- assistance/assistance priorities;
- infrastructure;
- coping strategies;
- health;
- children/women;
- politics and peace/managing security;
- religion.

A first data screening took place during the preparatory phase of the analysis. The variables related to each component in equation (1) were then selected. The next section describes the process of variable selection and elaboration to obtain unique indicators.

APPLYING THE RESILIENCE MODEL TO THE PALESTINIAN DATA

The analytical framework follows a three-step procedure: 1) identification and processing of selected variables for each resilience block; 2) development of decision matrices and multi-variate methods (factor analysis, cluster analysis, principal components analysis, etc.) to build the indicator for each block; and 3) application of the CART methodology to build precise splitting rules based on the regression tree, for a better understanding of the whole process. The use of CART also allows the validation of the decision process and the identification of factors (indicators) that play a major role within the different blocks.

The variable selection procedures for generating the indicators for each building block are particularly complex in the resilience framework, where multidimensional correlations often make individual variables relevant to several blocks. The conceptual model described in the previous section simplified this issue.

Income and food access (IFA)

This indicator is directly related to the household's degree of access to food. The main food insecurity concern in Palestine (Mane, Alinovi and Sacco, 2007) is economic access to food. The traditional indicators of food access capacity are income and consumption, but nutritional indicators have also been included in this analysis. Generation of the IFA indicator involved the use of five indicators:

- average per person daily income (NIS/person/day);
- average per person daily consumption expenditure (food and non-food);
- average dietary energy consumption (DEC as kcal/person/day);
- household food insecurity access score (HFIAS);
- dietary diversity and food frequency score (DD).

PPPS directly measured the first two indicators. The other three were estimated by using specific methodologies. Estimation of the DEC used a FAO methodology (described in details in Sibrian, Ramasawmy and Mernies, 2006) permitting the transformation of food acquisition data into kilocalories per person per day at the household level. HFIAS is a scale of perception of household food insecurity and access, based on the nine questions developed by Food and Nutrition Technical Assistance (FANTA) (Coates, Swindale and Bilinsky, 2006). The utilization of 20 food groups permitted computation of the dietary diversity and food frequency score, which can also be used as a proxy indicator for food access (Hoddinott and Yohannes, 2002). Regression techniques imputed missing values.

All these indicators aim to measure food access. To generate the IFA indicator, a factor analysis was run, using the principal factor method and the scoring method suggested by Bartlett (1937). This method produces unbiased factors, but these may be less accurate than those produced by the regression method suggested by Thomson (1951). The regression-scored factors have the smallest mean square error but it is possible that the true factors contain bias. The factor produced is quite meaningful and it is possible to consider it the underlying latent variable for food access. Table 13.1 shows the eigen-values for each factor, while Table 13.2 shows the factor loading for the original variables. This involves the high correlation of income, consumption and DEC with the IFA indicators, but even the DD and HFIAS have a meaningful correlation. HFIAS has a negative correlation because it increases as food security decreases.

TABLE 13.1
Eigen values

Factor	Eigen-value
Factor 1	1.82865
Factor 2	0.18174
Factor 3	-0.10394
Factor 4	-0.11670
Factor 5	-0.21905

TABLE 13.2
Factor loadings and correlations

Variable	Factor 1	IFA
Income	0.7568	0.8789
Consumption	0.6760	0.7839
DD	0.4082	0.4410
HFIAS	-0.3530	-0.3793
DEC	0.7125	0.8279

Access to public services (APS)

Access to public services is strictly related to the assets available at the household level and their functions. Poor access to public services affects the capacity of the household to manage risks and respond to a crisis. The public services considered in the analysis are:

- health: physical access and quality of the service;
- quality of the education system;
- perception of security;
- mobility and transport limitations;
- water, electricity and telecommunications networks.

Regarding health, measurement involved two indicators: *physical access* to health (need not received, received after or within time limit) and the health care *quality score* (based on the quality of services provided in different health areas). An additional indicator on the *quality of the education system* (on an ordinal scale of one to six) was also measured. A proxy index based on the general *perception of security* was constructed (on an ordinal scale of one to four). Various sources generated an indicator based on restrictions to mobility, and this was measured by using different questions in the questionnaire (on an ordinal scale of one to three). Finally, an indicator of the number of available services providing water, electricity and telecommunications was developed.

Spatial distribution is a key factor for access to public services. It cannot be assumed that the relevance of different services is constant among different regions. For this reason, different factor analyses were run for the five sub-regions: North West Bank, Middle West Bank, East Jerusalem (considered separately because it has different socio-economic characteristics from those of the rest of Middle West Bank), South West Bank, and Gaza Strip. Table 13.3 shows the scoring coefficients of the Bartlett method for each subregion. The missing values for this block were imputed using the mean at governorate level.

TABLE 13.3
Bartlett's scoring coefficients

	North WB	Middle WB	Jerusalem	South WB	Gaza Strip
Health, physical access	0.69948	0.83512	0.18661	0.4269	0.27528
Health, quality	0.71387	0.82941	0.33513	0.63329	-0.19755
Educational system	0.14309	0.31666	-0.02624	0.34521	0.26809
Security perception	0.50444	0.26072	0.30694	0.44549	0.71213
Mobility constraints	0.56666	0.14465	0.58338	0.31384	0.74085
Water, electricity, etc.	0.09623	0.15815	-0.07116	0.35888	-0.45009

Social safety nets (SSN)

Social safety nets are a crucial aspect in the mitigation of crises in Palestine. More and more households are becoming dependent on assistance from international agencies, charities and NGOs. Help received from friends and relatives is also substantial. Therefore, safety nets can be considered as the capacity of the system to mitigate shocks, and as a general indicator to be included in the estimation of resilience. The variables used for generation of the SSN indicator are:

- amount of cash and in-kind assistance (continuous variable in NIS/person/day);
- quality of assistance (ordinal scale of one to four);
- job assistance (binary response, yes/no);
- monetary value of first and second types of assistance (continuous variable in NIS/person/day);
- evaluation of the main type of assistance (ordinal scale of one to four);
- frequency of assistance (count, quantity of received assistance in the last six months);
- overall opinion on targeting (categorical; assistance targeted to the needy; including some not needy; and targeted without distinction).

In this case too, missing values were treated using the mean at governorate level. Different multivariate exploratory techniques (PCA, FA and CA) were used to find the common patterns in the data, but the different tools could not perform well, owing to the presence of non-normally distributed variables. For example, the scoring coefficients in the factor analysis underestimated the categorical variables. The final SSN indicator was generated using a weighted sum of the variables listed above. The equation used was:[27]

$$SSN = (stdSSN\_1 + 2*stdSSN\_2 + 2*stdSSN\_3 + stdSSN\_4 + 2*stdSSN\_5 + 0.5*stdSSN\_6 + + 0.5*stdSSN\_7)/9$$

Assets (A)

Assets are part of household capital, and their availability is an important coping mechanism during periods of hardship. They therefore have to be considered as a key factor in estimating resilience. Information on assets was not available in the PPPS dataset, and so it was decided not to use proxies so as not to contaminate the estimates.

Adaptive capacity (AC)

The adaptive capacity indicates the capacity of a household to cope and adapt after a shock, enabling it to continue performing its own key functions. In other words, adaptive capacity provides the household with the capacity to absorb the shock. Having more coping strategies means having more probability of mitigating food insecurity after losing a job, for example. The characteristic of adaptability is the buffer effect for the household's key functions. The indicators used to measure adaptive capacity are:

- diversity of income sources (count, one to five);
- coping strategy index (quantitative, one to 16);
- capacity to keep up with food security in the future (ordinal scale of one to five);
- number of assistance sources (count, one to six).

The first variable indicates the number of *income sources from different sectors* (public, private, etc.); during a crisis, the more sources of income the household has, the less it is exposed to the risk of losing its income. The coping strategy index represents the number of available coping strategies that have not yet been used.

It was necessary to use a specific weight for the variable, *number of assistance sources*. It was difficult to apply the factor analysis correctly to this variable for the entire sample because the variable was particularly relevant only for the poorer households. The

[27] Where "std" indicates the standardized value of the relevant variable.

arbitrary weight adopted for AC_4 was included in the following equation, maintaining constant the proportions among the factor loadings of the other variables:

$$AC = (stdAC\_1 + 2*stdAC\_2 + 2*stdAC\_3 + 0.5*stdAC\_4)/5.5$$

Stability (S)

Stability is a widely used concept in food security literature, although it is usually used to describe the stability of food supply. In this paper, it is considered as a cross-sectoral dimension of resilience. An index of income stability, for instance, may be its variability (increase, decrease or none) in the last six months. The variables used for the measurement of stability are:

- professional skills (continuous);
- educational level (continuous);
- employment ratio (ratio, zero to one);
- number of household members to have lost their jobs (continuous);
- income stability (ordinal: increased, the same, decreased);
- assistance dependency (ratio, zero to one);
- assistance stability (ordinal: increased, the same, decreased);
- health stability (count, zero to eight);
- education system stability (ordinal: increased, the same, decreased).

In this case, given the multidimensionality of the feature, no prior decisions were taken. A factor analysis was run to analyse the correlation matrix using the iterated principal factor method. This method re-estimated the communalities iteratively. Then, the Bartlett method was used to generate the S indicator. Table 13.4 shows the correlation coefficients of the S indicator with the original variables.

TABLE 13.4
Correlation matrix

	S1	S2	S3	S4	S5	S6	S7	S8	S9
Stability	0.7384	0.8378	0.6505	-0.0549	0.0993	-0.35	0.2733	0.1196	-0.025

Estimation of resilience (R)

So far, this paper has looked at the first stage of the analysis, but it is necessary to fit all the pieces of the puzzle together to estimate resilience. In other words, the indicators estimated in the previous paragraphs become covariates in the estimation of resilience. Recalling equation (1):

$$R_i = w_{IFA}\hat{IFA} + w_{APS}\hat{APS}_i + w_{SSN}\hat{SSN}_i + w_S\hat{S}_i + w_{AC}\hat{AC}_i + \varepsilon_i$$

For exploratory purposes, a factor analysis was run using the iterated principal factor method. Table 13.5 shows the eigen values, which indicate that the first two factors are relevant, and Table 13.6 shows the factor loadings for the first two factors.

TABLE 13.5
Eigen values

	Eigen-value
Factor 1	1.19054
Factor 2	0.334
Factor 3	0.1423
Factor 4	0.04417
Factor 5	-0.00019

TABLE 13.6
Factor loadings

	Factor 1	Factor 2
IFA	0.6028	-0.0564
AC	0.5485	0.2593
S	0.687	-0.2487
APS	0.2331	0.2688
SSN	0.0019	0.3599

Table 13.6 shows that factor one does not capture information regarding social safety nets, but factor two does. For this reason, approximated weights were used, to account for both factors. Finally, the following equation measured the resilience indicator:

$$R = (2*stdIFA + stdAPS + stdAC + stdS + 0.5*stdSSN)/5.5$$

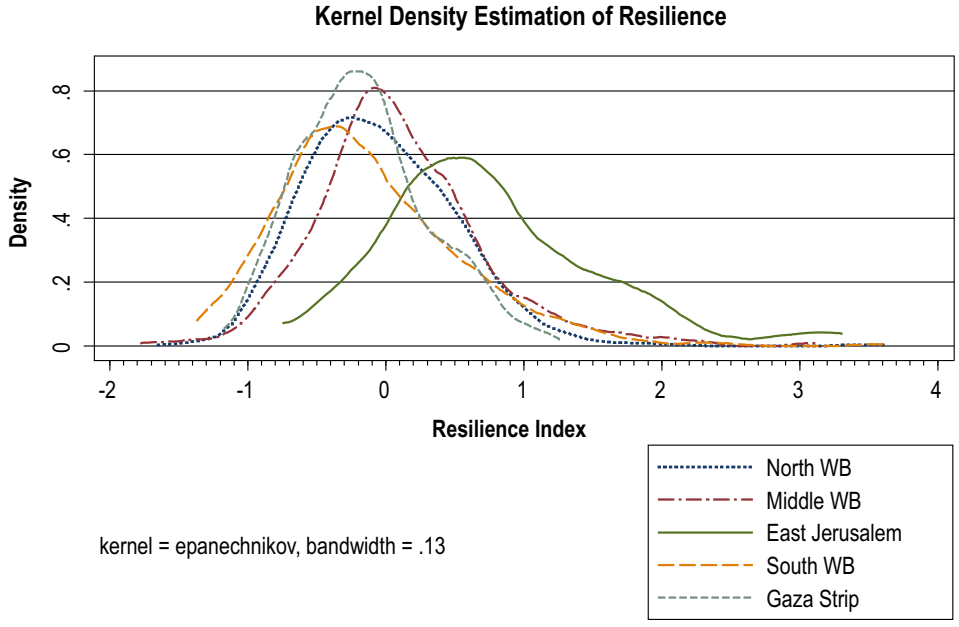
The coefficients used in the measurement of resilience are approximately proportional to the sum of the factor loadings in Table 12.6. The coefficient two for the standardized IFA represented the only difference. This was to place greater emphasis on household capital to make up for the lack of information on assets. The next section describes and discusses the results of these estimates.

DISCUSSION OF RESULTS

This section presents some of the estimates of the resilience index and its components in the five subregions of Palestine. Figure 13.3 shows the Epanechnikov's kernel density estimates of the resilience distribution. Presentation of the results involved the use of the non-parametric method owing to its major informative capacity.

Figure 13.3 shows the gap between East Jerusalem[28] and other regions. At first glance, it looks as though the other regions have more or less the same resilience level, so in this case the non-parametric approach is not very helpful. To obtain the significance level of the difference, a return to the parametric approach is required. Table 13.7 shows the means and standard deviations for resilience and its standardized components. The matrix in Table 13.8 shows the t-statistics for the pair comparison between the means of the different regions.

FIGURE 13.3.
The distribution of resilience in the five Palestinian subregions



[28] Jerusalem villages outside the wall are excluded. They are included in Middle West Bank.

TABLE 13.7
Means and standard deviations for resilience and its components

		Resilience		IFA		APS		SSN		AC		S	
Regions	**N**	**Mean**	**S.D.**	**Mean**	**S.D.**	**Mean**	**S.D.**	**Mean**	**S.D.**	**Mean**	**S.D.**	**Mean**	**S.D.**
North WB	648	-0.041	0.545	-0.131	0.760	-0.125	0.950	-0.044	1.116	0.083	0.999	0.098	0.941
Middle WB	614	0.101	0.617	0.214	1.033	0.136	0.927	0.095	0.761	0.051	1.030	-0.108	0.987
Jerusalem	93	0.746	0.797	1.767	1.511	0.081	0.882	-0.358	0.597	0.164	1.115	0.503	1.297
South WB	408	-0.127	0.670	-0.136	0.937	0.113	0.899	-0.319	0.973	-0.346	0.912	-0.034	1.092
Gaza Strip	324	-0.162	0.470	-0.480	0.498	-0.172	1.290	0.412	1.100	0.126	0.921	-0.092	0.854
Total	**2 087**	**0**	**0.624**	**0**	**1**	**0**	**1**	**0**	**1**	**0**	**1**	**0**	**1**

TABLE 13.8
Matrix of t-statistics for the comparison of means

	North WB	Middle WB	Jerusalem	South WB	Gaza Strip
North WB	0				
Middle WB	-4.3462	0			
Jerusalem	-12.1941	-9.0115	0		
South WB	2.2779*	5.5916	10.9327	0	
Gaza Strip	3.4148	6.7209	13.805	0.8034**	0

* Pr(T < t) = 0.9885: not significant at 99 percent, but significant at 95 percent.

** Pr(T < t) = 0.7890: not significant.

The differences among regional resilience levels are all significant except for that between the Gaza Strip and South West Bank. This is owing to the high level of social safety nets in the Gaza Strip. Gaza has the highest amount of assistance from relatives and friends, but it also has the highest level of dependency on external assistance. Jerusalem has the highest values for R, IFA, AC, S, but also the highest level of inequality because it has the highest standard deviation.

MODEL VALIDATION WITH CART

CART was applied to test the process used for estimating the resilience indicator, based on the concept that sets of different variables and indicators belonging to different dimensions of food insecurity, the social sector and public services, are strictly correlated to the overall resilience indicator. For this reason, validation procedures are necessary to improve understanding of the relation between resilience and original variables, using the CART methodology (Steinberg and Colla, 1995; Breiman *et al.*, 1984). Such tools also allow the resilience decision tree and related splitting rules to be built, which is very important for gaining an understanding of the key determinants of resilience. The greatest advantage of CART is its cross-validation procedures, which allow measurement of the errors in the model. Other advantages of using CART are:

- robustness as a non-parametric tool;
- capacity to handle complex data structures;
- no requirement for PDF assumptions;
- overtaking of heteroskedasticity and multicollinearity;
- greater accuracy of testing procedures;
- capacity to deal with missing values;
- transferability of decision rules to new observations.

The target variable for the model implemented with CART was the resilience indicator. As this is a continuous variable, CART performed a *regression tree* (when the target variable is categorical, CART performs a *classification tree*). The model included, as predictors, all the original variables used in the empirical approach. The weights deriving from the sample design were also considered.

FIGURE 13.4.
The upper part of the regression tree

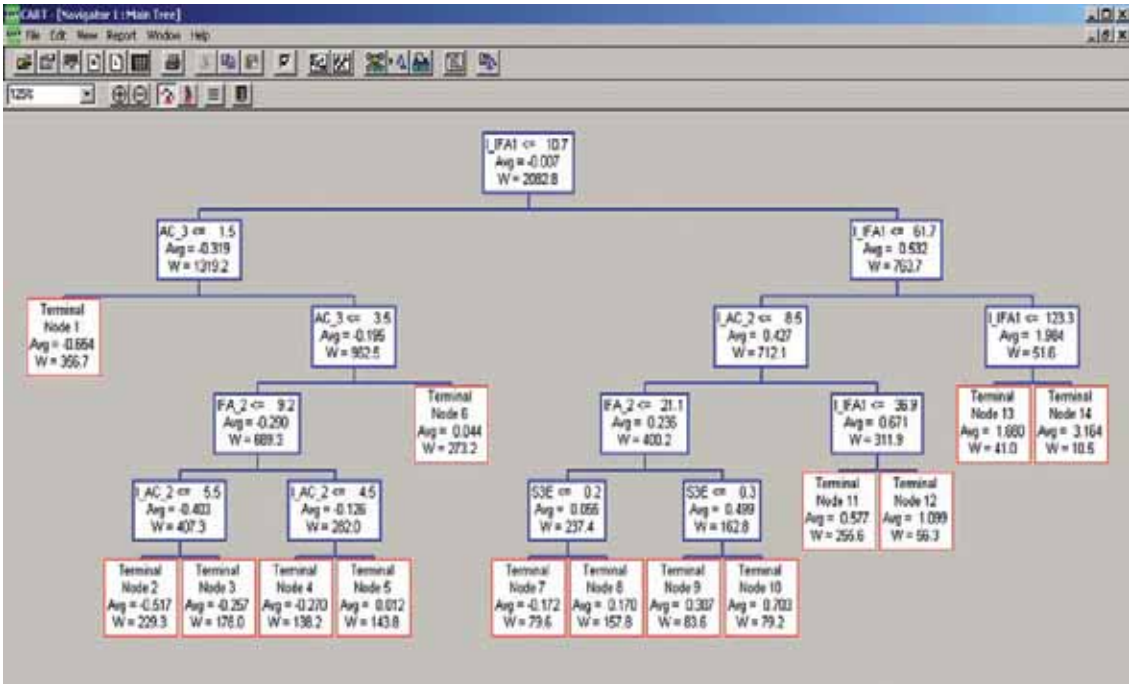


Figure 13.4 above illustrates the upper part of the regression tree generated by CART. The optimal tree has 141 terminal nodes, which has a relative cost (error) equal to 0.245. It is possible to calculate the approximated R-squared using the formula: (1- resubstitution error), that is, 1- 0.067 = 0.933. In fact, by running an OLS regression of the resilience index on the 31 original variables, the R-squared becomes 0.9825. The CART procedure included the use of the Gini splitting criterion and the tenfold cross-validation[29] for testing. Figure 13.4 shows the splitting rules, the mean of resilience and the weighted number of observations at each node.

The ranking of the variable importance shown in Table 13.9 explains the role of each variable in the definition of resilience. This ranking was measured considering the main splitters, competitors and surrogates.[30]

[29] The cross-validation test took place over ten sub-samples from the learning sample.

[30] When a variable is considered as a competitor, CART finds the best split that reduces node heterogeneity, whereas when the variable is considered as a surrogate, it is constrained to mimic the primary split.

TABLE 13.9
Variable importance

Code	Description	Importance	Code	Description	Importance
I_IFA1	Income	100	APS_4	Perception of security	2.57
IFA_2	Consumption	76.65	APS_5	Mobility constraints	2.13
I_IFA7	DEC	66.99	S6	Assistance dependency	1.75
I_AC_2	Coping strategies	50.37	SSN_4	Monetary value of 1st and 2nd type	1.65
I_IFA6	HFIAS	49.39	AC_1	Diversity of income sources	1.52
S3E	Employment ratio	46.79	S8	Health stability	1.40
AC_3	Capacity to keep up in the future	19.27	S9	Educational system stability	1.33
S2	Education level	7.46	S5	Income stability	1.24
APS_2	Health service quality	6.82	AC_4	No. of assistance sources	1.21
I_IFA5	Dietary diversity	6.44	SSN_6	Frequency of assistance	0.83
SSN_2	Quality of assistance	4.95	SSN_7	Opinion on targeting	0.61
SSN_5	Evaluation main assistance	4.23	APS_7	Water, electricity and telecommunications	0.61
SSN_1	Cash and in-kind assistance	3.74	S4	No. household members lost work	0.45
S1W	Professional skills	3.22	SSN_3	Employment assistance	0.13
APS_1	Physical access to health	2.95	S7	Assistance stability	0.05
APS_3	Education system	2.83			

Summing up, the main advantage of CART is its capacity to capture variables relevant for specific sub-groups of the population, which an OLS regression does not consider relevant for the whole population.

CONCLUSIONS

The analysis conducted on PPPS 2005 seems to confirm the validity of the conceptual framework adopted. The results are meaningful and the resilience index in the five subregions has significant differences. The same applies to the five components of the resilience model.

However, there were constraints on the analysis owing to the static nature of the available database. Therefore, in the future, it is necessary to carry out this analysis with panel data as soon as an appropriate database becomes available. It would also be interesting to extend the analysis to other key studies in order to assess the robustness of the proposed analytical framework as well as any emerging patterns of resilience.

Even though the methodology adopted gave significant results, it is necessary to test the other methodology proposed in this paper, that is, the structural equation modelling with Bayesian networks, before making a final decision on the most appropriate methodology.

Further work is also necessary on how to use the resilience index for identifying the key determinants needed to design adequate responses and policies to food insecurity, as well as for strengthening the economic resilience of households in crisis situations.

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Indicators on food deprivation and income deprivation at national and sub-national levels: methodological issues

Ricardo Sibrián[31]

ABSTRACT

Indicators to measure income and food deprivation are useful for understanding food insecurity at national level and within countries. This paper discusses two indicators: prevalence of food deprivation (undernourishment), and prevalence of critical food poverty. Both indicators are based on nutritional underlying criteria, which are also derived from food consumption and income data collected in household surveys. Prevalence of food deprivation is Millennium Development Goal (MDG) indicator number 5, which uses the distribution of energy consumption as a base; prevalence of critical food poverty is a new indicator that links food deprivation to income deprivation, based on the distribution of income.

The link is the concept of minimum dietary energy requirement (MDER) used in the FAO methodology as the cut-off value in the distribution of energy consumption for estimating undernourishment. The critical food poverty line for estimating the prevalence of critical food poverty is the cost of the MDER, based on energy-yielding nutrient prices for a macronutrient-balanced diet accessible to low-income population groups. The macronutrient-balanced diet uses the recommendations of a Joint WHO/FAO Expert Consultation on Diet, Nutrition and the Prevention of Chronic Diseases (2002, Geneva) as its point of reference. The following examples illustrate the results of both indicators for a sample of countries in different continents.

Key words: food poverty, undernourishment, food insecurity, food security

Acknowledgements: the European Community for financial support.

BACKGROUND

FAO has been monitoring food deprivation continuously on request since the 1996 World Food Summit (WFS) and the 2000 Millennium Declaration. The MDG target on hunger reduction refers to reduction in the proportion of the population suffering from food deprivation; the WFS target refers to reduction in the number of people suffering from food deprivation. The WFS target is more challenging than the MDG target. Reducing the number of food-deprived people implies reducing the proportion of food deprivation, while halving the proportion of food deprivation does not necessarily imply reducing the number of hungry people.

In 2002, FAO convened the International Scientific Symposium (ISS) on Measurement and Assessment of Food Deprivation and Undernutrition. ISS reviewed the methodologies currently available for monitoring food deprivation and undernutrition. ISS recognized that food insecurity is a multifaceted and complex phenomenon, and no perfect single measure captures all aspects. It also recommended the use of a suite of indicators to understand determinants of food insecurity, such as food availability, access and utilization, as well as vulnerability. All these dimensions

[31] Statistics Division, FAO, Rome.

are interrelated by reciprocal causal or associative links, and a suite of indicators may help to give an understanding of why people are food insecure and may help improve the targeting and design of informed policies and actions.

For this purpose, FAO Statistics Division has developed statistical procedures for estimating a suite of food security statistics using the Food Security Statistics Module (FSSM) software. FSSM produces many food security statistics at national and sub-national levels using food consumption and income data collected in national household surveys (NHS), including the prevalence of food deprivation and the number of undernourished in total population. It is the use of these two indicators that allows the monitoring of the MDG and WFS targets on food deprivation (hunger) reduction.

The statistical procedures in FSSM include new expert recommendations on energy requirements, as well as statistics derived from a Technical Expert Workshop on Energy Requirements for Estimating Food Deprivation and Food Excess (January 2005, Rome). FSSM also includes a recently published report of a Joint FAO/ World Health Organization (WHO)/United Nations University (UNU) Expert Consultation on Human Energy Requirements (FAO, 2004), for calculating the minimum energy requirements to estimate the prevalence of food deprivation.

OBJECTIVES

The main objective of this paper is to examine the indicators used for measuring food deprivation (hunger), including those used for monitoring the WFS and MDG targets, as well as a new indicator on income deprivation (critical food poverty). These indicators are the prevalence of food deprivation (undernourishment) in the total population (i.e., consuming insufficient food to meet minimum energy requirements) and the prevalence of critical food poverty (i.e., lacking income to acquire food to meet the minimum energy requirements). Both indicators use the same nutritional underlying criteria and are derived from food consumption and income data collected in household surveys.

METHODOLOGICAL ISSUES

In estimating the prevalence of food deprivation and critical food poverty, there are several methodological issues concerning the use of the underlying theoretical distribution for both dietary energy consumption (DEC) and income or proxy total expenditure. This section focuses on the statistical framework for both food deprivation and income deprivation indicators.

Statistical framework for estimating food deprivation

Prevalence of food deprivation is the proportion of the population below the minimum dietary energy consumption (MDER).

The probability distribution framework is defined as follows:

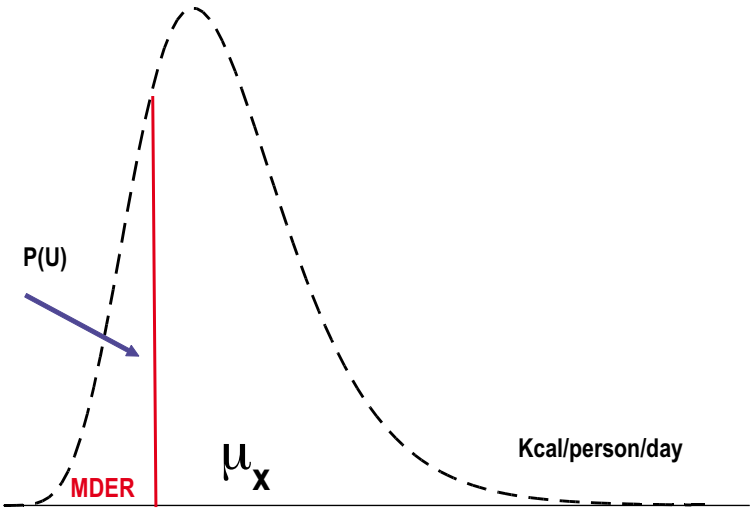
$$P(U) = P(X < MDER) = \int_{x<MDER} f_x(x)dx = F_x(MDER)$$

where *P(U)* is the proportion of food deprivation in total population; *(x)* is DEC (kcal/person/day); *MDER* is a cut-off point reflecting the minimum acceptable level of energy consumption (kcal/person/day); *f(x)* is the density function of energy consumption depicted on the right hand side of Figure 14.1; and *Fx* is the corresponding cumulative distribution function of DEC.

The curve f(x) in Figure 14.1. depicts the proportion of the population corresponding to the different per person DEC levels (x) represented by the horizontal line. The area under the curve up to MDER represents the proportion of the population consuming insufficient food to meet the minimum energy requirement,

P(U). Estimation of the prevalence of food deprivation involves the use of several approaches, P(U). The following paragraphs describe the most commonly used.

FIGURE 14.1.
Probability distribution framework for estimating food deprivation



The first approach is the adequacy of energy consumption, which is the ratio of energy consumption to energy requirement, expressed as a percentage. This is also of use in estimating inadequacy of macronutrient consumption, such as protein, and micronutrients, such as vitamin A. This indicator depends on the following: if the household DEC adequacy is less than 70 percent, for example, all household members are in the category of food-deprived in terms of dietary energy. The prevalence of food deprivation in total population is therefore the number of members of households falling into this category divided by the number of members in all sampled households and expressed as a percentage. Although this approach has been used less since the mid-1980s, because it does not take into consideration the distribution of energy consumption within the population - that is, the inequality in access to food - many practitioners still use it for the purpose of food insecurity assessments. The 70 percent inadequacy cut-off value, which is an implied MDER, yields the same prevalence of food deprivation in different populations with the same average energy consumption but different inequalities in the distribution of that energy consumption.

The second approach, recently proposed by Smith, Alderman and Aduayom (2006) from the International Food Policy and Research Institute (IFPRI), is a direct comparison of the household energy consumption of each sampled household in an NHS with the household energy requirement. The latter derives from the sum of the energy requirements of all members in the household for light physical activity, based on their median reference body weights in the WHO growth standards corresponding to their sexes and ages. Any household with a total energy consumption below the respective total energy requirement is classified as undernourished. The prevalence of food deprivation in the population is the total number of individuals in the households classified as food-deprived divided by the total number of individuals in all the sampled households.

This approach takes into consideration the inequality in access to energy consumption within a population. Unfortunately, however, the approach also has several flaws; for example, in deriving the household energy requirement from each of the individuals in the household, it does not comply with the nutritional expert group's

recommendation about applying energy requirements to groups rather than single individuals of a given sex and age (WHO, 1985; FAO, 2004). Another flaw is that in deriving the IFPRI-MDER, the value obtained is not a minimum acceptable level of energy requirement, because it takes the median reference body weight, which is the 50th percentile of the distribution of WHO growth standards for a given sex and age group, for light physical activity or a sedentary life style. The estimated MDER using the IFPRI approach is therefore an average of energy requirements for light physical activity or a sedentary life style, and not a minimum. A third flaw, which is also a flaw of the first approach, is the direct comparison of household energy consumption, which refers to a very short household reference period and ignores the effect of seasonal variation and other undesirable sources of variation on implied inequality of energy consumption. This results in overestimation of the prevalence of food deprivation, owing to an overestimated implicit variation in the distribution within the population and to an overestimated MDER, as documented elsewhere (Sibrian, Naiken and Mernies, 2007) and available at www.fao.org/faostat/foodsecurity/papers_en.htm.

FAO methodology has used a third approach. In estimating the prevalence of food deprivation, this approach uses a parametric distribution framework under the assumption that DEC per person per day follows a log-normal distribution. FAO Statistics Division has tested the log-normality assumption against other distributions, using household surveys from countries in different continents. The approach depends on three key parameters for each population group: the average DEC per person per day (total energy consumed by the entire population divided by the population size); the level of inequality in access to that energy consumption within the population; and the MDER for the population group. Two components measure inequality in access to energy consumption: the coefficient of variation (CV) of energy consumption due to income, and the CV of energy consumption due to biological factors (sex, age and physical activity). The former reflects the variation among means of energy consumption by income deciles, grouped on a per person basis. The latter reflects variations in the sex and age composition structure data collected in population censuses, as well as variations in body weight for attained heights collected in anthropometric surveys. The FAO/WHO/UNU Expert Consultation on Energy Requirements (FAO, 2004) derived MDER for given age and sex population groups. The body weight is the minimum acceptable weight for attained height (the fifth percentile of the WHO growth standards) and the minimum acceptable physical activity level is that of a sedentary life style.

Of these three approaches, the parametric approach provides the best statistical framework. It takes into account the amount of dietary energy consumed, the inequality in access to energy consumption within the population due to biological and income factors, and a nutritionally grounded MDER. The estimating procedures of this approach are detailed in FAO, 2003 available at www.fao.org/faostat/foodsecurity/files/undernourishment_methodology.pdf.

Statistical framework for estimating critical food poverty

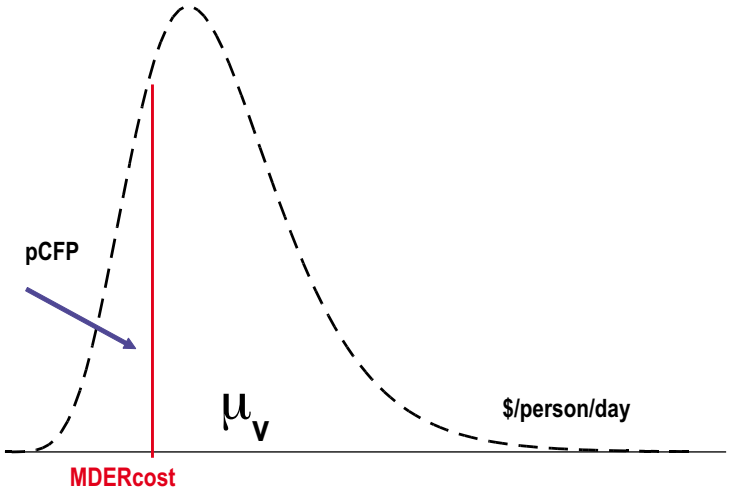
The prevalence of critical food poverty is the proportion of the population below the minimum level of income to acquire food to meet MDER, which is the same cut-off value for estimating the prevalence of food deprivation. The definition of the prevalence of critical food poverty using a probability distribution framework is similar to that of the prevalence of food deprivation, as follows:

$$P(CFP) = \int_{v<MDER\cos t} g_v(v)dv = G_v(MDER\cos t)$$

where *P(CFP)* is the proportion of critical food poverty in the total population; *(v)* = income (US$/person/day); *MDERcost* is a cut-off point reflecting the cost of

food (US$/person/day) to provide MDER; *g(v)* is the density function of income or proxy total expenditure, shown on the right hand side of Figure 14.2; and *Gv* is the corresponding cumulative distribution function of income.

FIGURE 14.2.
Probability distribution framework for estimating critical food poverty



In Figure 14.2, the curve g(v) depicts the proportion of the population corresponding to different per person per day income levels (v), represented by the horizontal line. The area under the curve up to MDERcost represents the proportion of the population with insufficient income to acquire food to meet MDER, pCFP. The linkage between P(U) and pCFP is MDER. When estimating P(U), MDER is in energy value, while for PCFP it is in monetary value, that is, the cost of MDER (MDERcost).

The proposed pCFP uses the parametric approach with three key parameters for each population group, similar to the P(U): average income per person per day; level of inequality in access to income within the population; and MDERcost.

The average income per person per day is the total income of the whole population divided by the population size. The CV of income measures the inequality of income, which under the log-normality distribution assumption is a one-to-one function of the traditional Gini coefficient. Estimation of the MDERcost uses the prices of food consumed by households in the lowest income quintile, ranked on an income-per-person-per-day basis. The dietary energy unit value for estimating MDERcost is derived from the nutritionally balanced contributions to total energy from proteins (12.5 percent), fats (22.5 percent) and carbohydrates (65 percent), using protein, fat and carbohydrate unit values from the recommendations of the Joint WHO/FAO Expert Consultation of 2002.

DATA REQUIREMENTS

The data needed to estimate both the P(U) and the pCFP indicators are as follows: 1) food consumed, in quantities and monetary value; 2) income, or proxy total expenditure; 3) sampled population, by age and sex; and 4) average height, by age and sex.

It is preferable to record the food items consumed in local monetary values corresponding to standard measurement units (kilograms, grams, litres or millilitres). It is also necessary to describe in as much detail as possible the food items consumed in the sampled households, to help their identification in food composition tables

when estimating the level of energy and the main energy-yielding nutrient (proteins, fats and carbohydrates) consumption. The energy, protein, fat and carbohydrate consumption levels and the food monetary value allow estimation of the energy and macronutrient monetary unit values. Estimation of the monetary value of the balanced MDER uses these unit values, that is, the cut-off value MDERcost. Food quantities and monetary values should refer to the food consumption (and not to food acquisition) of the members of the sampled households within the household reference period, regardless of when the food consumed was acquired or produced.

Estimation of the income data uses an aggregated value of all income components for all members of the sampled households based on the concepts and definitions in United Nations manuals. Household income deciles can be defined by ranking households according to income per person per day. Average income estimates by income decile permit estimation of the CV of income. Average energy consumption estimates by income decile permit estimation of the CV of energy consumption due to income. The CV of energy consumption due to biological factors is assumed to be constant at 20 percent, or can be estimated from available anthropometric data based on an induced distribution of energy requirements derived from the observed distribution of body weight for attained height in the population group.

Data on height and population, by age and sex, permit the estimation of MDER using the recommendations of the 2001 Joint FAO/WHO/UNU Expert Consultation on Human Energy Requirements. WHO growth standards, using the average attained height for given age and sex derived from anthropometric surveys, provide the minimum acceptable reference weight for height, for given age and sex. Countries have conducted these surveys as demographic and health surveys (DHS) on children and women of reproductive age, as multiple indicator cluster surveys (MICS) on children, and as other national nutritional surveys. NHS of specific population groups permit derivation of the age and sex population structure.

ESTIMATING PROCEDURES

Estimating the prevalence of food deprivation

The proportion of the population below the MDER is estimated as follows:

Φ [($\log_e$ MDER $-\mu$) / σ)] where Φ is the standard normal cumulative distribution.

It is assumed that the distribution of DEC, f(x), as indicated previously, is log-normal. The parameters μ and σ are estimated by using the mean DEC and CV of DEC, *CV(x),* as follows:

$$\sigma = [\log_e(CV^2(x) + 1)]^{0.5} \text{ and } \mu = \log_e \mu(x) - \sigma^2 / 2$$

The average DEC per person per day is:

$$\mu(x) = \sum_{j=1}^{k} f_j (x \mid v)_j / \sum_{j=1}^{k} f_j$$

and the standard deviation of DEC due to income is:

$$\sigma(x \mid v) = \sqrt{\left[\sum_{j=1}^{k} f_j (x \mid v)_j^2 - (\sum_{j=1}^{k} f_j (x \mid v)_j)^2 / \sum_{j=1}^{k} f_j\right] / (\sum_{j=1}^{k} f_j - 1)}$$

Where: k is the number of income deciles; f_j is the number of sampled households; and $(x|v)_j$ is the average DEC per person per day of the *jth* income or proxy total expenditure decile.

The CV of DEC due to income, CV($x|v$), is formulated as follows:

$$CV(x|v) = \sigma(x|v) / \mu(x)$$

Thus, the data required for estimating CV($x|v$) are the averages of DEC per person per day, the average household size by income group, using deciles of income (or total expenditure) per person per day.

The CV(x) of DEC is formulated as follows:

$$CV(x) = \sqrt{CV^2(x \mid v) + CV^2(x \mid r)}$$

CV($x|r$) is the CV of DEC due to biological factors, which on average has been estimated as 20 percent; however, if data on height for given age and sex are available for the entire population, CV($x|r$) can be estimated based on the induced distributions of weight for attained height and physical activity levels for the population groups.

The right-hand column of Table 14.1 presents the average DEC and in the middle column the average of household members both by decile of household total expenditure from a recent self-weighted sampling NHS (on a sample of 10000 households). It shows the prevalence of food deprivation for aggregated data from a hypothetical example. The estimates of parameters μ and σ are 7.495 and 0.244, respectively, derived from estimates of the CV of DEC due to income, CV($x|v$), and the average DEC, $\mu(x)$, as indicated above. This paper treats the estimate of MDER as exogenous. The estimated prevalence of food deprivation is 45.5 percent.

MDER is estimated using the attained height data collected from a representative sample of individuals in the given age and sex population groups.

TABLE 14.1
Estimating P(U) from 10000 sampled households

income decile ($/person/day)	average persons	average dietary energy consumption (Kcal/person/day)
1	6.5	1500
2	6.0	1600
3	5.5	1700
4	5.0	1800
5	4.5	1900
6	4.0	2000
7	3.5	2100
8	3.0	2200
9	2.5	2300
10	2.0	2400
all	**4.3**	**1853**
CV(due to income)	0.146	
CV(x)	0.248	
sigma	0.244	
mu	7.495	
mder	1750	exogenous
P(U)	45.5	percent

The procedure involves using the minimum reference weight for height (the fifth percentile in the WHO growth standards) derived from the data collected on attained height and the energy requirement per kilogram, which differs by age and sex in children, adolescents and adults. The procedure for deriving MDER for the total population is weighted by the age and sex structure of the population under study.

Estimating the prevalence of critical food poverty

The procedure for estimating the prevalence of critical food poverty (pCFP) is similar to that for estimating the prevalence of food deprivation, except that it is based on income distribution and the minimum cost of macronutrient-balanced MDER. The process for evaluating pCFP is as follows:

Φ [($\log_e$ MDERcost -μ) / σ)] where Φ is the standard normal cumulative distribution.

It is assumed that the distribution of income or proxy total expenditure, g(v), as indicated previously, is log-normal, with parameters μ and σ estimated on the basis of the mean income (or proxy total expenditure) and CV of income CV*(v)*, as follows:

$$\sigma = [\log_e (CV^2 (v) + 1)]^{0.5} \text{ and } \mu = \log_e \mu(v) - \sigma^2 / 2$$

The average income per person per day is:

$$\mu(v) = \sum_{j=1}^{k} g_j (v)_j / \sum_{j=1}^{k} g_j$$

and the standard deviation of income is:

$$\sigma(v) = \sqrt{\left[\sum_{j=1}^{k} g_j (v)_j^2 - (\sum_{j=1}^{k} g_j (v)_j)^2 / \sum_{j=1}^{k} g_j\right] / (\sum_{j=1}^{k} g_j - 1)}$$

Where *k* is the number of income decile; g_j is the number of sampled households; and $(v)_j$ is the average income (or proxy total expenditure) per person per day of the *jth* income (or proxy total expenditure) decile.

Formulation of the CV of income, CV(*v*), is as follows:

$$CV(v) = \sigma (v) / \mu(v).$$

Thus, the data required for estimating CV(*v*) are average income (or proxy total expenditure) per person per day, and average household size, by household per person per day income or expenditure decile.

The right hand column of Table 14.2 presents the average income (or proxy total expenditure) per person per day and in the middle column the average of members by decile of household income (or proxy total expenditure) per person per day from the self-weighted NHS used for estimating critical food poverty.

TABLE 14.2
Estimating pCFP from 10000 sampled households

income decile ($/person/day)	average persons	average income ($/person/day)
1	6.5	0.45
2	6.0	0.55
3	5.5	0.65
4	5.0	0.90
5	4.5	1.20
6	4.0	1.80
7	3.5	2.50
8	3.0	4.00
9	2.5	7.00
10	2.0	10.00
all	**4.3**	**2.00**
cv	**1.21**	
sigma	0.951	
mu	0.243	
mdercost	0.61	exogenous
pCFP	21.7	percent

It shows the prevalence of critical food poverty for aggregated data from a hypothetical example. The estimates of parameters μ and σ are 0.243 and 0.951, respectively, derived from estimates of the CV of income, CV(*v*), and the average total expenditure, μ(v), as indicated above. Estimate of MDERcost is 0.61 for balanced-MDER. The estimated prevalence of critical food poverty is 21.7 percent.

Estimation of MDERcost takes place by using MDER and the costs of proteins, fats and carbohydrates from households in the lowest income (total expenditure) quintile.

EXAMPLES

Many countries have estimated both indicators when assessing food insecurity derived from NHS data. Figures 14.3 and 14.4 illustrate results of both indicators for Georgia (Georgia, 2007) and Lao People's Democratic Republic (Lao PDR, 2007).

FIGURE 14.3.
Georgia 2004: households with young children

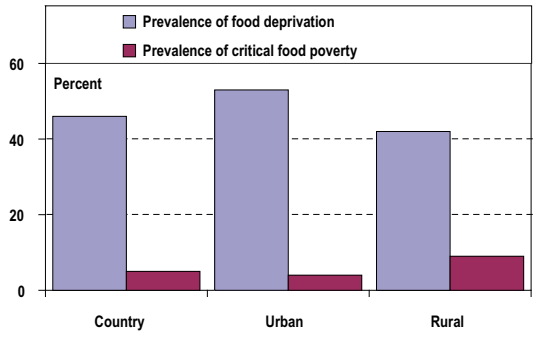
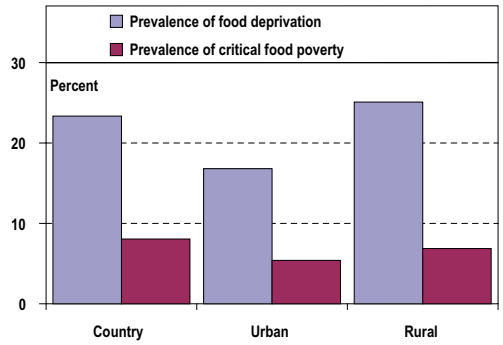


FIGURE 14.4.
Lao PDR 2002/2003: all households



CONCLUSION and REMARKS

Countries can monitor MDG targets on poverty and hunger reduction, based on NHS data on food consumption and income, at national and sub-national levels.

The indicators of food deprivation and critical food poverty discussed in this paper can be used to assess magnitude and trends obtained by using standard estimating procedures from NHS for the identification of food-insecure population groups and for evaluation of the social and economic impact of policies and interventions that aim to improve food security.

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Part 7.

Glossary

ANTHROPOMETRY
Use of human body measurements to obtain information about nutritional status.

AVERAGE ENERGY REQUIREMENT
It refers to the amount of energy considered adequate to meet the energy needs for normative ***average*** acceptable weight for attained height while performing ***moderate*** physical activity in good health.

BALANCED DIET
The diet is balanced when it is judged to be consistent with the maintenance of health in a population. The balance can be examined in terms of the contribution of the various energy-yielding macronutrients and other nutrients. A macronutrient-based balance food consumption pattern should contribute to total energy from proteins, fats and carbohydrates within recommended ranges as follows: proteins from ten to 15 percent, fats from 15 to 30 percent and carbohydrates from 55 to 75 percent, as from a technical report of a 2002 Joint WHO/FAO Expert Consultation (WHO 2003).

CRITICAL FOOD POVERTY
The prevalence of critical food poverty (pCFP) refers to the proportion of persons living on less than the cost of the macro-nutrient balanced MDER (for Minimum Dietary Energy Requirement see below and for balanced diet see above) with food prices from households in the lowest income quintile. It can be estimated at national and sub-national levels.

DEGREE OF FOOD DEPRIVATION
A measure of the overall food insecurity situation in a country, based on a classification system that combines prevalence of undernourishment, i.e. the proportion of the total population suffering from a dietary energy deficit, and depth of undernourishment, i.e. the magnitude of the undernourished population's dietary energy deficit.

DEPTH OF FOOD DEPRIVATION
It refers to the difference between the average dietary energy intake of an undernourished population and its average minimum energy requirement (MDER).

DIETARY ENERGY UNIT COST
The dietary energy unit cost is the monetary value in local currency of 1000 kilo-calories of food consumed.

DIETARY ENERGY CONSUMPTION
Food consumption expressed in energy terms. At national level, it can be calculated from the FBS (see below); the FBS estimate refers to both private (households) and public (hospitals, prisons, military compounds, hotels, residences, etc) food consumption. At sub-national levels it is estimated using food consumption data, with quantities collected in national household surveys (NHS); these estimates refer to private food consumption.

DIETARY ENERGY DEFICIT
Same as Depth of Food deprivation.

DIETARY ENERGY INTAKE
The energy content of food consumed.

DIETARY ENERGY REQUIREMENT

It refers to the amount of energy required by individuals to maintain body functions, health and normal physical activity.

DIETARY ENERGY SUPPLY

Food available for human consumption, expressed in kilocalories per person per day (kcal/person/day). At country level, it is calculated as the food remaining for human use after deduction of all non-food consumption (exports, animal feed, industrial use, seed and wastage)

FOOD BALANCE SHEETS

Food Balance Sheets (FBS) are compiled every year by FAO, mainly with country-level data on the production and trade of food commodities. Using these data and the available information on seed rates, waste coefficients, stock changes and types of utilization (feed, food, processing and other utilization), a supply/utilization account is prepared for each commodity in weight terms. The food component of the commodity account, which is usually derived as a balancing item, refers to the total amount of the commodity available for human consumption during the year.

FOOD CONSUMPTION DISTRIBUTION

Food consumption distribution refers to the variation of consumption within a population. It reflects both the disparities due to socio-economic factors and differences due to biological factors, such as sex, age, body-weight and physical-activity levels.

FOOD DEPRIVATION

Food deprivation refers to the condition of people whose food consumption is continuously below its requirements. FAO's measure of food deprivation refers to the proportion of the population whose dietary energy consumption is below the minimum energy requirement (see below).

FOOD INSECURITY

A situation that exists when people lack secure access to sufficient amounts of safe and nutritious food for normal growth and development and an active and healthy life. It may be caused by the unavailability of food, insufficient purchasing power, inappropriate distribution, or inadequate use of food at the household level. Food insecurity, poor conditions of health and sanitation, and inappropriate care and feeding practices are the major causes of poor nutritional status. Food insecurity may be chronic, seasonal or transitory.

FOOD SECURITY

A situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.

GINI COEFFICIENT

The Gini coefficient measures the extent to which the distribution of income (or, in some cases, consumption expenditure, food dietary energy consumption) among individuals or households within an economy deviates from a perfectly equal distribution. A Lorenz curve plots the cumulative percentages of total income received against the cumulative number of recipients, starting with the poorest individual or household. The Gini coefficient measures the area between the Lorenz curve and a hypothetical line of absolute equality, expressed as a percentage of the

maximum area under the line. Thus a Gini coefficient index of 0 represents perfect equality, while an index of 100 implies perfect inequality.

GINI COEFFICIENT DUE TO INCOME

The Gini coefficient is a measure of inequality in food consumption when income is used as the grouping variable and ranges from 0 (when income has no effect on food consumption) to one (when food consumption depends only on income). It can refer to inequality in food consumption due to income in monetary or in energy terms.

HOUSEHOLD CONSUMPTION EXPENDITURE

Household consumption expenditure refers to all monetary expenditure by the household and individual members on goods intended for consumption and expenditure on services, plus the value of goods and services received as income in kind and consumed by the household or individual members of the household. Thus the value of items produced by the household and utilised for own consumption, as well as the net rental value of owner-occupied housing and the gross rental value of free housing occupied by the household, each represent part of household consumption expenditure.

HOUSEHOLD FOOD CONSUMPTION EXPENDITURE

This refers to food consumed by household members during a specified period, at home and away from home, for example, at restaurants, bars, the work place, school, and so on. It includes food from all sources, purchased or from garden or farm. Further deductions should be made to allow for food given away to other households or non-household members and visitors as well as for wastage and losses occurring after acquisition.

HOUSEHOLD EXPENDITURE

Consumption plus non-consumption expenditure made by the household, both including food.

HOUSEHOLD NON CONSUMPTION EXPENDITURE

It refers to income taxes, other direct taxes, pension and social security contributions, remittances, gifts and similar transfers made by the household in monetary terms or in kind, including food such as given away, raw or ready to eat.

HOUSEHOLD INCOME

Income is the sum of all receipts, in money or in kind, which as a rule are received regularly and are of recurring nature, including food.

INCOME ELASTICITY OF FOOD DEMAND

The income elasticity of food demand measures the responsiveness of the quantity, monetary or nutrient value demanded of a good, to the change in the income of the people demanding the good. It is calculated as the ratio of the percent change in quantity demanded to the percent change in income.

INCOME INEQUALITY

Income inequality refers to disparities in the distribution of income.

INEQUALITY IN FOOD CONSUMPTION DUE TO INCOME

The inequality refers to the variation of the food consumption level within a population due to disparities in income distribution.

KILOCALORIE (KCAL)
The kilocalorie is a unit of measurement of dietary energy. In the International System of Units (ISU), the universal unit of dietary energy is the joule (J) but Kcal is still commonly used. One kilocalorie = 4.184 kilo-joules (KJ).

MACRONUTRIENTS
Used in this document to refer to the proteins, carbohydrates and fats that are required by the body in large amounts and that are available to be used for energy. They are measured in grams.

MICRONUTRIENTS
Refer to the vitamins, minerals and certain other substances that are required by the body in small amounts. They are measured in milligrams or micrograms.

MINIMUM DIETARY ENERGY REQUIREMENT
In a specified age/sex category, this refers to the amount of dietary energy per person required for a minimum acceptable body-weight for attained-height and carry out a ***light*** physical activity. For an entire population, the minimum energy requirement is the weighted average of the minimum energy requirements of the different age/sex groups in the population. This is expressed as kilocalories per person per day.

NUTRITIONAL STATUS
The physiological status of an individual that results from the relationship between nutrient intake and requirement and from the body's ability to digest, absorb and use these nutrients. Lack of food as well as poor health and sanitation and inappropriate care and feeding practices are the major causes of poor nutritional status.

SHARE OF FOOD EXPENDITURE
The proportion of household consumption expenditure allocated to food; it is also known as the Engel ratio.

UNDERNOURISHMENT
Undernourishment refers to the condition of people whose dietary energy consumption is continuously below a minimum dietary energy requirement for maintaining a healthy life and carrying out a light physical activity. The number of undernourished people refers to those in this condition.

UNDERNUTRITION
The result of undernourishment, poor absorption and/or poor biological use of nutrients consumed.

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