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Part B. Recent advances in assessment tools to measure household food security and nutrient deficiencies

Measuring household food security in poor Venezuelan households

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Abstract

Objective: To validate abbreviated methods that estimate food security level among poor communities in Caracas, Venezuela.
Design: Two independent cross-sectional studies were undertaken to internally and externally validate simple quantitative/qualitative methods. The quantitative measure was constructed from data on household food availability, gathered using the list-recall method. It is a count of the foods that explain 85% or more of household energy availability. The qualitative measure is a score of female-perceived food insecurity level estimated with a modified 'hunger index', reflecting food resource constraints and hunger experiences within the home. Socio-economic and food behaviour data that may predict household food security (HFS) levels were gathered. The second study was repeated a year later to measure the impact of an increase in the minimum wage on HFS levels.
Setting: Two poor urban communities in Caracas, Venezuela.
Subjects: All households in both communities that complied with selection criteria (poor and very poor families that share food resources) and were willing to participate. The sample comprised 238 and 155 female household food managers in the two communities.
Results: In 1995, data from females in 238 urban poor households provided evidence for the overall validity of the method. Its application in 1997 to 155 households in the other community gave support to the external validity of the method. Measures were repeated in 1998 on 133 subjects of the above sample, when the minimum wage was increased by 23%. Evidence is presented showing the sensitivity of the method to changes in the determinants of HFS. Data analysed during these three periods suggest that the method can be simplified further by using the food diversity score instead of the quantitative measure since these variables correlate highly with one another ($r \geq 0.854$).
Conclusions: This simple method is a valid and precise measure of food security among poor urban households in Caracas. The qualitative/quantitative measures complement each other as they capture different dimensions of HFS.

Keywords
Food availability
Food diversity
Hunger
Food security

Historically, the concept of food security has focused on the capacity of global and national food availability to meet the population's nutritional needs. World-wide, technological innovation has resulted in the production of sufficient food to cover the needs of a growing population. However, these positive tendencies in food production and productivity mask profound discrepancies between regions, nations, states, communities and households. At the beginning of the new millennium almost 850 million people[1], particularly in poor developing nations, suffer the consequences of chronic hunger and malnutrition on their bio-psychosocial development, productivity and quality of life.

Research has provided evidence that access to an adequate diet depends on employment and income security[2–5]. World-wide, poverty – or the lack of access to resources needed to live a productive life – has grown in magnitude and the depth of the gap between and within rich and poor nations has widened with neo-liberal economic globalisation. This economic paradigm is posited to pave the way for socio-economic growth, as scientific knowledge, technology, goods, services and people transcend national, political and economic barriers. However, results of its application in developing nations have shown that neo-liberal globalisation has benefited only a small minority of individuals who possess

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competitive capital and skills. Furthermore, in nations with unstable institutions and infrastructures, weak financial and legal mechanisms, and relatively low standards of living, a neo-liberal economy linked to the application of macro-social adjustment policies has proved disadvantageous for thousands of individuals thrown out of formal labour for lack of technical know-how or competitive skills. Therefore, the dismantling of the welfare state both in industrialised and developing nations has resulted in greater poverty, both in breadth and in depth, for the less privileged. For example, the income gap between rich and poor was 30:1 in 1960 and it was 74:1 in 1997. Consequently, the United Nations has estimated that 1.2 billion people live on less than a dollar a day[6].

During the World Food Summit held in Rome in November 1996, 187 nations agreed that: 'food security exists when all people at all times have physical and economic access to food sufficient in kinds and amounts to meet preferences and nutritional needs for a healthy active and productive life'. The countries recognised that food security implies both sufficient food availability and access to adequate foods, and that poverty reduction, social justice and sustainable food systems are essential conditions for the achievement of food security for all[7].

The national, regional and local governments of developing countries are working to resolve the problems of poverty, food insecurity and malnutrition. In a world that is more urbanised with increasing levels of development, the challenge grows as internal gaps widen, as urban employment becomes scarce, and as the possibility to access resources to meet basic needs becomes more difficult for the ever-growing poor. Evidence suggests that the association between income and household food security (HFS) is greater in the urban than in the rural sector[8].

In Venezuela, the achievement of national food security prevailed over HFS until the dismantling of subsidies in 1989–90 for the different components of the food system. Today, access to food is a national priority, especially for the underprivileged living in urban sectors that are home for 70–80% of the nation's poor. Better access to sufficient food is considered to depend on socio-economic development accompanied by increased access to employment and improvement in real income[9]. Meanwhile, the government addresses food insecurity through focused compensatory social programmes (CSPs) whose main objective is to provide the poor with a package of goods and services to help meet primary needs. Since these programmes require large financial investments from internal and external sources, representing an important proportion of the gross national product, the different government-implementing institutions should guarantee the cost-effectiveness of such programmes.

A summary of various evaluations of CSPs[10] highlights the main strengths and limitations of these programmes. Strengths include buffering of poverty, stimulating school attendance, employment generation, and a wide political and public acceptance of these programmes. The main weaknesses cited are lack of impact on the welfare level of the poor, incapacity of the programmes to reach the poorest of the poor, inefficient management, deficient targeting, the prevalence of corruption and paternalism. Additionally, some programmes do not include communication, education and evaluation strategies. Besides, the CSPs do not address the structural causes of poverty and do not establish strategies that guarantee social participation.

Most CSPs include food and direct monetary assistance to low-income households. However, the implementation of these activities was improvised and among other deficiencies lacked valid and precise measures of the prevalence and magnitude of food insecurity among households[11]. Baker and Grosh[12] estimated that 27 to 67% of the targeted population did not receive the benefits of CSPs and leakage – benefits that end up with those who do not need them – was estimated at 57 to 63%. Although no programme can achieve perfect targeting, it is possible that instruments that are simple, valid, precise, low-cost and can be applied, analysed and interpreted by community members could contribute significantly to detect and monitor food security levels of the CSPs' target population[13].

Adequate estimates of household food insecurity prevalence facilitate the study of its multiple effects on nutrition, health and human welfare. Besides, determining the relationship between food insecurity and household energy and nutrient availability is an important step towards the assessment of food insecurity risks for public health and well-being[14].

Measuring food insecurity among households: background

Researchers in the United States pioneered the development and validation of instruments to estimate household hunger and food insecurity[15–18]. The approaches include the construction of a hunger index[18], a food insecurity scale[17] and items included in national surveys[15,16].

In Argentina, Aguirre[19] documented household internal strategies to cope with hyperinflation and the impact of macroeconomic adjustment policies in 1989–94. Maxwell and co-workers[20,21] reported on survival mechanisms as indicators of food insecurity in the urban sector of Accra. In Latin America the food basket approach has been used to estimate the prevalence of food insecurity among households in Cali, Colombia[22] and in Cuba[23].

Process of developing a simple method to estimate food security among poor urban households

To our knowledge, this is the first abbreviated qualitative/quantitative method to estimate and monitor food security levels among poor urban households developed and validated in Latin America.

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The goal was to develop and validate a simple method that can estimate and monitor the food security level of poor households based on two measures: a quantitative measure that captures food sufficiency by measuring the main sources of energy and specific nutrients in the home, and a qualitative measure that estimates female-perceived changes in food intake due to constrained resources and experiences of hunger in the home.

To date, the process has included three studies in three poor urban communities in Caracas, Venezuela. The first study was undertaken in Ojo de Água Barrio in 1995, mainly to internally validate both the qualitative and quantitative measures. The second study was done in El Petróleo Barrio in 1997, to externally validate the method. Measurements were repeated in 1998 to determine whether the instruments were sensitive to an increase in minimum wage that same year, providing evidence of their usefulness for monitoring the impact of key external determinants of HFS levels. The third study, not reported in this paper, was undertaken this year in Antímano, a poor community in Caracas, serviced by a privately funded child nutrition centre (CANIA). In this third study the quantitative measure was simplified further based on results of the previous studies, so that community members themselves could apply the method and analyse and interpret the results.

Materials and methods

Methodological details regarding the pilot study, the study population, data collection procedures, data management and handling, and statistical analysis for the first study were reported previously[24]. The same methodological strategy was used in the second study but the statistical package SPSS for Windows version 8 instead of SYSTAT for Windows version 5 was used for data analysis. For comparative purposes, some data from the first study were reanalysed with the SPSS package.

In the second study, 155 households made up the sample in 1997 but because some families moved away from the community and some sample units refused to participate in the second study, this sample size was reduced to 133 in 1998. In both instances the samples were made up of poor and very poor households identified through a community census, and consisted of two or more individuals who shared food expenses.

The list-recall method[25] was used to measure the predictors of energy availability for households; that is, the number of foods that contributed at least 85% of total energy available to each family was coded as the energy predictor score for the household. The abbreviated list of core foods varied from 12 in 1995 and 1997 to 14 in 1998.

The Community Childhood Hunger Identification Project (CCHIP) Hunger Index, developed and used in the United States[18], was adapted for use as the qualitative measure of this simple method[5]. The two-point, eight-item scale, indicating perceived food insufficiency or altered food intake due to resource constraints, was modified into a four-point, 12-item scale. With the modified scale, households with zero points were considered food-secure. Twelve or fewer points reflected 'mild', 13–24 points 'moderate' and 25 points or more 'severe' food insecurity. Cronbach's alpha reliability analysis produced a coefficient of 0.92 in both communities, indicating very high and consistent reliability of the modified scale.

Results and discussion

A summary of the main sociodemographic characteristics of the study populations is presented in Table 1. Overall, the two communities present a strikingly similar profile: 32–38% of households are extremely poor, 20–23% are female-headed and almost 40% are extended households. Families have five members on average and three members depend economically on each earner in the home. Income per capita, standardised in US dollars, was

Table 1 Sociodemographic profile of study samples

Characteristics	Ojo de Água, 1995 ($n = 238$)	El Petróleo	
		1997 ($n = 155$)	1998 ($n = 133$)
Poverty level*			
Poor	68.5	63.0	62.0
Very poor	31.5	37.0	38.0
Gender of head of household			
Male	80.3	77.0	77.0
Female	19.7	23.0	23.0
Household type			
Nuclear	64.0	62.0	62.0
Extended	36.0	38.0	38.0
Household size	5.3 ± 2.3	5.4 ± 2.9	5.3 ± 2.3
Dependency ratio	2.9 ± 1.6	3.6 ± 1.8	3.7 ± 1.8
Income per person (US$)	62.30	68.91	75.0
Total income spent on food (%)	60.0	53.0	55.0

* Graffar method, modified.

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Table 2 Food predictors of household energy availability* (kcal person^{-1} day^{-1})

Food	Ojo de Água, 1995	El Petróleo 1997	El Petróleo 1998
1. Pre-cooked corn flour	364	1. 367	1. 353
2. White rice	256	2. 247	3. 242
3. Vegetable oil	239	3. 243	4. 228
4. Refined sugar	201	5. 225	5. 211
5. Wheat pasta	161	4. 235	2. 257
6. Powdered whole milk	79	8. 104	6. 111
7. White wheat bread	77	6. 104	7. 95
8. Black beans	64	7. 95	8. 60
9. Margarine	56	10. 61	9. 53
10. White cheese, hard	44	11. 44	10. 52
11. Mayonnaise	43	9. 43	11. 48
12. Chicken	37	12. 33	12. 44
13. Wheat flour			13. 40
14. Lentils			14. 30
15. Butter			

* List of foods that provide 85% or more of energy.

lowest in 1995, and increased from $62 to $69 per capita in 1997. However, a rise in the minimum wage in 1998 increased income by an average of 23% that year. Income spent on food decreased from 60% in 1995 to 53% in 1997, but increased slightly to 55% of total household income in 1998. This sociodemographic profile is similar to that reported by Rogers in the Dominican Republic[26] after a similar period of macroeconomic adjustment.

The food predictors of energy availability for 1995, 1997 and 1998 are shown in Table 2. Note that 11 foods did not vary in kind from one community to the other or from one period to the next. These then can be considered strategic foods because changes in supply or prices of these products may affect food security among poor and very poor urban households. These foods not only contribute around 80% of total energy but also a considerable proportion of proteins, lipids, vitamin A, calcium and iron to the diet of these households (Table 3).

The most-to-least common indications of food insecurity for the households in Barrio El Petróleo for 1997 and 1998 are shown in Table 4. Results are almost identical those reported in Barrio Ojo de Água in 1995[5]. Overall, lack of food money was the most common intra-household indicator of food insecurity. The preceding

Table 3 Energy and specific nutrients provided by food predictors of energy availability (% of total)

Nutrient	Ojo de Água, 1995	El Petróleo 1997	El Petróleo 1998
Energy (kcal)	80.52	80.96	82.39
Protein (g)	64.12	63.04	66.65
Lipid (g)	84.97	68.48	80.61
Vitamin A (RE)	46.15	49.65	39.31
Vitamin C (mg)	5.80	7.33	6.02
Calcium (mg)	66.56	69.69	52.19
Iron (mg)	62.64	64.47	65.02

RE – retinol equivalents.

Table 4 Percentage of positive responses to items in perceived food security scale; El Petróleo, 1997 and 1998

Item	1997 Poor	1997 Very poor	1998 Poor	1998 Very poor
Lack of food money	57	67	54	54
Buys less indispensable food for children	22	40	29	38
Anyone eats less than desired for lack of money	21	34	17	32
Reduces usual number of home meals for lack of money	17	36	16	32
Adults reduce number of usual meals for lack of money	13	31	14	28
Adults eat less at main meal for lack of food	13	30	17	24
Adults complain of hunger for lack of food	9	26	7	14
Adults go to bed hungry for lack of food	5	15	7	14
Child reduces usual number of meals for lack of money	2	16	5	14
Child eats less at main meal for lack of food	2	8	1	10
Child complains of hunger for lack of food	2	4	2	10
Child goes to bed hungry for lack of food	1	5	1	8

items reflect in-home adjustments to cope with constrained resources. Noteworthy is that adults appear to protect children's food security, a pattern reported not only in these studies but also with the use of the CCHIPS scale among hungry households in the United States[27]. Consistently, and similar to results in the 1995 study[24], a higher percentage of very poor compared with poor households reported adjustment strategies to household food insufficiency and hunger experiences among adults or children. Data suggest that children going hungry at home reflect the family's incapacity to cope with food insufficiency and thus the severity of the household's food insecurity.

Table 5 reports food security by social class, for the two communities studied. It should be noted that food security appeared to improve in 1997 compared with 1995, and

Table 5 Perceived food security level (%) by social class in Ojo de Água and El Petróleo Barrios

	Poor	Very poor	Total
Ojo de Água, 1995			
Secure	28	11	22
Insecure	72	89	78
Total	100	100	100

	Poor		Very poor		Total	
	1997	1998	1997	1998	1997	1998
El Petróleo, 1997 and 1998						
Secure	41	41	28	34	36	38
Insecure	59	59	72	66	64	62
Total	100	100	100	100	100	100

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Table 6 Regression models: predictors of energy availability

Variable	Standardised β	t	P-value
Ojo de Água, 1995*			
Constant		13.193	0.000
Perceived HFS score	−0.298	−5.025	0.000
Food cost per month	0.286	4.905	0.000
Female education	0.134	2.306	0.022
El Petróleo, 1997†			
Constant		10.036	0.000
Perceived HFS score	−0.393	−5.635	0.000
Food cost per month	0.306	4.473	0.000
Female education	0.164	2.438	0.016
El Petróleo, 1998‡			
Constant		12.512	0.000
Perceived HFS score	−0.322	−4.179	0.000
Food cost per month	0.320	4.261	0.000
Female education	0.184	2.437	0.016

* $F = 27.315$; adjusted $R^2 = 25.9\%$; $P = 0.000$.
† $F = 27.915$; adjusted $R^2 = 34.4\%$; $P = 0.000$.
‡ $F = 18.779$; adjusted $R^2 = 28.8\%$; $P = 0.000$.

especially for the very poor in 1998. This latter result was unexpected, since more poor compared with very poor earners work in the formal labour economy, and the minimum wage increased by 23% in 1998. Nonetheless, small- and medium-scale industry laid off workers, increasing the unemployment rate in the formal sector. On the other hand, increased wages improved the buying capacity of an important segment of the population, which may have increased the demand for goods and services offered by those in the informal sector, mainly the very poor. These results suggest that the perceived food insecurity scale is sensitive to changes in food security level among the underprivileged.

To test for accuracy and overall validity of the HFS measures proposed in these studies, multivariate step-wise regression analysis was applied relating these measures to the social, economic and demographic factors that the literature suggests are associated with the phenomena being measured. Table 6 reports the variables that explain variation in the predictors of energy availability score for households studied in the two communities. The most important predictor was perceived food security score, providing evidence for a link between the quantitative measure and the qualitative measure. Food cost per month and female education were the other determinants that consistently emerged in the analysis. The evidence provides support for the external validity of the measure. Likewise, predictors of energy availability score were the strongest determinants of perceived food security level in both communities, whereas income or food cost per month, social class and household size were other significant determinants (Table 7).

A significant finding in these studies was the high correlation between predictors of energy availability score and food diversity score (Table 8). The latter is a count of all kinds of food available to the home for a period of one week. Besides, the determinants of food diversity score are very similar to those of predictors of energy availability score: namely, perceived food security level, food cost per month and female education (Table 9). This provides evidence that the food diversity score can be used instead of predictors of energy availability score, thus further simplifying the abbreviated method proposed in these studies. This facilitates application of the method by non-specialists, i.e. community members themselves, making it a useful instrument for the surveillance of food security at the local level.

Conclusions and recommendations

Taken together, all of the above provide evidence for the internal and external validity of the abbreviated qualitative/quantitative method for assessing HFS level among

Table 7 Regression models: perceived household food insecurity score

Variable	Standardised β	t	P-value
Ojo de Água, 1995*			
Constant		0.273	0.785
Predictors of energy availability score	−0.282	−4.555	0.000
Monthly income per person	−0.244	4.025	0.000
Social class score†	0.140	2.267	0.024
El Petróleo, 1997‡			
Constant		9.907	0.000
Predictors of energy availability score	−0.442	−6.106	0.000
Monthly income per person	−0.182	2.513	0.013
El Petróleo, 1998§			
Constant		5.776	0.000
Food diversity score	−0.356	−4.125	0.000
Household size	0.469	4.835	0.000
Food cost per month	−0.314	−2.843	0.005

* $F = 18.779$; adjusted $R^2 = 28.8\%$; $P = 0.000$.
† The higher the score, the poorer the household.
‡ $F = 28.809$; adjusted $R^2 = 26.7\%$; $P = 0.000$.
§ $F = 20.138$; adjusted $R^2 = 30.3\%$; $P = 0.000$.

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Table 8 Correlation coefficients: food predictors of energy availability score and food diversity score

	Correlation coefficient	*P*-value
Ojo de Água, 1995	0.854	0.000
El Petróleo, 1997	0.818	0.000
El Petróleo, 1998	0.795	0.000

poor urban households. Furthermore, the quantitative measure complements the qualitative measure because they capture different dimensions of HFS. These measures provide different inputs for programme and policy planning and implementation. The positive responses to the perceived food insecurity scale items reflect household coping mechanisms to constrained resources. Data suggest that, within the home, adults tend to protect children's food security by sacrificing their own intake. Additional studies should be undertaken to establish who among the adults are the most vulnerable within the home.

Evidence is provided for the stability in time of the food predictors of energy availability in the home and these foods provide important amounts of other nutrients, namely, proteins, lipids, vitamin A or derivatives, iron and calcium. Thus, these may be considered strategic foods, because changes in their availability or prices may affect the poor's access to them and thus may compromise their food security. These, then, are foods that should be protected within the nation's food policy, or that should be considered in food subsidy programmes for the less privileged. They are foods that are candidate vehicles for fortification with micronutrients found to be deficient in the food supply.

In the process of developing abbreviated methods to assess food security among the poor, these studies provide evidence that the above method can further be simplified. A consistent correlation between food predictors of energy availability and food diversity score suggests that the latter can be used instead of the former. This considerably simplifies data gathering, analysis and interpretation of the quantitative measure, and thus makes it a useful tool for community surveillance and evaluation. Compared with traditional methods of assessing food availability and intake, it facilitates provision of timely information to decision-makers.

Table 9 Regression model: food diversity score; El Petróleo, 1998

Variable	Standardised β	*t*	*P*-value
Constant		5.776	0.000
Food diversity score	−0.356	−4.125	0.000
Household size	0.469	4.835	0.000
Food cost per month	−0.314	−2.843	0.005

$F = 20.138$; adjusted $R^2 = 30.3\%$; $P = 0.000$.

To adjust the method further to the distinct realities of communities in Venezuela, a study that will include all regions in the country is to be undertaken starting this year. Likewise, the applicability of the method to rural communities will be explored, and research within the realm of food and nutrition anthropology is being planned for the purpose of comprehending the multiple dimensions of food insecurity within the different food and nutritional scenarios in which people live.

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