

## Indicators and Nutritional Outcomes of Household Food Insecurity among a Sample of Rural Malaysian Women

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**Abstract:** The objectives of this study were to determine the indicators and nutritional outcomes of household food insecurity among a sample of poor rural communities in Malaysia. The Radimer/Cornell Hunger and Food Insecurity Instrument was utilized to categorize food secure and insecure households. Demographic, socioeconomic, coping strategies and anthropometric information were collected through in-depth interviews with Malay and Indian women (n=200). More than 50% of the households experienced some degree of food insecurity. In general, the food insecure households were characterized as living below poverty line and had larger household size, more children, school-going children and non-working mothers. For both households, major expenditures were on foods, utilities, child education, loans and transportation with food insecure households spending higher proportion of their incomes (97%) compared to food secure households (84%). While more than 50% of food insecure women were overweight (26%) and obese (30%), the percentages of overweight and obese among food secure women were 30 and 9%, respectively. Similarly, more food insecure women (40%) had at-risk waist circumference ( $\geq 88$ cm) than food secure women (29%). Overweight and abdominal adiposity among the women were associated with a number of independent variables such as women as housewives, women with more children, larger household size and food insecurity. However, after adjusting for factors that are related to body mass index and waist circumference, only food insecurity remained as a significant risk factor for overweight and at-risk waist circumference. Although more validity tests are required, the findings demonstrated that the Radimer/Cornell Hunger and Food Insecurity Instrument has some validity to be utilized in Malaysian population. Given that obesity is an emerging public health concern in the developing nations, the findings that food insecurity is a risk factor for overweight must be further investigated.

**Key words:** Household food insecurity, food insecure women, obesity

### Introduction

In 2000, the overall incidence of poverty in both rural and urban areas of Malaysia was 3.8 and 13.2%, respectively (EPU, 2001). Poverty may contribute to the inability of some households or certain members within the households to have access to enough food to meet their basic requirements. This phenomenon referred to as food insecurity, has been shown to affect the health and nutritional status of individuals, particularly women, children and elderly (Adams *et al.*, 2003; Kaiser *et al.*, 2002; Alaimo *et al.*, 2001; Lee and Frongillo, 2001). While food insecurity has direct effects on nutritional status, its effects on general health and the overall quality of life can either be direct or indirect through nutritional status (Campbell, 1991).

The Radimer/Cornell Hunger and Food Insecurity instrument identifies food insecurity experienced at household, individual and child levels and maintains that food insecurity is a managed process (Radimer *et al.*, 1990). The household makes necessary adjustments to address food insecurity with the children being spared until food insecurity becomes most severe. Several local studies have shown that the

instrument is applicable as a direct assessment of food insecurity among poor communities in Malaysia (Zalilah and Tham, 2002; Zalilah and Ang, 2001; Zalilah, 1998). Thus, the objectives of this paper are to assess food insecurity among low-income rural communities using the Radimer/Cornell Hunger and Food Insecurity instrument and to determine the possible contributory factors and nutritional outcomes of food insecurity among the women in these communities.

### Materials and Methods

**Location:** The district of Sabak Bernam in the state of Selangor was purposively chosen for its high percentage of poor rural households. According to the Ministry of Rural development of Malaysia, the district had 1150 households or 62% of the total welfare recipients in Selangor in the year 2000. The rural population of Sabak Bernam can be found in 12 villages and two palm oil plantations with majority were Malay. Based on the information from the District Office, seven (7) of the largest villages in terms of population size and both plantations were purposively selected for the study.

**Subjects:** There were a total of 840 households in the 7 villages and 2 plantations. As this study was part of a larger research, based on these criteria, a total of 200 households were identified with Malay and Indian households comprising of 140 and 60 respectively:

The households have at least a child aged between 1-6 years and the mother (non-pregnant) aged above 20 years. In households with more than one child aged 1-6 years, the youngest of the children was selected for the child-mother pair.

The households are divided into two groups - mother was overweight (BMI  $\geq 25$  kg/m<sup>2</sup>) / child was underweight (WAZ  $< -1$  SD) and mother was normal (BMI 18.5 - 24.9 kg/m<sup>2</sup>) / child was normal (WAZ  $-1 \leq x \leq 2$  SD).

**Instruments and variables:** Enumerators made several house visits to collect all the pertinent research information from each household over a period of one year. During the visits, mothers were interviewed on demographic and socioeconomic of the households and were asked on household food inventory and dietary intake. Weight, height, waist and hip measurements were conducted by trained research assistants using SECA digital scale, SECA body meter and non-stretchable fiber measuring tape, respectively. The Radimer/Cornell Hunger and Food Insecurity instrument was utilized whereby the ten items reflect four levels of food insecurity with increasing severity - food secure, household food insecure, individual or adult food insecure and child hunger. The instrument was administered to the mothers in the absence of the household heads (spouses, parents or in-laws) as based on our previous experiences, mothers were quite hesitant to respond to the items if the household heads were present.

**Statistical Analysis:** The first step in the statistical analysis was to compare the food secure and food insecure households on demographic, socioeconomic, expenditure and anthropometric variables. Chi-square analysis and T-tests were utilized for categorical and continuous variables, respectively. Logistic regressions were utilized to determine the factors contributing to household food insecurity and nutritional outcomes of food insecurity. An OR greater than 1 indicates that the variable is a risk factor while an OR of less than 1 has a protective measure.

## Results and Discussion

In this sample of rural households (n=200), 42% reported to be food secure, 14% household food insecure, 9.5% individual food insecure and 34.5% child hunger. Previous studies with urban low-income households indicated that the prevalence of overall food insecurity was higher (66.6 and 65.7%) than 58% reported in these rural low-income communities (Zalilah

and Ang, 2001; Zalilah, 1998). These differences could be due to two possible explanations. First, despite the fixed incomes of the urban households, the higher standard of living and the frequent unexpected food and non-food expenses may put the urban households at more risk of experiencing food insecurity. Even though the rural households in general have variable or non-fixed incomes, they may be protected against food insecurity because of the lower standard of living, less unexpected food and non-food expenses and the ability to depend on non-market food items (e.g. home-grown vegetables and fruits, home-reared poultry or cattle and fish from lakes, rivers or sea). It has been suggested that recent economic changes (which may stress household budgets) instead of income-based indicators should be considered in the analysis of food insecurity as the former may contribute to temporary bouts of food insecurity (Rose, 1999). Second, the rural and urban households may have different cultural perception on food sufficiency or security. While eggs or salted fish are sufficient as the main dish for a meal among the rural households, these foods may be perceived as insufficient for a meal by the urban dwellers. Thus, given the same amount and types of foods, it is more likely for the urban low-income households to report food insecurity compared to the rural low-income households.

In general, the food insecure households were characterized by households living below poverty line and had larger household size, more children, school-going children and non-working. Baer and Madrigal (1993) reported that even when household income was controlled, larger household size is associated with food insufficiency as the foods available in the households had to be shared with many household members. Home ownership and household savings have also been found to provide some protection against food insecurity (Olson *et al.*, 1997; Rose *et al.*, 1995). In this study, significantly more of food secure (94%) than food insecure (80%) households had savings which may help to lessen the financial burden of households during events that stress household budgets.

There was no difference in education level among food secure and food insecure women, however, there were more non-working women (76%) in the food insecure than food secure (48%) households. Education and income generation and control of women have been reported to be the key variables in a woman's control over household resources and decision making power and consequently in child health and survival (Piwoz and Viteri, 1985). In the present study, the combination of working experience (socialization with other people) and ability to generate and control financial resources in the households may allow the women to provide enough food for family members, manage income and food resources efficiently and be innovative in coping with

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household income or food insufficiency.

The food insecure households had significantly more expenditures (90%) than food secure households (76%) (Table 1). Many of the food insecure households had their total expenditures exceeded the monthly incomes. This was made possible as they would use their savings, borrow money from others or there is a system whereby they could take the food or non-food items from the grocery shops and pay at the end of the month or later. For both households, the major expenditures were on foods, utilities, child education, loans and transportation with food insecure households spent a higher proportion of their incomes (97%) on these items compared to food secure households (84%). Lino (1996) reported that nearly 70% of total expenditures of poor households with children were on housing (shelter - rent, maintenance and repairs, mortgage interest, property tax and home insurance; and utilities - gas, electricity, fuel, telephone and water) and food compared with 42% for non-poor households. Similarly, our findings indicated that with larger household size and more children, the food insecure households had approximately 80 - 90% of total expenditures on housing (utilities and to some extent loan) and food compared to 60 - 70% among the food secure households.

Table 1 also indicates that more than 50% of food insecure women were overweight (26%) and obese (30%), while for the food secure women, the percentages of overweight and obese were 30% and 9%, respectively. Our findings that more food insecure women were overweight and obese were similar to findings reported elsewhere (Adams *et al.*, 2003; Olson, 1999). When the prevalence of overweight and obesity were tabulated according to the levels of food insecurity, the percentage of obesity was lowest among food secure women - food secure (overweight - 29.8%; obesity - 9.5%); household food insecure (overweight -35.7%; obesity - 21.4%); individual food insecure (overweight - 15.8%; obesity - 42.1%); child hunger (overweight - 24.6%; obesity - 30.4%). Similarly, approximately 40% of food insecure women (household food insecure-28.6%; individual food insecure-36.8%; child hunger-39.1%) had at-risk waist circumference ( $\geq$  88cm) than food secure women (28.6%), however, the percentages with high waist-hip-ratio ( $>0.85$ ) did not differ significantly between the two types of households (26.2% vs.25.9%).

Overweight and abdominal adiposity are associated with a number of independent variables: women as housewives (OR=2.27, CI=1.26-4.12), more children (OR=1.24, CI=1.04-1.47), larger household size (OR=1.18, CI=1.01-1.39) and food insecurity (OR=1.97, CI=1.11-3.49) were significant risk factors for overweight while only food insecurity (OR=1.94, CI=1.03-3.67) and more children (OR=1.20, CI=1.01-1.44) were associated with at-risk waist circumference (Table 2). Even after

adjusting for factors that are related to body mass index and waist circumference, food insecurity remained as a significant risk factor for overweight (OR=1.4, CI=1.11-3.06) and at-risk waist circumference (OR=1.27, 1.15). The association between food insecurity and obesity remains unclear. In food rich countries, food insecurity is associated with overweight, obesity and disordered eating behaviors among women (Kendall *et al.*, 1996; Townsend *et al.*, 2001). In many less developing countries, food insecurity has been shown to contribute to inadequate food intakes, nutrient deficiencies (e.g. iron and zinc) and poor reproductive health in women. For example, food insecurity was reported to be associated with underweight but not obesity among men and women in north central Trinidad (Gulliford *et al.*, 2003). However, in recent years, these countries which are also undergoing rapid socio-economic development and consequently nutrition transition, have also been burdened with both under and over-nutrition phenomena in the same households (e.g. undernourished children and overweight adults) (Gillispie and Haddad, 2001; Doak *et al.*, 2000).

Several explanations have been put forward to elucidate this complex interaction of food insecurity and obesity. Several studies have shown that the diets of women reporting household food insecurity or food insufficiency were not only inadequate in nutrient and food variety but also in calorie (Tarasuk and Beaton, 1999; Dixon *et al.*, 2001). If so, then the lower calorie intake and the overall poor diet quality actually contradict the association between food insecurity and obesity. Basiotis and Lino (2002) reported that although women in food insufficient households had a worse diet quality (e.g. lower vegetable, fruit and milk but higher cholesterol intakes and lack food variety), they had higher (but not statistically significant) caloric intake than women from food sufficient households. In another study, Townsend *et al.* (2001) reported that food insecurity was significantly associated with total energy intake but not with dietary fat or saturated fat. In general, the energy and nutrient intakes were higher (but not statistically significant) among the food insecure than food secure women in the present study (2003, unpublished data).

It has also been hypothesized that women may be deprived of food during bouts of food insecurity or insufficiency but they may engage in bingeing behaviors during short-term food availability. Thus, the frequent episodes of binge eating and food restraint may put the women at risk of being overweight and obese (Dietz, 1995). Townsend *et al.* (2001) suggested that the higher prevalence of overweight among moderately food insecure women who received food stamps compared to that of food stamp recipients who were mildly food insecure and food secure could be due to overeating by the food insecure households when food stamps or money for food is available and then followed by a short

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Table 1: Demographic, socioeconomic and nutritional characteristics of food secure and food insecure households

Characteristics	Food Secure (n = 84)	Food Insecure (n = 116)	p value
	N (%) Mean (SD)	N (%) Mean (SD)	
Household size	5.0 (1.6)	5.8 (1.9)	< 0.01
Number of children	2.8 (1.4)	3.6 (1.8)	< 0.001
Number of schooling children	1.2 (1.2)	2.2 (1.6)	< 0.01
Years of schooling (father)	7.5 (2.6)	6.4 (2.3)	< 0.01
Years of schooling (mother)	7.5 (2.6)	7.1 (2.5)	ns
Father's income (RM)	618.8 (391.6)	464.8 (271.1)	< 0.001
Mother's income (RM)	254.6 (373.5)	103.7 (215.4)	< 0.001
Household income (RM)	954.2 (665.4)	644.0 (440.2)	< 0.001
Income per capita (RM)	202.7 (139.3)	120.3 (94.5)	< 0.001
< 55.4 a	1 (1.2)	9 (7.8)	< 0.001
55.4 - 110.87 b	18 (21.4)	60 (51.7)	
> 110.87	65 (77.4)	47 (40.5)	
Employment status (father)			
Employed	58 (69.9)	78 (67.2)	ns
Own Account Worker	25 (30.1)	38 (32.8)	
Employment status (mother)			
Employed	44 (52.4)	28 (24.1)	< 0.001
Housewife	40 (47.6)	88 (75.9)	
Savings	79 (94.0)	93 (80.2)	< 0.01
Own land	18 (21.4)	15 (12.9)	ns
Total expenditure (RM)	669.2 (447.8)	537.3 (259.6)	< 0.01
Total expenditure (% income)	76 (26.2)	90 (33.9)	< 0.001
Body Mass Index (kg/m <sup>2</sup> )			
<18.5	3 (3.6)	4 (3.4)	< 0.01
18.5-24.9	48 (57.1)	47 (40.5)	
25.0-29.9	25 (29.8)	30 (25.9)	
≥ 30	8 (9.5)	43 (30.2)	
Waist circumference (cm)			
< 88 cm	60 (71.4)	69 (59.5)	< 0.05
≥ 88 cm	24 (28.6)	47 (40.5)	
Waist-hip ratio			
≤ 0.85	62 (73.8)	86 (74.1)	ns
> 0.85	22 (26.2)	30 (25.9)	

a: hard core poor; b: poor. USD1 = RM3.8

period of involuntary food restriction. This continuous cycle of temporary food abundance and food restriction could result in a gradual weight gain over time. There are several limitations to the study that may affect the research findings. First, although we have controlled various demographic, socioeconomic and dietary variables so as not to confound the association between food insecurity and obesity, there may be other potential confounders which are not considered in the analyses or measured in this study e.g. physical activity level. However, our findings indicate that many of the food insecure women were housewives and they had more children compared to women from food secure households. Whether the combination of higher energy intake and lower physical activity level (less time to exercise due to child care) is associated with being a

housewife and thus contributes to overweight requires further examination. Second, the sample analyzed in this study was selected based on criteria set for a larger research on dual-malnutrition in the same households. Thus, the pre-defined criteria (overweight mother-underweight child vs. normal weight mother-normal weight child) may introduce bias (e.g. non-representative) to the present findings on food insecurity and obesity. Third, the study employed a cross-sectional design which did not capture the seasonality effects (e.g. rainy season may affect the fish catch or the price of rubber) on household food consumption and consequently food insecurity. This could contribute to the no difference in energy and nutrient intakes between the two groups (2003, unpublished data). Finally, although the Radimer/Cornell Hunger and Food Insecurity has

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Table 2: Crude and adjusted odds ratio (OR) and 95% confidence interval (CI) for at risk waist circumference ( $\geq 88$  cm) and overweight ( $\geq 25$  kg/m<sup>2</sup>) among rural women by food security status (n=200)

Variables	Overweight status		Waist circumference status	
	Crude OR (CI)	Adjusted <sup>1</sup> OR (CI)	Crude OR (CI)	Adjusted <sup>1</sup> OR (CI)
Ethnicity (reference - Malay)	0.66 (0.36-1.21)	1.26 (0.55-2.92)	0.60 (0.30-1.20)	0.59 (0.23-1.48)
Age (women)	1.02 (0.98-1.06)	1.01 (0.96-1.05)	0.99 (0.95-1.03)	0.97 (0.93-1.02)
Years of schooling (women)	1.07 (0.96-1.20)	1.09 (0.95-1.25)	1.07 (0.95-1.20)	1.08 (0.94-1.26)
Employment status (women) (reference - working)	2.27** (1.26-4.12)	2.13 (0.96-4.24)	1.69 (0.88-3.26)	1.00 (0.42-2.38)
Number of children	1.24* (1.04-1.47)	1.12 (0.93-1.21)	1.20* (1.01-1.44)	1.15 (0.86-1.27)
Household size	1.18* (1.01-1.39)	1.33 (0.98-1.79)	1.14 (0.97-1.34)	1.06 (0.78-1.45)
Household income	0.99 (0.97-1.01)	0.99 (0.98-1.00)	1.00 (0.99-1.00)	1.00 (0.99-1.00)
Income per capita	0.97 (0.96-1.00)	0.98 (0.97-1.01)	0.99 (0.98-1.01)	0.99 (0.99-1.00)
Food security (reference-food secure)	1.97* (1.19-3.49)	1.40* (1.11-3.06)	1.94* (1.03-3.67)	1.27* (1.15-1.57)
Kcal intake	0.99 (0.97-1.0)	0.98 (0.97-1.01)	1.00 (0.99-1.00)	0.99 (0.99-1.00)

\* P<0.05; \*\* P<0.01. <sup>1</sup>Variables included in the adjusted models were ethnicity, household income, household size, income per capita, number of children, age of women, years of schooling of women, employment status of women, food security status and energy intake

been used in previous research with urban low-income households or pre-tested with rural women in Malaysia, there may still be inter-individual variation in the interpretation of the items which could lead to under- or over-reporting of food insecurity.

**Applications:** The paradox of food insecurity, poverty and obesity certainly requires further clarification. However, the results of this study should at least contribute to the awareness among nutritionists that the nutritional outcomes (over-nutrition) of food insecurity among women in the developed countries seem to be replicated in less developing countries which are going through rapid demographic, socioeconomic and nutritional transitions.

Given that obesity and dual forms of malnutrition in the same household are emerging public health concerns in the less developing nations, especially among the poor households, the findings that food insecurity is a risk factor for overweight and obesity must be further investigated. In addition, more studies are needed to clarify whether restricted access to healthy food choices or poor diet quality and sedentary lifestyle are implicated in the association between food insecurity and obesity.

**Acknowledgements**

This research was supported by funds from Japan Ministry of Education and Welfare and Universiti Putra Malaysia.

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