IFPRI
FCND DP No. 94

FCND DISCUSSION PAPER NO. 94

TARGETING URBAN MALNUTRITION: A MULTICITY ANALYSIS OF THE SPATIAL DISTRIBUTION OF CHILDHOOD NUTRITIONAL STATUS

Saul Sutkover Morris

Food Consumption and Nutrition Division

International Food Policy Research Institute
2033 K Street, N.W.
Washington, D.C. 20006 U.S.A.
(202) 862–5600
Fax: (202) 467–4439

September 2000

ABSTRACT

This paper assesses the degree to which childhood malnutrition and its contributing factors are clustered by neighborhood in seven different cities in Africa, Asia, and Latin America. The analysis is based on data from eight different national household surveys that used a two-stage sampling design (households within clusters). Spatial clustering was assessed using the intracluster correlation coefficient (r), which may be interpreted as the proportion of the total variance in a variable that is associated with the cluster to which it belongs. In general, per capita expenditures and the share of the household budget spent on food showed a high level of spatial clustering across the seven cities, but the magnitude of this clustering varied markedly from city to city. Spatial clustering in the provision of basic services also varied greatly. There was consistently little evidence of spatial clustering of infectious disease, childhood mortality, or the weight-based nutrition indicators. Age-standardized height, on the other hand, showed slightly more spatial clustering, with a median intracluster correlation of $r = 0.12$. Some cities showed relatively higher levels of spatial clustering on several measures of deprivation simultaneously, while other cities showed consistently lower levels of clustering. Many nutrition interventions are intrinsically geographically targeted. While geographical targeting tends to be administratively simpler than individual targeting and can be politically convenient, the current analysis suggests that where nutrition interventions are focused on stunting (low height-for-age), targeting by

neighborhood may often lead to unacceptably high rates of undercoverage and leakage of benefits to the nonneedy.

CONTENTS

TABLES

ACKNOWLEDGMENTS

Many thanks to Bynyak Sen of the Bangladesh Bureau of Statistics for facilitating access to the Bangladesh Household Expenditure Survey; to the Development Economics Research Group at the World Bank for access to the Living Standards Measurement Surveys; to Prem Sangraula at the International Food Policy Research Institute (IFPRI) for assistance in the analysis of the Nepal Living Standards Survey; and to James Garrett and Marie Ruel at IFPRI for comments on an earlier draft of this manuscript.

Saul Sutkover Morris
International Food Policy Research Institute

1. INTRODUCTION

In many developing countries, the number of malnourished children in urban areas is increasing, both in absolute numbers and as a proportion of all malnourished children (Haddad, Ruel, and Garrett 2000). In order to stem the growth of urban malnutrition, effective interventions are needed that reach those at greatest risk. Current strategies to reach these individuals appear to have been strongly influenced by the prevalent view that

> Urban poverty is primarily concentrated in squatter settlements and slum areas…with overcrowding and substandard housing, lack of potable water, uncollected garbage, a high incidence of child mortality and infectious diseases, and malnutrition all being the norm. (UNICEF 1994, 2).

This statement implies that urban neighborhoods are highly differentiated with respect to manifestations of social deprivation, but that within neighborhoods, conditions are largely homogeneous. Empirical support for this claim, however, is surprisingly limited. In an examination of survey data from Abidjan and Accra (Morris et al. 2000), we found that in Abidjan, garbage collection and access to potable water were indeed unequally distributed across neighborhoods, but that nutritional status was highly heterogeneous within neighborhoods, showing no "clustering" in particular areas. In Accra, nutritional status was also heterogeneous within neighborhoods, as were many other variables such as household income (the proxy measure for which was total expenditures), drinking water source, and education of the household head.

If nutritional status is not clustered by neighborhood, then nutrition-focused interventions that are geographically defined will lead to serious undercoverage of those at risk, as well as to provision of program benefits to the nonneedy. This conclusion applies equally to community-based nutrition projects, such as have been described in Bangladesh, Ecuador, Haiti, and Kenya (UNICEF 1994), to physical upgrading programs (Habitat 1996), and to local economic development initiatives, such as have been described in Lima, Peru (Zaaijer and Sara 1993). In this paper, therefore, we attempt to determine the degree to which malnutrition, poverty, overcrowding, substandard housing, lack of potable water, child mortality, and infectious diseases are clustered by neighborhood in seven different cities in Africa, Asia, and Latin America. In each case, our analysis is based on publicly available, large-sample, representative household survey data.

2. DATA SOURCES

This analysis uses data from eight different nationally representative surveys, all in the public domain. All the surveys used two-stage random sampling, with or without initial stratification by subnational region or type of locality. In each case, the primary sampling unit was a geographical *cluster*, usually based on administrative subdivisions such as census tracts; the ultimate sampling unit was the dwelling or the household. In the following paragraphs, each survey is described in turn.

The *Peru Living Standards Measurement Survey, 1994* covered diverse aspects of household welfare, including the nutritional status of young children. The country was first divided into seven geographic regions (including Metropolitan Lima), then within each region clusters of 100 households were selected, and within each selected cluster, a fixed number of dwellings was chosen at random. The present analysis uses only data from households in Metropolitan Lima. Further information can be obtained from the Living Standards Measurement Surveys Website: www.worldbank.org/lsms/.

The *Panama Living Standards Survey, 1997* also covered diverse aspects of household welfare, including the nutritional status of young children. The country was first divided into 20 quasigeographic strata (including "indigenous areas," and "areas of difficult access"). In the urban areas, clusters consisting of two or more adjacent census tracts were selected with probability proportional to size, and within each selected cluster a fixed number of dwellings was selected at random, without replacement. The present analysis uses only data from households located in Panama City (including San Miguelito). Further information can be obtained from the Living Standards Measurement Surveys Website (see above).

The *Tanzania Human Resource Development Survey, 1993–4,* a nationally representative survey of 5,000 households in Tanzania, was principally intended to investigate households' use of and expenditures on social services, but included modules on household composition, household characteristics (including the educational levels of household members), and expenditures. The survey was a joint effort undertaken by the Department of Economics of the University of Dar es Salaam, the Government of Tanzania, and the World Bank, and was funded by the World Bank, the Government of Japan, and the British Overseas Development Agency. Nutritional data were not collected. The sample used all 222 clusters of the National Master Sample maintained by the Tanzanian Bureau of Statistics, and within each cluster, 20–25 randomly selected households were targeted for interview. The present analysis uses only data from households located in Dar es Salaam. Further information can be obtained from the Living Standards Measurement Surveys Website (see above).

The *Tanzania Demographic and Health Survey, 1996* was designed to provide data that would allow the calculation of demographic rates and to collect reliable data on diseases and nutritional status of children under five. Information on household characteristics, including the educational levels of each household member, was also collected. First local government wards or branches were selected, then enumeration areas within these wards or branches. Finally, households were selected from a household listing on the basis of contiguity, beginning with a random number. The present analysis uses only data from households located in enumeration areas in urban segments of the Dar es Salaam region. The sample design and major findings from the survey have been published by the Tanzanian Bureau of Statistics and Macro International Inc. (1997), and documentation and the data are available from the Demographic and Health Surveys Website at www.macroint.com/dhs/.

The *South Africa Integrated Household Survey, 1993-4* covered diverse aspects of household welfare, including the nutritional status of young children. The clusters were, in most cases, Census Enumerated Sub-Districts, but where these were “relatively large” they were divided into blocks of approximately equal population size using aerial photographs. The clusters were selected by systematic sampling with probability proportional to size, and within each selected cluster a systematic sample of “stands” was selected with a fixed sampling fraction. Two sets of data were used in the present analysis: those clusters located within the borders of the Johannesburg Metropolitan Area, and those in the Cape Metropolitan Area. Further information can be obtained from the Living Standards Measurement Surveys Website (see above).

The *Nepal Living Standards Living Survey, 1997* covered diverse aspects of household welfare, including the nutritional status of young children. The country was first divided into four strata based on ecological zones and, in most cases, wards were selected as the primary sampling units using probability proportional to size. In urban areas, larger wards were first split into sub-wards of equal sizes. With the exception of the Far-Western Development Region, 12 households were selected for interview from each of the survey cluster, using systematic random sampling with replacement. The present analysis uses only data from the urban area of the Kathmandu valley. Further information can be obtained from the Living Standards Measurement Surveys Website (see above).

The *Bangladesh Household Expenditure Survey, 1995–6* was principally intended to characterize poverty in Bangladesh, and included information on expenditures, household characteristics (including the educational levels of household members), and community characteristics. Nutritional data were not collected. Primary Sampling Units, consisting of two or more contiguous census enumeration areas with a combined population of approximately 250 households, were selected using probability proportional to size from a nationally representative sampling frame based on the 1991 population census. Twenty households were then selected from each cluster by systematic sampling with replacement. The present analysis uses only data from households located in the urban sections of the Dhaka Statistical Metropolitan Area. The sample design and major findings from the survey have been published by the Bangladesh Bureau of Statistics (1998). Further information can be obtained from the Bangladesh Poverty Assessment Website at www.worldbank.org/html/extdr/offrep/sas/bangladesh-poverty/.

The *Bangladesh Demographic and Health Survey, 1996–7* was designed to provide data that would allow the calculation of demographic rates and to collect reliable data on diseases and nutritional status of children under five. Information on household characteristics, including the educational levels of household members, was also collected. Each of the six administrative divisions in the country was divided into urban and rural areas. In the urban areas the primary sampling unit was the administrative division termed *mahalla*. These clusters were selected with probability proportional to size, and within each cluster, households were selected using systematic sampling. The present analysis uses only data from households located in the urban sections of the Dhaka Statistical Metropolitan Area. The sample design and findings from the survey have been published by the Bangladeshi National Institute of Population Research and Training, Mitra and Associates, and Macro International Inc. (Mitra et al. 1997). Documentation and data are available from the Demographic and Health Surveys Website (see above).

Basic information on each survey sample (number of clusters and number of households per cluster) is included in Table 1.

3. VARIABLES

Variables were initially selected and then recoded as necessary to achieve comparability across surveys. Substandard housing was defined as a house with an earth floor or a house without electricity. Potable waste was defined as water from a closed system located in the home or in the yard. Spatial clustering of garbage collection could not be assessed, since this information was not collected in any of the surveys. Crowding was measured as the number of usual residents in the household divided by the total number of rooms used by them (excluding dedicated kitchens and bathrooms), except in the case of the Tanzania Demographic and Health Survey, which only collected information on the number of *sleeping* rooms. Households' relative ability to satisfy their consumption needs was determined on the basis of their per capita annual consumption expenditures (Grootaert 1982) and the proportion of the household budget used to purchase food (the "food share"). Expenditure aggregates had already been calculated for Peru, Panama, Bangladesh, Nepal, and South Africa. For Dar es Salaam, they were

Table 1—Childhood nutritional status and its contributing factors in seven developing country cities. Numbers are percentages (number with characteristic/number of observations) unless otherwise stated

	Lima	Panama	Dar es Salaam		Jo'burg	Cape Town	Kath'du	Dhaka	
			(HRDS)	(DHS)				(HES)	(DHS)
Number of clusters included in the analysis	138	148	50	27	20	21	33	34	21
Median number of households/cluster (range)	6 (5-8)	10 (2-15)	22 (4-38)	18 (5-57)	27 (3-64)	26 (11-42)	12 (12-12)	20 (20-20)	16 (11-21)
Earth floor in home	11.1% (92/831)	1.3% (18/1388)	8.2%**a** (93/1134)	12.3% (72/585)	0.7% (4/576)	0.4% (2/534)	31.6% (125/396)	-	19.5% (65/333)
Drinking water from a closed-system water source in the home or yard	86.4% (732/847)	98.5% (1367/1388)	50.1% (567/1121)	34.5% (202/586)	97.4% (564/579)	92.1% (491/533)	94.2% (373/396)	66.5% (452/680)	70.9% (236/333)
Electricity in the home	98.6% (835/847)	98.6% (1368/1387)	53.0% (597/1126)	45.9% (269/586)	85.1% (491/577)	82.9% (442/533)	99.5% (394/396)	88.2% (600/680)	93.1% (309/332)
Median number of persons/room (lower and upper quartiles)	0.73 (0.50-1.00)	1.25 (0.80-2.00)	2.00 (1.33-3.00)	2.00**b** (1.50-3.00)	1.00 (0.50-2.00)	0.80 (0.50-1.25)	1.17 (0.82-1.50)	-	-
Median per capita household expenditure (lower and upper lower quartiles)	$1,087 (748-1,693)	$2,329 (1,390-3,993)	$437 (300-736)	-	$2,074 (1,037-5,118)	$1,892 (1,046-3,966)	$393 (268-639)	$361 (246-554)	-
Median food share (lower and upper quartiles)	37.7% (27.4-47.2)	36.6% (27.9-46.5)	51.6% (44.1-59.3)	-	34.9% (20.2-49.0)	31.9% (21.0-49.1)	37.0% (27.7-47.7)	50.6% (39.0-62.9)	-
15-day prevalence of diarrhea, under 5s	12.4% (40/323)	15.8%**c** (86/543)	-	9.9% (33/334)	unreliable data			-	8.2% (135/147)
One-month prevalence of respiratory infection, under 5s	-	44.4% (241/543)	-	34.2%**d** (114/333)				-	36.7%**d** (54/147)
Children died as a proportion of children ever born to women aged 15-50 at time of survey	4.9%**e** (87/1778)	1.6%**f** (40/2452)	15.1% (526/3491)	14.9%**f** (205/1378)	-	-	13.7%**g** (216/1572)	-	10.2%**h** (91/896)
Mean height-for-age Z-score of under-5s (SD; n)	-0.49 (1.41; 299)	-0.22 (1.16; 511)	-	-1.36 (1.48; 283)	-0.53 (1.70; 171)	-0.80 (1.47; 172)	-1.29 (1.47; 86)	-	-1.60 (1.46; 132)
Mean weight-for-age Z-score of under-5s (SD; n)	0.13 (1.21; 299)	-0.01 (1.18; 514)	-	-1.05 (1.24; 283)	-0.43 (1.60; 171)	-0.42 (1.58; 172)	-0.84 (1.15; 86)	-	-1.65 (1.22; 132)
Mean weight-for-height Z-score of under-5s (SD; n)	0.57 (1.25; 295)	0.16 (1.00; 507)	-	-0.22 (1.37; 291)	-0.08 (1.56; 170)	0.10 (1.59; 171)	-0.05 (1.00; 84)	-	-0.85 (1.02; 132)

NOTES: (**a**) Eight households occupying more than one building double-counted in this tabulation, (**b**) persons/sleeping-room, (**c**) one-month prevalence, (**d**) two-week prevalence, (**e**) women aged 15-45, (**f**) women aged 15-49, (**g**) ever-married women, (**h**) ever-married women aged 10-49. Exchange rates: 1US$=1.1 Nuevos Soles (Peru), 1.00 Balboas (Panama), 500 Shillings (Tanzania), 3.42 Rand (S. Africa), 50 Rupees (Nepal), 41.1 Thaka (Bangladesh).

calculated from the original disaggregated data using the approach suggested by Hentschel and Lanjouw (1996).

Mortality was measured as the proportion of live-born children of all women of reproductive age that had died up to the time of the survey. Infectious disease was interpreted as the proportion of children under five reported as having suffered diarrhea or respiratory infections over the previous two weeks or one month, depending on the survey. Morbidity data from the South African survey were excluded because the form of the question asked (Has any member of the household been sick or injured during the past two weeks?) was considered too nonspecific to elicit reliable information. Data from Kathmandu were also excluded because of a very large number of missing values. Finally, nutritional status was assessed using standardized measures of height-for-age, weight-for-age, and weight-for-height, based on the reference population of the National Center for Health Statistics (NCHS) (Hamill et al. 1977). Data on housing conditions, household expenditures, and childhood nutritional status were available for all seven cities; data on crowding was missing for Dhaka, and mortality data were missing for the South African cities.

4. STATISTICAL ANALYSIS

Descriptive statistics presented are proportions for dichotomous variables such as the availability of drinking water from a closed-system source; medians (with lower and upper quartile bounds) for asymmetrically distributed variables such as per capita household expenditures, and means (with standard deviations) for the nutritional status variables, which were normally distributed. Spatial clustering was assessed using the intracluster correlation coefficient (r), which may be interpreted as the proportion of the total variance in a variable that is associated with the cluster to which it belongs.[1] This coefficient varies from 0.00 (no clustering at all) to 1.00 (all variability is at the level of the cluster, the clusters are internally homogeneous), and was estimated in two different ways depending on the type of variable. For continuous variables, r was estimated from a random-effects analysis of variance model (Snedecor and Cochran 1980), with asymptotic 95 percent confidence limits computed as described in the Stata manual (StataCorp 1999). Highly asymmetric variables, such as per capita expenditures and number of persons per room, were log-transformed prior to analysis, since analysis of variance methods are sensitive to violations of the assumption of normality. For binary variables, r was estimated using the Generalized Estimating Equation approach, assuming a logit link, binomial error structure, and exchangeable correlation among observations from the same cluster (Zeger and Liang 1986). Confidence limits are not available using this approach. In cases where the proportion of households or individuals with a particular characteristic exceeded 98 percent or was less than 2 percent, the associated intracluster correlation coefficient was not reported, since it has no meaningful interpretation in the absence of variation. Where negative intracluster correlations were estimated, these were truncated at zero in accordance with the interpretation described

[1] For a discussion of the analysis of intra-urban spatial distributions using area sampling, see the Appendix

above. It should be noted that values of ρ = 0 do not imply that all the clusters have the same mean; rather, they indicate that the between-cluster variance is no greater than the within-cluster variance. Consequently, two randomly selected observations from the same cluster would not be expected to be any more similar to each other than two randomly selected observations from different clusters.

As noted in our previous paper (Morris et al. 2000), any attempt to define high, low, and moderate levels of clustering is arbitrary. However, Deaton (1997) has noted that “for quantities like income and consumption in rural areas of developing countries, *r* is often substantially larger than zero and values of 0.3 to 0.4 are frequently encountered.” On the other hand, Bennett and coworkers (1991) note that “in practice, values above 0.4 are uncommon, except for variables which are specific to the locality rather than the household, and hence clustered by definition.” Therefore, we therefore adopted the following classification:

≥0.3	high intracluster correlation,
≥0.2, < 0.3	moderately high intracluster correlation,
≥0.1, < 0.2	moderately low intracluster correlation,
< 0.1	low intracluster correlation.

We wished to determine whether levels of spatial clustering in one aspect of deprivation, e.g., crowding, were systematically associated across the cities investigated with levels of spatial clustering of other variables, e.g., nutritional status. Therefore, we used the intracluster correlation coefficients for the seven dimensions of deprivation for which we had extensive cross-city data (per capita expenditures, the budget food share, electricity supply, potable water, height-for-age, weight-for-age, and weight-for-height Z-scores), calculating Pearson's correlation coefficients (Snedecor and Cochran 1980) between each possible combination of variables. We included in this analysis the intracluster correlation coefficients from our previous analysis of Abidjan and Accra (Morris et al. 2000) to increase the sample size from seven to nine cities. In cases where two estimates of the intracluster correlation coefficient were available for the same city, the average of the two values was used. A high correlation between two variables in this analysis indicates that those cities with high levels of spatial clustering in one variable tend to be the same cities that show high levels of spatial clustering in the other variable. Conversely, a low correlation indicates that those cities with high levels of spatial clustering in the first variable show little or no spatial clustering in the second variable. All analyses were conducted using Stata v6.0 (StataCorp 1999).

5. RESULTS

Table 1 shows descriptive statistics for the seven cities. Lima, Panama City, Johannesburg, and Cape Town were middle-income cities, with median per capita expenditures in the range of US$1,000–2,500 per annum. Dar es Salaam, Kathmandu, and Dhaka, on the other hand, were low-income cities, with median per capita expenditures below US$500 per annum. Median households spent approximately one-half of their budgets on food in Dhaka and Dar es Salaam, and one-third or a little more in the remaining cities. Access to potable water was extensive (>85 percent households) in Lima, Panama City, Johannesburg, Cape Town, and Kathmandu, moderate in Dhaka (67–71 percent), and limited in Dar es Salaam (35–50 percent). Similarly, access to electricity was extensive in all cities except for Dar es Salaam. More than 10 percent of homes had earth floors in Lima, Dar es Salaam (DHS sample only), and Dhaka, and crowding was most acute in Dar es Salaam and least acute in Lima. Ten–15 percent of children born to women of reproductive age had previously died in Dar es Salaam, Kathmandu, and Dhaka. In Panama City, less than 2 percent of live-born children had died. Period prevalences of diarrhea and respiratory illness were rather similar in the cities where this information was collected. Dhaka had the lowest mean nutritional status (all three indicators), followed by Dar es Salaam and Kathmandu. Lima, Johannesburg, and Cape Town had mean height-for-age Z-scores in the range 0.5–0.8, and the South African cities had mean weight-for-age Z-scores of similar magnitudes. Children in Panama City had nutritional status very similar to the North American children of the NCHS reference standard, while mean weight-for-height Z-scores were markedly above zero in Lima.

Table 2 shows intracluster correlation coefficients for the same variables in the same seven cities. Per capita expenditures showed high levels of spatial clustering in Lima, Panama City, Johannesburg, and Cape Town, moderately high levels in Dhaka and Dar es Salaam, and moderately low levels in Kathmandu. The proportion of the household budget used to purchase food showed high levels of spatial clustering in

Table 2—Spatial clustering of childhood nutritional status and its contributing factors in seven cities. Numbers are intracluster correlation coefficients

	Lima	Panama	Dar es Salaam		Jo'burg	Cape Town	Kath'du	Dhaka	
			(HRDS)	(DHS)				(HES)	(DHS)
Earth floor in home	0.28	-	0.13**a**	0.09	-	-	0.25	-	0.23
Drinking water from a closed-system water source in the home or yard	0.73	-	0.22	0.30	0.31	1.00	0.08	0.82	0.60
Electricity in the home	-	-	0.25	0.31	0.76	0.95	-	0.38	0.10
Persons/room(**b**)	0.22 (0.15-0.29)	0.27 (0.21-0.34)	0.09 (0.04-0.14)	0.03**c** (0.00-0.07)	0.51 (0.32-0.70)	0.46 (0.29-0.63)	0.03 (0.00-0.09)	-	-
Per capita household expenditure(**b**)	0.43 (0.36-0.51)	0.52 (0.45-0.58)	0.21 (0.13-0.29)	-	0.63 (0.46-0.80)	0.67 (0.52-0.82)	0.17 (0.07-0.27)	0.27 (0.16-0.38)	-
Food share(**b**)	0.27 (0.20-0.34)	0.43 (0.36-0.50)	0.09 (0.04-0.14)	-	0.53 (0.35-0.72)	0.56 (0.39-0.73)	0.08 (0.01-0.16)	0.19 (0.10-0.29)	-
15-day prevalence of diarrhea, under 5s	0.03	0.05**d**	-	0.00	-	-	-	-	0.02
One-month prevalence of respiratory infection, under 5s	-	0.16	-	0.00**e**	-	-	-	-	0.04**e**
Children died as a proportion of children ever born to women aged 15-50 at time of survey	0.06**f**	-	0.01	0.02**g**	-	-	0.04	-	0.00**h**
Mean height-for-age Z-score of under-5s (SD; n)	0.20 (0.07-0.34)	0.12 (0.03-0.21)	-	0.04 (0.00-0.12)	0.16 (0.00-0.32)	0.18 (0.02-0.34)	0.00 (0.00-0.22)	-	0.12 (0.00-0.28)
Mean weight-for-age Z-score of under-5s (SD; n)	0.12 (0.00-0.26)	0.05 (0.00-0.13)	-	0.08 (0.00-0.18)	0.08 (0.00-0.20)	0.08 (0.00-0.19)	0.00 (0.00-0.22)	-	0.16 (0.00-0.33)
Mean weight-for-height Z-score of under-5s (SD; n)	0.00 (0.00-0.13)	0.05 (0.00-0.13)	-	0.03 (0.00-0.10)	0.00 (0.00-0.08)	0.15 (0.00-0.30)	0.11 (0.00-0.35)	-	0.04 (0.00-0.17)

NOTES: (**a**) Eight households occupying more than one building double-counted in this tabulation, (**b**) log transformation, (**c**) persons/sleeping-room, (**d**) one-month prevalence, (**e**) two-week prevalence, (**f**) women aged 15-45, (**g**) women aged 15-49, (**h**) ever-married women aged 10-49.

Panama and the South African cities, a moderately high level in Lima, a moderately low level in Dhaka, and low levels in Dar es Salaam and Kathmandu. Access to potable water was highly spatially clustered in Lima, Johannesburg, Cape Town, and Dhaka, moderately highly clustered in Dar es Salaam, and almost unclustered in Kathmandu. Similarly, coverage of electricity was highly clustered in the South African cities, and highly to moderately highly clustered in Dar es Salaam, with equivocal findings from the two Dhaka surveys. Substandard housing, as evidenced by earth floors, showed moderately high clustering in Lima, Dhaka, and Kathmandu, but low to moderately low clustering in Dar es Salaam, while crowding showed extremely high clustering in Johannesburg and Cape Town, moderately high clustering in Lima and Panama City, and low clustering in Dar es Salaam and Kathmandu. There was virtually no indication of spatial clustering in child mortality (median r = 0.02) or in morbidity (median r = 0.025 for diarrhea and ρ = 0.04 for respiratory illness), with the possible exception of Panama City, where respiratory infections showed an intracluster correlation of 0.16.

Height-for-age Z-scores showed low spatial clustering in Dar es Salaam and Kathmandu, and moderately low clustering in Panama City, Johannesburg, Cape Town, and Dhaka. The highest level was seen in Lima (r = 0.20). It is possible to determine what this relatively high level of clustering implies for the feasibility of geographically targeting nutrition programs by ranking each cluster on the basis of its mean height-for-age Z-score and determining what proportion of stunted children (Z-score <-2) reside in the clusters with the lowest mean values. Thus, if a geographically targeted program to eliminate stunting were able to reach 15 percent of all Lima's children, starting with those living in the clusters with the lowest mean height-for-age Z-scores and progressing to those with higher values, only 38 percent of all stunted children would be reached and 69 percent of program benefits would be given to nonstunted children.

Weight-for-age Z-scores showed low spatial clustering in Panama City, Dar es Salaam, Johannesburg, Cape Town, and Kathmandu, and moderately low levels in Lima and Dhaka. Weight-for-height Z-scores showed low spatial clustering in Lima, Panama City, Dar es Salaam, Johannesburg, and Dhaka, and moderately low levels in Cape Town and Kathmandu.

Table 3 shows cross-city correlations between levels of spatial clustering in different dimensions of deprivation. Each possible pairwise combination of a total of seven different variables is considered. The table indicates that the same cities tend to show relatively high levels of spatial clustering in electricity supply, crowding, expenditure levels, and the share of the household budget going to food, with all pairwise

Table 3—Pairwise correlations across nine cities between levels of spatial clustering in seven different dimensions of social deprivation

	Potable water	Electricity	Persons/ room	Per capita expenditure	Food share	Height-for-age	Weight-for-age
Electricity in the home	0.57						
Persons/room	0.51	**0.90**					
Per capita expenditure	0.64	**0.98**	**0.94**				
Food share	0.58	**0.96**	**0.96**	**0.99**			
Height-for-age Z-score	0.69	0.77	**0.83**	**0.80**	**0.76**		
Weight-for-age Z-score	0.54	-0.11	0.51	0.22	0.17	0.66	
Weight-for-height Z-score	0.24	0.58	0.20	0.20	0.24	0.04	-0.18

Notes: The number of observations varies from five to nine due to missing observations, as in Table 2. Statistically significant correlations shown in bold.

comparisons for these variables showing cross-city correlations greater than or equal to 0.9. Spatial clustering of standardized height-for-age (stunting) was also strongly associated with spatial clustering in these indices of deprivation (cross-city correlations in the range 0.76–0.83). However, spatial clustering in the weight-based nutritional measures was not significantly associated at the 5 percent level with spatial clustering in other dimensions of deprivation.

6. DISCUSSION

This article examines the degree to which child malnutrition, infectious disease, and mortality, as well as poverty, overcrowding, substandard housing, and lack of access to basic services, tend to concentrate in particularly disadvantaged neighborhoods in developing country cities. Findings are presented for seven cities in Africa, Asia, and Latin America, complementing an earlier analysis that focused exclusively on two West African cities (Morris et al. 2000). The data used are all from representative household surveys that interviewed residents in 20–148 locations per city. Thus, although the full range of neighborhood variation cannot be determined, extensive geographical coverage is assured.

The results suggest that the conventional view that urban deprivation is “primarily concentrated in squatter settlements and slum areas” (UNICEF 1994, 2) greatly oversimplifies a complex reality. Although per capita expenditures and share of household budget spent on food generally showed a high level of spatial clustering across the seven cities, the magnitude of this clustering varied markedly from city to city. Spatial clustering in the provision of basic services such as water and electricity also varied dramatically from one city to another, from virtually uniform access across clusters (as with drinking water supply in Kathmandu) to almost total concentration of services in less severely disadvantaged neighborhoods (Cape Town). There was consistently little evidence of spatial clustering of infectious disease (diarrhea or respiratory illness), childhood mortality, or the weight-based nutrition indicators. Age-standardized height showed a little more spatial clustering, with a median intracluster correlation of $r = 0.12$ across the seven cities. This was higher than the values observed for the weight-based measures ($r = 0.08$ for weight-for-age and $r = 0.04$ for weight-for-height), but was still indicative of only very moderate spatial clustering. Spatial clustering of age-standardized height showed some city-to-city variation, ranging in our sample from $r = 0.00$ in Kathmandu to $r = 0.20$ in Lima.

Combining findings from the seven cities analyzed in this paper and the two cities analyzed in our previous paper (Accra and Abidjan), it was apparent that some cities showed relatively higher levels of spatial clustering on several measures of deprivation simultaneously, while other cities showed consistently lower levels of clustering. In particular, there were high city-level correlations between levels of spatial clustering of electricity supply, crowding, household expenditure, food budget share, and age-standardized height. Cities that showed relatively higher levels of spatial clustering on all these measures were Cape Town, Johannesburg, Panama, and Lima. It can hardly be a coincidence that the two cities that acquired their spatial structure as a result of *apartheid* were those that also showed most evidence of spatial clustering of multiple aspects of deprivation. Commenting on the challenges facing urban policymakers in Johannesburg, Beavon (1997) has said "the current urban crisis centres on redressing the legacy of the past whereby the indigenous population was consciously marginalized through a process of creating ghettos within the fabric of what was conceived to be a whites-only town." Indeed, because of this legacy, it may be appropriate to interpret the levels of clustering seen in the South African cities as a global upper bound. Urban Panama has also been said to present "a very special case among Latin American countries, a case of poverty in the midst of wealth" (Camazón, García-Huidobro, and Morgado 1989). This situation is attributed to the exceptional openness of the Panamanian economy and the polarization of its modern and informal sectors—the so-called "global city effect." In terms of the magnitudes of spatial inequalities, Lima appears to closely resemble Panama City, although it must have reached that stage by a quite different path: situated in the midst of a barren plain unsuitable for agriculture, the urbanized surface of the city increased 3.5-fold between 1969 and 1985 as desperately poor—and relatively low-stature—migrants poured in from the countryside (Harms 1997), presumably exacerbating spatial inequalities.

The relevance of the present findings on the spatial clustering of standardized weight-for-height is lessened by the fact that for virtually all the cities studied, the distribution of this variable coincided almost exactly with the North American reference population. This indicates that neither thinness (wasting) nor obesity is likely to be a significant public health problem in these environments, in contrast to what was observed for age-standardized height, which was low compared to the reference population everywhere except in Panama City. The two cities where the distribution of standardized weight-for-height did not mirror the North American reference population were Dhaka, where values were low, indicating the likely presence of significant numbers of wasted children, and Lima, where values were high, suggesting a problem of obesity. However, there was no indication of spatial clustering in standardized weight-for-height in either of these cities ($\rho = 0.04$ and $\rho = 0.00$, respectively). Age-standardized weight is a nutritional indicator that represents the combined effects of linear growth (age-standardized height) and soft tissue mass (weight-for-height). In our sample of cities, levels of spatial clustering in this measure were more closely associated with the distribution of age-standardized height than with weight-for-height.

These complex patterns have important policy implications. First, it is necessary to consider whether the levels of spatial clustering of childhood nutritional status identified are sufficiently high to justify the geographical targeting of nutrition interventions in cities. Physical upgrading programs are intrinsically geographically targeted, yet the large outlays involved are frequently justified by invoking the supposed health benefits that will result. Local economic development initiatives may also have less effect on childhood nutritional status than might be imagined if large numbers of vulnerable households do not live in the target areas. With respect to community-based initiatives, some of these are necessarily geographically targeted—the *comedores* *populares* or soup kitchens of Lima being an obvious example—while others, such as food and nutrition education, or micronutrient supplementation, are not. However, even when the type of intervention permits alternative approaches, geographical targeting tends to be administratively simpler than individual targeting, since geographic divisions can be assigned priority on the basis of existing aggregate data (Baker and Grosh 1994). In addition, political considerations may favor highly visible interventions in obvious "problem" communities, rather than more subtle (and usually more intrusive) approaches to identifying those in greatest need.

The current analysis suggests that where nutrition interventions are focused on stunting (low height-for-age), there may be some limited scope for targeting by neighborhood in cities with high structural inequalities, such as in South Africa and Latin America. However, even in these cases, it should be borne in mind that neighborhoods are far from homogeneous, and that both undercoverage and leakage of program benefits will result from restricting benefits to a few neighborhoods. This was evident from the example given for Lima, i.e., that if a nutrition intervention were geographically targeted using the mean height-for-age Z-score of the cluster as the targeting criterion, only 38 percent of all stunted children would be reached while 69 percent of program benefits would be given to nonstunted children. On the other hand, only in very particular cases—such as in Bangladesh—are urban nutrition programs likely to be focused on wasting (low weight-for-height), since this problem is not prevalent in most urban areas. We see no evidence that neighborhood targeting would be an appropriate strategy for measures for the prevention of wasting or the rehabilitation of wasted children in Dhaka, since the intracluster correlation coefficient for standardized weight-for-height was negligibly low.

The low levels of spatial clustering of nutritional status observed thus pose a problem for the design of effective nutrition interventions. Previous experience in urban poverty alleviation has led many policymakers to conclude that "exclusively focusing on city-level approaches offers few prospects for directly tackling urban poverty problems at the local level" (Zaaijer and Sara 1993). Now the very same problems of undercoverage and leakage that led to disillusionment with citywide approaches are present again as arguments against excessively localized interventions in the area of nutrition. However, the implementation of nutrition programs at the citywide level is likely to be fraught with difficulties, because the resources required for endogenous development—such as effective community activist groups—are to be found at the local, not city, level. Furthermore, even if geographic targeting of nutrition interventions is inadequate, it remains to be determined what alternative model might replace the "pockets of undernutrition" framework in guiding the design of effective programs for the cities of tomorrow.

APPENDIX

Analysis of Intra-Urban Spatial Distributions Using Area Sampling

The present analysis is based on area sampling within defined urban boundaries. The principle is similar to that of “quadrat sampling,” which “involves randomly placing a quadrat of predetermined size *n* times over the study area, each time counting the number of points, x_i, that fall within the quadrat” (Thomas and Huggett 1980) In this case, Census Enumeration Areas (or other similar administrative subdivisions) are used instead of quadrats: although the land area of the different Census Enumeration Areas, or CEAs, may differ, they always encompass a predetermined number of households, *n*, making them conceptually equivalent to quadrats. Like quadrat sampling, CEA sampling lends itself to analysis of variance techniques, in which the “total variation in a set of data is separated into components associated with possible sources of variability whose relative importance we wish to assess” (Thomas and Huggett 1980, 253).

If we assume that the CEAs are simply convenience-based subdivisions of true, sociologically meaningful neighborhoods, then we can express our outcome measures (income, nutritional status, etc.) as a function of measurable determinants that operate at the household/individual level, at the neighborhood level, and also possibly at the CEA level. In addition, we anticipate neighborhood-specific and CEA-specific random- or fixed-effects giving rise to the “clustering” of outcomes at these levels. The whole relationship can be expressed as

$$y_{nci} = a + b_1 X_n + b_2 Z_c + b_3 W_i + u_n + x_c + e_i$$

where *y* is the outcome measure, subscript *n* denotes neighborhoods, subscript *c* denotes CEAs, subscript *i* denotes households (or individuals), ***X*** are neighborhood-specific determinants, ***Z*** are CEA-specific determinants, ***W*** are household- (or individual-) specific determinants, *á* is a fixed intercept term, the *â*'s are regression coefficients, *u* is a neighborhood-specific error-term, *î* is a CEA-specific error-term, and *å* is the usual household- (or individual-)specific error-term.

If we further assume that *u*, *î*, and *å* are distributed Normally with zero means and variances $ó^{2}_{u}$, $ó^{2}_{î}$, and $ó^{2}_{å}$, then we have a random-effects model in which the total variance in our outcome measures (such as income) can be decomposed into three additive elements:

$$s^{2}_{tot} = s^{2}_{u} + s^{2}_{x} + s^{2}_{e}$$

where $ó^{2}_{tot}$ is the total variance, $ó^{2}_{u}$ is the between-neighborhood variance, $ó^{2}_{î}$ is the within-neighborhood, between-CEA variance, and $ó^{2}_{å}$ is the within-CEA, between-household (or between-individual) variance. It should be noted that if these variance components have between derived from a model with no covariates (as in this paper), then they represent the observed spatial patterning, some of which almost certainly could be "explained" on the basis of the clustering of determinants.

This model implies that the clustering within 'true' neighborhoods, $\tilde{n}_n$, is given by:

$$r_n = s_u^2 \big/ s_{tot}^2$$

On the other hand, the parameter estimated in this paper is given by:

$$r' = \frac{1}{s_{tot}^2}(s_u^2 + s_x^2)$$

The difference is due to the fact that the small area sampling method is unable to distinguish between $\acute{o}^2_u$ and $\acute{o}^2_{\hat{\imath}}$, assigning them both to a single "between-CEA" variance category. It is clear that—provided there is non-zero variation at the between-CEA, within neighborhood level—$\tilde{n}$ is always greater than $\tilde{n}_n$. The estimates in this paper are therefore to be interpreted as *upper bounds* to the true neighborhood clustering of deprivation.

REFERENCES

Baker, J.L., and M.E. Grosh (1994). Poverty reduction through geographic targeting: How well does it work? *World Development* 22 (7): 983–95.

Bangladesh Bureau of Statistics (1998). *Household expenditure survey, 1995–96*. Dhaka.

Beavon, K.S.O. (1997). Johannesburg: A city and metropolitan area in transformation. In Rakodi, C., ed. *The urban challenge in Africa: Growth and management of its large cities*. Tokyo and New York: United Nations University Press.

Bennett, S., T. Woods, W.M. Liyanage, and D.L. Smith (1991). A simplified general method for cluster-sample surveys of health in developing countries. *World Health Statistics Quarterly* 44 (3): 98–106.

Bureau of Statistics [Tanzania], and Macro International Inc. (1997). *Tanzania Demographic and Health Survey, 1996*. Calverton, Md., U.S.A.

Camazón, D., G. García-Huidobro, and H. Morgado (1989). Labour market performance and urban poverty in Panama. In Rodgers, G., ed. *Urban poverty and the labour market: Access to jobs and incomes in Asian and Latin American cities*. Geneva: International Labour Office.

Deaton, A. (1997). *The analysis of household surveys: A microeconometric approach to development policy*. Washington, DC: World Bank.

Grootaert C. (1982). *The conceptual basis of measures of household welfare and their implied survey data requirements*. Living Standards Measurement Study Working Paper No. 19. Washington, DC: World Bank.

Habitat [United Nations Centre for Human Settlements] (1996). *An urbanizing world: Global report on human settlements, 1996*. Oxford: Oxford University Press.

Haddad, L., M.T. Ruel, and J.L. Garrett (2000). Are urban poverty and undernutrition growing? Some newly assembled evidence. *World Development*, in press.

Hamill, P.V.V., T.A. Drizid, C.L. Johnston, R.B. Reed, A.F. Roche, and W.M. Moore (1977). NCHS growth curves for children birth–18 years. Vital and Health Statistics Series 11 (165). DHEW Pub. No. (PHS) 78-1650. Hyattsville, Md., USA: U.S. Department of Health, Education, and Welfare.

Harms, H. (1997). To live in the city centre: Housing and tenants in central neighbourhoods of Latin American cities. Environment & Urbanization 9 (2): 191–212.

Hentschel, J., and P. Lanjouw (1996). *Constructing an indicator of consumption for the analysis of poverty: principles and illustrations with reference to Ecuador*. Living Standards Measurement Study Working Paper No. 124. Washington, DC: World Bank.

Mitra, S.N, A. Al-Sabir, A.R. Cross, and J. Kanta (1997). *Bangladesh Demographic and Health Survey, 1996–7.* Dhaka and Calverton, Md., USA: National Institute of Population Research and Training (NIPORT), Mitra and Associates, and Macro International, Inc.

Morris, S.S., C. Levin, M. Armar-Klemesu, D. Maxwell, and M.T. Ruel (2000). Does geographic targeting of nutrition interventions make sense in cities? Evidence from Abidjan and Accra. *World Development,* in press.

Snedecor, G.W., and W.G. Cochran (1980). *Statistical methods, 7th ed*. Ames, Iowa: Iowa State University Press.

StataCorp (1999). *Stata Reference Manual*. Release 6. College Station, Texas: Stata Corporation.

Thomas, R.W., and R. J. Huggett (1980). *Modelling in geography: A mathematical approach*. Totowa, N.J: Barnes & Noble Books.

UNICEF (United Nations Children's Fund) (1994). *The urban poor and household food security: Policy and project lessons of how governments and the urban poor attempt to deal with household food insecurity, poor health and malnutrition. Concepts, evidence and case studies*. Urban Examples No. 19. New York.

Zaaijer, M., and L.M. Sara (1993). Local economic development as an instrument for urban poverty alleviation: A case from Lima, Peru. *Third World Planning Review* 15 (2): 127–142.

Zeger, S.L., and K.Y. Liang (1986). Longitudinal data analysis for discrete and continuous outcomes. *Biometrics* 42: 121–123.

FCND DISCUSSION PAPERS

01 *Agricultural Technology and Food Policy to Combat Iron Deficiency in Developing Countries*, Howarth E. Bouis, August 1994

02 *Determinants of Credit Rationing: A Study of Informal Lenders and Formal Credit Groups in Madagascar*, Manfred Zeller, October 1994

03 *The Extended Family and Intrahousehold Allocation: Inheritance and Investments in Children in the Rural Philippines*, Agnes R. Quisumbing, March 1995

04 *Market Development and Food Demand in Rural China*, Jikun Huang and Scott Rozelle, June 1995

05 *Gender Differences in Agricultural Productivity: A Survey of Empirical Evidence*, Agnes R. Quisumbing, July 1995

06 *Gender Differentials in Farm Productivity: Implications for Household Efficiency and Agricultural Policy*, Harold Alderman, John Hoddinott, Lawrence Haddad, and Christopher Udry, August 1995

07 *A Food Demand System Based on Demand for Characteristics: If There Is "Curvature" in the Slutsky Matrix, What Do the Curves Look Like and Why?*, Howarth E. Bouis, December 1995

08 *Measuring Food Insecurity: The Frequency and Severity of "Coping Strategies,"* Daniel G. Maxwell, December 1995

09 *Gender and Poverty: New Evidence from 10 Developing Countries*, Agnes R. Quisumbing, Lawrence Haddad, and Christine Peña, December 1995

10 *Women's Economic Advancement Through Agricultural Change: A Review of Donor Experience*, Christine Peña, Patrick Webb, and Lawrence Haddad, February 1996

11 *Rural Financial Policies for Food Security of the Poor: Methodologies for a Multicountry Research Project*, Manfred Zeller, Akhter Ahmed, Suresh Babu, Sumiter Broca, Aliou Diagne, and Manohar Sharma, April 1996

12 *Child Development: Vulnerability and Resilience*, Patrice L. Engle, Sarah Castle, and Purnima Menon, April 1996

13 *Determinants of Repayment Performance in Credit Groups: The Role of Program Design, Intra-Group Risk Pooling, and Social Cohesion in Madagascar*, Manfred Zeller, May 1996

14 *Demand for High-Value Secondary Crops in Developing Countries: The Case of Potatoes in Bangladesh and Pakistan*, Howarth E. Bouis and Gregory Scott, May 1996

15 *Repayment Performance in Group-Based credit Programs in Bangladesh: An Empirical Analysis*, Manohar Sharma and Manfred Zeller, July 1996

16 *How Can Safety Nets Do More with Less? General Issues with Some Evidence from Southern Africa*, Lawrence Haddad and Manfred Zeller, July 1996

17 *Remittances, Income Distribution, and Rural Asset Accumulation*, Richard H. Adams, Jr., August 1996

18 *Care and Nutrition: Concepts and Measurement*, Patrice L. Engle, Purnima Menon, and Lawrence Haddad, August 1996

19 *Food Security and Nutrition Implications of Intrahousehold Bias: A Review of Literature*, Lawrence Haddad, Christine Peña, Chizuru Nishida, Agnes Quisumbing, and Alison Slack, September 1996

20 *Macroeconomic Crises and Poverty Monitoring: A Case Study for India*, Gaurav Datt and Martin Ravallion, November 1996

21 *Livestock Income, Male/Female Animals, and Inequality in Rural Pakistan*, Richard H. Adams, Jr., November 1996

22 *Alternative Approaches to Locating the Food Insecure: Qualitative and Quantitative Evidence from South India*, Kimberly Chung, Lawrence Haddad, Jayashree Ramakrishna, and Frank Riely, January 1997

23 *Better Rich, or Better There? Grandparent Wealth, Coresidence, and Intrahousehold Allocation*, Agnes R. Quisumbing, January 1997

24 *Child Care Practices Associated with Positive and Negative Nutritional Outcomes for Children in Bangladesh: A Descriptive Analysis*, Shubh K. Kumar Range, Ruchira Naved, and Saroj Bhattarai, February 1997

25 *Water, Health, and Income: A Review*, John Hoddinott, February 1997

26 *Why Have Some Indian States Performed Better Than Others at Reducing Rural Poverty?*, Gaurav Datt and Martin Ravallion, March 1997

27 *"Bargaining" and Gender Relations: Within and Beyond the Household*, Bina Agarwal, March 1997

28 *Developing a Research and Action Agenda for Examining Urbanization and Caregiving: Examples from Southern and Eastern Africa*, Patrice L. Engle, Purnima Menon, James L. Garrett, and Alison Slack, April 1997

29 *Gender, Property Rights, and Natural Resources*, Ruth Meinzen-Dick, Lynn R. Brown, Hilary Sims Feldstein, and Agnes R. Quisumbing, May 1997

30 *Plant Breeding: A Long-Term Strategy for the Control of Zinc Deficiency in Vulnerable Populations*, Marie T. Ruel and Howarth E. Bouis, July 1997

31 *Is There an Intrahousehold 'Flypaper Effect'? Evidence from a School Feeding Program*, Hanan Jacoby, August 1997

32 *The Determinants of Demand for Micronutrients: An Analysis of Rural Households in Bangladesh*, Howarth E. Bouis and Mary Jane G. Novenario-Reese, August 1997

33 *Human Milk—An Invisible Food Resource*, Anne Hatløy and Arne Oshaug, August 1997

34 *The Impact of Changes in Common Property Resource Management on Intrahousehold Allocation*, Philip Maggs and John Hoddinott, September 1997

35 *Market Access by Smallholder Farmers in Malawi: Implications for Technology Adoption, Agricultural Productivity, and Crop Income*, Manfred Zeller, Aliou Diagne, and Charles Mataya, September 1997

36 *The GAPVU Cash Transfer Program in Mozambique: An assessment*, Gaurav Datt, Ellen Payongayong, James L. Garrett, and Marie Ruel, October 1997

37 *Why Do Migrants Remit? An Analysis for the Dominican Sierra*, Bénédicte de la Brière, Alain de Janvry, Sylvie Lambert, and Elisabeth Sadoulet, October 1997

38 *Systematic Client Consultation in Development: The Case of Food Policy Research in Ghana, India, Kenya, and Mali*, Suresh Chandra Babu, Lynn R. Brown, and Bonnie McClafferty, November 1997

39 *Whose Education Matters in the Determination of Household Income: Evidence from a Developing Country*, Dean Jolliffe, November 1997

40 *Can Qualitative and Quantitative Methods Serve Complementary Purposes for Policy Research? Evidence from Accra*, Dan Maxwell, January 1998

41 *The Political Economy of Urban Food Security in Sub-Saharan Africa*, Dan Maxwell, February 1998

42 *Farm Productivity and Rural Poverty in India*, Gaurav Datt and Martin Ravallion, March 1998

43 *How Reliable Are Group Informant Ratings? A Test of Food Security Rating in Honduras*, Gilles Bergeron, Saul Sutkover Morris, and Juan Manuel Medina Banegas, April 1998

44 *Can FAO's Measure of Chronic Undernourishment Be Strengthened?*, Lisa C. Smith, with a *Response* by Logan Naiken, May 1998

45 *Does Urban Agriculture Help Prevent Malnutrition? Evidence from Kampala*, Daniel Maxwell, Carol Levin, and Joanne Csete, June 1998

46 *Impact of Access to Credit on Income and Food Security in Malawi*, Aliou Diagne, July 1998

47 *Poverty in India and Indian States: An Update*, Gaurav Datt, July 1998

48 *Human Capital, Productivity, and Labor Allocation in Rural Pakistan*, Marcel Fafchamps and Agnes R. Quisumbing, July 1998

49 *A Profile of Poverty in Egypt: 1997*, Gaurav Datt, Dean Jolliffe, and Manohar Sharma, August 1998.

50 *Computational Tools for Poverty Measurement and Analysis*, Gaurav Datt, October 1998

51 *Urban Challenges to Food and Nutrition Security: A Review of Food Security, Health, and Caregiving in the Cities*, Marie T. Ruel, James L. Garrett, Saul S. Morris, Daniel Maxwell, Arne Oshaug, Patrice Engle, Purnima Menon, Alison Slack, and Lawrence Haddad, October 1998

52 *Testing Nash Bargaining Household Models With Time-Series Data*, John Hoddinott and Christopher Adam, November 1998

53 *Agricultural Wages and Food Prices in Egypt: A Governorate-Level Analysis for 1976-1993*, Gaurav Datt and Jennifer Olmsted, November 1998

54 *Endogeneity of Schooling in the Wage Function: Evidence from the Rural Philippines*, John Maluccio, November 1998

55 *Efficiency in Intrahousehold Resource Allocation*, Marcel Fafchamps, December 1998

56 *How Does the Human Rights Perspective Help to Shape the Food and Nutrition Policy Research Agenda?*, Lawrence Haddad and Arne Oshaug, February 1999

57 *The Structure of Wages During the Economic Transition in Romania*, Emmanuel Skoufias, February 1999

58 *Women's Land Rights in the Transition to Individualized Ownership: Implications for the Management of Tree Resources in Western Ghana*, Agnes Quisumbing, Ellen Payongayong, J. B. Aidoo, and Keijiro Otsuka, February 1999

59 *Placement and Outreach of Group-Based Credit Organizations: The Cases of ASA, BRAC, and PROSHIKA in Bangladesh*, Manohar Sharma and Manfred Zeller, March 1999

60 *Explaining Child Malnutrition in Developing Countries: A Cross-Country Analysis*, Lisa C. Smith and Lawrence Haddad, April 1999

61 *Does Geographic Targeting of Nutrition Interventions Make Sense in Cities? Evidence from Abidjan and Accra*, Saul S. Morris, Carol Levin, Margaret Armar-Klemesu, Daniel Maxwell, and Marie T. Ruel, April 1999

62 *Good Care Practices Can Mitigate the Negative Effects of Poverty and Low Maternal Schooling on Children's Nutritional Status: Evidence from Accra*, Marie T. Ruel, Carol E. Levin, Margaret Armar-Klemesu, Daniel Maxwell, and Saul S. Morris, April 1999

63 *Are Urban Poverty and Undernutrition Growing? Some Newly Assembled Evidence*, Lawrence Haddad, Marie T. Ruel, and James L. Garrett, April 1999

64 *Some Urban Facts of Life: Implications for Research and Policy*, Marie T. Ruel, Lawrence Haddad, and James L. Garrett, April 1999

65 *Are Determinants of Rural and Urban Food Security and Nutritional Status Different? Some Insights from Mozambique*, James L. Garrett and Marie T. Ruel, April 1999

66 *Working Women in an Urban Setting: Traders, Vendors, and Food Security in Accra*, Carol E. Levin, Daniel G. Maxwell, Margaret Armar-Klemesu, Marie T. Ruel, Saul S. Morris, and Clement Ahiadeke, April 1999

67 *Determinants of Household Access to and Participation in Formal and Informal Credit Markets in Malawi*, Aliou Diagne, April 1999

68 *Early Childhood Nutrition and Academic Achievement: A Longitudinal Analysis*, Paul Glewwe, Hanan Jacoby, and Elizabeth King, May 1999

69 *Supply Response of West African Agricultural Households: Implications of Intrahousehold Preference Heterogeneity*, Lisa C. Smith and Jean-Paul Chavas, July 1999

70 *Child Health Care Demand in a Developing Country: Unconditional Estimates from the Philippines*, Kelly Hallman, August 1999

71 *Social Capital and Income Generation in South Africa, 1993-98*, John Maluccio, Lawrence Haddad, and Julian May, September 1999

72 *Validity of Rapid Estimates of Household Wealth and Income for Health Surveys in Rural Africa*, Saul S. Morris, Calogero Carletto, John Hoddinott, and Luc J. M. Christiaensen, October 1999

73 *Social Roles, Human Capital, and the Intrahousehold Division of Labor: Evidence from Pakistan*, Marcel Fafchamps and Agnes R. Quisumbing, October 1999

74 *Can Cash Transfer Programs Work in Resource-Poor Countries? The Experience in Mozambique*, Jan W. Low, James L. Garrett, and Vitória Ginja, October 1999

FCND DISCUSSION PAPERS

75 *Determinants of Poverty in Egypt, 1997*, Gaurav *Datt* and Dean Jolliffe, October 1999

76 *Raising Primary School Enrolment in Developing Countries: The Relative Importance of Supply and Demand*, Sudhanshu Handa, November 1999

77 *The Political Economy of Food Subsidy Reform in Egypt*, Tammi Gutner, November 1999.

78 *Determinants of Poverty in Mozambique: 1996-97*, Gaurav Datt, Kenneth Simler, Sanjukta Mukherjee, and Gabriel Dava, January 2000

79 *Adult Health in the Time of Drought*, John Hoddinott and Bill Kinsey, January 2000

79 *Adult Health in the Time of Drought*, John Hoddinott and Bill Kinsey, January 2000

80 *Nontraditional Crops and Land Accumulation Among Guatemalan Smallholders: Is the Impact Sustainable?* Calogero Carletto, February 2000

81 *The Constraints to Good Child Care Practices in Accra: Implications for Programs*, Margaret Armar-Klemesu, Marie T. Ruel, Daniel G. Maxwell, Carol E. Levin, and Saul S. Morris, February 2000

82 *Pathways of Rural Development in Madagascar: An Empirical Investigation of the Critical Triangle of Environmental Sustainability, Economic Growth, and Poverty Alleviation*, Manfred Zeller, Cécile Lapenu, Bart Minten, Eliane Ralison, Désiré Randrianaivo, and Claude Randrianarisoa, March 2000

83 *Quality or Quantity? The Supply-Side Determinants of Primary Schooling in Rural Mozambique*, Sudhanshu Handa and Kenneth R. Simler, March 2000

84 *Intrahousehold Allocation and Gender Relations: New Empirical Evidence from Four Developing Countries*, Agnes R. Quisumbing and John A. Maluccio, April 2000

85 *Intrahousehold Impact of Transfer of Modern Agricultural Technology: A Gender Perspective*, Ruchira Tabassum Naved, April 2000

86 *Women's Assets and Intrahousehold Allocation in Rural Bangladesh: Testing Measures of Bargaining Power*, Agnes R. Quisumbing and Bénédicte de la Brière, April 2000

87 *Changes in Intrahousehold Labor Allocation to Environmental Goods Collection: A Case Study from Rural Nepal*, Priscilla A. Cooke, May 2000

88 *The Determinants of Employment Status in Egypt*, Ragui Assaad, Fatma El-Hamidi, and Akhter U. Ahmed, June 2000

89 *The Role of the State in Promoting Microfinance Institutions*, Cécile Lapenu, June 2000

90 *Empirical Measurements of Households' Access to Credit and Credit Constraints in Developing Countries: Methodological Issues and Evidence*, Aliou Diagne, Manfred Zeller, and Manohar Sharma, July 2000

91 *Comparing Village Characteristics Derived From Rapid Appraisals and Household Surveys: A Tale From Northern Mali*, Luc Christiaensen, John Hoddinott, and Gilles Bergeron, July 2000

92 *Assessing the Potential for Food-Based Strategies to Reduce Vitamin A and Iron Deficiencies: A Review of Recent Evidence*, Marie T. Ruel and Carol E. Levin, July 2000

93 *Mother-Father Resource Control, Marriage Payments, and Girl-Boy Health in Rural Bangladesh,* Kelly K. Hallman, September 2000