Analysis of disparities in nutritional status by wealth and residence: examples from Angola, Central African Republic and Senegal

Authors:

Gina Kennedy and Guy Nantel
Nutrition Planning, Assessment and Evaluation Service
Food and Nutrition Division
Food and Agriculture Organization of the United Nations
Viale delle Terme di Carcalla, 00100
Rome, Itlay
Email : gina.kennedy@fao.org

Acknowledgements:

We would like to thank Seevalingum Ramasawmy, FAO Statistician for support with the statistical analysis and Seán Kennedy, IFAD Technical Advisor, Human Health and Nutrition and Prakash Shetty, Ruth Charrondiere and MarieClaude Dop, Nutrition Planning, Assessment and Evaluation Service, FAO for valuable comments on the manuscript.

Analysis of disparities in nutritional status by wealth and residence in Angola, Central African Republic and Senegal

1.0 Introduction

Most of what is known about conditions in urban and rural areas is based on simple comparisons of urban and rural populations. This paper demonstrates simple urban/rural comparisons mask wide disparities in sub-groups according to wealth. There is a strong relationship between poverty and chronic malnutrition in both urban and rural areas, this relationship does not change by simply living in an urban environment. However, urban and rural living conditions and lifestyles differ, and it is important to consider these differences when designing programs and policies to address malnutrition.

In developing countries, 40.9% of the population currently live in urban areas. Projections indicate that by 2030 the urban population will reach 56.4% (United Nations Population Division, 2002). Latin America and the Caribbean are already highly urbanized (75.8%), while in Asia and Africa the percent of the population living in urban areas is 38.0% and 37.7% respectively (United Nations Population Division, 2002). In sub-Saharan Africa the urban population is expected to double, rising from 209 million to 440 million in twenty years (UNCHS-Habitat,2002). The rapid increase of urban populations in developing countries has created severe challenges for municipal authorities charged with provision of basic services.

Already, the current population of many urban agglomerates overwhelms existing infrastructure for basic service provision. Over one billion people live in city slums without adequate shelter, water or sanitation. Poverty in urban areas is rising as is disparity among income classes (UNCHS, 2002). A recent study by IFPRI noted an increase in the absolute numbers of urban poor as well as an increase in the share of urban poor in overall poverty (Haddad, Ruel and Garrett, 1999).

Children are the most vulnerable members of any population. Childhood nutrition status is closely tied to poverty and reflects the overall level of deprivation and inequalities in development (deOnis, M., Frongillo, E., and Blossner, M., 2000; Frongillo, E., deOnis, M. and Hanson, K., 1997; deOnis. M., Monteiro, C., Akre, J. and Clugston, G., 1993). Anthropometric measures, or measurements of the human body, such as, height, weight and arm circumference are some of the most widely used and standardized means of deriving indicators of nutritional status. Indicators of nutritional status in children under the age of five are derived using three indices, based on height, weight, age and gender of the child. The index is compared with an internationally accepted childhood growth reference, using standardized cut-off points to define the presence of malnutrition.

The key indicators are underweight (low weight-for-age), stunting (low height-for-age) and wasting (low weight-for height). This paper will consider two of these indicators, underweight and stunting. The Millennium Development Goals have chosen to use an indicator of nutritional status, weight-for-age, to reflect progress in achieving the goal of reducing poverty. Stunting, or chronic malnutrition is another widely used indicator and

represents poor linear growth caused by sustained food deprivation, repeated illness or both. Stunting is considered a barometer of the populations' ability to meet basic needs, such as food, health care and housing (de Onis, M., Frongillo, E. and Blossner, M., 2000).

Childhood malnutrition is implicated in over half of all child mortality (UNICEF, 2000). When children are stunted, their immune systems are generally weakened and they are more susceptible to episodes of diarrhoeal illness and other infections. There is evidence that severe stunting decreases cognitive ability and school performance (Mendez, M. and Adair, L., 1999).

The prevalence of malnutrition measured by the indicators of underweight and stunting are highest in sub-Saharan Africa and South Asia, and generally lower in Latin America and the Caribbean. UNICEF estimates that over 150 million children under five years of age suffer from underweight, the majority of these children live in South Asia and sub-Saharan Africa (UNICEF, 2003). While the prevalence of stunting is decreasing worldwide, the least progress is expected in Africa, where it is predicted that although the prevalence will decrease modestly, the number of children affected will rise from 44 million to 48 million (deOnis, M. and Blossner,M., 2003).

When prevalence of underweight and stunting in urban and rural areas are compared, the urban population regularly appears better off. However, these comparisons mask the heterogeneity of the urban population and do not take into account the disparities in

wealth within urban populations. This paper analyzes the differences in stunting and underweight in urban and rural areas by wealth quintile to investigate whether living in an urban environment confers advantage irrespective of socio-economic status.

2.0 Methodology

UNICEF Multiple Indicator Cluster Survey (MICS) data were used to perform the analysis on the prevalence of stunting in urban and rural areas and across wealth income quintiles. The MICS data sets were chosen over other data sets (DHS/WHO Global Database on Child growth) as they include anthropometric measures of children under five years of age and a measurement of wealth. The questions used to establish the wealth index include, household access to electricity, radio or television, household ownership of bicycle, motorcycle or car, type of material of dwelling floor, number of rooms in the dwelling, main source of drinking water and type of toilet facility. The index is created in order to derive a measure of economic status in the absence of income or consumption data. The terms wealth and economic status will be used interchangeably in this paper.

Databases for eight countries were available (Angola, CAR, Chad, Comoros, Côte d'Ivoire, Niger, Rwanda and Senegal). Certain of the datasets were excluded for reasons of missing or questionable data, while others were not included in the analysis due to insufficient sample size in urban areas. Three countries with high quality anthropometric data and adequate sample sizes in urban and rural areas were retained for the present analysis (Angola, 2001, Central African Republic, 2000 and Senegal, 2000).

The data were downloaded into the SPSS statistical package (version 11.5), cleaned and analyzed. Only children age 0-59 months were included, records flagged for implausible anthropometric measurement were discarded and all records used indicated wealth index quintile and residence. The WHO recommended cut-off points of height-for-age and weight-for-age Z scores < -2.00 standard deviations of the NCHS/WHO childhood growth curves were used to indicate presence of stunting and underweight (WHO, 1995). The Chi square test for statistical significance was performed using EPICalc. Linear regression analysis was run in SPSS.

Certain limitations to the data sets should be noted. Allocation of the population into quintiles using the wealth index was based on the entire population sampled. As would be expected, post-stratification of the population in each wealth index quintile by urban or rural residence resulted in larger numbers of the urban population in the higher wealth income quintiles and larger numbers of the rural population in the lower income quintiles. As per the recommendations in the MICS survey guide, sample sizes were checked to ensure that each sub-set analysed included a minimum of 25 observations (UNICEF, 2000). UNICEF MICS sampling methodology recommends selecting a sample based on probability proportional to size, unless the national survey team determines it is desirable to use a different type of probability sample. It was not possible to verify the methodology followed.

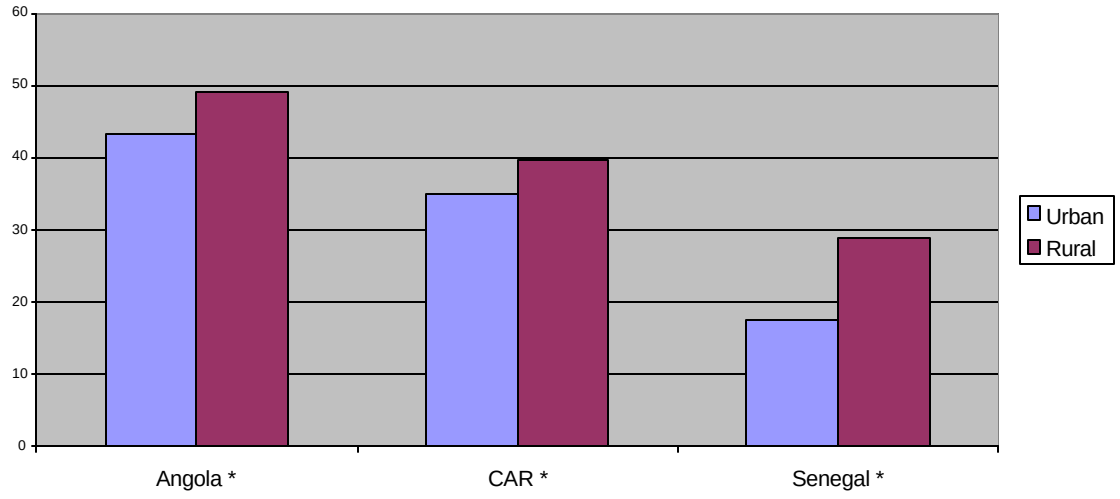
3.0 Results

A series of relationships were tested using the prevalence of stunting and underweight and comparing this by residence and wealth index quintile. Stunting was chosen as it is the best reflection of poverty and chronic deprivation, the variable of interest in this analysis. Data on underweight are also presented, as this is the indicator currently being used to monitor progress toward the Millennium Development Goals.

Stunting

The overall prevalence of stunting is significantly greater in rural areas in all three countries when simple urban/rural comparisons are made (Figure one).

Figure 1: Prevalence of Stunting by Residence



** Indicates ÷2 pvalue <0.05*

The prevalence of stunting was stratified by wealth index quintile to look for differences between the poorest quintile and the other quintiles. Significant differences were seen between the poorest quintile and every other quintile in Senegal, between the poorest and 2, 4th and 5th quintiles in the Central African Republic and, and between the poorest and the 3rd, 4th and 5th quintiles in Angola (Table 1). The results show stunting is significantly higher in lower economic groups.

Table 1: Prevalence of Stunting by Wealth Quintile – 3 Countries

Wealth Index (Quintiles)		Angola		Central African Republic		Senegal	
		(%)	p value+	(%)	p value+	(%)	p value+
Poorest	1st	52.20		42.53		34.48	
	2nd	50.00	0.334696	37.71	0.000207*	29.71	0.001371*
	3rd	47.64	0.039179*	40.14	0.065882	23.74	0.000001*
	4th	44.96	0.000983*	34.63	0.000000*	18.73	0.000001*
Least poor	5th	33.05	0.000001*	32.49	0.000001*	13.69	0.000001*

+ Test for significance comparing 1st quintile to subsequent quintiles * significant at p<.05

The prevalence of stunting in children of the same wealth index quintile living in urban and rural areas was compared to look for differences across urban and rural areas. There were no significant differences across urban and rural populations within the same quintile in any of the countries. (Tables 2-4). The prevalence of stunting is the same in urban and rural areas when economic status is considered.

Table 2: Angola – Prevalence of Stunting by Wealth and Residence.

Wealth Index (Quintiles)		Urban		Rural		p value ($\div^2$)
		(n)	(%)	(n)	(%)	
Poorest	1st	205	50.24	749	52.74	0.525
	2nd	492	50.81	476	49.16	0.608
	3rd	773	46.44	329	50.46	0.221
	4th	914	46.28	216	39.35	0.0655
Least poor	5th	1031	33.46	46	23.91	0.1779
	Total	3415	43.34	1816	49.06	0.000076*

* significant at p<.05

Table 3: Central African Republic – Prevalence of Stunting by Wealth and Residence.

Wealth Index (Quintiles)		Urban		Rural		p value ($\div^2$)
		(n)	(%)	(n)	(%)	
Poorest	1st	335	43.88	2649	42.36	0.595974
	2nd	573	35.43	2153	38.32	0.204619
	3rd	782	37.98	1988	41.00	0.144424
	4th	1414	34.23	882	35.26	0.613872
Least poor	5th	1653	32.30	412	33.25	0.712593
	Total	4757	35.00	8084	39.71	0.000001*

* significant at p<.05

Table 4: Senegal – Prevalence of Stunting by Wealth and Residence.

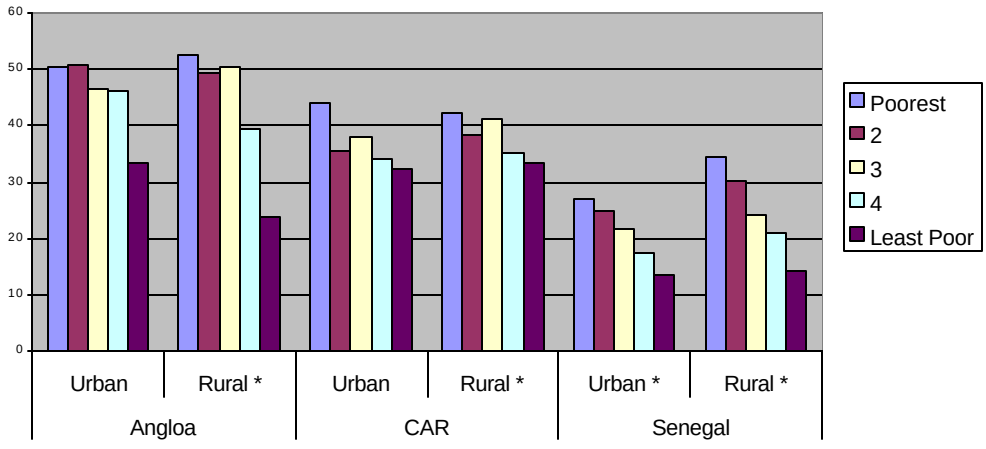
Wealth Index (Quintiles)		Urban		Rural		p value ($\div^2$)
		(n)	(%)	(n)	(%)	
Poorest	1st	37	27.03	1796	34.63	0.335659
	2nd	144	25.00	1956	30.06	0.199731
	3rd	464	21.77	1701	24.28	0.260038
	4th	845	17.28	511	21.14	0.077512
Least poor	5th	872	13.65	92	14.13	0.898653
	Total	2362	17.44	6056	28.80	0.000001*

* significant at p<.05

Linear regression to assess the strength of the relationship between stunting and wealth at national level was run using the total prevalence of stunting for each country as the

dependent variable and wealth index quintile as the independent variable. A significant negative linear correlation between prevalence of stunting and wealth was found in all three countries (Angola R^2=.835, â=-4.334, p=.03; CAR R^2=.816, â=-2.315, p=.035; Senegal R^2=.999, â=-5.255, p=.000). The strength of the relationship between prevalence of stunting and wealth in urban and rural areas was tested in the same way. Figure two shows stunting prevalence by residence and wealth. When the population is divided into urban and rural residence, the correlation with wealth is significant in rural areas of Angola and Central African Republic (Angola R^2=.804, â=-6.747, p=.039; CAR R^2=.778, â=-2.128, p=.048) and in both urban and rural areas of Senegal (urban R^2=.984, â=-3.448, p=.001; rural R^2=.990, â=-4.992, p=.000). Although there is a linear relationship between stunting and wealth in urban areas of Angola and Central African Republic, the relationship was not statistically significant. Reasons for this are not clear, but possible confounding factors could be critical non-food expenditures such as rent and commuting expenses taking priority over non-essential food needs.

Figure 2: Prevalence of Stunting by Residence and Wealth Index Quintile



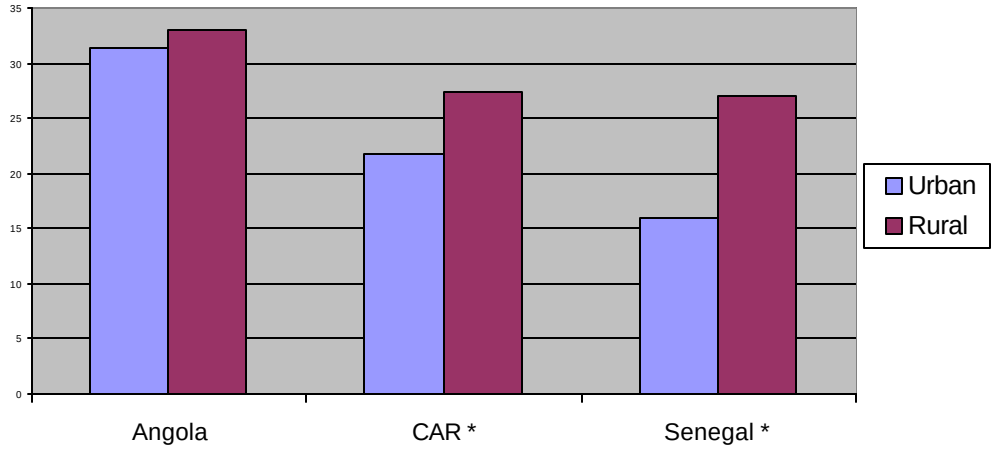
* *Indicates significant linear correlation between prevalence of stunting and wealth*

Underweight

The overall patterns observed for underweight are very similar to stunting. Underweight is presented in the paper as it is the indicator chosen to monitor progress toward achieving the Millennium Development Goals.

As with stunting, the overall prevalence of underweight is significantly lower in urban compared to rural areas in Senegal and the Central African Republic (Figure 3). Although the prevalence of underweight is lower in urban (31.42%) compared to rural (33.07%) in Angola the difference is not statistically significant. Reasons for this difference may be the longstanding civil unrest and greater numbers of displaced persons in urban areas.

Figure 3: Prevalence of Underweight by Residence



** Indicates ÷2 p-value <0.05*

Comparing the prevalence of underweight in the poorest quintile, to each of the other quintiles, shows statistically significant differences for all quintiles in Central African

Republic and Senegal and the two wealthiest quintiles in Angola. (Table 5). These results are very similar to stunting, showing significant differences between prevalence of underweight and wealth.

Table 5: Prevalence of Underweight by Wealth Quintile – 3 Countries

Wealth Index (Quintiles)	Angola		Central African Republic		Senegal	
	(%)	p value+	(%)	p value+	(%)	p value+
Poorest 1st	36.47		31.21		31.85	
2nd	35.25	0.569777	26.00	0.000009*	27.48	0.00248*
3rd	34.67	0.386469	24.49	0.000001*	22.91	0.000001*
4th	31.24	0.010506*	23.38	0.000000*	17.58	0.000001*
Wealthiest 5th	22.92	0.000000*	18.79	0.000001*	12.33	0.000001*

+ ÷² *t*est for significance comparing 1st quintile to subsequent quintiles * significant at p<.05

When the prevalence of underweight children of the same wealth index quintile living in urban and rural areas was compared the differences were not significant for any of the quintiles in Angola, only for children in the poorest quintile in the Central African Republic and for children in the poorest, second and wealthiest quintiles in Senegal. (Tables 6-8). This pattern is somewhat different than that of stunting, where there were no significant differences between urban and rural populations of the same economic status. It is possible that sample size in the quintiles is a factor, as there are more households classified in the wealthiest quintiles in urban areas and larger numbers in the poorest quintile in rural areas. However, since relative sample size in the urban and rural quintiles does not change by nutrition indicator, it does not explain the difference.

Table 6: Angola – Prevalence of Underweight by Wealth and Residence.

Wealth Index (Quintiles)		Urban		Rural		p value ($\div^2$)
		(n)	(%)	(n)	(%)	
Poorest	1st	214	41.59	773	35.06	0.079051
	2nd	518	37.26	492	33.13	0.169682
	3rd	804	35.70	341	32.26	0.263
	4th	948	31.75	217	29.03	0.435
Least poor	5th	1049	22.88	46	23.91	0.87
	Total	3533	31.42	1869	33.07	0.216175

* significant at p<.05

Table 7: Central African Republic – Prevalence of Underweight by Wealth and Residence.

Wealth Index (Quintiles)		Urban		Rural		p value ($\div^2$)
		(n)	(%)	(n)	(%)	
Poorest	1st	358	26.26	2766	31.85	0.031721*
	2nd	602	23.26	2263	26.73	0.084519
	3rd	821	24.00	2050	24.68	0.701803
	4th	1485	22.96	927	24.06	0.534690
Least poor	5th	1730	18.38	431	20.42	0.331988
	Total	4996	21.82	8437	27.30	0.000000*

* significant at p<.05

Table 8: Senegal – Prevalence of Underweight by Wealth and Residence.

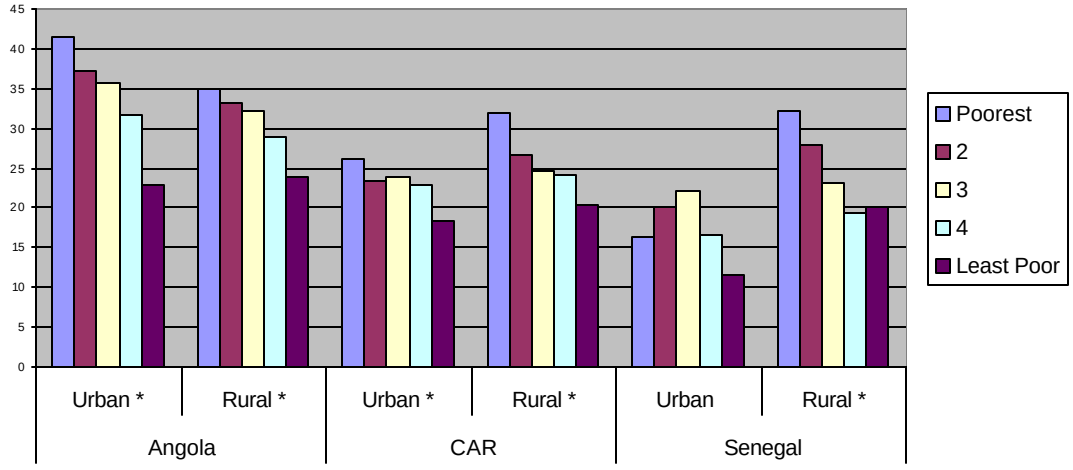
Wealth Index (Quintiles)		Urban		Rural		p value ($\div^2$)
		(n)	(%)	(n)	(%)	
Poorest	1st	37	16.22	1831	32.17	0.039241*
	2nd	144	20.14	1996	28.01	0.041*
	3rd	468	22.01	1719	23.15	0.602853
	4th	853	16.53	512	19.34	0.186723
Least poor	5th	879	11.49	94	20.21	0.014531*
	Total	2381	15.96	6152	27.05	0.000001*

* significant at p<.05

As for stunting, linear regression holding the wealth index quintile constant and using the prevalence of underweight as the dependent variable showed significant negative correlation for all three countries (Angola R^2=.802, â=-3.113, p=.03; CAR R^2=.934, â=-2.746, p=.007; Senegal R^2=.998, â=-4.893, p=.000), indicating that prevalence of underweight is significantly correlated to wealth.

Figure four shows the prevalence of underweight by wealth index quintile and residence. The correlations were significant in both rural (R^2=.914, â=-2.640, p=.011) and urban (R^2=.923, â=-4.293, p=.009) areas of Angola, rural (R^2=.926, â=-2.553, p=.009) and urban (R^2=.781, â=-1.606, p=.047) areas of Central African Republic and in rural (R^2=.900, â=-3.259, p=.014) Senegal. A difficulty with the interpretation of underweight is that it does not distinguish between chronic and acute malnutrition. The lack of a strong linear relationship between wealth and prevalence of underweight in urban Senegal may be due to confounding with acute malnutrition. A similar study in South Africa found that prevalence of stunting correlated well with income, while acute malnutrition was less responsive to income (Zere, E. and McIntyre, D, 2003). Since the relationship between chronic malnutrition and wealth in urban areas of Senegal was linear and significant, the poor linear correlation between wealth and underweight may have to do with confounding factors or small sample size in the lowest wealth quintiles of urban areas.

Figure 4: Prevalence of Underweight by Wealth and Residence



** Indicates significant linear correlation between prevalence of underweight and wealth*

4.0 Discussion

Poverty seems to be a major factor in chronic malnutrition. While the magnitude of rural malnutrition emerges as greater overall, the significance of the differential between rural and urban areas diminishes when poverty status is factored into the analysis. Consistently, in Angola, the Central African Republic and Senegal, there was no significant difference in the prevalence of stunted urban children when compared to rural children of the same wealth index quintile. For children in the poorest families, simply living in an urban environment, does not appear to confer any particular advantage in terms of linear growth.

Inequalities between the poorest and the least poor quintiles existed in all three countries and were similar for stunting and underweight. Two previous studies, one in South Africa and one based on analysis of 11 DHS data sets have shown similar inequalities among rich and poor in urban and rural areas (Zere, E. and McIntyre, D., 2003; Menon et al., 2000). In South Africa, the highest inequalities were observed in the largest cities (Zere, E. and McIntyre, D., 2003).

Some of the most important individual causal factors for child malnutrition are diet, burden of disease and caring practices. Diets have been shown to differ between urban to rural environments, this is discussed in more detail in the following section. When rural and urban areas are compared to each other, the prevalence of infection is higher in rural areas. More research is needed in order to determine whether there are significant differences across wealth income quintiles. Caring practices, such as when to seek treatment during children's illness and continued feeding during illness are more appropriate in urban settings. The determinants for these behaviours need to be explored beyond simple urban/rural comparisons.

Diets in urban areas often contain a larger proportion of dietary energy derived from fat and sugar and are increasingly reliant on processed products (Popkin, 2000). This could explain part of the difference in the level of significance between rates of underweight and stunting in urban and rural populations. Urban diets may be more adequate in terms of meeting energy requirements, but do not necessarily contain more micronutrients particularly in the lower income groups. Micronutrients are important for adequate

childhood growth. Lack of adequate micronutrient intake has been shown to be a factor in stunting prevalence (Rosado, J. 1999).

Price and income are the two most influential factors influencing food purchases (Haddad, L., 2003). Urban residents are obliged to purchase the majority of the food consumed within the household. An advantage that persons in rural areas have over urban counterparts is the availability and access to wild or non-cultivated foods, including seasonal fruits and green leaves, which are good sources of essential micronutrients. The reliance on cash based economy may constrain the ability of the urban poor to diversify their diet. Research from Bangladesh (Torlesse, et al. 2003), has shown a negative correlation between malnutrition in urban areas and food expenditure on non-grain products, as urban populations spent more on food items other than rice, the prevalence of underweight in children decreased. One of the reasons sighted for this was the increased micronutrient density of non-rice food purchases. The feasibility of the urban poor to diversify their diets and the issue of micronutrient intake among poor urban populations are two areas deserving much more attention.

Overweight and obesity are most commonly associated with affluence, however there is mounting evidence that obesity is becoming a public health problem in developing countries (deOnis and Blossner, 2003). Much of this transition is due to increasing urbanization and dramatic changes in diet and physical activity patterns. These lifestyle changes are likely compounded by poor nutrition status in childhood. Stunting during childhood predisposes individuals to later problems with overweight (Popkin et al.,

1996). As countries develop and become more economically prosperous, adults stunted as children are more likely to become obese and suffer from non-communicable diseases such as coronary heart disease and diabetes.

At present the prevalence of overweight children in the three countries studied is of minor significance when compared to the prevalence of undernutrition. (Angola 0.5%, Central African Republic 0.8% and Senegal 2.6% deOnis and Blossner, 2003). Reducing underweight and stunting remain clearly identifiable public health priorities. At the same time, programs designed to address undernutrition should monitor improvements in nutrition status and incorporate dietary quality considerations to prevent inadvertent increases in the prevalence of overweight.

5.0 Conclusions

Undernutrition is a fundamental problem for developing countries. This paper has demonstrated that the problem is similar for same level socio-economic groups in urban and rural areas. When decisions are made using aggregated urban and rural figures, discrepancies between socio-economic groups may be masked. Better documentation and monitoring of trends in malnutrition stratified by socio-economic status is needed.

The issue of dietary quality receives little attention, yet it is fundamental to the achievement of adequate nutritional status. The urban poor are in a particularly precarious position due to reliance on a cash based economy and minimal opportunities for own food production or harvest of wild foods. Attention to dietary quality is an

essential policy and programmatic consideration for nutrition improvement programs in both urban and rural areas. The particular constraints of the urban poor in accessing adequate amounts of micronutrients should be an area for further research.

Urbanisation is associated with dramatic changes in lifestyles and diets. While it is appropriate to focus on reducing undernutrition, visionary policies and programs will be those designed to address the inequalities in malnutrition on either end of the spectrum. Measurements of childhood nutritional status using anthropometry can detect changes in both under and over nutrition, making anthropometry an ideal tool for monitoring changes. Dietary quality is a key feature which can be used to address both problems of under and over nutrition.

References

deOnis, M. and Blossner, M.. 2003. The World Health Organisation Global Database on Child Growth and Malnutrition: methodology and applications. *International Journal of Epidemiology* 32:518-526.

deOnis, M., Frongillo, E., and Blossner, M.. 2000. Is malnutrition declining? An analysis of changes in levels of child malnutrition since 1980. *Bulletin of the World Health Organization,* 78(10):1222-1233.

deOnis. M., Monteiro, C., Akre, J. and Clugston, G. 1993. The worldwide magnitude of protein-energy malnutrition: an overview from the WHO Global Database on Child Growth. *Bulletin of the World Health Organization* 71(6):703-712.

Frongillo, E. A. (Jr), de Onis, M. and Hanson, K. M. 1997. Socioeconomic and demographic factors are associated with worldwide patterns of stunting and wasting of children. *Journal of Nutrition*. 127: 2302-2309.

Haddad, L., Ruel, M. and Garrett, J. 1999. *Are urban poverty and undernutrition growing? Some newly assembled evidence*. FCND Discussion Paper No. 63. International Food Policy Research Institute, Washington DC

Haddad, L. 2003. Redirecting the diet transition: What can Food Policy Do? *Development Policy Review* 21(5-6):599-614.

Maxwell, D., Levin, C., Amar-Klemesu, M., Ruel, M., Morris, S. and Ahiadeke, C. 2000. *Urban Livelihoods and Food and Nutrition Security in Greater Accra, Ghana*. IFPRI Research Report 112.

Mendez, M. and Adair, L. 1999. Severity and Timing of Stunting in the First two years of life affect performance on cognitive tests in late childhood. *Journal of Nutrition,* 129:1555-1562.

Menon, P., Ruel, M. and Morris, S. 2000. Socio-economic differentials in child stunting are consistently larger in urban than in rural areas. *Food and Nutrition Bulletin* 21(3):282-289.

Popkin, B. 2000. Urbanization and the Nutrition Transition. *Achieving Urban Food and Nutrition Security in the Developing World.* 2020 Vision, Focus 3, Brief 7 of 10.

Popkin, B., Richards, M. and Montiero, C. 1996. Stunting is associated with overweight in children of four nations that are undergoing the nutrition transition. *Journal of Nutrition,* 126(12):3009-3016.

Popkin, B., Horton, S., Kim, S., Mahal, A. and Shuigao, J. Trends in Diet, Nutritional Status and Diet related non-communicable diseases in China and India: The Economic costs of the Nutrition Transition. *Nutrition Reviews* 59(12):379-390,2001.

Rosado, J. 1999. Separate and joint effects of micronutrient deficiencies on Linear Growth. *Journal of Nutrition,* 129(2)

Torlesse, H., Kiess, L. and Bloem, M. 2003. Association of Household Rice Expenditure with Child Nutritional Status Indicates a Role for Macroeconomic Food Policy in Combating Malnutrition. *Journal of Nutrition* 133:1320-1325.

UNCHS (Habitat). 2002. *The State of the World's Cities, 2001*. Nairobi, Kenya.

UNICEF, 2000. *Monitoring Progress Toward the Goals of the World Summit for Children*. End-Decade Multiple Indicator Survey Manual. Division of Policy and Planning, Programme Division. United Nations Children's Fund NY,NY

UNICEF. 2003. *End Decade Databases- Malnutrition* Accessed 14/11/03 online at www.childinfo.org/eddb/malnutrition/index.

United Nations Population Division. 2002. *World Urbanization Prospects The 2001 Revision.* Population Division, Department of Economic and Social Affairs. United Nations Secretariat.

WHO. 1995. *Physical status: The use and interpretation of anthropometry*. WHO Technical Report Series 854. Geneva.

Zere, E. and McIntyre, D. 2003. Inequities in under-five child malnutrition in South Africa. *International Journal for Equity in Health* 2:7. Accessed online 24/11/03 http://www.equityhealthj.com/content/2/1/7.