

1982

Urbanization and Malnutrition in the Sudan

Richard A. Lobban Jr.

Rhode Island College, rlobban@ric.edu

Follow this and additional works at: <https://digitalcommons.ric.edu/facultypublications>



Part of the [Social and Cultural Anthropology Commons](#)

Citation

Lobban Jr, R. A. (1982). Urbanization and malnutrition in the Sudan. *Northeast African Studies*, 4(1), 9-18.

This Article is brought to you for free and open access by Digital Commons @ RIC. It has been accepted for inclusion in Faculty Publications by an authorized administrator of Digital Commons @ RIC. For more information, please contact digitalcommons@ric.edu.

URBANIZATION AND MALNUTRITION IN THE SUDAN*

Richard A. Lobban, Jr.
Rhode Island College

The complex and contradictory nature of the process of urbanization is manifest in a wide variety of ways. Inherent within the process are patterns of socio-economic differentiation such as class formation, social stratification and complex division of labor. Topics such as urban health and nutrition demand an anthropological perspective insofar as they are products of human culture and specific relations of production at specific periods. In short, a study of human health would be very limited without an understanding of its anthropological and its epidemiological context. The search for causality and correlation would likewise be frustrated.

Remarkably, many inquiries into health matters have detached or segregated the health variables from the socio-cultural milieu. The task of this paper is to initiate a preliminary study which attempts to view one facet of human health--that of malnutrition, as it correlates or articulates with urbanization as a process.

Difficulties in defining urbanization have long been identified, but generally the types of definitions fall in two main categories which are not necessarily mutually exclusive. The first type is that which seeks a quantitative expression of urban scale in terms of its demographic features of age - sex composition, migration, rates of growth, and over-all population size. The second type of definition embraces description and analysis of the cultural processes of transformation and adaptation to urban life as seen in voluntary associations, changes in family and marriage, ethnic encapsulation or dissolution, social stratification and so forth.

For some analytical purposes it may be useful to dichotomize these qualitative aspects of urban life but in social reality these two dimensions are intricately interpenetrating. In this brief paper an effort will be made to combine both in terms of constructing an urban context in which the specifics of malnutrition may vary. Since I am writing mainly as an urban anthropologist rather than a nutritionist or medical anthropologist I offer a definition of urbanization as a cultural process of adaptation to stress in cities. The notion of "stress" is meant to imply the lack of alignment or integration of social institutions as a result of the process of class formation which is inherent in urbanization. In this particular case, the misalignment is represented by malnutrition. Nutritional deficiencies, perhaps unlike some other diseases, are fundamentally tied to social realities such as nutritional education, resource distribution and domestic budgets. The urban milieu offers a potentially stressful environment for variation in frequency and intensity of malnutrition.

*Throughout this paper I use the simple term "malnutrition" to cover the terms Protein-Calorie Malnutrition (PCM) and Protein-Energy Malnutrition (PEM).

General Survey of the Data

The study of nutrition and anthropology is not new in Africa (cf. Richards 1932) but has taken a more sophisticated orientation. Devalt and Pelto (1977: 82) or Dantje (1977: 105) point out that the more recent studies have taken two different approaches, that is, 1) studies of idea systems and cultural beliefs about nutrition and, 2) studies of social, political and economic factors. Clearly these approaches are linked but the epistemology in this paper considers that the second approach incorporates data at a more substantive, material level. Nevertheless, "it [is] generally recognized that the causative factors of malnutrition may be seen as a complex of poverty and ignorance, but there is no unanimity as to the relative importance and underlying causes" (Bantje 1977: 97). The complications of analysis are increased by the fact that malnutrition is a direct contributor to such ailments as kwashiorkor and marasmus and has a synergistic interaction with such diseases as malaria, gastro-enteritis, dysentery, pneumonia, and measles.

A summary viewpoint is expressed by Lindenbaum (1977: 152):

The etiology of malnutrition involves poverty, bad housing, poor hygiene and lack of information about the value of foods and of family planning. These factors in turn relate to wider economic and political issues which conspire to produce deprived segments in the world population. Nutritional anthropologists should focus then not on food alone, but on the interlocking physiological and social factors responsible for gross differences in human survival.

In an even more succinct statement Wood (1979: 57) observed that "unquestionably, the primary sources of poor nutrition are economic and environmental."

On a more substantive level it is often seen (Bailey 1975: 359) that some traditional foods which are of nutritional value are given less prestige and, particularly in the urban areas, decline in their importance. At the same time foods with less nutritional value such as refined white flour, sugar-laced beverages and sweets are accorded social distinction (Wood 1979: 63). In the context of class formation, the poorer strata are caught in this contradiction and reduce what is nutritionally beneficial while increasing their consumption of poorer foods. The contradiction is most acute with poor urban women who are pregnant or lactating and deny good nutrition to their fetus or to nursing infants. In the latter case, the nutritional deficiencies may be compounded by the mother's activity in the cash/wage sector which restricts the length of time that the infant can have nutritious breast milk. Some considerable attention has also, and appropriately, been drawn to the commercialization and propagation of milk substitutes which are designed to replace mother's milk but in so doing sacrifice this excellent infant food and stretch domestic food budgets even further. Poverty heightens the problems of lactation failure (Newman and Gulliver 1979: 66). This cluster of variables is tragically manifested in the notoriously high levels of infant mortality in the developing nations and in increased potentials for mental retardation (Schaeffer 1966, Ramalingaswami 1975, Mopley 1980).

Wood (1979: 63) explicitly links many of the problems of malnutrition to rapid urbanization in which "cultural shock" in "contact situations" has the devastating effect of interfering with traditional nutritional adaptations. Poorer migrants from the rural countryside, squatters, and unemployed are more apt to fail in adapting to the nutritional resources and values in the urban area. The stark image of blank expressions and distended bellies of children is by no means the only manifestation of urban malnutrition which may also include, with much of the same etiology, high rates of obesity resulting from excessive caloric intake concurrent with protein-deficiency.

The concept of contradiction in urban life may be seen in the fact that while the urban areas offer possible employment not found in the rural areas, they also make wage labor obligatory to support the domestic units. Urban areas may have the best health facilities of a nation, but they exist in the midst of some of the worst health environments. For example, relatively confined urban space can be systematically drained and sprayed for malaria control, but malaria often increases as a correlate of urbanization through the attraction of malaria-carrying migrants from the countryside (Bruce-Chwatt 1980: 17). Urban areas can mean cleaner and more regular water supply but alternatively may mean an increase of gastroenteritis as a result of urban squalor (Rowland and Barrell 1980: 33). Such examples illustrate the complex nature of the study of urban epidemiology, and the case of malnutrition is quite parallel. With education and relative economic comfort prepared milk substitutes easily and successfully replace mother's milk, but for the urban poor the absence of hygiene, proper formulas, bacterial contamination, and a poor maternal diet result in particularly high malnutrition in the urban centers (Newman and Gulliver 1979: 66-67). In numerous studies (Moodie and Whitman 1971, Dodge and Demeke 1970, Newman and Gulliver 1979) poverty and low income are the strongest correlates of malnutrition in the context of rapid urbanization.

Despite the clear correlations which have been shown to exist between malnutrition and urbanization in the developing nations, there is no necessary or inevitable relationship (cf. Harrison 1980: 68). It is urbanization under certain specific socio-economic or political conditions which result in stressful contradictions of this sort. It is rapid urbanization coupled with rapid class formation and without effective instruments of mass articulation with the health infrastructure which are the parameters within which high frequencies of malnutrition are to be found. Caution must be exercised in seeking to apply class perspectives to other illnesses. Coronary heart disease (CHD) seems to be more common among the upper class groups in the urban areas of developing countries (Marmot 1980: 135-138). Hypertension (Scotch 1963) may increase with recency of urban migration. The risk of CHD is higher among those wealthy urban segments which have most recently come to occupy that status (Marmot 1980: 141-142). A particularly complex relation between disease and class is seen with duodenal ulcers in a study by Susser and Stein (1962) which showed no regular class variation under age 45, but for patients over 45 the incidence of ulcers increase with higher class position; this pattern only existed during certain decades. Arterial disease also fails to show absolute class correlations and schizophrenia, which often does correlate with lower class, may do so because of the downward social mobility linked with the disease making that association symptomatic and not etiological (Cartwright 1980: 147-149). Specific forms of cancer have high class or occupational associations while other forms of malignancy do not have any such linkage. Cartwright (1980: 151-156) also stresses the lack of uniformity in the definition of class employed in studies of disease-class relationships.

The associations between class and various diseases quite clearly require avoidance of simplistic and narrowly deterministic models. These must be replaced with models which are disease-specific, and which incorporate perspectives on urban differentiation, scale, migration and general resource base. The model on which this article is based uses the notion of contradiction to draw our attention to critical areas in which the specific disease of malnutrition may be studied in its demographic and cultural context. In general terms this contradiction is seen in lack of incorporation within the urban political economy and in the marginality of the health and educational infrastructure. Subsequent social network analysis may also prove to be fruitful in examining the etiology and epidemiology of malnutrition, but such interpretations will require additional time and space than are presently available.

The Sudanese Data

An initial view of certain demographic and epidemiological variables in the Sudan permits a better understanding of the relationship between urbanization and malnutrition in that nation. First of all, the "Three Towns" urban agglomeration, composed of Khartoum, Omdurman, and Khartoum North, is an important city with respect to its disproportionate dominance of the countryside, the skewed availability of social and health services and employment, and the pronounced role of rural-to-urban migration in rapidly increasing the population. More specifically, Khartoum Province is considered to be 72.8 percent urban in contrast with Upper Nile Province which is 95.3 percent rural or with Red Sea Province which has 35.7 percent of its population identified as nomadic (National Health Program 1975: 4).

The skewed nature of urban resources is seen in 1974 data which found 50 percent of all practicing doctors in Khartoum or Gezira provinces where only 14 percent of the national population lives. The other half of the doctors "serve" 86 percent of the population. The 957 physicians in the Sudan give a national ratio of one doctor for every 125,000 people. Clearly, many people will never see a doctor in their entire lives (National Health Program 1975: 33).

As the most urbanized region of the Sudan, Khartoum Province's urban population is composed of 33.8 percent migrants, or 80 percent of migrant origin if this perspective is restricted to those over 18 years of age (Department of Statistics 1966: 11-13). The role of urban migration may also be seen in the fact that the population of the Sudan is growing at a high 2.5 percent per year but that the "Three Towns" are growing at about 7.6 percent. The difference may primarily be attributed to migration although lower urban death rates probably play a role. The relatively high Crude Death Rate of 24 per 1,000 is not unlike that for the other developing nations but is about twice that for Europe and North America. The infant death rate of about 140 per 1,000 (National Health Program 1975: 5-6) is extremely high and is a subject to which I will return. Although urban migration is very significant, and a major motivation for migration is wage employment, it is ironic to note that the portion of those economically active in a household falls from 30.4 percent in the rural areas to 26.2 percent in the urban areas.

Closely related to this discussion are some salient points about income. Income statistics are variable and subject to misinterpretation when given in gross *per capita* form, yet it is important to note that when increases in the Gross Domestic Product took place (and this was not in every year) the increase in the cost of consumer goods always outstripped these gains. During the 1970-1973 period food costs rose 29.9 percent, housing, 43.9 percent, and clothing was up 33.3 percent. These rates of inflation have not been slowed in more recent years (National Health Program 1975: table 21.3). Since so many in the urban population are migrants it is relevant to cite a study of fourteen villages in the Gezira area (Taha 1979: 195) which found that 60 percent of the household heads (n=189) had an income of 14 Sudanese pounds or less per month and that for those people over 15 years of age (n=6,454) only 11 percent had more than primary education. At the same time these poorly educated and poorly paid individuals were compelled to pay 56.8 percent of their budgets for food alone. Inflation had already curbed improvements in clothing and housing and was beginning to erode basic nutrition.

Because of a strong cultural preference for beans and because of relatively widespread animal husbandry the Gezira population investigated did not show signs of protein deficiency, but did show a caloric deficiency averaging 147 calories per day (614 KJ/day) (Taha 1978: 147; Taha 1979: 198).

The degree of malnutrition generally declines as a function of increased income; a correlation which has been supported in numerous studies already cited. Thus we have demonstrated by example the existence of a rural population which is suffering from a systematic degradation of its economic position which often results in increasing degrees of malnutrition. It is this same population which contributes significantly to the wider process of Sudanese urbanization.

Urbanism and Disease

The National Health Program (1975, Table 3.9 p. 28) offers illustrative data on a number of prominent diseases in the Sudan:

Relative Percentages of Reported Cases of Common Diseases

	1965-66	1967	1974
Malnutrition/anemia	5.0	9.0	10.5
Dysentery	5.5	7.0	12.0
Tuberculosis	7.5	6.0	4.5
Malaria	11.0	12.0	16.0

These figures are inherently conservative and the same report (p.49) suggests that the increase of malaria, for example, may have already reached 20 percent of the entire national population. For children, with their notably high death rates, Taha (1979: 198) reports that about three fourths of their often-fatal diseases are respiratory infection and gastroenteritis. Verification of these national trends is found in the Pathology Survey of Khartoum Province (MEFIT 1975: 18) which found malaria to be the primary disease at 701 cases for 10,000 people while one third of the rural population was infected with this disease. Bacillary and amoebic dysentery was second in the study of urban pathology at a frequency of 452 cases per 10,000 followed by influenza at 239 cases per 10,000.

These various afflictions merit their own investigation but are raised here because of their intricate interpenetration with malnutrition as a profoundly complicating factor. The rural and urban dichotomies are also not autonomous given the importance of rural to urban migration and even if the urban population were able to improve its health environment, its economy is continually taxed by the migrants who infect the urban population and generally lower the income and educational levels of the urban population.

Aside from such complicating factors as gastroenteritis, malaria, and respiratory infection, malnutrition is a killer. Taha (1979) reports that one third of all pediatric hospitalizations are a result of malnutrition. About 18 percent of the hospitalized cases of malnutrition and anemia result in death, (slightly more for male children and slightly less for females). Overall mortality is higher for children less than one year of age (National Health Program 1975: Table 3.5). The same source (Table 3.7) also indicates that from 1965 to 1974, Khartoum Province had a rather constant 5 percent of all nationally reported cases of malnutrition or anemia. During the 1970-74 period this meant about 32,000 reported cases annually in Khartoum Province. Relative to the portion of the national population in this province (about 7.6 percent) one may claim that urbanization has, in general terms, reduced the expected frequency of malnutrition. The conclusion is somewhat misleading however because of the class nature of malnutrition. For the better educated and higher income groups malnutrition is quite rare but with poorer strata or new migrants from the countryside the proportions are much higher. In the poorer residential areas livestock are sometimes kept near the living areas, waste collection is irregular, water puddles are neither drained nor sprayed, slaughtering and meat sales are not hygienic, water and electric supply is

not regular allowing for loss of stored foods, and human wastes are deposited liberally. The Taha (1979: 196) study in Gezira villages found 63 percent without any latrines and of those with pit latrines none was water-sealed. This urban epidemiological picture relates directly to malnutrition inasmuch as dysentery, gastroenteritis and malaria are linked to these urban conditions, yet with these diseases, their symptomatology may be short-lived. Malnutrition and loss of appetite is clearly associated with these above diseases, both as an effect and as a complicating factor.

Discussion about the correlates of urban poverty and malnutrition should also address the question of family size and birth order. From the time of Malthus and before, poverty had incorrectly been considered as *caused by* large family size. Of course, it is not simply a matter of family size, but of the relative productivity of family members; likewise, malnutrition does not correlate with family size (Taha 1979: 198). Some small families had malnutrition, some large families did not. Income and class position were more meaningful variables. Moreover, Taha also determined in his 14 village study that birth order was not a correlate of malnutrition in the Sudan even though this may be the case elsewhere. Indeed, the word *kwashiorkor* means 'second child disease' in Ga, a language of Ghana (Wood 1979: 73-75).

The Sudanese National Health Program has sought to measure the degree of malnutrition using the "Boston standard" Gomez classification, an indicator which projects mean weights for various age groups. From 90-100 percent on the "Boston standard" is considered normal; 75-89 percent indicates the first degree of malnutrition; 60-74 percent the second degree; and below 60 percent of the "Boston standard" indicates third degree malnutrition.

Using this typology in three surveys of Sudanese children, aged 0-4 years it was found that 50 percent were normal and 50 percent had some degree of malnutrition, although of that malnourished half, 40 percent had only first degree malnutrition; 9 percent second degree and just 1 percent had third degree (National Health Program 1975: 95). It is not clear whether this report is the same, or a different, study cited in Osman and Abdel Fattah (1979) which indicates that research in the mainly rural provinces of Kassala, Red Sea, and Darfur showed mean heights of boys and girls at about the 50 percent level suggesting acute rather than chronic malnutrition.

Investigations in the Sudan are much needed (cf. Taha 1978: 137) but an interesting journalistic report in *Sudanow* (December 1980) entitled "Plenty to Show, but Little to Eat" describes the significant advances in mechanized agriculture at Chukudum but says this development in cash cropping is associated with famine and widespread gastroenteritis. In this context food crop production declines and agricultural workers are forced to buy food with their very low incomes.

The need for longitudinal scientific studies of urban nutrition also leaves much to be desired but one may refer to the Abdel Fattah and El Amin (1971: 2) study of food consumption in the Three Towns area which focused on 40 households in El Goz and in El Hilla El Gideda. About half of the low and middle income residents were skilled workers whose nutrition was generally good except that their diet included an average of 155 grams of sugar daily which made up a large part of the 61 percent of carbohydrates in their meals. Fats for frying and stewing represented another quarter of their food source. Unlike many developing nations, animal protein was in sufficient supply. Dietary problems existed mainly in the over-reliance on sugars and fats to make-up an adequate daily calorie intake and in a slight deficiency of riboflavin because of a lack in leafy green vegetables. Some malnutrition was reported for children. It must be recalled that this study was in 1971 and food cost and supply has deteriorated considerably by the early 1980's.

Observations and Conclusions

Solutions to the problems of nutrition in the Sudan in general and its urban areas in particular must necessarily accept the interconnectedness of epidemiological, developmental, health, demographic and cultural factors. Special attention is needed in the rural areas, among the poor urban migrants and with infants and children in general. The linkages between urban class formation, socio-economic stratification and malnutrition are strongly illustrated even with the limited number and quality of longitudinal or situational studies. Although poverty is a strong correlate of malnutrition in the Sudan it is likely that massive health and nutrition education would have considerable ameliorative effect. The Taha survey (1979) noted the relationship between low income and low expenditure on food as well as poor housing and hygiene. Ignorance about a balanced diet for infants and children, and the apparent decline in breast feeding with inadequate bottle substitutes are aggravating features.

A concise conclusion to this paper is also found in the remarks of Mopley (1980: 37) who says that;

The worldwide distribution of childhood malnutrition and infection is closely associated with poverty and lack of justice in meeting basic human needs. No other criterion of the quality of life shows so directly the level of need in a society or in the world community.

In equally profound terms Wood (1979: 101-102) offers her view that:

A radical change in the nutrition status of malnourished populations is no more beyond the realm of possibility than was flying to the moon a few years ago, but it must be thoroughly appreciated that the accomplishment of the former will take even more knowledge, planning, and concerted effort than was required by the outer space projects. The result would surely be more profound: an improved quality of life for the many millions who now confront a life of inadequate nourishment, hunger, or starvation. The solutions of their problems lie now in the realm in which the Social Sciences can make a maximum contribution.

NOTE

During the course of my 1979-80 field work in the Sudan my research associate, Asma Abdel Rahman Abdel Fateh, seconded from the Ministry of Health while pursuing graduate research in anthropology at the University of Khartoum, was stricken by a malaria attack and in her weakened condition contracted a respiratory infection, and perished. This article is dedicated to her memory and influence in this research. During my own 1979-80 field work I also contracted malaria three times, but being well-nourished I recovered after heavy doses of a quinine-derivative.

REFERENCES

- Abdel Fattah, Asma A.R. and Alawia El Amin, 1971. Food Consumption Survey in Khartoum, Nutrition Division, Ministry of Health, Khartoum, Sudan. Sudan Medical Journal, in press.
- Abdel Fattah, Asma A.R. and Alawia El Amin, 1973. 'Food Consumption Patterns with Regional Characteristics with Special Reference to Infants and Pre-School Children,' in Yousif, Bagchi and Khattab (eds.), *Food and Nutrition in the Sudan*, 71-98.
- Bailey, K.V., 1975. 'Malnutrition in the African Region' *WHO Chronicle*, 29: 354-464.
- Bantje, Han, 1977. 'Sociological Aspects of Nutrition Education in Jamaica,' Fitzgerald (ed.), *Nutrition and Anthropology in Action*, 94-105.
- Bennett, F.J. and J.P. Stanfield, 1972. 'The Clinical Conditions and Aetiology of Malnutrition in Uganda,' in V.F. Amann, D.G.R. Belshaw and J.P. Stanfield (eds.), *Nutrition and Food in an African Economy*, 1-9. Kampala: Makerere University.
- Bruce-Chwatt, L.J., 1980. 'From Malaria Eradication to Malaria Control,' in Clegg and Garlick (eds.), *Disease and Urbanization*, 13-20.
- Cartwright, R.A., 1980. 'Social Class and Disease,' in Clegg and Garlick (eds.), *Disease and Urbanization*, pps. 145-158.
- Clegg, E.J. and Garlick, J.P. (eds.), 1980. *Disease and Urbanization*, Symposium of the Society for the Study of Human Biology Vol. 20, Taylor and Francis, Ltd. London.
- Department of Statistics, 1966. General Survey of Urban Areas, 1964-66, Population Survey Tables 7 and 8, Khartoum.
- Dewalt, K.M., and G.H. Pelto, 1977. 'Food Use and Household Ecology in a Mexican Community,' in Fitzgerald (ed.), *Nutrition and Anthropology in Action*, pps. 79-93.
- Dodge, R.E. and T. Demeke, 1970. 'The Epidemiology of Infant Malnutrition in Dabot,' *Ethiopian Medical Journal* 8: 53-72.
- Fitzgerald, T.K. (ed.), 1977. *Nutrition and Anthropology in Action*, Van Gorcum, Amsterdam: The Netherlands.
- Gebre-Medhin, M. and B. Vahlquist, 1973. 'Nutrition Problems in Relation to Health: Experience in Ethiopia,' *World Medical Journal*, 20: 106-110.
- Harrison, G.A., 1980. 'Urbanization and Stress,' in Clegg and Garlick (eds.), *Disease and Urbanization*, pps. 55-72.
- Harrison, Gail G., William L. Rathje and Wilson W. Hughes, 1975. 'Food Waste Behavior in an Urban Population,' *Journal of Nutrition Education*, 7: 13-16.
- Jelliffe, D.B. and F.J. Bennett, 1961. 'Cultural and Anthropological Factors in Infant and Maternal Nutrition,' *Proceedings, Federation of American Societies for Experimental Biology*, Supplement No. 7, pps. 185-187.

- Jelliffe, D.B., 1962. 'Urbanization and Child Nutrition in Africa,' *International Child Welfare Review*, 16: 67-73.
- Lindenbaum, Shirley, 1977. 'The 'Last Course': Nutrition and Anthropology in Asia,' in Fitzgerald (ed), *Nutrition and Anthropology in Action*, pps. 141-155.
- Marmot, M.G., 1980. 'Affluence, Urbanization and Coronary Heart Disease,' in Clegg and Garlick (eds.), *Disease and Urbanization*, pps. 127-143.
- MEFIT, 1975. Regional Plan of Khartoum and Master Plan for the Three Towns, Direction for a Health Plan, Phase III, May.
- Moodie, A. and W. Wittman, 1971. 'The Background of Protein Deficiency in an Urban Community,' in J.W. Classens and H.J. Potgieter (eds.) pps. 355-359, *Protein and Food Supply in the Republic of South Africa*. Capetown: A.A. Balkema.
- Morley, D.C., 1980. 'Nutrition and Infectious Disease,' in Clegg and Garlick (eds.) *Disease and Urbanization*, pps. 37-43.
- National Health Program, 1977/1978-1983/1984. The Democratic Republic of the Sudan, Khartoum, 24 April, 1975.
- Newman, James and Gulliver, Catherine. 'Patterns of Protein-Energy Malnutrition and Food Deprivation Among Infants and Toddlers in Africa South of the Sahara.' *Afr. Stud. Rev.* (Waltham, Mass), 22, 2, Sept. 1979, pps. 65-76.
- Omer, H.O., M.I.A. Omer, and O.O. Khalifa, 1975. 'Patterns of Protein-Energy Malnutrition in Sudanese Children and Comparison with Some Other Middle Eastern Countries,' *J. Trop. Paediatric Environment Child Health*, 21 (6): 329-333.
- Osman, A.K. and Abdel Fattah, Asma A.R., 1979. 'Impact of the School Feeding Program on the Nutritional Status of Children,' National Seminar on Nutritional Improvement, 12-14 May, 1979, Nutrition Division, Ministry of Health, Khartoum, Sudan.
- Ramalingaswami, V., 1975. 'Nutrition, Cell Biology, and Human Development,' *WHO Chronicle*, 29: 306-312.
- Richards, Audrey, 1932. *Hunger and Work in a Savage Society*, Ratledge: London.
- Rose, G.A., 1976. 'Epidemiological Evidence for the Effects of the Urban Environment,' in *Man and Urban Environments*, Harrison and Gibson (eds.), Oxford U.P.
- Rowland, M.G.M. and Barrell, R.A.E., 1980. 'Ecological Factors in Gastro-enteritis,' in Clegg and Garlick (eds.) *Disease and Urbanization*, pps. 21-35.
- Sai, F.T., 1967. 'The Impact of Urban Life on the Diets of Rural Immigrants and Its Repercussions on the National Status of the Community,' *Ghana Medical Journal*, 6: 134-39.
- Schaeffer, A.E., 1966. 'Observations from Exploring Needs in National Nutrition Programs,' *American Journal of Public Health*, 56: 1088-1096.

- Scotch, N., 1963. 'Sociocultural Factors in the Epidemiology of Zulu Hypertension,' *American Journal of Public Health*, 53: 1205-1213.
- Scragg, J. and Rubidge, C., 1960. 'Kwashiorkor in African Children in Durban,' *British Medical Journal*, ii, 1759-1766.
- Sudanow, 1980. 'Plenty to Show, Little to Eat,' December, pps. 25-27.
- Susser, M.W. and Stein, Z.A., 1962. 'Civilization and Peptic Ulcer,' *Lancet*, i, 115-119.
- Taha, S.A., 1978. 'Household Food Consumption in Five Villages in the Sudan,' *Ecology of Food and Nutrition*, 7 (3): 137-142.
- Taha, S.A., 1979. 'Ecological Factors Underlying Protein-Calorie Malnutrition in an Irrigated Area of the Sudan,' *Ecology of Food and Nutrition*, 7 (4): 193-201.
- Whitehead, R.G., M.G.M. Rowland, and T.J. Cole, 1976. 'Infection, Nutrition and Growth in a Rural African Environment,' *Proceedings of the Nutrition Society*, 35: 369-375.
- Wittmann, W.J., O.L. Hansen, 1965. 'Gastroenteritis and Malnutrition,' *South African Journal of Nutrition*, 1: 13-21.
- Wood, Corinne Shear, 1979. *Human Sickness and Health: A Biocultural View*, Mayfield Publishing Co., Palo Alto, California.
- Yousif, Y.B., Bagchi, K., and Khattab, A.G., 1973. 'Food and Nutrition in the Sudan,' Proceedings of the First National Food and Nutrition Seminar, March 1972, National Council for Research, Khartoum, Sudan.