

SECOND CARNEGIE INQUIRY INTO POVERTY
AND DEVELOPMENT IN SOUTHERN AFRICA

Adult malnutrition in
South Africa

by
Stephen J O' Keefe

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Two surveys were conducted to investigate the present nutritional status of urban and rural Blacks in Natal and Kwazulu. In the absence of accepted national standards, we have used - mainly for comparative reasons - those published by Jelliffe (1) and generally employed as "International" standards. For reasons of time and practicality we concentrated on two main areas, one in Durban, the largest urban area in Natal, the other in the Nqutu area of central Zululand which has a relatively large rural population. From both geographic and socio-economic viewpoints, these two areas should provide a reasonable assessment of any major differences between the two populations, whilst accepting that more subtle and minor differences may well have been overlooked.

SELECTION OF SAMPLES

- a) URBAN: A pilot survey revealed a wide variation in nutritional status of urban Blacks (2) with female domestic workers being commonly obese (60% were greater than 40% overweight) and unemployed males being generally undernourished. We eventually chose factory workers who were generally healthy, active, received free meals at work and were reasonably well paid (ie. all received a salary that 'enabled a family to maintain a comfortable standard of living' : Uni-Lever Ltd., S Africa).
- b) RURAL: Ordinance Survey Maps of the Nqutu area in Central Kwazulu were used to randomly select five areas (see Fig.1) from which to draw our samples. Large village areas were avoided and settlements were approached across open veld or rough tracks using a 4-wheel drive vehicle. Most settlements consisted of a group of 5-15 mud huts containing one family group. Permission was obtained wherever possible from the local "Induna" or Chieftain. As with other surveys in rural

areas women were more available for interview than men. The reason was twofold: the adult male population was depleted due to immigration to urban areas (in particular the mines) and those that remained were usually busy working in the fields.

METHODS

Anthropometric Measurements:

- a) Height : without shoes, was measured using a home-constructed pole measure. Reproducibility of measurement by one operator was less than 1%.
- b) Weight : One set of commercial bathroom scales (Krupp Industries) was used for all measurements. The scales were checked and re-zeroed each morning.
- c) Triceps Skinfold Thicknesses (TSF) : Standard Harpenden calipers were used, the same operator taking all measurements.
- d) Mid-arm Circumference (MAC) : This was taken at the same time as the above measurements.
- e) Arm Muscle Circumference (AMC) : Was calculated from the formula

$$AMC = MAC - \frac{1}{2} TSF$$

Where TSF and MAC are expressed in centimeters.

- f) Arm Muscle Area (AMA)

$$AMA = \frac{(MAC - \frac{1}{2} TSF)^2}{4 \frac{1}{2}}$$

DIETARY RECALL

A simple questionnaire was designed to assess the frequency of dietary intake of the various commonly used food stuffs in the rural population. In each area studied a local interpreter (eg. health visitor, district nurse, or teacher) was employed in order to get as much detailed information as possible. However it proved impossible under the conditions of study to obtain accurate assessments of 'quantity' of each food taken. Consequently, more emphasis was made on 'frequencies' of intake.

RESULTS

Breakdown of the population samples into age-group decades (20-30, 30-40 etc) showed no significant differences in nutritional status and dietary intake with the exception that middle aged males and females were heavier than the 20-30 year olds. However significant differences were observed between urban and rural male and female subgroups (Table 1) Average heights for both urban and rural groups were below those of European or American values. However weight for height measurements were only low in rural males with 26% of the sample being less than 80% of international standards. On the other hand obesity was extremely common among urban females, 33% being greater than 40% overweight. Rural women were also generally overweight, the corresponding figure for obesity being 18%. Our conclusion that the excess weight was due to fat and not muscle was based on the excessive triceps skinfold measurements and relatively normal values for arm muscle area (Table 1)

Direct comparison between urban and rural measurements shows that urban adults were significantly taller and weighed more than their rural counterparts. In addition they were fatter and males appeared to have larger arm muscle measurements.

Dietary Intake Pattern in the Rural Population

Table 2 summarises the intake frequency of various common foodstuffs. It is immediately apparent that the diet consists of a staple of 'putu', or mealie meal, and little else. Meat is extremely rarely taken, most (44% males, 51% females) getting meat only once a month. Milk products again were rarely taken with the exception of condensed or powdered milk in tea. At the time of survey (ie. during summer rains) a wild form of spinach, 'imfina' was widely available and was regularly collected, boiled and consumed with putu. Alcohol consumption was

uncommon in women (very rare in young women ie. 86% denied any intake) whilst most men (53%) consumed moderate quantities of home-brewed beer. Spirits were taken occasionally by 10% of males, mainly those in the age group 35-45 years.

Most individuals (58% males, 70% females) passed only one stool per day, which was soft but formed. Health, crudely ascertained by the number of visits to the local hospital or clinic, was generally good (ie. less than one visit per annum). Classical signs of malnutrition were notable by their absence. (It is possible that such individuals were too ill to participate in the survey). However signs of kwashiorkor were not uncommon among children of the age group $1\frac{1}{2}$ - $3\frac{1}{2}$. Bottle feeding of sour milk and mealie pap by grannies whilst mother was away working in the towns was often seen.

The following analysis would suggest the usual intake pattern of most rural Africans (in gm/day)

	<u>Volume</u>	<u>Protein</u>	<u>Carbohydrate</u>	<u>Fat</u>
Mealie meal	4 cups x 3	36	312	12
Spinach	$\frac{1}{2}$ cup	1 g	3	--
		<hr/> 37	<hr/> 315	<hr/> 12

The total caloric content would be 1268 Kcal/d. It would be difficult for any ambulant adult to put weight on on such a diet. Consequently the obese ladies surveyed must have either consumed massive quantities of putu, or added large helpings of sugar. The level of protein intake is clearly borderline and insufficient to meet the additional requirements of stress, sickness or pregnancy. In order to achieve adequate protein intake, approximately 24 cups of mealie meal would be needed!

SUMMARY & CONCLUSIONS

CONCLUSIONS

1. Rural adults are more stunted than the urban population
2. 26% of rural males are greater than 20% underweight
3. 33% of urban females are 40% overweight (ie. obese)
4. 18% of rural females are obese
5. Rural diets are deficient in protein: meat is taken on average four times per month by males and 3 times by females.
6. The most common food pattern in rural adults is putu (mealie meal) three times a day.
7. Fresh milk, eggs and beans are rarely used.

Whilst lack of money and poor distribution and availability of various foodstuffs are major factors in the poor nutrition of urban and rural Zulus, education alone could improve the diet, for example by increasing the use of beans, eggs and fresh vegetables and reducing total carbohydrate.

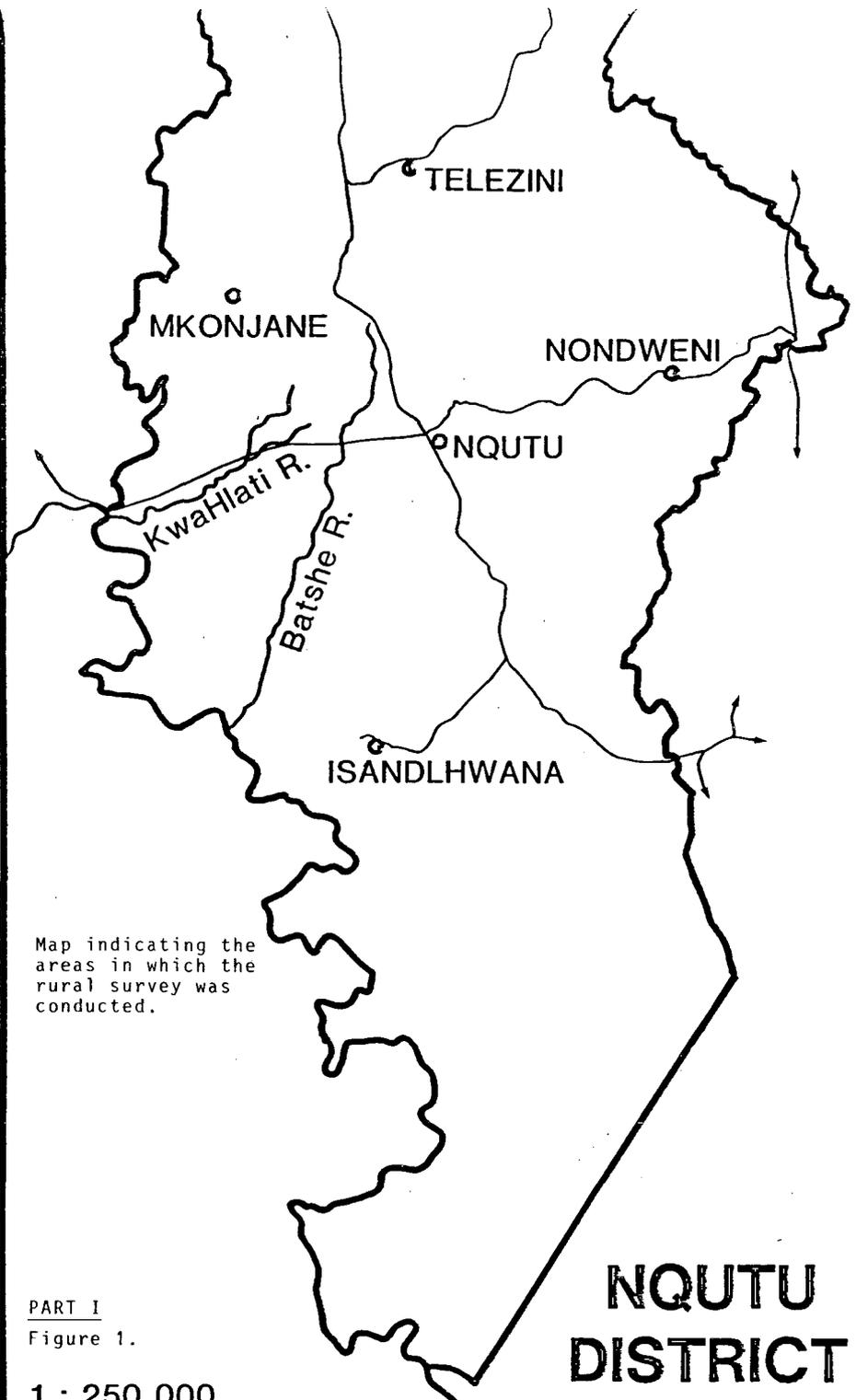
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LEGENDS

Table 1 : Comparison of group mean values \pm SD for anthropometric data on urban and rural Zulus where TRI = triceps skinfold thicknesses, % Bwt = % of ideal body weight, mac = mid arm circumference, ama = arm muscle area, amc = arm muscle circumference

Table 2 : Intake frequencies of rural Zulus of various common foods.

Fig 1 : Map indicating the areas in which the rural survey was conducted.



Map indicating the areas in which the rural survey was conducted.

PART I
Figure 1.

1: 250 000

NQUTU DISTRICT

PART I

TABLE 1

	Sex	n	AGE	HT	WT	TRI	% BWT	MAC	AMA	AMC	WT/HT
INTERNATIONAL	o		42	171	67,3	12,5	100	29,3	56	25,3	0,39
STANDARDS	♀		41	161	56,9	16,5	100	28,5	50	23,2	0,35
U R B A N	o	9.4	41 _± 11	170 _± 7	73 _± 13	9 _± 4	110	28 _± 3	61	27,5	.43
TOTAL	♀	81	31 _± 8	162 _± 5	73 _± 14	22,1 _± 11	126	29 _± 3.4	42	22,5	.45
R U R A L	o	255	41 _± 18	166 _± 1	61 _± 1,8	6,7 _± 0,4	95	28 _± 0,7	54,7	26,1	.36 _± .05
TOTAL	♀	264	45 _± 17	158 _± 1.2	64 _± 3	16,8 _± 2,2	117,8	31 _± 0,9	52,4	25,4	.41 _± .1
A L	o	35	43 _± 19,2	164 _± 5,6	50,5 _± 4	4,7 _± 1,4	79	25,5 _± 1,7	46 _± 6,7	24 _± 1,8	0,3 _± 0,02
80%BWT	♀	11	47,5 _± 21	154,5 _± 5,1	42 _± 1,9	6,8 _± 2	79	23,9 _± 1,4	37,8 _± 3;97	21,7 _± 1;1	0,27 _± 0,01
140% BWT	o	4	49 _± 11,05	169 _± 9,9	88 _± 6,98	11,3 _± 3,2	140	35,1 _± 3,3	35,1 _± 17,5	31,5 _± 3,4	0,52 _± 0,01
	♀	27	44,4 _± 13	158,7 _± 6,2	89,8 _± 10,8	28,3 _± 7,9	162	36,9 _± 4.7	64,2 _± 16,4	28 _± 4,5	0,57 _± 0,07

LEGENDS

Table 1: Comparison of group mean values \pm SD for anthropometric data on urban and rural Zulus where TRI= triceps skinfold thicknesses, %Bwt= % of ideal body weight, mac= mid arm circumference, ama= arm muscle area amc= arm muscle circumference.

VARIABLE	SEX	n	MEAN	STD. DEV.	
MEAT	M	136	4,485	7,201	Times per month
	F	141	2,752	4,629	
EGGS	M	136	2,919	5,145	"
	F	141	2,596	5,382	
FRESH MILK	M	136	5,382	9,107	"
	F	141	2,759	7,202	
MAAS	M	136	5,581	8,839	"
	F	141	3,021	6,496	
FISH	M	136	2,382	4,360	"
	F	141	2,390	4,929	
VEGETABLES	M	136	19,522	12,499	"
	F	141	23,255	10,084	
MEALIE MEAL	M	136	2,294	0,657	per day
	F	141	2,411	0,633	
BREAD	M	136	0,816	0,623	"
	F	141	0,837	0,605	
BEANS	M	136	4,346	7,677	per month
	F	141	2,794	4,942	
RICE	M	136	1,846	3,532	"
	F	141	1,369	3,136	

TABLE 2: Intake frequencies of rural Zulus of various common foods

PART II

Malnutrition and Disease in Adult Natal Blacks (Zulus)

Stephen O'Keefe, GI Clinic
Groote Schuur Hospital and
University of Cape Town.

INTRODUCTION

Two hospital surveys were undertaken in order to assess the nutritional status of patients in urban and rural areas of Natal. The urban study was conducted in the General Medical Wards at King Edward 8th Hospital in Durban and the rural at a number of small Mission Hospitals in Zululand. Both reports have been published (2,3) but will be summarised below.

URBAN SAMPLE Eight hundred and three adult patients were examined of which 550 were male and 253 female.

RURAL SAMPLE Two hundred and seven patients were assessed in four Mission Hospitals situated in Nqutu, Nongoma, Ingwavuma and Manguzi. 98 were male and 109 were female.

RESULTS Table I gives the group mean values for the two groups. In the urban sample both male and female patients were significantly malnourished as compared to control measurements (see previous paper) and International Standards. Depletion of body fat stores was most apparent in males, 82% having triceps skinfold thicknesses below 60% of standard - the level commonly taken to indicate significant malnutrition. In comparison, 55% of female patients had a TSF below this level. On the other hand, 33% of females and only 12% of males were considered overweight on admission. Twelve per cent of women were severely obese (ie. 40% overweight). Calculations of arm muscle area were reduced to 93% and 80% of standard for males and females. Low plasma protein concentrations were common with 68% of males and 61% of females demonstrating hypoalbuminaemia (ie. $< 35\text{g/L}$).

In the rural sample the incidence of hospital malnutrition was even more striking. Ninety three per cent of male and 72% female adult patients had triceps measurements below 60% of standard indicating gross depletion of fat stores. Forty nine per cent of males were clinically marasmic. As with the comparison between healthy urban and rural Blacks, the rural patients were smaller in stature indicating stunting.

RELATIONSHIP BETWEEN NUTRITION AND DISEASE PATTERNS

Both in the urban and rural surveys there was noted to be a strong association between malnutrition (depletion) and infective disease. Forty two per cent of malnourished urban patients and 50% of rural marasmic patients were suffering from acute respiratory infections. Within these groups 20% of the urban and 38% of the rural groups had active tuberculosis - mainly pulmonary. On the other hand there was a similar strong positive correlation between overweight and cardiovascular disease, in particular hypertension. Thus strong evidence was obtained for a direct relationship between nutritional status and the specific disease patterns.

CONCLUSIONS

1. Incidence of malnutrition in urban hospitals : 82% of males, 55% of female patients (general medical wards).
2. Incidence of malnutrition in rural hospitals: 93% of males, 72% of female patients.
3. Positive correlations between
 - a. malnutrition (depletion) and infective disease, in particular pulmonary tuberculosis.
 - b. Over nutrition and hypertensive cardiovascular disease.

PART II

TABLE 1

Hospitalised Patients

	Sex	N	AGE	WT	HT	%BWT	TRI	MAC	AMC	AMA
URBAN	M	550	42 \pm 16	55 \pm 12	171 \pm 8	82 \pm 17	6 \pm 2	23,3 \pm 4	25	52
	F	253	41 \pm 19	52 \pm 21	161 \pm 7	91 \pm 23	14,4 \pm 11	23,9 \pm 5	22	40
RURAL	M	98	42 \pm 16	53 \pm 10	167 \pm 7	82 \pm 15	4,3 \pm 1,5	24 \pm 3,1	23	42
	F	109	41 \pm 16,5	52 \pm 10	152 \pm 6	95 \pm 10	8,1 \pm 3,5	25,1 \pm 4,1	22	39

Comparison of urban and rural anthropometric measurements in Zulus. %BWT = percentage of ideal body weight, TRI = triceps skinfolds, MAC = mid arm circumference, AMC = arm muscle circumference, AMA = arm muscle area.

PART III

Nutritional status of Adult Blacks and Coloureds in South Africa: A review of four surveys in the Transvaal, Cape Town and Natal.

Four surveys of healthy population groups in different parts of the country were conducted. Individual reports are included in the Carnegie Commission Meetings. The results are summarised in Table I.

- a. Transvaal Mineworkers: Heights and weights of 3396 recruits for the minefields were provided of Prof. J. Hansen. Breakdown into regions of origin demonstrated that an average Vendans (n = 24 only) were tallest (173cm) and Transkeians (n=717) and Zulus (n=149) were the shortest (165cm) but the differences were not significant (mean height : 169). The sample included groups from Lesotho, Ciskei, Transkei, Kwazulu, OFS, Lebowa, Queenstown, Pietermaritzburg, Swaziland, Venda and Bophututswana. Average weight was 59.0kg and average percentage of ideal body weight 90% (range 87-94), again with no significant differences between the tribal groups.
- b. Northern Transvaal: Rural
The study was conducted by Dr C B Ijsselmuiden from Elim Hospital and included 395 women but only 41 males. The explanation for the low male count was depletion of male population, due to migrant labour schemes. Mean heights for women were significantly greater as compared to the rural Zulu survey (see Part I), the rural Cape Xhosa survey (see Willowmore survey : N Ndaba) and the rural Cape Coloured survey (N Ndaba). However, weights were significantly lower than the Zulu and Xhosa groups and consequently % ideal body weights also lower. Weights were similar to those of the Coloured group but since heights were greater, percentage ideal body weight were again lower. The size of the male survey negates any strong conclusions on the nutritional status of rural males Vendans, but the few triceps skinfold measurements made were remarkably high, with a mean value of 14.97 as compared to that of rural Zulus at 6.67mm. The female measurements were also higher at 20.69mm as compared to the Zulu mean of 16.8. My opinion is that these

Cont/...

measurements are unrealistic as the percentage ideal body weight measurements were in fact lower for women (ie. 108% for Vendans and 118% for Zulus).

Willowmore Survey : Karoo : Cape Rural

This house to house study was conducted by Nomsa Ndaba in a primarily rural area, and provides a good local comparison between Coloured and Black (primarily Xhosa) residents. The most interesting finding is that whilst the Coloureds were as tall as the Blacks, they were slimmer, both in the male and female groups (males 90% of ideal body weight as compared to 103% in Xhosa, females 117% as compared to 126%). Male Xhosa also had larger arm muscle measurements.

Summary and Conclusions

1. There were no major anthropometric differences between the male members of difference Black (Bantu) tribes in South Africa.
2. Rural Zulu women were more overweight than rural Transvaal (Vendan) women.
3. Rural Coloureds in the Cape (Karoo) were slimmer than the local Black (Xhosa) population.

TABLE 1

	N	HEIGHT	WEIGHT	SKINFOLDS	%BWT	MAC
TRANS- VAAL (Venda)	M =41	170,87 \pm 1,94	66,85 \pm 6,55	14,97 \pm 4,86	99,21 \pm 9,54	
	F =395	162,32 \pm 4,71	60,07 \pm 2,42	20,69 \pm 3,29	108,22 \pm 3,71	
XHOSAS (Cape)	95	M 1,63 \pm 0,04	62,15 \pm 6,76		103,17 \pm 9,6	26,18 \pm 1,79
		F 1,54 \pm 0,02	65,81 \pm 3,23		125,75 \pm 8,85	27,65 \pm 1,32
COLOUREDS (Cape)	541	M 1,64 \pm 0,02	55,93 \pm 0,78		90,33 \pm 4,08	24,29 \pm 0,59
		F 1,53 \pm 0,02	60,62 \pm 4,11		117,27 \pm 9,46	26,82 \pm 1,38
ZULUS	M=255	166,42 \pm 1,04	61,01 \pm 1,82	6,67 \pm 0,43	94,8 \pm 2,28	28,21 \pm 0,71
	F=264	157,69 \pm 1,22	64,37 \pm 2,87	16,8 \pm 2,15	117,8 \pm 5,81	30,76 \pm 0,9

Summary of anthropometric measurements in four groups of Black and Coloured rural populations. Significant differences were seen (Students' t test) between

- heights of male Vendans and Zulus,
- % Bwt of female Vendans and Zulus,
- % Bwt of male and female Xhosas and Coloureds.
- weights of female Vendans and Zulus
- weights of female Xhosas and Coloureds

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These papers constitute the preliminary findings of the Second Carnegie Inquiry into Poverty and Development in Southern Africa, and were prepared for presentation at a Conference at the University of Cape Town from 13-19 April, 1984.

The Second Carnegie Inquiry into Poverty and Development in Southern Africa was launched in April 1982, and is scheduled to run until June 1985.

Quoting (in context) from these preliminary papers with due acknowledgement is of course allowed, but for permission to reprint any material, or for further information about the Inquiry, please write to:

SALDRU
School of Economics
Robert Leslie Building
University of Cape Town
Rondebosch 7700