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Food and Nutrition in Pakistan (A Cross-regional Study)

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Though the nutritional status of an individual is the outcome of complex interaction of a host of environmental factors, income is the mirror-image of a household's purchasing capacity. Another major factor in determining nutritional status in developing countries is considered to be the family size.

Higher income levels are regarded as a prerequisite for the improved nutritional status of household [Berg (1973); Levinson and Morinda (1974); Seyoam, Kindaue and Gebru (1986)]. It is posited that, with improvement in a household's income, the absolute expenditure on food is likely to go up as also the intake of four essential nutrients.[1] It has been observed in various studies that food intake level in developing countries varies significantly across income classes (Seyoam, Kindaue and Gebru (1986). A World Bank study underscored the fact that serious and intensive nutritional deficiencies that exist in almost all developing countries are largely a reflection of poverty (World Development Report 1980).

A large family size may adversely affect the nutritional status of every member of a household because it may be associated with decreased per capita human impact i.e. the allocation of food per member is likely to decrease with the increase in the number of household members which, in turn, may have a negative effect on per capita nutrient intake.

The main objective of this study is to evaluate the intake of energy, protein, vitamins and minerals by rural and urban households across income groups and provinces. A relationship between household income and size with food nutrients will be developed to see the impact of these economic and demographic variables on the level of nutrient intake. This analysis may be very fruitful because preferences for food nutrients so obtained can be useful in indicating which foodstuffs are preferred to meet the required allowance of the four important nutrients.

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[1] Calories, Protein, Vitamins and Minerals.

METHODOLOGY

The data employed in this study is classified on the basis of different income groups selected from the rural and urban structure in Pakistan. Food items have been selected from the Household Income and Expenditure Survey for the year 1979. Food nutrients are calculated from the Food Composition Table Planning and Development Division, (1985). Four nutrients i.e. energy, protein, vitamins and minerals are considered to be important indicators of the nutritional status of a household. To estimate an average level of intake of various nutrients, the quantities of various food items consumed by different income groups are multiplied by its constituents contained in 1000 grams of the given food items. The work is carried out for rural and urban sectors of all the four provinces. The impact of household income and size will be tested for nutrient intake of different income groups. Adequacy of this relationship will be examined through a log-linear function.[2]

RESULTS

Energy and Protein Intake

A number of nutritionists have strongly argued that protein is inefficiently metabolized whenever energy intake is inadequate for human requirement [Goldman and Ranade (1974); Butt and Mahmood (1986); Food and Agricultural Organization (1974)]. They emphasize that adequacy of energy intake must receive first consideration so that any additional protein supplied to meet the estimated protein needs will be efficiently utilized for body growth, and repair and maintenance. The figures of energy intake by households in rural areas of the Punjab and NWFP as reported in Table 1, are almost equal to the recommended allowance of energy.[3] Other provinces are deficient in energy intake. The most deficient groups belong to Baluchistan and the urban areas of Sind. Carbohydrates are the main source of energy intake in Pakistan. Protein intake is more than the recommended allowance but, in fact, in most of the regions, particularly in the lower income groups, it is utilized more for energy purposes rather than for growth and maintenance of the body. Table 3 also highlights the sources of energy, protein, fats and carbohydrates. In all urban areas the percentage of animal protein is higher than that of rural areas. The opposite results are observed in the case of fats. In rural areas of Punjab and Sind 55 percent and 44 percent of fat intake is from animals. The greater use of 'desi

[2] $\text{Log } xi = i + i \log Y + i \log S$

where

xi = Stands for various food nutrients consumed by a household

S = Household Size

Y = Household income (in Rs).

[3] The recommended allowances of various nutrients, as reported in Table 2 are calculated keeping in view the age and sex distribution of the population in rural urban areas.

Table 1

Food Nutrient Intake by Region

		Punjab		Sind		NWFP		Baluchistan	
		Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
Calories	(kcal)	2326	2045	2067	1816	2264	2011	1782	1792
Protein	(gm)	68	59	56	51	64	56	50	50
Fats	(gm)	44	47	48	48	45	51	36	40
Carbo-hyderates	(gm)	419	348	353	294	407	334	313	309
Calcium	(mg)	584.21	502.45	522.94	405.59	437.34	446.30	340.34	334.11
Iron	(mg)	29.77	24.75	23.67	20.50	27.85	23.22	21.52	20.23
Thiamin	(mg)	2.05	1.68	1.54	1.38	1.90	1.54	1.49	1.47
Riboflavin	(mg)	1.11	0.98	0.98	0.85	1.01	0.93	0.78	0.78
Niacin-B	(mg)	10.09	16.52	16.73	15.13	18.40	16.09	15.10	15.36
Carotene	(mcg)	689.93	742.99	509.68	588.06	671.49	718.54	466.50	585.82
Ascorbic Acid	(mg)	30.62	36.54	24.23	30.91	28.22	33.40	18.51	27.11

Table 2

Food Nutrient Requirement by Region

		Punjab		Sind		NWFP		Baluchistan	
		Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
Calories	(kcal)	2339	2355	2296	2290	2241	2350	2462	2232
Protein	(gm)	29	29	28	28	27	29	31	29
Calcium	(mg)								
Lower Limit		440	440	440	440	440	440	440	
Upper Limit		540	540	540	540	540	540	540	
Iron	(mg)								
Lower Limit		7.68	7.64	7.39	7.16	7.52	7.46	7.65	6.97
Upper Limit		14.87	14.99	14.27	13.59	14.83	14.34	14.99	14.23
Thiamin	(mg)	0.93	0.94	0.91	0.90	0.93	0.89	0.99	0.93
Riboflavin	(mg)	1.40	1.40	1.37	1.36	1.34	1.42	1.48	1.39
Niacin	(mg)	15.44	15.54	15.16	15.12	14.79	15.48	16.42	15.39
Vitamin A	(mcg)	600.20	603.20	578.62	580.40	558.53	597.59	623.17	586.17
Ascorbic Acid	(mg)	26.06	26.18	25.52	25.25	25.05	25.97	27.22	25.67

Table 3

Animal viz-a-viz *Vegetables Sources*

(in percent)

	Calories		Protein		Carbo-hyderates		Fats	
	Animal	Vege-table	Animal	Vege-table	Animal	Vege-table	Animal	Vege-table
Punjab								
Rural	13	87	15	85	2	98	55	45
Urban	11	89	19	81	2	98	35	65
Sind								
Rural	14	86	22	78	3	97	44	56
Urban	11	89	24	76	2	98	27	73
NWFP								
Rural	19	81	15	85	2	98	31	69
Urban	11	89	22	78	2	98	29	71
Baluchistan								
Rural	7	93	14	86	1	99	26	74
Urban	8	92	19	81	1	99	22	78

ghee' (butter oil) is the main cause. In the urban areas preference for poultry, fish and mutton are the cause of higher animal protein intake.

The same is true for the adverse effect of household size. The results obtained for household size elasticity for animal protein in case of rural Punjab are opposite to those obtained for other provinces (Table 4). Here the household size elasticity for energy from animals is positive. This may be due to the reason that large families are in a position to look after a larger number of livestock. On the other hand, in urban areas of Sind the adverse effect of household size on energy intake is greater than the positive effect of household income. This shows that the incidence of malnutrition in this region of Pakistan is mainly due to growth in household size and lower purchasing power. There may be other reasons like varied diet patterns, illiteracy, and ignorance, etc.

Vitamins and Minerals

In this paper, five major vitamins i.e. Thiamin (Vitamin B), Riboflavin Vitamin (B2), B Carotene (Vitamin A) and Ascorbic Acid (Vitamin C) and two minerals i.e. iron and calcium are analysed across income groups and urban rural areas of the

Table 4

Household Income and Size Elasticities of Various Food Nutrients

	Punjab		Sind		NWFP		Baluchistan	
	Urban	Rural	Urban	Rural	Rural	Urban	Rural	Urban
Calorie Intakes								
Animal Sources								
Income Elasticity	.64	.27	.52	.26	.37	.50	.63	.73
	(11.41)	(3.58)	(9.38)	(5.31)	(3.30)	(4.52)	(9.56)	(2.95)
Size Elasticity	−.49	.58	−.72	−.10	−.32	−.50	−.63	−.50
	(−3.47)	(3.04)	(−7.44)	(−1.10)	(−1.07)	(−2.29)	(−5.93)	(−.89)
Vegetable Sources								
Income Elasticity	.10	.19	.08	−.23	.07	.44	.08	.19
	(6.47)	(10.83)	(1.50)	(−.91)	(2.11)	(8.55)	(0.79)	(2.51)
Size Elasticity	−.13	−.22	−.16	.43	.14	−.64	−.06	−.31
	(−3.35)	(−4.94)	(−1.59)	(0.92)	(1.57)	(−6.36)	(−.36)	(−1.78)
Protein Intake								
Animal Sources								
Income Elasticity	.60	.36	.53	.29	.40	.50	.52	.56
	(10.47)	(3.44)	(10.29)	(8.10)	(3.38)	(5.00)	(8.27)	(2.78)
Size Elasticity	−.39	.43	−.72	−.19	−.33	−.46	−.45	−.24
	(−2.69)	(1.65)	(−7.65)	(−2.84)	(−1.06)	(−2.33)	(−4.56)	(−.52)

Continued –

Table 4 – *(Continued)*

Vegetable Sources								
Income Elasticity	.05	.15	.01	−.38	.05	.44	−.02	.15
	(2.61)	(10.39)	(0.20)	(−1.22)	(1.35)	(7.89)	(−.18)	(1.90)
Size Elasticity	−.09	−.16	−.01	.67	.16	−.72	.13	−.26
	(−1.87)	(−4.16)	(−.11)	(1.9)	(1.54)	(−6.47)	(0.75)	(−1.41)
Fats Intake								
Animal Sources								
Income Elasticity	.68	.24	.53	.26	.37	.51	.71	.78
	(11.64)	(3.14)	(9.0)	(3.96)	(3.07)	(4.54)	(8.28)	(3.16)
Size Elasticity	−.55	.65	−.72	−.07	.28	.50	−.74	−.55
	(−3.67)	(3.29)	(−6.67)	(−.62)	(−.92)	(−2.25)	(−5.50)	(−.97)
Vegetable Sources								
Income Elasticity	.20	.26	.27	.05	.21	.36	.17	.23
	(4.95)	(6.08)	(2.39)	(.44)	(3.08)	(8.81)	(1.53)	(1.82)
Size Elasticity	−.15	−.66	−.54	−.04	−.08	−.36	−.34	−.50
	(−1.19)	(−6.05)	(−2.57)	(−.23)	(−.44)	(−4.51)	(−1.94)	(−1.74)
Carbo-hyderates								
Animal Sources								
Income Elasticity	.49	.23	.45	.19	.37	.40	.56	.86
	(8.19)	(3.43)	(10.04)	(7.59)	(4.61)	(2.74)	(4.70)	(1.54)
Size Elasticity	−.36	.43	−.69	−.10	−.49	−.50	−.43	−.85
	(−2.40)	(2.58)	(−8.45)	(−2.29)	(−2.30)	(−1.74)	(−2.31)	(−.66)

Continued –

Table 4 – *(Continued)*

	Punjab		Sind		NWFP		Baluchistan	
	Urban	Rural	Urban	Rural	Rural	Urban	Rural	Urban
Vegetable Sources								
Income Elasticity	.09	.19	.03	−.29	.04	.45	07	.19
	(6.42)	(10.22)	(.69)	(−1.05)	(1.04)	(8.04)	(.63)	(2.40)
Size Elasticity	−.13	−.19	−.06	.54	.19	−.67	.003	−.28
	(−3.90)	(−3.94)	(−.71)	(1.05)	(2.07)	(−6.17)	(.02)	(−1.56)
Calcium								
Income Elasticity	.33	.24	.27	.11	.24	.41	.25	.40
	(3.68)	(8.35)	(7.20)	(1.55)	(4.91)	(4.65)	(2.72)	(2.00)
Size Elasticity	−.31	.05	−.41	−.02	−.25	−.58	− 17	−.47
	(−9.88)	(.66)	(−5.98)	(−.19)	(−1.92)	(−3.37)	(1.19)	(1.02)
Phosphorous								
Income Elasticity	.15	.22	.10	−.13	.09	.44	.09	.19
	(10.54)	(9.85)	(2.45)	(−.64)	(2.65)	(7.89)	(0.51)	(2.55)
Size Elasticity	−.18	−.13	−.13	.32	.11	−.66	.08	−.24
	(−5.21)	(−2.38)	(−1.77)	(−.83)	(1.22)	(−6.08)	(0.54)	(−1.41)
Iron								
Income Elasticity	.16	.21	.08	−.07	.10	.42	.08	.24
	((8.25)	(11.86)	(.200)	(−.38)	(2.87)	(8.28)	(0.80)	(2.43)
Size Elasticity	−.19	−.12	−.13	−.23	.06	−.62	.01	−.36
	(−3.84)	(−2.70)	(−1.50)	(−.70)	(.65)	(−6.27)	(.04)	(−1.59)

Continued –

Table 4 – *(Continued)*

Thiamine								
Income Elasticity	.09	.17	.04	−.31	.06	.43	−.004	.16
	(5.84)	(11.16)	(0.92)	(−1.07)	(1.61)	(7.70)	(−.04)	(1.96)
Size Elasticity	−.14	−.16	−.04	.59	.16	−.68	.15	−.19
	(−3.58)	(−3.96)	(−.47)	(1.12)	(1.67)	(−6.10)	(1.03)	(−1.04)
Riboflavin								
Income Elasticity	.26	.25	.22	.026	.19	.44	.20	.31
	(11.28)	(10.87)	(6.34)	(.51)	(3.7)	(7.91)	(2.21)	(2.7)
Size Elasticity	−.26	−.10	−.31	.06	−.09	−.64	− 12	−.38
	(−4.45)	(−1.65)	(−4.72)	(.28)	(−.65)	(−5.84)	(−.86)	(1.46)
Niacin								
Income Elasticity	.15	.24	.12	−.15	.11	.45	.08	.24
	(11.54)	(9.49)	(2.64)	(−.65)	(2.63)	(7.48)	(.78)	(2.99)
Size Elasticity	−.18	−.14	−.16	.32	.09	−.66	−.03	−.29
	(−5.39)	(−2.17)	(−1.94)	(.76)	(.82)	(−5.62)	(.16)	(−1.59)
B-Carotene								
Income Elasticity	.41	.34	.34	.07	.35	.44	.13	.44
	(6.12)	(5.92)	(4.16)	(.44)	(3.73)	(3.22)	(.65)	(.93)
Size Elasticity	−.42	−.30	−.40	.17	−.45	−.59	.06	−.21
	(−2.45)	(−2.07)	(−2.63)	(.59)	(−1.81)	(−2.20)	(.19)	(−.20)
Vitamin C								
Income Elasticity	.25	.28	.36	.15	.35	.37	.04	.74
	(2.07)	(3.94)	(7.65)	(1.42)	(3.35)	(3.24)	(.17)	(3.67)
Size Elasticity	−.29	−.30	−.52	−.21	−.58	−.58	.12	−.95
	(−.94)	(−1.86)	(−5.98)	(−1.08)	(−2.03)	(−2.46)	(.32)	(−2.87)

provinces. There are three bases of our analysis: (1) To check the level of nutrient intake in each income group. (2) To check whether a rise in household income or size shows a positive or negative effect on nutrient intake. (3) To make a comparison of nutrient intake across regions at each income group level.

According to Tables 1 and 2 most regions in the country are self-sufficient in Thiamin, Niacin, Iron, Calcium and Ascorbic Acid. But the people living in rural areas of Baluchistan are deficient in Ascorbic Acid, Niacin and Calcium. Their deficiency in Ascorbic Acid and Calcium is serious because on average the recommended allowance for these vitamins and minerals is 27.22 mg, 470 mg and –570 mg respectively while their intake is 18.51 mg and 340.34 mg. They are slightly deficient in Niacin. In this region, the adverse effect of household size is relatively greater than the positive effect of household income on nutrient intake. The major reason for deficiency of Ascorbic Acid and Calcium seems to be either non-availability of food items which contain higher amounts of Ascorbic Acid and Calcium or that these people do not prefer such food items. This conclusion is drawn because we have observed that even people lying in the higher income groups are deficient in Ascorbic Acid and Calcium intake. Price cannot be the cause of these deficiencies in the higher income groups. Another reason may be the ignorance of people about their nutritional requirements. Urban areas of Sind and Baluchistan are also deficient in Calcium intake whereas rural areas of Sind are self-sufficient. In urban areas of Sind and Baluchistan income elasticity is observed to be .27 and .25 respectively. Both elasticities are significant but their magnitudes are relatively low as compared to the magnitude of income elasticity observed for other regions of Pakistan. In Baluchistan, income groups in the Rs 3001 to Rs 3500 range are deficient in Calcium but in the case of Sind higher income groups are taking Calcium in excess of the recommended allowance. The causes of Calcium deficiency in urban areas of Sind and Baluchistan are different. In the case of Sind, low purchasing power and adverse household size are the main causes of deficiency in Calcium intake whereas in Baluchistan non-availability of food items containing sufficient amount of Calcium or ignorance of the people about their nutritional requirements may be the main cause of this deficiency.

Riboflavin is another important vitamin and its deficiency, along with deficiency of energy, brings about diseases like masmaras and kwashiakor. In Pakistan the rich and the poor are deficient in this vitamin which clearly shows that Riboflavin intake is much lower than the recommended allowance. Whole cereals and pulses are the main sources of this vitamin. Polishing of rice and grinding of cereals wastes Riboflavin and this seems to be the main cause of deficiency of this vitamin, at least in the poorer classes.

Vitamin A is derived from two sources i.e. B-Carotene and Retinal. Retinal source of Vitamin A is rare and mostly found in animal foods whereas B-Carotene is

freely available in daily diet and easily accessable. However, the amount of B-Carotene required is twice that of Retinal(Food and Agriculture Organization 1974).

CONCLUSIONS AND POLICY RECOMMENDATIONS

Severe limitations on the purchasing power of the poor is the main cause of malnutrition. Our lower income groups are deficient in energy, Calcium, Vitamin A and Riboflavin. But in rural Punjab, however, the poor are self sufficient in these nutrients.

From the foregoing analysis one can conclude that with improvement in the economic status of the poor, adequate emphasis should be placed on their food consumption patterns. In Baluchistan even the rich are deficient in important nutrients due to their traditional food consumption patterns.

The present study shows that the high rate of population growth in Sind with limited capabilities results in reduced available per capita food demand culminating in various degrees of malnutrition. Briefly, in Pakistan for some nutrients in which all income groups are self-sufficient (protein, thiamin and iron) where there is a wish among high income groups to meet the nutritional requirements by consuming high status food, there is a way for the poor to attain the recommended level through staple food items.

Several measures can be taken to improve the food intake of lower income groups:

1. There is need for family planning to keep the rate of population growth within reasonable limits.
2. Government should take into account a range of foods rather than cash crops only, along with other high nutrient items. Special emphasis should be given to food crops etc.
3. Agricultural prices should be stabilized and nutritious food should be made available in the markets.
4. There is need for an optimal trade-off between cash crops and food crops.
5. Losses due to inefficient handling, transportation and milling should be minimized.
6. It is necessary that basic nutritional educational information should be provided at all levels.
7. Government should introduce minimum wage legislation.

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Comments on "Food and Nutrition in Pakistan (A Cross-regional Study)"

First of all I would like to thank the authors for an interesting and enlightening paper on "Food and Nutrition in Pakistan (A Cross-regional Study)". This paper attempts not only to assess the size of the problem, but also to identify the causes and consequences of inadequate nutrition intake.

I am, however, not a food and nutrition expert and my only "competence in the field", as Dr Chaudhry so kindly put it, is in using the 1979 HIES in our paper to be presented tomorrow. It would have been useful, therefore, for laymen such as myself, if some of the theory behind the work had been given. Obviously because of size limitations, this is difficult.

One of my concerns with the paper is the effect that multicollinearity may have on the equations, as the household size and income variables are likely to be collinear. Investigation into this should be carried out as it could have important effects upon the results. In fact, Sohail Malik *et al.* (1987) in their paper presented at this conference, found the family size variable to be strongly correlated with household income in all years, which led to severe multicollinearity problems. They overcame these by dividing through by family size and conducting their analysis on a per capita basis.

Turning to the tables, the number of people in the various provinces and the R^2 statistic should possibly have been produced, and while it is presumed that the figures in brackets on Table 4 are T-statistics it would be nice to have this confirmed. A more detailed analysis of the allocation of food *amongst* family members would also have been interesting. My particular concern is with women being treated as equal adult members in nutritional consumption. Some of the work carried out by Amartya Sen (amongst others) may be relevant here as he appears to have found that adults in a household may have more nutritional requirements. The female members of the family, however, will need less *vis-a-vis* the male members. (1) The composition of food across regions and provinces, is it the same in terms of minerals, vitamins, energy and protein, and if not, has this been accounted for? Further, the question of quality should be remembered. (2) Is it important to know how family size changes? For instance will there be a different requirement in nutritional terms if the family size is increased through marriage rather than through birth?

I would be interested to see a further piece of work that should be quite easy to achieve and potentially very rewarding. This is, to break down the 1979 HIES into suitable income groups and find if the nutritional level varies as one would expect that it does. I would hypothesize that the more well off are generally above the minimum nutritional level. It would also be interesting to find out what income group had the "best" diet, for example, the very wealthy may not have a nutritionally balanced diet due to their consumption of excess fats/junk food.

Turning to the conclusions, most of the steps to improve the diet of the low income group appear to be perfectly reasonable. If people grow more crops, even highly nutritious ones, they may not consume more as they may still be sold. Solving the nutrition problem by cutting down on exports may not be acceptable, as the foreign exchange earnings could perhaps be used where it would be more socially profitable.

Finally, the work is an interesting starting point for an analysis of nutrition in Pakistan. More experimentation and research in this area must be useful.

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