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Food consumption pattern and dietary diversity

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Introduction

This chapter provides information about the quantities of food items consumed and the dietary diversity of the survey households. Household food consumption has been defined as the total amount of food available for consumption in the household, generally excluding that eaten away from home unless taken from the home (Klaver, Knuiman *et al.* 1982). It serves as a direct indicator of food security as well as a distal proxy for a poverty indicator (WFP 2007). Research on developing countries show that as income increases, the poorest households spend a major share of their additional income on food expenses. This increase in the food budget resulting from rise in income is manifested by increased quantity as well as improved quality of the food (Subramanian and Deaton 1996). Further the share of food expenses increase in their budget, more it is characterized by the diversity in the type of food they acquire and consume, although not necessarily altering their calorie intakes (Behrman and Deolalikar 1989).

Dietary diversity is the sum of the number of different food groups consumed over a given reference period (Hoddinott and Yohannes 2002). It is considered as a proxy to household food security. In poorest households increased food expenditure resulting from additional income is associated with increased quantity and quality of the diet. Diversity in diet is an important outcome in and of itself. A more diversified diet is associated with a number of improved outcomes in areas such as, birth weight, child anthropometric status, and improved hemoglobin concentrations (Swindale and Bilinsky 2006). Diversity in the diet is highly correlated with factors such as caloric and protein adequacy, percentage of protein from animal sources, and household income.

Information about food consumption and diversity in diet is important from the programmatic point of view as it has the potential to be used to effectively change,

modify or add programme activities. Understanding the baseline consumption pattern of the poorest of the poor households and the extent of their dietary diversity is important to assess the impact of the programme in terms of poverty alleviation as well as improvement in their food security, and health and nutritional wellbeing. Also, it will help design policies or programmes targeting specific population which depends on geographical or household characteristics.

Methodology

The STUP baseline survey was conducted on 29,140 households from 19 districts of Bangladesh. This research, however, included households that only had complete dietary information. Therefore, after necessary cleaning of the data, only 21,868 households were finally included in this study, of which 18,956 households were from the STUP I areas while the remaining 2,912 households from the STUP II areas. A structured questionnaire, based on the three-day recall method was applied to gather dietary information. Data was collected from the female members of the households, who are usually more informed about food purchases, intra-household food allocation, cooking and child feeding. The respondents were asked to recall all food items that they had consumed within the last three days prior to the interview. A checklist of food items was used by the enumerators to help the respondents recall the names and amount of the food consumed. The checklist also helped them calculate the number of household members who had eaten during those days.

Per capita calorie consumption was derived by dividing the total household consumption of three days by the number of persons (including guests) in that household for the same time. The quantity of food consumed at household level was first estimated in household measures (i.e., cup, spoon, bowl etc). The enumerators then converted those measures into their raw weight in grams. The amounts of ingredients of cooked food were calculated using a conversion table that had been provided to the enumerator. The food items were pooled into six basic groups for programmatic use as shown in Figure 2. Conversion Factors (CF) were not used during conversion of amount in grams to calorie for any of the food items. Considering this overestimated the actual calorie derived from

the food by 10%, the analysis was done after the adjustment for this increment (Gibson 2005).

The number of persons per day was calculated based on the number of persons who ate at least one meal during any specific day. The total number of persons having a meal in each day was then compared to the other two days and a maximum variability of 3 persons between any of the three days was only considered in the analysis. To standardize the consumption of individuals within households, all children below age 10 years were weighted 0.5 to convert them to adult equivalent (Gibson 2005; BBS 2007).

The enumerators also recorded the amount of money spent on the food consumed during the 3 days prior to data collection. In terms of food produced, received in kind or collected otherwise, where the households did not have to spend money, the expense equivalent for that food item was calculated and used in the analysis. The food expenditure was calculated based on the local market price for the food.

Two dietary diversity scores were used in the analysis based on food groups. The first was based on the six basic food groups, i.e., cereal, pulse, vegetables, fruits, animal products, and oil. The second was based on more diverse food groups created by separating leafy vegetables from 'vegetables', and splitting animal products into meat, fish, egg and milk as suggested by Helen Keller International, Bangladesh and Household Dietary Diversity Indicator Guide (Damton-Hill, Hassan *et al.* 1988; Swindale and Bilinsky 2006).

All analyses for this chapter have been done using STATA version 9 and SPSS WIN version 15.

Results

As expected in the context of rural Bangladesh, the total amount (g) of food intake was significantly higher ($p<0.001$ and $p=0.034$) in economically better-off households compared to the poorer households (NTP vs. TUP) within same STUP areas, as well as

between households (TUP vs. TUP) (p<0.001) of the two areas (Table 1). Further, the between-area comparison shows that the total amount (g) of food consumed by the households of STUP I areas was significantly higher (p<0.001) than the amount consumed by households of STUP II areas. On average about two thirds (62.3%) of the amount consumed by the households had been from cereal-based foods. Within the same area, the share of cereal-based food in the diet (percentage of total intake) was significantly higher (p<0.001 and p=0.028) in TUP households than that of the NTP households. However, there was no difference found between households of the two areas. Marked differences (p<0.001) were observed in the amount intake from pulses between TUP households of the two areas (e.g., 3 vs. 6). Significant (p<0.001) differences were also observed between same categories of households from STUP I and STUP II areas.

The intake of vegetables, which included potato and other roots and tubers, was higher in the non-poor households compared to the poorer households (Table 1). Contrary to the general trend in consumption, however, intake of green leafy vegetables (*shak*) was higher in the TUP households compared to the NTP households (p<0.001). The average amount (83.6g) of animal products consumed by the survey households is identical to national average intake (88.3g) (BBS 2007).

Table 1: Mean per capita per day quantity of food intake (g) by the survey households.

Variable	STUP I			STUP II			*p* values		
	NP (1)	NTP (2)	TUP (3)	NP (4)	NTP (5)	TUP (6)	2 vs. 3	5 vs. 6	3 vs. 6
Total (g)	999.9	921.1	868.8	908.3	849.1	811.5	<0.001	0.034	<0.001
Cereal (g)	587.7	577.6	560.3	538.2	539.5	528.1	<0.001	ns	<0.001
Pulses (g)	12.4	9.6	10.6	22.3	17.8	21.8	ns	ns	<0.001
Vegetables	198.2	194.3	189.3	165.3	158.4	151.2	ns	ns	<0.001
Leafy (g)	40.2	49.2	61.5	25.5	30.1	33.6	<0.001	ns	<0.001
Others (g)*	158.0	145.1	127.8	139.8	128.3	117.6	<0.001	ns	0.033
Fruit (g)	55.2	41.2	30.3	45.0	30.0	22.4	<0.001	ns	ns
Animal product	111.1	70.6	50.9	93.6	68.6	57.9	<0.001	ns	ns
Fish (g)	52.7	39.7	33.7	54.5	43.3	38.8	<0.001	ns	ns
Meat (g)	11.9	5.7	3.4	13.9	11.6	8.3	0.004	ns	0.017
Egg (g)	4.6	2.7	2.6	6	4.1	4.2	ns	ns	0.005
Milk (g)	41.9	22.5	11.1	19.1	9.6	6.6	<0.001	ns	ns
Oil (g)	13.3	10.7	10.3	18.4	15.2	14.4	ns	ns	<0.001
Others (g)	21.9	17.1	17.1	25.5	19.4	15.6	ns	ns	ns
% from cereal	58.8	62.7	64.5	59.3	63.5	65.1	<0.001	0.028	ns
n	**4268**	**8922**	**5766**	**998**	**1268**	**646**			

*includes potato
ns: Not significant at the 5% level

Consistent with the amount of food consumption shown in Table 1, the total calorie intake within STUP areas was higher in economically better-off households compared to the poorer households (i.e., NP vs. NTP, NTP vs. TUP etc.) (Table 2). This trend, however, is not consistent in consumption of other types of food. The households of STUP I areas in general, consumed significantly ($p<0.001$) more calories (2264.1 Kcal) than the households of STUP II (2203.1 Kcal) areas. On average, about four-fifth (80.1%) of the calories consumed by the households were from cereal-based foods. Within the same area, poorer households gained more percentage of energy from cereal-based foods compared to the economically better-off households.

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Calorie intake from vegetables including potato and other roots and tubers, was significantly (p<0.001) higher in TUP from STUP I compared to STUP II households. In contrary to the general trend in Table 2, calorie intake from green leafy vegetables (*shak*) was higher in the TUP households.

The calorie consumed from oil and animal products are significantly higher (p<0.001 and p<0.01 respectively) in households of STUP II areas compared to households of STUP I areas. The calories consumed from oil in households of STUP II areas is about 40% higher than that of STUP I households, however, the consumption of animal products was only found to be 10% higher.

Table 2: Mean per capita per day calorie intake (Kcal) by the survey households.

Variable	STUP I			STUP II			*p* values		
	NP (1)	NTP (2)	TUP (3)	NP (4)	NTP (5)	TUP (6)	2 vs. 3	5 vs. 6	3 vs. 6
Total (Kcal)	2346.4	2210.6	2126.9	2254.4	2159.5	2095.6	<0.001	ns	ns
Cereal (Kcal)	1881.9	1849.9	1794.8	1722.6	1727.4	1690.6	<0.001	ns	<0.001
Pulse (Kcal)	38.5	29.7	32.9	69.1	55.2	67.9	ns	ns	<0.001
Vegetables	114.4	107.0	102.1	98.4	93.3	88.6	<0.001	ns	<0.001
Leafy (Kcal)	15.4	19.6	25.1	9.4	11.0	12.9	<0.001	ns	<0.001
Others (Kcal)*	99.0	87.4	77.0	89.0	82.3	75.7	<0.001	ns	ns
Fruit (Kcal)	36.1	25.7	19.2	30.6	19.9	16.0	<0.001	ns	ns
Animal product	104.0	68.3	53.1	103	76.6	64.1	<0.001	0.043	0.037
Fish (Kcal)	57.0	43.7	37.8	66.0	51.2	44.4	<0.001	ns	ns
Meat (Kcal)	12.3	5.8	3.5	14.2	12.0	8.5	0.005	ns	0.023
Egg (Kcal)	7.3	4.3	4.1	9.6	6.6	6.8	ns	ns	0.004
Milk (Kcal)	27.4	14.5	7.6	13.0	6.8	4.4	<0.001	ns	ns
Oil (Kcal)	108.1	86.8	84.3	148.9	123.2	116.6	ns	ns	<0.001
Others (Kcal)	63.1	42.9	39.4	77.7	59.7	46.0	ns	ns	ns
% from cereal	80.2	83.7	84.4	76.4	80.0	80.7	<0.001	ns	<0.001
n	**4268**	**8922**	**5766**	**998**	**1268**	**646**			

*includes potato
ns: Not significant at the 5% level

The mean food expenditure of the households from STUP II areas (Tk. 27.23) is significantly (p<0.001) higher than that of households of the STUP I areas (Tk. 24.04) (Table 3). The within-area NTP-TUP difference (p<0.001 and p=0.013) and the between-area difference among TUP households (p<0.001) was also found to be significant. Although, the total amount of per capita calorie gained from cereal-based foods is almost 80% over the areas, the households only spent about half (54.7%) of their food expenses on cereal-based food.

The amount spent on purchasing fish by households across areas was about half of the total amount spent on animal products. This does not necessarily indicate the preference of the households for fish over other animal products, but perhaps highlights the wider availability of fish in villages.

Table 3: Mean per capita per day food expenditure (Taka) by survey households.

	STUP I			STUP II			*p* values		
	NP (1)	NTP (2)	TUP (3)	NP (4)	NTP (5)	TUP (6)	2 vs. 3	5 vs. 6	3 vs. 6
Total (Tk.)	26.52	22.35	20.40	30.17	25.52	23.96	<0.001	0.013	<0.001
Cereal (Tk.)	12.79	12.35	11.97	13.68	13.57	13.18	<0.001	ns	<0.001
Pulse (Tk.)	0.65	0.49	0.59	1.07	0.88	1.15	<0.001	0.053	<0.001
Vegetables	2.82	2.42	2.1	2.72	2.25	2.12	<0.001	ns	ns
Leafy (Tk.)	0.26	0.31	0.37	0.31	0.33	0.34	<0.001	ns	ns
Others (Tk.)*	2.56	2.11	1.73	2.41	1.92	1.78	<0.001	ns	ns
Fruit (Tk.)	0.99	0.60	0.45	0.98	0.46	0.41	<0.001	ns	ns
Animal product	6.48	4.18	3.12	7.23	5.4	4.22	<0.001	ns	ns
Fish (Tk.)	3.62	2.68	2.16	4.22	2.98	2.41	<0.001	0.041	ns
Meat (Tk.)	1.55	0.77	0.47	1.80	1.72	1.13	0.014	ns	0.045
Egg (Tk.)	0.47	0.29	0.27	0.61	0.39	0.44	ns	ns	<0.001
Milk (Tk.)	0.84	0.44	0.22	0.60	0.31	0.24	<0.001	ns	ns
Oil (Tk.)	1.15	0.94	0.94	2.55	1.33	1.36	ns	ns	<0.001
Others (Tk.)	1.64	1.37	1.23	1.94	1.63	1.52	<0.001	0.036	ns
% from cereal	48.2	55.3	58.7	46.9	53.2	55.3	<0.001	0.014	0.011
n	**4268**	**8922**	**5766**	**998**	**1268**	**646**			

*includes potato

ns: Not significant at the 5% level

Comparison with national data

We compared the amount of food consumed by households of the STUP areas with the national rural consumption as reported by Household Income and Expenditure Survey (HIES) by Bangladesh Bureau of Statistics (BBS 2007). The method suggested by HKI was followed in defining 'vegetables' and 'other' type of foods which may have varied from the definition that has been used in HIES. We therefore, excluded these two food groups from comparing with the HIES data.

The total amount of food intake by households of the STUP I areas (952.0g) was higher than that of national rural consumption (946.3g). The mean intake of households of STUP II areas (876.3g), however, was much lower than the national rural mean. The share of cereal-based foods is much higher in the households of the STUP areas as percentage of total intake (62.3% vs. 51.3%). The STUP II households consumed a greater amount of pulses, fruits, and oil compared to the national rural average.

Table 4: Comparison of per capita mean amount of food intake of the survey households with Household Income and Expenditure Survey

	STUP I	STUP II	Total	2005 HIES Rural
Total (g)	952.0	876.3	914.2	946.3
Cereals (g)	580.8	538.5	559.7	485.6
Pulse (g)	10.9	20.1	15.5	12.7
Vegetables (g)*	195.7	161.5	178.6	218.4
Fruit (g)	46.6	37.0	41.8	32.4
Animal product (g)	86.9	80.2	83.6	88.3
Oil (g)	11.9	16.7	14.3	14.3
Others (g)	19.2	22.3	20.7	94.6
% from cereal	62.2	62.5	62.3	51.3

*includes potato

The amount of major food groups (i.e., cereal, pulse, vegetables, fruits, animal product, and cooking oil) consumed by the survey households have been compared to the

recommended intake[1] for a Bangladeshi individual (Figure 1 and Table 5). Expectedly, the average total amount (i.e., 891.2 g/person/day) consumed from the major food groups by all categories of households is much lower compared to the recommended intake (i.e., 1015 g/person/day). The quality of their diet is also compromised by adding more of cheaper cereal-based foods to achieve fulfilling volumes of food. The bulk of the cereal-based food took shares of the other food groups, further compromising a balanced diet that is important for a healthy life.

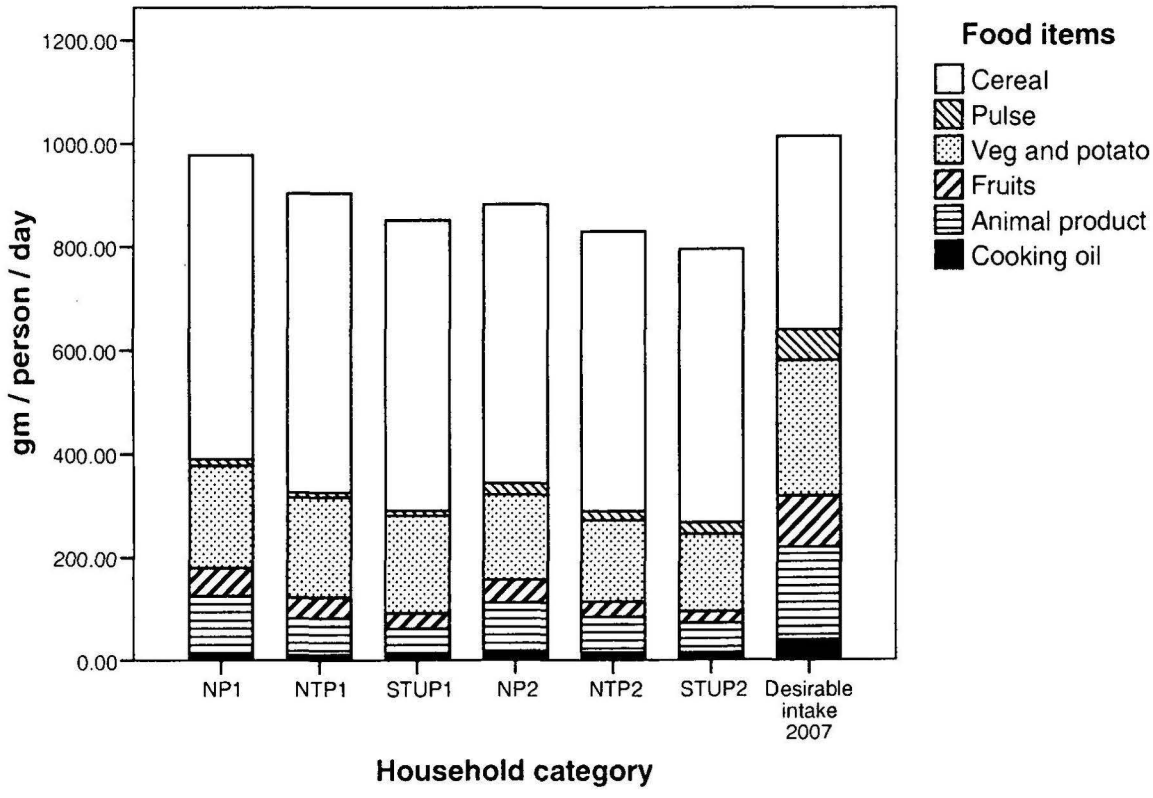

Figure 1: Consumption (gram) of selected food groups of the survey households compared to the recommended intake for Bangladeshi individuals.

[1] National Food Policy Capacity Strengthening Project, Food Planning and Monitoring Unit Ministry of Flood and Disaster Management/ Ministry of Agriculture, Government of Bangladesh expert consultation, August 2007

To achieve the recommended intake, consumption of cereal-based foods need to be reduced to about two-thirds (67.7%) of the current consumption of the STUP households (Figure 1 and Table 5). Conversely, the amount consumed from all other food groups need to be increased by varying degrees. Pulse consumption should be increased by four times, while vegetables by 1.5 times of the current intake. In addition, as much as three times more fruits, animal products, and oil need to be added to the diets of the survey households to achieve the recommended intake amount.

Table 5: Consumption (gram) of selected food groups of the survey households compared to the recommended intake for Bangladeshi individuals.

	STUP I			STUP II			Desirable intake
	NP	NTP	TUP	NP	NTP	TUP	2007
Cereals (g)	587.7	577.5	560.2	538.2	539.5	528.1	375
Pulse (g)	12.4	9.6	10.6	22.3	17.8	21.8	60
Vegetables* (g)	198.2	194.3	189.3	165.3	158.4	151.2	260
Fruit (g)	55.2	41.2	30.3	45.0	30.2	22.5	100
Animal pro	111.1	70.6	50.9	93.6	68.6	57.9	180
Oil (g)	13.4	10.7	10.4	18.4	15.2	14.4	40
Total	978	903.9	851.7	882.8	829.7	795.9	1015

*includes potato

Similar to the calorie consumption pattern, we observed much the same monotonic trend in dietary diversity within households of the STUP I and STUP II areas. In general, the households of STUP I areas consumed fewer varieties of food compared to the households of STUP II areas (Figure 2). The differences between NTP and TUP households within the same areas were also pronounced. Across STUP I and STUP II areas, about two-thirds (66.8% and 69.5%) of the non-poor households and half (44.3% and 54.0%) of the poorer households consumed 5 or more major food groups. More than a fifth (23.4% and 21.9%) of the non-poor households and about a tenth of the poorer households (8.9% and 10.5%) in both areas consumed all 6 food groups.

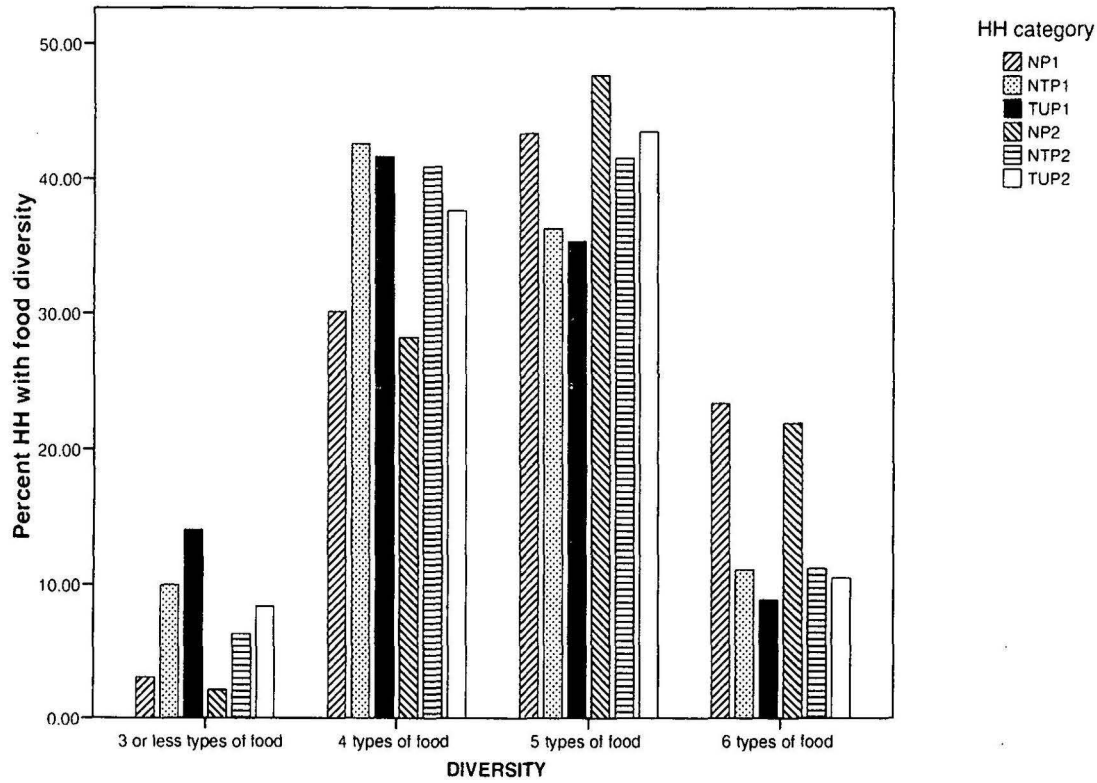

Figure 2: Proportion of households achieving dietary diversity (six food groups).

We explored the food groups that lacked most in achieving a completely diverse diet covering the major (i.e., macro-nutrient) six food groups (Figure 3). Results show that fruits and pulses were the food groups that were most deficient in all types of households. Very small percentages of households were found to be lacking oil or animal protein in their diet, while only few were deficient in vegetables. As expected, none of the households were found deficient in cereal-based food in their diet. More than half (ranging from 56.2% to 80.3%) of all household categories fell short of only fruits in their diets across areas with more percentage of STUP II households lacking fruits compared to the STUP I households. The NTP-TUP household differences in both areas were also found significant ($p<0.01$) in terms of deficiency only in fruits to achieve a completely diverse diet. Conversely, fewer STUP II households lacked pulse in their diet

compared to the STUP I households. Similar NTP-TUP differences were observed in both areas although in a reverse direction.

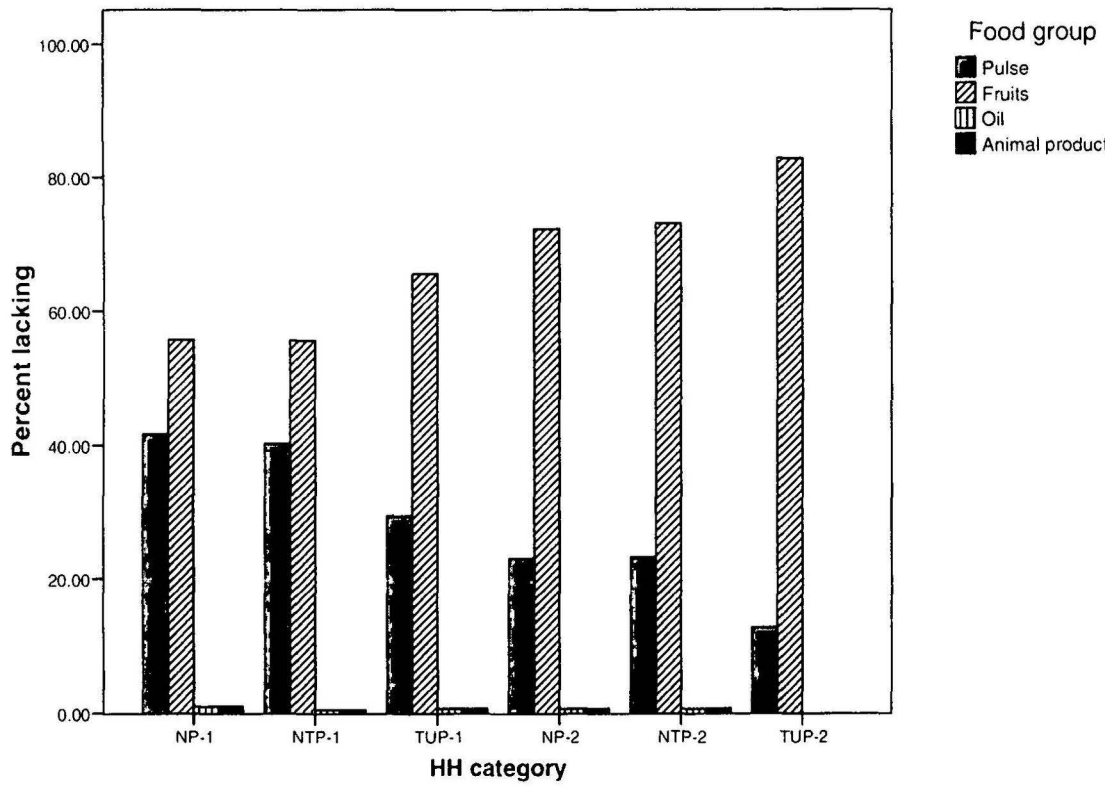

Figure 3: Proportion of household by categories lacking only one group of food in achieving diversity in their diet (six groups).

Further exploration of dietary diversity shows that about 80% of all households consumed six or more out of 12 food groups (as mentioned in the methodology section). Only a small percentage (0.7%) of households consumed all food groups. These household were therefore, not included in the graphical presentation. The percentage of households decreased with the increase in dietary diversity score.

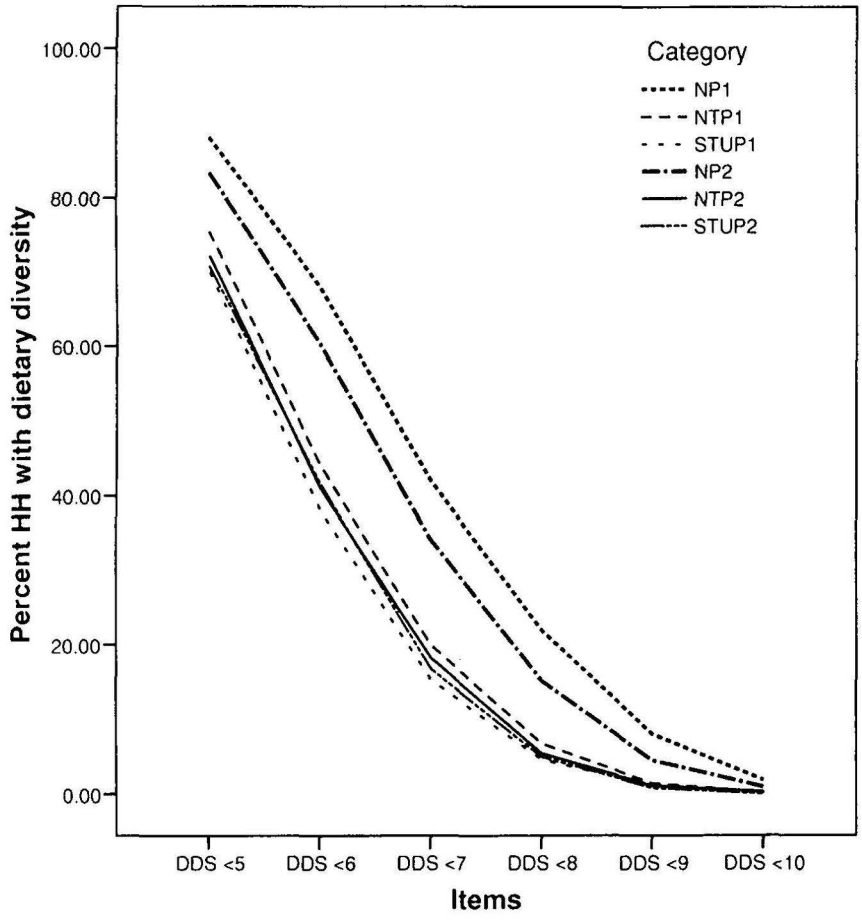

Figure 4: Proportion of households achieving dietary diversity (12 food groups).

Discussion and conclusion

The major purpose of this study was to create a benchmark profile of the TUP households to evaluate the impact of the programme after a certain period of intervention. Another aim was to suggest the programme implementers on specific issues to strengthening the intervention components. We focused on four key findings of the study. First, the food consumed by the TUP households was much lower in amount compared to the

recommended intake for Bangladeshis as set by the national expert committee. The intake was also lower than the mean national rural intake. Second, although the STUP II households consumed lesser calories, their food expenditure was significantly higher than that of STUP I households. Third, across areas, percentage of calorie intake from cereal-based foods was much higher than the recommended intake and the national average. Forth, the diet of the TUP households is far from reaching the desirable diversity in major food groups.

Within the same area, the higher calorie intake of the non-poor (NP) households compared to the poorer (TUP) households supports the findings of the study that the calorie intake increases with a rise in income in the developing countries **(Subramanian and Deaton 1996)**. On the contrary, the households of STUP II areas consumed less calories than households of the STUP I areas, although they spent more money in buying food (BBS 2004). This suggests that the households of the economically better-off areas (i.e., STUP II) may have had consumed relatively pricey food items such as pulse, fish, meat, and egg, inclusion of which in their diet added quality but not necessarily increased the total calorie intake (Behrman and Deolalikar 1989). Further, adding these non-inferior food items, i.e., demand of which increases with increase in income, improved the diversity of their diet.

This phenomenon is also consistent with the characteristics of the households from poorer socio-economic areas where the cheaper cereal-based food adds to the bulk of the food volume to provide fulfilling meals. The share of expenses of the pricey food items replaced the cheaper cereal-based foods and vegetables in the households of STUP II areas. Such increased calorie consumption of oil and animal product may have been also due to the relief packages that composed mainly of rice, pulse, and oil.

The difference between STUP areas in the consumption of pulses, animal protein, and oil may have been due to the variation in the availability of animal protein and pulses in the southern areas. The southern districts may have a different food culture with higher dependency on pulses compared to the northern districts. Another likely explanation

could be based on the composition of food relief that had been provided to the households affected by hurricane *Sidr* in some of the southern districts (STUP II) of Bangladesh. The high amount of pulses and oil that had been provided to the households to meet their protein needs may have allowed the households to spare money to buy more animal food which leveraged the consumption of quality proteins of all STUP II households.

The pulse supplementation provided by the program to the TUP households has the potential to improve the quality as well as add diversity to their diets. Previous studies on TUP households show that the intervention did not change pulse consumption, although it did increase the intake of animal protein by the households (Haseen 2007). It is likely that the income generating activities of the program particularly relating to poultry, goat and cow rearing also has the potential to improve the quality of the diets of the ultra poor. Efforts should continue, however, to find out way to sustainably include animal protein in the diets of TUP households not involved in IGA related to poultry and livestock.

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